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Impact of barriers to SARS-Cov-2 vaccination uptake in HIV-infected patients

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Abstract: HIV-positive (PLWH) persons should take the SARS-CoV-2 vaccination first due to the increased risk of developing a deadly strain of COVID-19. That's why it's important to monitor population vaccination rates and identify PLWH who aren't immunized. PLWH were examined for SARS-CoV-2 immunization and non-vaccination. It was a cross-sectional study, conducted in the Tehsil Headquarters Hospital Sohawa from May-October 2021. Ninety five HIV-positive patients of both genders were presented. 14-60 years were the age of patients. HIV, demographics, and vaccination status were collected after written informed consent. Clinically adverse outcomes were assessed among vaccinated and non-vaccinated HIV infected patients. There were 56 (58.9%) males and 39 (41.1%) females. Frequency of homosexual transmission group was higher among 48 (50.2%) cases, followed by heterosexual group 25 (26.3%), 15 (15.8%) patients with injected drugs and 7 (7.4%) patients were HIV-infected with other reason. We found that 54 (56.8%) patients were vaccinated and 41 (43.2%) patients were unvaccinated. Frequency of ICU stay and mortality was significantly higher among non-vaccinated patients with p value <0.005. Non-vaccinated patients cited no-safety, medical facility distrust, and covid-19 as a transient illness. This study found HIV-unvaccinated people had increased odds of unfavorable outcomes.

Keywords: HIV-positive, covid-19 vaccination, adverse outcomes**,** perceptions.

INTRODUCTION

The acquired immunodeficiency syndrome (AIDS) is caused by the human immunodeficiency virus (HIV), a ribonucleic acid virus that is a member of the lentivirus genus of the Retroviridae family (Ferguson *et al.,* 2002. AIDS is characterized by a compromised immune response and opportunistic infections. HIV-1 is the more common strain, however HIV-2 also exists (HIV-2). Although HIV-1 and HIV-2 have comparable pathogenic properties and tend to advance to AIDS in infected persons, HIV-2 is less virulent and epidemiologically limited to western Africa compared to HIV-1, which is more widely disseminated and has a higher tendency to progression (Nyamweya *et al.,* 2013). According to the Joint United Nations Programme on HIV and AIDS (UNAIDS), between the years of 2020 and June 2021, there were 38 million persons living with HIV worldwide [(UNAIDS) TJUNPoHA. Global HIV & AIDS statistics fact sheet 1981]. Since the beginning of the HIV pandemic in 1981, around 80 million individuals have been infected and about 1.5 million have died from AIDS-related diseases within the same time period (Feola *et al.,* 2006). People living with HIV (PLWH) may be more susceptible to opportunistic infections, especially those with high HIV viremia, because of the alterations in innate and adaptive immune function associated with HIV/AIDS (US Food and Drug Administration COVID-19 Vaccines 2021).

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Although the first epidemic of SARS-CoV-2, the virus that produces COVID-19, subsided about two years ago, the threat to global public health posed by many variants of the virus that appear to be more contagious persists. Both the World Health Organization in Geneva, Switzerland and the Food and Drug Administration in Silver Spring, Maryland, USA have identified effective vaccination coverage as the most critical method for containing the continuing COVID-19 epidemic. The federal government, state governments and municipal governments have all made it a top priority to increase vaccination rates after an emergency authorisation was granted for the distribution of several vaccinations [World Health Organization Corona virus Disease (COVID-19): Herd Immunity, Lockdowns and COVID-19. 2020]. The efforts to eradicate COVID-19 may be hampered, however (Fisk, 2021), by members of underrepresented communities who either refuse vaccination or cannot obtain it. Inability to get the vaccine is a major factor in the low vaccination rate (e.g., transportation, cost and location of services). Vaccine hesitancy, which is defined as the delay in the acceptance or refusal of vaccinations despite availability (Bhaskaran *et al.,* 2021) is a major obstacle to adoption, especially among minority communities and can be linked, at least in part, to mistrust in the health care system and the vaccine itself.

