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Research Article

COVID-19 Vaccine Risk Perception and Associated Vaccine Hesitancy Among HIV-Infected People at Parirenyatwa Centre of Excellence

Moreblessing Fungirayi[1], Judith Rukweza[1], Maxwell Mhlanga[2, *]

[1]Department of Nursing Science, University of Zimbabwe, Harare, Zimbabwe
[2]Centre of Gender Equity, University of Global Health Equity, Kigali, Rwanda

Abstract

Background: The impact of COVID-19 on people living with HIV (PLWH) is particularly concerning due to their existing health vulnerabilities. The low uptake of the COVID-19 vaccine and the failure to achieve herd immunity highlight the need to address vaccine hesitancy, especially in developing countries battling multiple infectious diseases. *Objective:* This study aimed to determine the relationship between COVID-19 vaccine risk perception and vaccine hesitancy among PLWH. *Materials and Methods:* An analytical cross-sectional design was used, involving 348 participants from Parirenyatwa Centre of Excellence, recruited via systematic random sampling. Data collection, following ethical approval, was conducted using a self-administered questionnaire. The data were categorized into structure, process, and outcome, and analyzed with SPSS version 22. *Results:* The study found that 79.9% of PLWH perceived a risk in taking the COVID-19 vaccine. About 55% had moderate knowledge of COVID-19, and 48.4% of those vaccinated had completed the vaccine course, with 43.2% receiving two doses and 7.2% only one dose. Motivations for vaccination included accessing services, travel compliance, work allowances, and entry permissions. Vaccine hesitancy was evident in 56% of participants, who were also unlikely to recommend vaccination to others. A positive correlation ($r=0.159$, $p<0.03$) was observed between vaccine risk perception and hesitancy. Barriers included fear of long waits, vaccine safety concerns, and insufficient information. *Conclusions:* The study demonstrated a significant positive correlation between vaccine risk perception and hesitancy among PLWH. It underscores the necessity of tailored vaccination messages addressing the specific concerns of PLWH and the need for increased governmental investment in awareness campaigns to achieve 75% herd immunity.

Keywords

COVID-19, COVID-19 Vaccine, Risk Perception, Vaccine Hesitancy, PLWH

1. Introduction

Coronavirus disease (COVID-19) is a disease that was first discovered in China in 2019 and was immediately declared a pandemic by the World Health Organization [1]. Since the onset of the pandemic, there has been low uptake of the COVID-19 vaccine despite its development. Vaccine risk perception has been greatly associated with vaccine hes-

*Corresponding author: mmhlanga@ughe.org(Maxwell Mhlanga)

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itancy, resulting in low vaccine uptake and higher mortality rates.

The primary aim of vaccination, besides protecting individuals, is to achieve herd immunity, wherein indirect protection of the population occurs through vaccination or immunity developed from a previous infection [2]. The herd immunity threshold varies depending on the disease; for example, herd immunity for measles is at 95%. However, the threshold for COVID-19 is still unknown. Zimbabwe began its vaccination campaign in February 2021, ambitiously targeting 60% of its eligible population by December 2021 [2]. The eligible population for vaccination in Zimbabwe has since been expanded from individuals aged 16 and above to those aged 12 and above [3]. Those without active COVID-19 disease and those who are not severely immune-compromised are eligible for the vaccine [4].

Vaccine hesitancy has existed since the advent of vaccines in the 1800s [5]. Like other vaccines, the COVID-19 vaccine has faced resistance and hesitancy [6-8]. This hesitancy has been aggravated by the improper use of social media [9]. Vaccine hesitancy is a significant problem in public health as it serves as a major barrier to achieving equitable herd immunity [10]. Previous vaccine hesitancy studies have focused on the general population. However, this study will concentrate on a special group with unique needs and concerns: people living with HIV (PLWH). This study aims to provide insight into the behavior of PLWH during the COVID-19 pandemic.

Currently, there is no clear evidence on the risk level of PLWH contracting COVID-19, with the global prevalence of HIV at 1% [11]. However, the risk of developing severe or fatal COVID-19 infection is 30% greater in PLWH compared to people without HIV infection [4, 11]. The world population is 7.85 billion, with PLWH making up 37.7 million [12-14]. In 2020 alone, 680 thousand people died due to HIV-related illnesses [14]. Literature suggests that the risk of COVID-19 in people with and without HIV appears similar, though the data might be contradictory [15]. Since the outbreak of the HIV pandemic, extensive research has aimed to reduce and, if possible, eradicate the disease. However, unforeseen pandemics like COVID-19 impact this goal, necessitating a quick examination of how the HIV and COVID-19 pandemics coexist.

The inconsistencies in the published literature regarding whether PLWH are at higher risk of COVID-19 or severe disease result in more unanswered questions for PLWH. However, what determines vaccine acceptance and hesitancy varies with time, place, and specific vaccines. Thus, the true causes of hesitancy concerning vaccines are poorly understood [16]. The COVID-19 pandemic has caused a shift in the HIV care continuum, and if not addressed timely, it may lead to serious negative health outcomes for PLWH [17]. According to the WHO [18], countries have reported disrupted service delivery due to the COVID-19 pandemic, potentially increasing morbidity and mortality in already immune-compromised individuals [18-20]. UNAIDS suggested that PLWH should be prioritized for COVID-19 vaccinations regardless of CD4+ T lymphocyte count (CD4 count) and HIV viral load levels (HIVVL) [14].

Other than the direct effects, the COVID-19 pandemic has caused shelter-in-place orders, unemployment, and widespread social anxiety, which may interact synergistically to worsen outcomes for PLWH [17]. The pandemic affects retention-in-care, adherence to antiretroviral therapy (ART), and COVID-19 testing and clinical outcomes. According to Sun and others, PLWH in China were already affected by high stress levels due to HIV stigma, physiological stress, and suboptimal adherence [21].

In Zimbabwe, PLWH above the age of 15 years account for 14.6% of the total population [22]. With the Zimbabwean government's goal to achieve 60% herd immunity against COVID-19, if 14.6% were hesitant, there would be serious consequences. PLWH significantly contribute to the overall population, making it important to study their risk perceptions and coping strategies. Identifying the prevalence of vaccine hesitancy and its associated factors is critical for successful vaccination rollouts, especially in developing countries that continuously struggle with emerging infectious diseases [16].

