KNOWLEDGE, ATTITUDE AND PERCEPTION OF AFRICAN IMMIGRANTS TOWARD COVID-19 VACCINATION IN A SUBURBAN SOUTH AFRICAN SETTING

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ABSTRACT

Background: The COVID-19 pandemic has posed unprecedented challenges globally. Vaccination has emerged as a crucial tool in mitigating the impact of the virus. However, the success of vaccination campaigns depends largely on public acceptance and uptake. This study aimed to assess the knowledge, attitudes, and perceptions of African immigrant participants towards the COVID-19 vaccine.

Methods: The study was a cross-sectional descriptive study in which a close-ended validated questionnaire was used to collect data from 202 participants from a peri-urban area of Cape Town. Participants were presented with a series of questions assessing their knowledge, attitudes, and perceptions towards the COVID-19 vaccine. Responses were scored and categorised to evaluate the participants' understanding and acceptance of the vaccine.

Results: The study included 202 participants with a mean age of 31.6 years, ranging from 18 to 80 years. The majority (42.5%) fell within the 26-33 years age group, and 65% were aged 33 or younger. Males constituted 60% of the participants, and about half (49.5%) were born in Zimbabwe. A significant portion (68.53%) had not experienced COVID-19 symptoms, while 47% had not received any COVID-19 vaccination at the time of the research. With regards to the overall knowledge of the COVID-19 vaccine, 24.26% have poor knowledge, 46.04% have fair knowledge, and 29.70% have good knowledge. With regards to overall attitude, 59% have a negative attitude, and 41% have a positive attitude. For the overall perception, 52% have a negative perception and 48% a positive perception.

Conclusion: These findings underscore the complexity of vaccine acceptance and highlight the need for multifaceted strategies to improve vaccine uptake. These could include educational interventions to address knowledge gaps and misconceptions, as well as strategies to leverage social influence and address attitudinal barriers to vaccination. Further research is needed to explore these factors in more depth and develop effective interventions for improving vaccine acceptance and uptake among this population.

Keywords: knowledge and attitude, coronavirus, COVID-19 vaccines, immigrant health

DECLARATION

I, DR SHEDRACH I. OHIAGU, declare that "***KNOWLEDGE, ATTITUDE AND PERCEPTION OF AFRICAN IMMIGRANTS TOWARD COVID-19 VACCINATION IN A SUBURBAN SOUTH AFRICAN SETTING"*** submitted to the University of Cape Town for the degree of Master of Medicine in Family Medicine is my own work, and that it has not been submitted for any degree or examination at this or any other university.

Signed by candidate

Signature

Dr SHEDRACH I. OHIAGU

December 2023

DEDICATION

I dedicate this dissertation to the glory of God Almighty, acknowledging the divine grace and special favours bestowed upon me, facilitating the successful completion of the challenging residency programme at the University of Cape Town. Additionally, my heartfelt dedication extends to all individuals who have experienced the impact of COVID-19 at various points in time.

~~ Dr SHEDRACH I. OHIAGU

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Dr SHEDRACH I. OHIAGU

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is a novel virus that causes severe acute respiratory syndrome and is responsible for the ongoing global pandemic termed “coronavirus disease 2019” or COVID-19. SARS-CoV-2 is a member of the coronavirus family, which also includes viruses that cause the common cold, as well as more severe respiratory illnesses like severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS). The name “SARS-CoV-2” reflects its genetic similarity to the original SARS-CoV, which caused the SARS outbreak in 2002-2003. Both viruses belong to the coronavirus family and share similarities in their genetic makeup. The term “coronavirus” is derived from the crown-like spikes that protrude from the virus’s surface, resembling the sun’s corona when viewed under a microscope. It first emerged in Wuhan, Hubei Province, China, in December 2019. Despite rigorous attempts by the Chinese authorities to contain the disease, it rapidly spread to other provinces in China and subsequently to the rest of the world (1). The health burden and socioeconomic cost caused by this novel coronavirus pandemic is one of the most severe health challenges recorded in recent history, second only to the 1918–1920 flu pandemic that claimed over 100 million lives globally (2). The World Health Organization (WHO), in response to the global spread of SARS-CoV-2 and its devasting impact on human lives, declared COVID-19 as a pandemic on 12 March 2020 (3).

1.2 BACKGROUND TO THE STUDY

As the virus continued to spread globally, Governments and Authorities across the world hastened to institute measures to curb the spread of the virus and mitigate its impact (4, 5). The initial effort deployed globally to mitigate the spread of the virus includes lockdown and travel restrictions, engaging the public with health-protective behaviours, and providing for wearing face masks, social distancing and hygiene behaviours (6, 7). Besides multiple preventive public health measures directed to curtail the spread of the virus, developing a safe and potent vaccine is public health’s most effective preventative strategy to save lives and end the socioeconomic and

global health crisis caused by the SARCOV2 virus (8-10). However, due to commendable, collective collaboration between the government (particularly in the First World), relevant public and private research institutes and unprecedented financial support (11), in just less than a year with an unprecedented speed of development and reliable efficacy (over 90% for Moderna and Pfizer), a multitude of vaccines was developed aimed at ending the SARS-CoV-2 pandemic (12). During the early phase of the global vaccine roll-out, vaccine delivery was prioritised to healthcare workers and subsequently to clinically vulnerable individuals and the elderly (>65 years) (13-15). Though the prevalence of SarsCov2 infection is low in Africa compared to the rest of the world, the impact is disproportionately huge primarily due to a lack of adequately trained health workers and poor health infrastructure, and it is exacerbated by weak fiscal policy (16).