HIV's possible link to COVID-19 is still up for debate, with studies and speculations ranging from inconclusive to downright contradictory. COVID-19 has been linked in certain studies (Lee *et al.,* 2021) to a higher risk of severe

illness and mortality in PLWH compared to HIV-negative persons, although these findings have been disputed by other research (DCoAEoA-HdS Group 2010). This is because of the disparity in the data that is accessible, in addition to the presence of a number of basic confounders that may influence the risk of death in PLWH (Van Hout and Hope 2019). These confounders include socioeconomic status, race, access to antiretroviral medication (ART), and age. Importantly, ART has been linked to a decreased incidence of opportunistic infections in PLWH and has been shown to restore effective immunity. Mellor *et al*. found that greater CD^{4+} T-cell counts in PLWH who were receiving ART were related with a lower probability of contracting COVID-19. The immunological response to immunisation in PLWH may be negatively impacted by ART because of the risk of severe acute inflammatory response syndrome or chronic inflammation. An efficient worldwide strategy for COVID-19 immunisation is further complicated by the low availability and adoption of ART therapy in specific locations, notably South-East Asia and Africa (Hariyanto *et al.,* 2021). Furthermore, the COVID-19 pandemic's shock to global health systems led to disruptions in normal HIV care, such as lower ART adoption, loss to follow up and social and mental health difficulties. When taken together, they create a perfect storm that contributes to worse clinical outcomes of COVID-19 in PLWH, especially in developing countries where the HIV epidemic is most widespread. The incidence of severe COVID-19 in Africa is greater than in North America, according to recent systematic reviews and meta-analyses (Consejo International, Sistema Nacional de Salud: Madrid, Spain, 2021). Therefore, the correlation between COVID-19 and HIV infection is convoluted and specific geographical and sub-populational characteristics must be taken into account on an individual basis.

Those who were older, had many chronic conditions, or worked in high-risk industries were given vaccination priority during the campaign (Vallée *et al.,* 2021, regardless of whether or not they tested positive for HIV. Priority categories for immunisation expanded to include PLWH with a CD4 cell count of less than 200 cells per L and those younger than 60 years old with chronic illnesses on March 21, 2021 (Vallée *et al.,* 2021. However, there is scant data on how immunizations were distributed to at-risk populations. Previous researches have reported that despite PLWH having a higher risk of infection than the overall HIV-negative population, they are less likely to get vaccinated against other infectious illnesses. Concerns voiced by PLWH regarding vaccines include the potential for adverse clinical consequences, the potential for a deterioration of the diagnosis of HIV infection, and the potential for a subpar immunological response because to their already impaired immune systems. Reports of vaccine hesitancy in this population (Ackah *et al.,* 2022) highlight the need for epidemiology of vaccination coverage between many PLWH and the timely identification of poorly sub-groups. This is due to cultural and social differences present in this population may make vaccines inaccessible to them.

This study was conducted to determine the covid-19 vaccination status among HIV-positive cases and to report any adverse outcomes.

MATERIALS AND METHODS

This cross-sectional study was conducted at Tehsil Headquarters Hospital Sohawa and comprised of HIV-infected patients**.** Patients were aged between 14-60 years. Participants were asked about their age, sex, race, sexual orientation, level of education, income, marital status, political leanings (conservative, medium or low, liberal, or other), number of years since HIV diagnosis, current HIV viral load suppression status, and annual influenza vaccination habits, among other socio-demographic and health-related questions. Alcohol consumption was assessed by means of the Alcohol Use Disorders Identification Test (AUDIT-C) (screening cut-offs of 4 for men and of 3 for women linked with the existence of a drinking disorder (AUD). In addition, participants were queried as to whether or not they had already been checked for COVID-19, whether or not they or anybody in their families had been afflicted with or had died from COVID-19 since January 2020 and whether or not they had had any signs of COVID-19 since that time. Only individuals receiving clinical follow-up treatment and who had recently accessed the public health care system were considered for inclusion in this research.

Sample size

Sample size was 95 patients with HIV infection, confidence interval 95%; using WHO software for sample size calculation.

Inclusion criteria

HIV diagnosed patients
Both genders
Age 14-60 years
Alcohol consumers

Exclusion criteria

Patients <14 years of age, cardiac failure, severe other medical illness and those were not agreed to provide written consent were excluded from this study.