Some countries, like Austria, have made COVID-19 vaccination mandatory. In Zimbabwe, vaccination is not mandatory [23]. However, access to certain government functions requires a vaccination card, compelling many people to reconsider their decision not to get vaccinated.

The history of pandemics is as old as humankind, and for the past four decades, the world has been fighting the HIV pandemic [24]. There have been several pandemics, such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), but HIV and these pandemics have never coexisted globally. Thus, behaviors of PLWH in pandemics have limited literature [15]. Some individuals consider themselves safe from COVID-19. Those in rural areas regard themselves as at low risk and are therefore unwilling to be vaccinated. In urban areas, people have mixed attitudes toward vaccines. While some perceive themselves at low risk, others who perceive high risk still do not intend to get vaccinated, instead placing faith in traditional prevention methods like steaming with natural herbs [25].

COVID-19 vaccine hesitancy among the general population is of great concern, and PLWH are not exempted. Although limited literature is available on COVID-19 vaccine hesitancy among PLWH, a study in South India (n=4438) showed that over a third (38%) were hesitant to get vaccinated [26]. These findings are consistent with a study conducted in Britain, which found that vaccine hesitancy was significantly higher among PLWH compared to participants not living with HIV [27]. A study by Wu and others showed lower willingness for COVID-19 vaccination among PLWH compared to the general population in Wu-

han [28]. Conversely, another study in China showed that more than half of the participants were willing to take up the vaccine rather than being hesitant [29]. A study from South Africa discovered that 22% were unsure, while 21% stated they did not intend to be vaccinated [30]. Locally, there is no published literature yet on vaccine hesitancy among PLWH in Zimbabwe. However, a study by Mundagowa and others of the general population found that more than half (50.1%) were hesitant to get vaccinated [31].

According to Ekstrand et al., vaccine hesitancy is influenced by a lack of confidence in the efficacy and safety of vaccines and distrust in sources of vaccine-related information [26]. In Zimbabwe, fear of side effects, younger age, higher medical mistrust related to COVID-19, and use of social media for COVID-19 information were associated with lower willingness to accept vaccination [31].

Ekstrand suggest that the global effort to end the COVID-19 pandemic is largely dependent on the ability of countries to achieve high uptake of effective vaccines. According to Tlale and team, there are significant variations in COVID-19 vaccine risk perception in different countries. Several socio-demographic factors play a role in vaccine risk perception [32]. Such information is critical for a country to implement tailor-made COVID-19 vaccination programs [33]. Hence, based on this observation, there is a need to determine the association between COVID-19 vaccine risk perception and vaccine hesitancy to intervene accordingly.

These burdens affect the physical, emotional, and social well-being of PLWH, interfering with how they cope with the disease [34]. This altered coping interferes with the delivery of effective healthcare and access to HIV treatment [34]. For example, a study in France showed that a significant number of participants declared vaccine hesitancy [35].

The findings of this study would not be confined to the COVID-19 pandemic only but could be generalized to other pandemics. This study aims to answer questions such as how PLWH perceive their risk regarding the vaccine and how it influences their hesitancy or acceptance. The purpose of this study is to determine the association between COVID-19 vaccine risk perception and associated vaccine hesitancy among people with HIV.

Objectives

1. To characterize COVID-19 vaccine risk perception among people with HIV infection.
2. To determine the prevalence of COVID-19 vaccine hesitancy among eligible people with HIV infection.
3. To determine the association between COVID-19 vaccine risk perception and COVID-19 vaccine hesitancy among people with HIV infection
4. To establish the factors associated with COVID-19 vaccine hesitancy among people with HIV infection.

2. Methods

2.1. Study Setting

The study was conducted at the Parirenyatwa Centre of Excellence, Harare Zimbabwe. Parirenyatwa Group of Hospitals is the largest Central Hospital in the country and many clients from the whole country come to the Centre of Excellence as referrals.

2.2. Research Design

The study employed an analytical cross-sectional study design.

2.3. Study Population

This study targeted people living with HIV. The set criteria of inclusion were PLWH, eligible for vaccination and above 18 years of age, who were not seriously ill, on Antiretroviral Therapy (ART), with low viral load, high CD4 count, and those who did not have active COVID-19 disease. The accessible population for this study were PLWH eligible for the COVID-19 vaccine above 18 years of age receiving care at Parirenyatwa Centre of Excellence as they were able to make their own decisions.

2.4. Sampling

The sample size of 348 was calculated using the OpenEpi online application. The participants were selected through systematic random sampling. The researchers used the OI/ART register to see the OI/ART numbers, as captured for all patients enrolled for care, and used it as a sampling frame. The researchers collected the data over 10 days meaning an average of 34 people per day. From the register, the researcher divided the total number of participants booked for the day by 34 to find the kth number. The researcher started from the first number and choose every kth number. Then, using random number tables, cases were selected systematically and at random based on their assigned OI/ART numbers.

2.5. Inclusion and Exclusion Criteria

Those who were included in this study were PLWH, taking their ART as they are unlikely to be severely immunosuppressed (a contraindication for COVID-19 vaccination). They were aged above 18 years as they can consent on their own. They were Shona or English speaking as these were the two principal languages and were of any level of education. The participants were also visiting the Parirenyatwa Centre of Excellence for their routine review during the time of data collection.

The study excluded people without HIV, or PLWH but

below the age of 18 (as they were not able to consent) and those who neither speak Shona nor English were excluded from the study. Seriously ill patients (since it is a contraindication) and mentally challenged patients were excluded as they were not to consent on their own. People with active COVID-19 disease were excluded as well as pregnant women as there was a potential conflict of interest (as there are still unclear protocols on pregnant women vaccination).

2.6. Study Variables

Vaccine hesitancy was the dependent variable and was determined by the willingness to get vaccinated, factors that led to one getting vaccinated, whether they would recommend someone for the vaccine, and whether they trusted the people recommending them to get vaccinated.

The main independent variable was vaccine risk perception which was measured as to how the individual perceived themselves as at risk of the COVID-19 vaccine after being vaccinated. The risk perception was based on the individual's rating of what are their chances of getting COVID-19 post-vaccination, how those surrounding them will not infect them even if they are unvaccinated and the severity of COVID-19 disease if one is vaccinated. A score of 20 is a high-risk perception and 4 is a low-risk perception.