The study was conducted after approval of hospital ethical committee. Hospitalizations (more than 24h having diagnosis of respiratory illness and any of the following conditions: dyspnea, tachypnea, hypoxemia, hypoxia, or hyperventilation), ICU admissions (suffered respiratory distress or sepsis) and related clinical outcomes were collected. Getting vaccinated against SARS-CoV-2 was

the main result (as a binary: vaccinated or unvaccinated). HIV-related factors, including median years on ART, current ART, and most recently CD4 cell count; HIV-exposure risk categories, including PWID, MSM, male heterosexual, and female homo/hetero/bisexual; and median years on ART, present ART, and most latest CD4 cell count.

STATISTICAL ANALYSIS

SPSS 24.0 was used to analyze data. Chi-square and t test was used to determine significant difference <0.005. Mean standard deviation, frequencies and percentages were use for categorical variables.

RESULTS

There were 56 (58.9%) males and 39 (41.1%) females. (fig. 1). Among 95 cases, 49 (51.6%) patients were from rural areas and 46 (48.4%) cases from urban areas. Majority patients 56 (58.9%) were not educated. 60 (63.2%) cases were single and 35 (36.8%) patients were married. Frequency of homosexual transmission group was higher among 48 (50.2%) cases, followed by heterosexual group 25 (26.3%), 15 (15.8%) patients with injected drugs and 7 (7.4%) patients were HIV-infected with other reason. Eleven (11.6%) patients had history of corona-virus disease. We found that 51 (53.7%) patients had CD4 count >500 cells/µL. (table 1).

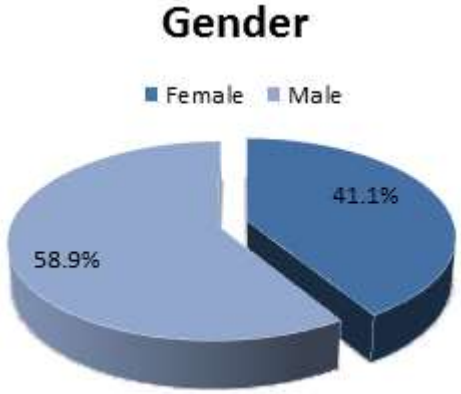

Fig. 1: HIV-positive patients with gender distribution

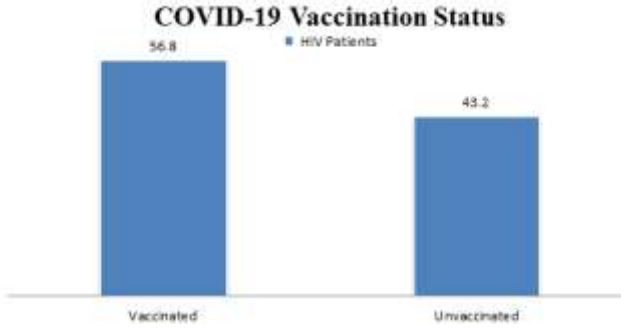

Fig. 2: Vaccination status among all cases

We found that 54 (56.8%) patients were vaccinated and 41 (43.2%) patients were unvaccinated (fig. 2). Among non-vaccinated cases no-safety, no-trust on medical centers and covid-19 is temporary infection were the most common reasons/perceptions of non-vaccination (table 2). Frequency of ICU stay and mortality was significantly higher among non-vaccinated patients with p value <0.005 (table 3).

Table 1: Patients with baseline characteristics

Variables	Frequency	Percentage
Residence		
Rural	49	51.6
Urban	46	48.4
Education Status		
Educated	56	58.9
Non-Educated	39	41.1
Cause of HIV		
Homosexual	48	50.2
Heterosexual	25	26.3
Drug Injected	15	15.8
Others	7	7.4
History of Coronavirus		
Yes	11	11.6
No	84	88.4
CD4 count (cells/µL)		
>500	51	53.7
<500	44	46.3

Table 2: Perception of Covid-19 vaccine among non-vaccination cases

Variables	Frequency	Percentage
Perception		
No-safety	18	43.9
No-trust on medical centers	13	31.7
Covid-19 is temporary	10	24.4
Total	41	100

DISCUSSION

The purpose of the study was to determine the acceptance rate of the COVID-19 vaccination as well as probable explanations for the reluctance of HIV-positive individuals to receive the vaccine. In previous study, possible explanations for the vaccine's reluctance to be used include the following: the vaccine's adverse effects; questions over the vaccine's safety, efficacy and effectiveness. The short period of the clinical trials; COVID-19 infections; a lack of knowledge; and social trust (Luo *et al.,* 2021). In our analysis, no-safety of vaccine, no-trust on medical centers and covid-19 is temporary infection were the most common reasons/perceptions of non-vaccination.

Table 3: Frequency of ICU stay and mortality among all cases

Variables	Vaccinated (54)	Non-Vaccinated (41)	P value
ICU Stay			
Yes	3 (5.6%)	12 (29.3%)	0.002
No	51 (94.4%)	29 (70.7%)	
Mortality			
Yes	0	5 (12.2%)	0.004
No	54 (100%)	36 (87.8%)	

In our study the immunization uptake rate for COVID-19 was 56.8% overall. This is greater than an observational research done in the United States, which found 36%, and on par with a prior literature review and morpho from the Western world, which found 51% (Shekhar *et al.,* 2021). Our estimate is less than those found in observational studies performed in China (86.2%), France (76.9%), Saudi Arabia (64.9%), Canada (80.2%), Germany (91.7%), and the United Kingdom (59.0%) (Xu *et al.,* 2021; Gagneux-Brunon *et al.,* 2021, Elharake 2021, Dzieciolowska 2021, Holzmann-Littig 2021, Abuown 2021 and Wonodi 2021). Reasons for the continent's poor vaccination acceptance rate for COVID-19 may include people's lack of faith in the vaccine, the proliferation of false information in the media, conspiracy theories, the infodemic, people's religious convictions, and their lack of vaccination history (Pollán *et al*., 2022).

Existing research has shown that migrants are more likely to contract COVID-19 than the general public (Nomah *et al.,* 2021) and PLWH (Robinson *et al.,* 2021). Not surprisingly, a lower rate of vaccine coverage was discovered among this population. It is possible that immigrants access to SARS-CoV-2 vaccinations is hampered by the fact that they suffer systemic obstacles to healthcare access and are influenced by a wide range of socioeconomic determinants of health. Lower vaccination rates and greater vaccine reluctance have been reported amongst migrants and many other ethnic minority groups (Dror *et al.,* 2020). This study raises serious concerns and necessitates additional research into the reasons for the low level of acceptance and the hurdles to healthcare and vaccination availability among migrants who are HIV positive.

According to the results of our study, those who did not have a long-term partner at the time of the study were much less likely to have had the vaccination. Theoretically it is considered that a significant proportion of people who do not have families opt to live by themselves, which may result in vaccination being less of a priority. According to the research that has been published, having children living in the household or being a parent are both unfavorable predictors of COVID-19 vaccination. This might be because parents are worried that the vaccine's side effects would impair their ability to provide adequate care for their children if they get it. More research is necessary in order to comprehend how the responsibility of looking for a kid or another adult could have impacted the unwillingness of PWH to be vaccinated. Since the vaccine can only be licensed for use in children aged 12 and older, school-based programmes that encourage immunization within the family as a whole might be an alternative worth considering (Centers for Disease Control and Prevention COVID-19 Vaccines for Children and Teens 2019).

The lower incidence of SARS-CoV-2 prognosis, related hospital admissions and ICU hospitalizations and fatalities among vaccinated PLWH in comparison with those who were not vaccinated is a key indicator of the benefits gained from SARS-CoV-2 vaccinations in this group There is a need for more study to assess the effectiveness of vaccinations among PLWH as well as the influence of immunization on poor clinical outcomes in settings that are more representative of the real world.

CONCLUSION

We concluded in this study that HIV non vaccinated patients had higher risks of adverse outcomes. There is need to change perception of patients regarding Covid-19 vaccination because vaccine resulted higher protection rate against infectious disease.

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