2.7. Research Instruments

The study utilized an interview schedule with a questionnaire as a data collecting instrument which was administered in either Shona or English. The questionnaire comprised of questions adapted from previous studies. The instrument included 4 sections. Section A and B comprised demographic data and COVID-19 knowledge. The knowledge level score ranged from the highest of 9 to the lowest of 5. High knowledge level would be 9/9, moderate knowledge level would be 7-8/9 while low knowledge level would be 5-6/9. Section C was on risk perception. A Likert Scale was used for the vaccine risk perception questions. Questions with options from strongly agree (5) to strongly disagree (1) were asked. Low vaccine risk perception would be 5-12/25, moderate vaccine risk perception would be 13-19/25 and high vaccine risk perception would be 20-25/25. Section D assessed vaccine hesitance as well as ways of improving vaccine uptake among PLWH. Vaccine hesitancy was scored out of 12 with low vaccine hesitancy being 5.

To guarantee maximum validity, the questionnaire was designed using the main objective. The supervisor and other experienced health care workers and experts assessed the content validity. The Shona version of the questionnaire was developed with the aid of a linguist.

2.8. Ethical Considerations

This study received ethical approval from the Joint Research and Ethics Committee for Parirenyatwa and the University of Zimbabwe Faculty of Medicine and Health Sciences (JREC Ref: 251/2022). Approval was also obtained from relevant site authorities and written informed consent was obtained from consenting participants.

2.9. Data Collection Procedure

The researchers secured a quiet, well-lit, confidential space to conduct interviews. The researchers sought permission from the Director of Medical Services at Parirenyatwa Group of Hospitals to go through the records of the PLWH and systematically selected the subjects suitable to be in the study. Individuals attending the Parirenyatwa Centre of Excellence for their routine review were asked to volunteer into participating in the study. Only individuals meeting the inclusion criteria were where taken in for further evaluation. Upon admission into the study venue, they were given the informed consent forms which they read and probed before signing the consent forms. After the signature, they were then asked to complete a questionnaire asking about their COVID-19 risk perception and the associated vaccine hesitancy. Demographic information such as their age and knowledge about COVID-19 was included. After completing the questionnaire, the researchers thanked the participants for their cooperation.

2.10. Data Analysis

The data was entered in SPSS Version 26 and analysed. The quantitative data was presented in tables, graphs and pie charts and descriptive statistics were used to describe the data. The qualitative data was put into themes and data was manually analysed.

To test the hypothesis and draw up correct inferences, conclusions recommendations as well as bases for future research, the following association were established from the data collected.

1. Association between COVID-19 knowledge level and perceived COVID-19 vaccine risk
2. Association between COVID-19 knowledge and vaccine hesitancy
3. Association between COVID-19 vaccine risk perception and vaccine hesitancy

These associations were made using Pearson's correlational analysis which measures the strength and direction of linear relationships between pairs of continuous variables. A Chi square test of association used to determine the factors associated with vaccine risk perception as well as vaccine hesitancy.

3. Results

The study aimed to determine the association between COVID-19 vaccine risk perception and associated vaccine hesitancy among people with HIV between the ages of 18

years and above.

3.1. Demographic Characteristics

The majority of the respondents (51.7%; n=180) were aged between 31 and 64 years. Of the respondents, 54.9 % (n=191) were female and 45.1% (n=157) were male. Most of the participants were married (35.3%) with a few 11.2% having been widowed. Amongst the respondents, the majority (54.9%, n=191) had ordinary level as their highest educational qualification with 2.9 % (n=7) having never been to school and 2% (n=10) obtained only Primary education. The majority (38.8%, n=135) were informally employed while only 3.4% (n=12) were unemployed. The majority of the respondents (53.2%, n=185) had a total monthly income of below US$ 100 with only 14.7% earning above US$200 (Table 1). More than half (57.5%, n=200) of the respondents were Pentecostal, (36.5%, n=127) were from the apostolic religion and (4.0%, n=21) were from other religious groups.

Table 1. *Demographic characteristics of participants.*

Characteristics	Frequency (N=348)	Percentage %
Age		
18-30 years	136	39.1
31-64 years	180	51.7
65 and above	32	9.2
Sex		
Male	157	45.1
Female	191	54.9
Marital status		
Not married	107	30.7
Separated	79	22.7
Widowed	39	11.2
Married	123	35.3
Level of education		
I never went to school	10	2.9
Primary	7	2.0
'O' level	191	54.9
'A' level	71	20.4
Tertiary Level	69	19.8
Employment status		
Unemployed	12	3.4
Formally employed	100	28.7
Informally employed	135	38.8
Self-employed	101	29.0
Monthly income		
Less than $100	185	53.2
$100-$200	112	32.2
Above $200	51	14.7

Most of the respondents (49.1%, n=171) had over 10 years of HIV infection while those below 5 years accounted for 21.6% and the rest 29.3% were between 5 and 10 years (Table 2).

Table 2. *Respondents by Number of years one has lived with HIV.*

Characteristic	Frequency (N=348)	Percentage (%)
Below 5 years	102	29.3
5-10 years	75	21.6
Above 10 years	171	49.1

3.2. Experiences and Knowledge of COVID-19 and the COVID-19 Vaccine

The majority (71%, n=247) indicated that they had never tested positive while 29% indicated that they had tested positive for COVID-19. Of the 100 respondents who tested positive for COVID-19, 58% reporter Mild symptoms, 26% moderate and 16% severe symptoms. Thirty-six per cent of the respondents knew someone who had tested positive for COVID-19 while 64% knew no one.

With regards to knowledge of COVID-19 vaccine and safety perception, almost all of the participants (98.6%) had heard about the COVID-19 vaccine. However, 58.3% believed that the vaccine was not safe for them with 33.6% not sure and 8% sure of the vaccine's safety (Table 3).

Table 3. Respondents by COVID-19 vaccine knowledge and Vaccine Safety.

Characteristic	Frequency (n=348)	Percentage (%)
Have you heard about the COVID-19 vaccine?		
No	5	1.4
Yes	343	98.6
How safe do you think the COVID-19 vaccine will be for you?		
Not safe	203	58.3
Not sure	117	33.6
Safe	28	8.0

3.3. COVID-19 Vaccine Risk Perception

A significant majority (93.1%) of the participants strongly agreed or agreed that HIV-infected individuals are at risk of contracting COVID-19. There was considerable uncertainty regarding the risk of re-infection post-vaccination, with 45.4% of participants being unsure and 46.3% expressing agreement to some extent. A high percentage (85.3%) were concerned about the severity of COVID-19 in HIV-infected individuals.

Table 4. Respondents by Vaccine risk perception.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
HIV-infected people are at risk of contracting COVID-19?	72.1% (n=251)	21.0% (n=73)	5.5% (n=19)	0.6% (n=2)	0.9% (n=3)
If HIV-infected people receive the COVID-19 vaccine they will be at risk of re-infections	21.6% (n=75)	24.7% (n=86)	45.4% (n=158)	6.3% (n=22)	2.0% (n=7)
I believe an unvaccinated person near me will not give me COVID-19?	58.9% (n=205)	29.0% (n=101)	8.3% (n=29)	1.7% (n=6)	2.0% (n=7)
I am worried COVID-19 is severe in HIV-infected people?	63.5% (n=221)	21.8% (n=76)	8.9% (n=31	4.9% (n=17)	0.9% (n=3)

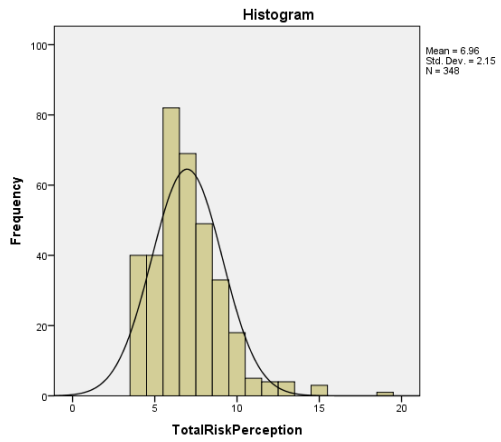

Figure 1. Respondents by risk perception score.

The scores of vaccine risk perception among the respondents showed a normal distribution (μ=6.95, σ=2.15, N=348) (Figure 1). Ninety percent of the respondents had a moderate risk perception score whereas 10% had a high risk perception score.

3.4. Vaccine Hesitancy

Among the respondents 56% (n=195) had received the COVID-19 vaccine with the remainder 44% (n=153), saying they had not received their first dose. Of those who had received the COVID-19 vaccine, 59.9% had received Sinopharm with 38.4% having received Sinovac (Figure 2).

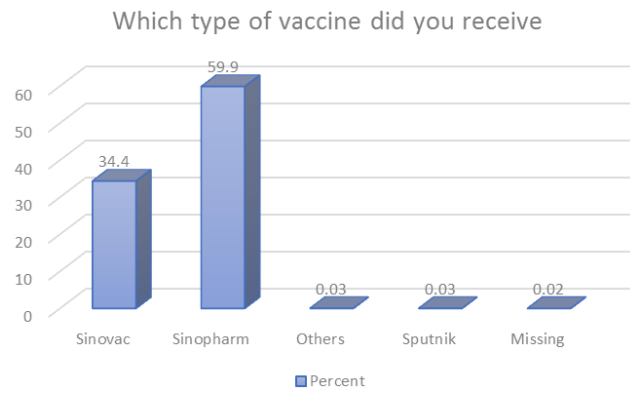

Figure 2. *Respondents by type of vaccine received.*

The choice of the type of vaccine was most influenced by availability (79.7%, n=192) rather than peer recommendation (16.1%). Country of manufacture had little to no effect (0.04%). In this study, 48.4% of those who had been vaccinated had received the full course of the vaccine with 43.2% having received their second dose while 7.2% had received the first dose only. Three (1.2%) of the participants did not indicate their last dose (Table 5).

Table 5. *Respondents by the last dose taken.*

Last dose	Frequency (n=192	Percentage %
First dose	14	7.2
Second Dose	83	43.2
Third Dose	93	48.4
Missing	3	1.2

With regards to reasons for choosing to be vaccinate, about 81% of the respondents indicated their reason for vaccination as the need to be protected against COVID-19. The others cited family/friends being vaccinated as another reason (9%) and 10% did so because they were no longer able to access their services (Figure 3). The majority (50%) were unlikely to recommend someone for the vaccine while 16% were very likely to recommend someone for the vaccine. About 9% were not sure and 1% did not comment. Most of the respondents (53.4%) had no trust in the people who were recommending them for vaccination. Most of the respondents (46.8%) said the government was recommending them for the vaccine while friends/family were cited by 15.5%. The rest indicated health workers as the ones recommending them for vaccination. The majority of the participants (53%), felt that there is no adequate information that can make someone make an informed decision to get vaccinated.

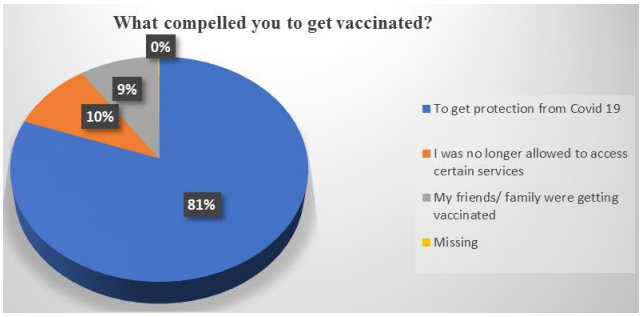

Figure 3. *Respondents by what compelled them to get vaccinated.*

The vaccine hesitancy score and the normal distribution curve (μ=8.32, σ=1.44, N=348) (Figure 4).

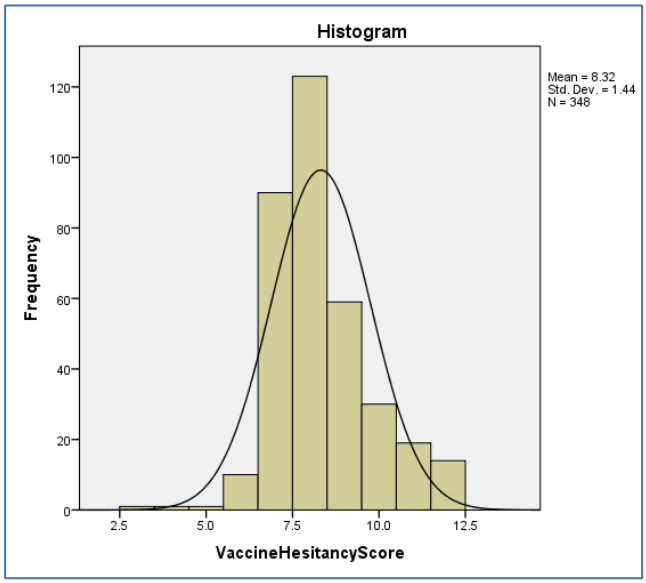

Figure 4. *Respondents by total vaccine Hesitancy score.*

3.5. Reasons for Not Taking COVID-19 Vaccine

About 5.7% of respondents (n=20) cited difficulty in traveling to the vaccination site as a barrier and 4.3% (15 individuals) mentioned the cost of travel as a deterrent. Similarly, 17.5% (n=61) were concerned about the risk of contracting COVID-19 while going to get vaccinated. About 11 percent of the respondents were worried about the accessibility of the vaccination centers whereas 18.1% (n=63) were deterred by the possibility of long wait times at the vaccination centers. Sixteen percent (n=-55) found it difficult to arrange help for their caring responsibilities while getting vaccinated and 16.7% (n=58) faced difficulty in taking time off work to get vaccinated (Table 6).

Table 6. Respondents by reasons for not taking the vaccine.

Reason	Frequency (N=348)	Percentage (%)
Difficulty travelling to receive the vaccine	20	5.7
Cost of travel to receive the vaccine	15	4.3
I would feel unsafe going to receive the vaccine due to the risk of catching the coronavirus (COVID-19)	61	17.5
Worries about accessibility at the vaccination centre	37	10.6
Difficulty finding help for caring responsibilities while I am getting vaccinated	55	15.8
Possible long wait at the vaccination centre	63	18.1
Difficult to take time off work	58	16.7
I am not expecting any difficulties	37	10.6
Missing	2	.6

3.6. The Relationship Between Vaccine Risk Perception and Vaccine Hesitancy

The Pearson correlation coefficient between Total Risk Perception and Vaccine Hesitancy Score was 0.159, indicating a positive correlation. This positive correlation was statistically significant, as indicated by the p-value of .003 ($p < 0.01$) (Table 7).

Table 7. Pearson Correlation Matrix of Vaccine Risk Perception and Vaccine hesitancy.

		Total Risk Perception	Vaccine Hesitancy Score
Total Risk Perception	Pearson Correlation	1	.159**
	Sig. (2-tailed)		.003
	N	348	348
Vaccine Hesitancy Score	Pearson Correlation	.159**	1
	Sig. (2-tailed)	.003	
	N	348	348

**. Correlation is significant at the 0.01 level (2-tailed)

Table 8. Model Summary Regression Analysis of Vaccine Risk Perception and Vaccine hesitancy.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.159[a]	.025	.023	1.423

a. Predictors: (Constant), Total Risk Perception

The R Square value was 0.025, which meant that approximately 2.5% of the variance in Vaccine Hesitancy can be explained by Total Risk Perception (Table 8).

The regression analysis reveals that Total Risk Perception is a significant predictor of Vaccine Hesitancy among the study participants. Specifically, an increase in perceived risk related to the COVID-19 vaccine corresponds to an increase in vaccine hesitancy. The positive coefficient indicates that higher risk perception is associated with greater hesitancy to get vaccinated. Despite the significant relationship, the effect size (as indicated by the Beta value) is relatively small, suggesting that other factors may also play important roles in influencing vaccine hesitancy (Table 9).

Table 9. Coefficients of regression for vaccine hesitancy.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	7.574	.259		29.252	.000	7.064	8.083
	Total Risk Perception	.107	.036	.159	3.001	.003	.037	.177

a. Dependent Variable: Vaccine Hesitancy Score

3.6. Factors Associated with COVID-19 Vaccine Hesitancy

The Chi-square test of association showed that there was no significant association between knowledge of COVID-19 Vaccine and risk perception (p=0.526) (Table 10).

Table 10. Association between COVID-19 knowledge and vaccine risk perception.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.286[a]	2	.526
Likelihood Ratio	2.184	2	.336
Linear-by-Linear Association	.001	1	.979
N of Valid Cases	348		

Association between COVID-19 knowledge level and vaccine hesitancy.

Table 11. Association between COVID-19 knowledge level and vaccine hesitancy.

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.018[a]	4	.000
Likelihood Ratio	16.779	4	.002
Linear-by-Linear Association	4.846	1	.028
N of Valid Cases	348		

a. 2 cells (22.2%) have expected count less than 5. The minimum expected count is .34.

There was statistically significant association between COVID-19 knowledge and vaccine hesitancy (p<0.0001) (Table 11).

4. Discussion

The purpose of this study was to determine the association between COVID-19 vaccine risk perception and associated vaccine hesitancy among people with HIV aged above 18 years at Parirenyatwa Centre of Excellence.

4.1. Demographic Characteristics of Respondents

The majority (51.7%) of respondents were aged between 31 and 64 years, while those above 65 years constituted the minority. These findings align with those of Liu et al, where 51.3% (N=378) were aged 31-40 years [36]. This age group is likely to be sexually active and thus more susceptible to acquiring HIV, which explains why fewer participants were under 30. In Zimbabwe, the life expectancy of people living with HIV (PLWH) is currently 36 years, contributing to the lower representation of those above 65 years [37].

Females made up the majority (54.9%) of respondents. This finding is consistent with Ekstrand and colleagues in South India, where 51.6% of respondents were female [26]. In contrast, a correctional observational survey among PLWH in China reported 98.9% male respondents [36], and another Chinese study found 95.7% male respondents [38]. In the Zimbabwean context, females typically have better health-seeking behaviours than men [39].

Slightly more than half (51.7%) of the respondents were married, unlike the study by Liu et al., where the majority (70.0%) were unmarried [36]. A significant portion (11.2%) of participants were widowed, likely having lost their partners to HIV/AIDS, given the life expectancy of 36 years [37].

4.2. Vaccine Risk Perception

The study aimed to characterize COVID-19 vaccine risk perception among people living with HIV (PLWH). Among the respondents, 89.9% had a high perception of vaccine risk, while the remaining respondents had a moderate perception

of vaccine risk. This high-risk perception could be attributed to the belief held by 58.3% of respondents that the vaccine was not safe, with only 8% demonstrating knowledge of vaccine safety. Educational level may also have been a factor, as only 54.9% had 'O' Levels as their highest level of education. Therefore, it is concluded that the majority of PLWH were risk-averse to the vaccination process.

Overall, there was a high vaccine risk perception. Approximately 90% of the respondents believed that the vaccine increased the risk of PLWH contracting COVID-19 and reinfection. Additionally, around 50% were unaware that unvaccinated individuals posed a risk to them. Consequently, they were very unlikely to recommend vaccination to others, as demonstrated by the 64% who indicated their reluctance to recommend the vaccine. Vaccine risk perception was not associated with COVID-19 risk perception, [(χ^2) 2 > 3.171, p = 0.526).

4.3. Vaccine Hesitancy

The findings highlighted a moderate vaccine hesitancy where 78.2% of the respondents had a moderate vaccine hesitancy with only 18.1% demonstrating high vaccine hesitancy. The reason why vaccine hesitancy could be on the decrease was that almost everyone had heard about the COVID-19 vaccine (98.6%). Notwithstanding that the research also showed that the information available was inadequate to deal with vaccine hesitancy that would achieve herd immunity in Zimbabwe. Vaccine hesitancy was significantly associated with COVID-19 knowledge.

4.4. Association Between Vaccine Risk Perception and Vaccine Hesitancy

The research discovered that there is a positive correlation and association between COVID-19 vaccine risk perception and vaccine hesitancy among PLWH. The results showed a positive relationship between COVID-19 vaccine risk perception and vaccine hesitancy (r=0,159, p<0.03). There is limited literature assessing the association between COVID-19 vaccine risk perception and associated vaccine hesitancy. The positive sign on the correlation coefficient means that as vaccine risk perception increases, vaccine hesitancy also increases.

Although the relationship is not very strong there is a need to implement the study on larger sample size. This is because a weak association with a larger sample size is statistically significant [40]. Further research thus, is needed to fine-tune the findings and find if the association is statistically significant.

The regression analysis further reinforces that COVID-19 vaccine risk perception contributes to increased vaccine hesitancy (β=0.159, R^2=025).

4.5. Factors Associated with Vaccine Hesitancy

There were other factors affecting vaccine hesitancy found in the study. Among those vaccinated (56%), the choice of the vaccine was largely dependent on its availability (79.9%). Consequently, the majority of those vaccinated (59.9%) had received Sinopharm as their vaccine of choice.

The findings indicate that those who had been vaccinated did so primarily due to higher COVID-19 risk perception. Most of them (81%) cited protection from COVID-19 as the reason for vaccination. Additionally, a significant portion of respondents (53.1%) indicated they had no trust in people recommending vaccination. Many respondents expressed distrust in the government (46.8%) and healthcare workers (37.1%). This is consistent with Bogart et al. in 2020, who found a lack of confidence in the President among Black Americans, and Adjei et al. in 2021, where most respondents in Ghana indicated mistrust in political figures [6, 41].

Respondents also felt there was inadequate information to make an informed decision on vaccination. Key barriers to vaccination included: possible long wait times at vaccination centres (18.1%), feeling unsafe going to receive the vaccination due to the risk of catching COVID-19 (17.5%), difficulty taking time off work (16.7%), and difficulty finding help for caring responsibilities while getting vaccinated (15.8%).

To motivate people to get vaccinated, the most popular suggestions were monetary incentives (similar to those used in male circumcision campaigns) and making vaccines available in strategic areas like Centres of Excellence, bus terminals, and shopping centres.

4.6. Study Implications

The study aimed to determine vaccine risk perception among PLWH and identify factors associated with COVID-19 vaccine hesitancy within this group. It also sought insights from PLWH on addressing vaccine hesitancy, with implications for all vaccine-preventable diseases. Improving vaccine uptake among PLWH could reduce morbidity and mortality, enhancing their quality of life. Identifying hesitancy factors can inform policy-making and health promotion strategies.

The study also supports the nursing profession in practicing evidence-based care, enhancing clinical relevance and accountability, which benefits PLWH. For nursing to be recognized as a profession, continuous research to expand the body of knowledge is crucial. This study identifies gaps and provides a basis for future research, helping the researcher master the art and science of research.

As of May 2022, global vaccine coverage is at 60.6%, with South Africa at 31.4% and Zimbabwe at 29.4% [37]. Tailor-made interventions could achieve herd immunity. The pandemic highlights the importance of universal health coverage, showing that neglecting any segment of the population risks global health [29].

In Zimbabwe, the National Health Strategy 2021-2025 aligns with the National Development Strategy (NDS) to reduce morbidity and mortality from communicable and non-communicable diseases and improve public health sur-

veillance and disaster preparedness.

4.7. Limitations of the Study and Recommendations

Resource Constraints: The researchers could not increase the sample size due to time and resource constraints. More time and other resources were unavailable for such an exercise, given the limited duration for broader engagement across the country.

Geographical Dispersion: The researchers were unable to use other centres due to resource and time constraints. It was not feasible to administer questionnaires across multiple countries and centres.

There is a need for further studies to broaden the scope of the research to cover the entire population of Zimbabwe and all age groups, particularly those under 18, both PLWH and non-PLWH. Further research is needed to test the association with a larger sample to establish statistical significance. Additionally, there is a need to develop a template for handling PLWH during pandemics.

Further research is also necessary on the use of innovative nursing strategies, technologies, and techniques to address COVID-19 risks and perceptions associated with vaccine hesitancy.

It is also recommended to engage in studies to benchmark our nursing infrastructure, training methods, and competencies to address vaccine hesitancy and other associated COVID-19 risks.

5. Conclusion

This study aimed to determine the association between COVID-19 risk perception and vaccine hesitancy among PLWH attending Parirenyatwa Centre of Excellence 18 years of age and above. The Health Belief Model guided the research. The Person's correlation test was then used in testing the association between vaccine risk perception and vaccine hesitancy. The findings showed high-risk perception which was positively associated with vaccine hesitancy. The relationship was a weak association. Social behavior change communication efforts should focus on addressing myths and misconceptions about vaccines to reduce hesitancy and increase uptake of these lifesaving interventions.

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Author Contributions

Moreblessing Fungirayi: Development of the original draft

Judith Rukweza: Supervison and technical review

Maxwell Mhlanga: Review of the manuscript, data analysis and discussion.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] World Health Organisation. Coronavirus disease 2019 pandemic. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019 [accessed on 28 February, 2022].

[2] Murewanhema G, Musuka G, Denhere K, Chingombe I, Mapingure MP, Dzinamarira T. The Landscape of COVID-19 Vaccination in Zimbabwe: A Narrative Review and Analysis of the Strengths, Weaknesses, Opportunities and Threats of the Programme. Vaccines (Basel). 2022 Feb https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8877028/

[3] Mazingaizo S. Zimbabwe may consider Mandatory COVID-19 Vaccinations. Sunday Times. 2021. https://bit.ly/3vwOBM0

[4] Xiao, Y., & Torok, M. E. (2020). Taking the right measures to control COVID-19. The Lancet Infectious Diseases, 20(5), 523-524. https://doi.org/10.1016/S1473-3099(20)30152-3

[5] MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. Vaccine, 33(34), 4161-4164. https://doi.org/10.1016/j.vaccine.2015.04.036

[6] Bogart, L. M., Ojikutu, B. O., Tyagi, K., Klein, D. J., Mutchler, M. G., Dong, L. & Kellman, S. (2021). COVID-19 related medical mistrust, health impacts, and potential vaccine hesitancy among Black Americans living with HIV. Journal of acquired immune deficiency syndromes (1999), 86(2), 200. https://doi.org/10.1097/QAI.0000000000002570

[7] Paek, H. J., & Hove, T. (2017). Risk perceptions and risk characteristics. In Oxford research. https://www.oxfordreference.com/display/10.1093/acref/9780190455378.001.0001/acref-9780190455378-e-283

[8] Sigel, K., Swartz, T., Golden, E., Paranjpe, I., Somani, S., Richter, F., ... & Glicksberg, B. S. (2020). Coronavirus 2019 and people living with human immunodeficiency virus: outcomes for hospitalized patients in New York City. Clinical infectious diseases, 71(11), 2933-2938. https://doi.org/10.1093/cid/ciaa880

[9] Guan, W. J., Ni, Z. Y., Hu, Y., Liang, W. H., Ou, C. Q., He, J. X., ... & Zhong, N. S. (2020). Clinical characteristics of coronavirus disease 2019 in China. New England journal of medicine, 382(18), 1708-1720. https://doi.org/10.1056/NEJMoa2002032

[10] Gerretsen, P., Kim, J., Quilty, L., Wells, S., Brown, E. E., Agic, B, & Graff-Guerrero, A. (2021). Vaccine Hesitancy Is a Barrier to Achieving Equitable Herd Immunity Among Racial Minorities. Frontiers in medicine, 8. https://doi.org/10.3389/fmed.2021.668299

[11] Ogolodom, M. P., Mbaba, A. N., Alazigha, N., Erondu, O. F., Egbe, N. O., Golden, I., ... & Eke, C. M. (2020). Knowledge, attitudes and fears of healthcare workers towards the Coronavirus disease (COVID-19) pandemic in South-South, Nigeria. Health Science Journal, 1-10. https://doi.org/10.36648/1791-809X.S1.002

[12] Prabhu, S., Poongulali, S., & Kumarasamy, N. (2020). Impact of COVID-19 on people living with HIV: a review. Journal of virus eradication, 6(4), 100019. https://doi.org/10.1016/j.jve.2020.100019

[13] Abu, E. K., Oloruntoba, R., Osuagwu, U. L., Bhattarai, D., Miner, C. A., Goson, P. C., ... & Agho, K. E. (2021). Risk perception of COVID-19 among sub-Sahara Africans: a web-based comparative survey of local and diaspora residents. BMC public health, 21(1), 1-13. https://doi.org/10.1186/s12889-021-11600-3

[14] UNAIDS. COVID-19 vaccines and HIV. https://www.Unaids.Org/en/resources/documents/2021/covid19-vaccines-and-hiv

[15] Apuke, O. D., & Asude Tunca, E. (2021). Modelling the Factors That Predict the Intention to Take COVID-19 Vaccine in Nigeria. Journal of Asian and African Studies, 00219096211069642.

[16] Patwary MM, Disha AS, Bardhan M, Haque MZ, Kabir MP, Billah SM, Hossain MR, Alam MA, Browning MHEM, Shuvo FK, Piracha A, Zhao B, Swed S, Shah J, Shoib S. Knowledge, Attitudes, and Practices Toward Coronavirus and Associated Anxiety Symptoms Among University Students: A Cross-Sectional Study During the Early Stages of the COVID-19 Pandemic in Bangladesh. Front Psychiatry. 2022 Apr 1; 13: 856202. https://doi.org/10.3389/fpsyt.2022.856202

[17] Cabello A, Zamarro B, Nistal S, Victor V, Hernández J, Prieto-Pérez L, Carrillo I, Álvarez B, Fernández-Roblas R, Hernández-Segurado M, Becares J, Benito JM, Rallón N, Téllez R, Castaño ÁL, Herrero A, Górgolas M. COVID-19 in people living with HIV: A multicenter case-series study. Int J Infect Dis. 2021 Jan; 102: 310-315. https://doi.org/10.1016/j.ijid.2020.10.060

[18] Butler, R. (2016). Vaccine Hesitancy: what it means and what we need to know in order to tackle it. J. Vaccine, 34, 1643-1649.

[19] Liang, M., Luo, N., Chen, M., Chen, C., Singh, S., Singh, S., & Tan, S. (2021). Prevalence and mortality due to COVID-19 in HIV co-infected population: a systematic review and meta-analysis. Infectious diseases and therapy, 10(3), 1267-1285.

[20] Drain PK, Garrett N. SARS-CoV-2 pandemic expanding in sub-Saharan Africa: Considerations for COVID-19 in people living with HIV. EClinical Medicine. 2020 Apr 22; 22: 100342. https://doi.org/10.1016/j.eclinm.2020.100342

[21] Siegrist, M., & Árvai, J. (2020). Risk perception: Reflections on 40 years of research. Risk Analysis, 40(S1), 2191-2206. https://doi.org/10.1111/risa.13599

[22] Ministry of Health and Child Care of Zimbabwe (2021). https://www.mohcc.gov.zw/

[23] Eve Dubé, Caroline Laberge, Maryse Guay, Paul Bramadat, Réal Roy & Julie A. Bettinger (2013) Vaccine hesitancy, Human Vaccines & Immunotherapeutics, 9: 8, 1763-1773, https://doi.org/10.4161/hv.24657

[24] Chen, H., Li, X., Gao, J., Liu, X., Mao, Y., Wang, R., & Dai, J. (2021). Health Belief Model Perspective on the Control of COVID-19 Vaccine Hesitancy and the Promotion of Vaccination in China: Web-Based Cross-sectional Study. Journal of Medical Internet Research, 23(9), e29329. https://doi.org/10.2196/29329

[25] Chigevenga, R. (2021). Commentary on the Zimbabwean People's Response towards the Anticipated COVID-19 Vaccine. Journal ISSN, 2766, 2276.

[26] Ekstrand, M. L., Heylen, E., Gandhi, M., Steward, W. T., Pereira, M., & Srinivasan, K. (2021). COVID-19 Vaccine Hesitancy Among PLWH in South India: Implications for Vaccination Campaigns. Journal of acquired immune deficiency syndromes (1999), 88(5), 421. https://doi.org/10.1097/QAI.0000000000002803

[27] Kaida, A., Brotto, L. A., Murray, M., Côté, H. C., Albert, A. Y., Nicholson, V., ... & Ogilvie, G. S. (2022). Intention to receive a COVID-19 vaccine by HIV status among a population-based sample of women and gender-diverse individuals in British Columbia, Canada. AIDS and Behavior, 1-14. https://doi.org/10.1007/s10461-022-03577-w

[28] Wu J, Xu D, Li Q, Tarimo CS, Wang M, Gu J, Wei W, Zhang X, Huang Y, Ma M, Zhao L, Shen Z, Miao Y. The association between lifestyle and COVID-19 vaccine hesitancy in China: A large-scale cross-sectional survey. J Affect Disord. 2022 Sep 15; 313: 92-99. https://doi.org/10.1016/j.jad.2022.06.038

[29] Huang, X., Yu, M., Fu, G., Lan, G., Li, L., Yang, J., ... & Xu, J. (2021). Willingness to receive COVID-19 vaccination among people living with HIV and AIDS in China: a nationwide cross-sectional online survey. JMIR public health and surveillance, 7(10), e31125. https://doi.org/10.2196/31125

[30] Govere-Hwenje, S., Jarolimova, J., Yan, J., Khumalo, A., Zondi, G., Ngcobo, M., ... & Bassett, I. V. (2022). Willingness to accept COVID-19 vaccination among people living with HIV in a high HIV prevalence community. Research Square, rs-3. https://doi.org/10.21203/rs.3.rs-824083/v1

[31] Mundagowa, P. T., Tozivepi, S. N., Chiyaka, E. T., Mukora-Mutseyekwa, F., & Makurumidze, R. (2022). Assessment of COVID-19 vaccine hesitancy among Zimbabweans: A rapid national survey.PloS one, 17(4), e0266724. https://doi.org/10.1371/journal.pone.0266724

[32] Schmid P, Rauber D, Betsch C, Lidolt G, Denker M-L. Barriers of Influenza Vaccination Intention and Behavior – A Systematic Review of Influenza Vaccine Hesitancy, 2005–2016. PLoS One. 2017; 12(1): e0170550. https://doi.org/10.1371/journal.pone.0170550

[33] Shmueli, L. (2021). Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behaviour model. BMC Public Health, 21(1), 1-13. https://doi.org/10.1186/s12889-021-10816-7

[34] Hossain, M. B., Alam, M., Islam, M., Sultan, S., Faysal, M., Rima, S., ... & Mamun, A. A. (2021). Health belief model, theory of planned behaviour, or psychological antecedents: what predicts COVID-19 vaccine hesitancy better among the Bangladeshi adults?. Frontiers in Public Health, 1172. https://doi.org/10.3389/fpubh.2021.711066

[35] Vallée, A., Fourn, E., Majerholc, C., Touche, P., & Zucman, D. (2021). COVID-19 vaccine hesitancy among French people living with HIV. Vaccines, 9(4), 302. https://doi.org/10.3390/vaccines9040302

[36] Lin Y, Hu Z, Zhao Q, Alias H, Danaee M, Wong LP (2020) Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. PLoS Negl Trop Dis 14(12): e0008961. https://doi.org/10.1371/journal.pntd.0008961

[37] Chimbetete, C., Shamu, T., Roelens, M., Bote, S., Mudzviti, T., & Keiser, O. (2020). Mortality trends and causes of death among HIV positive patients at Newlands Clinic in Harare, Zimbabwe. PloS one, 15(8), e0237904. https://doi.org/10.1371/journal.pone.0237904

[38] Qi, L., Yang, L., Ge, J., Yu, L., & Li, X. (2021). COVID-19 Vaccination Behavior of People Living with HIV: The Mediating Role of Perceived Risk and Vaccination Intention. Vaccines, 9(11), 1288. https://doi.org/10.3390/vaccines9111288

[39] Mufunda, E., Albin, B., & Hjelm, K. (2012). Differences in health and illness beliefs in Zimbabwean men and women with diabetes. The open nursing journal, 6, 117. https://doi.org/10.2174/1874434601206010117

[40] Hole G, (2017), Research Skills One, Correlation interpretation, accesed at http://users.sussex.ac.uk on 29/06/22

[41] Perehudoff, K., Demchenko, I., Alexandrov, N. V., Brutsaert, D., Ackon, A., Durán, C. E., ... & Babar, Z. U. D. (2020). Essential medicines in universal health coverage: a scoping review of public health law interventions and how they are measured in five middle-income countries. International journal of environmental research and public health, 17(24), 9524. https://doi.org/10.3390/ijerph17249524