1.3 THE RESEARCH PROBLEM

The global landscape of the COVID-19 pandemic has underscored the vulnerability of immigrant populations to infection, a vulnerability exacerbated by a variety of factors such as misinformation, reliance on informal news outlets, language barriers, cultural disparities, and conflicting beliefs about the disease process. These challenges, coupled with broader issues like discrimination, stigma, economic deprivation, and limited access to public healthcare services, have intensified the risk faced by immigrants in the context of the pandemic (17-19). Within the South African context, approximately four million African immigrants, constituting less than 10% of the total population, are grappling with unique challenges related to COVID-19 (International Organization for Migration). Statistical data from the South African Department of Statistics indicates a disproportionate susceptibility of immigrants to both the virus and its socioeconomic impact (20, 21). This susceptibility is rooted in complex dynamics, including discrimination, the fear of xenophobic attacks, potential illegal arrests, exclusion from government relief packages, and a pervasive perception that immigrants are placing a strain on available resources, influencing their health-seeking behaviours (20, 22).

Undoubtedly, immigrants find themselves in a precarious health situation, as the very nature of immigration can influence health-related behaviours. Notably, undocumented immigrants often delay or altogether avoid seeking medical assistance

due to fears of arrest or discrimination (23). These multifaceted challenges necessitate an in-depth exploration of the knowledge, attitudes, and perceptions of African immigrants, specifically towards COVID-19 vaccination within a suburban South African setting.

1.4 PURPOSE OF THE STUDY

A closer look at the COVID-19 vaccination initiatives reveals a model that tends to perpetuate the structural barriers often faced by migrant communities in accessing essential healthcare services in their host nation. It, therefore, becomes imperative to unravel the intricate web of factors contributing to the vaccination hesitancy or acceptance among African immigrants. Addressing these challenges requires a nuanced understanding of the cultural, social, economic, and legal contexts that shape their experiences. By identifying these complexities, the research aims to pave the way for future studies that could eventually result in targeted interventions and policies that not only enhance vaccination uptake but also promote the overall well-being of the immigrant population in the face of the ongoing pandemic. It is envisaged that; further exploration of the outlined research problem holds the potential to uncover nuanced insights that can inform evidence-based strategies for promoting COVID-19 vaccination among African immigrants in the South African suburban settings.

1.5 LITERATURE REVIEW

1.5.1 THE SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2

SARS-COV-2 (causing COVID-19) is easily transmitted from saliva or mucus droplets of an infected person via coughs or sneezes to others who are within proximity (about six feet) or by touching contaminated objects or surfaces (24). The most common symptoms reported by patients with SARSCOv-2 infection include fever, cough, dyspnoea, weakness and fatigue, headache and diarrhoea. However, the majority of individuals with SARSCoV-2 infection are asymptomatic carriers (2, 3). Over 315 million confirmed cases of COVID-19 have been recorded globally, and an estimated 5.5 million deaths have been associated with the disease (25)

The emergence of COVID-19 with a potentially devastating impact on all spheres of human lives, coupled with the enormous effect on global healthcare systems, governments and authorities across the world, all hastened to institute measures to

curb the spread of the virus and mitigate its impact (4, 5). The initial efforts deployed globally to reduce the spread of the virus included lockdown and travel restrictions, as well as engaging the public with health-protective behaviours, including wearing face masks, social distancing, and hygiene behaviours (6, 7). Although these measures helped considerably in curbing the spread of the virus, the restriction of movement led to a loss of jobs and food shortages, mainly due to the disruption in the supply chain. Some individuals were stuck away from home as flights, trains, and public transport were restricted except for those supporting essential services (26). Besides multiple preventive public health measures deployed to curtail the spread of the virus, developing a safe and potent vaccine is public health's most effective preventative strategy to save lives and end the global socioeconomic and health crisis caused by the SARCOV2 virus (8-10).

However, as the COVID-19 pandemic continues to ravage the world, this raised the urgent need to develop a COVID-19 vaccine, and the process was reduced to 12-18 months, albeit maintaining safety and effectiveness standards (27, 28). There was an applaudable collective collaboration to achieve this unprecedented fit between governments (particularly of the first world), relevant public and private research institutions and unprecedented financial contribution to facilitate the process (11). Also, the pivotal, extreme shortening of the COVID-19 vaccine development process is a monumental breakthrough in the science of biotechnology and molecular biology (11, 27). SARS-CoV-2 primarily spreads through respiratory droplets when an infected person talks, coughs, or sneezes. It mainly targets the respiratory system, causing a range of symptoms from mild respiratory issues to severe pneumonia, acute respiratory distress syndrome (ARDS), and, in some cases, death. Understanding the virology and epidemiology of SARS-CoV-2 is crucial for public health efforts, including the development of vaccines and treatments.

1.5.2 DEVELOPMENT APPROVAL OF COVID-19 VACCINES

Vaccination is the process of administering a vaccine to enable the recipient to acquire (29) active immunity against a particular infectious disease. Without vaccination, the mortality and morbidity rates from COVID-19 would have been much higher (30, 31). Two vaccines targeted at halting the SARS-CoV-2 pandemic developed in less than a year with exceptional speed and dependable effectiveness (more than 90% for

Moderna and Pfizer) were approved by the World Health Organization (WHO) and/or the United States (US) Food and Drug Administration for emergency use during 2020 (12). This breakthrough brought much-desired relief to the public health community, ending the year on a positive note. Since then, more COVID-19 vaccines have received emergency use authorisation (EUA) (32). By Feb 18 2021, eight different vaccines have been rolled out globally: Pfizer-BioNTech, Oxford-AstraZeneca, Moderna, Sinopharm-Beijing, Gamaleya (Sputnik V), Sinovac, Sinopharm-Wuhan and Bharat Biotech (Covaxin) (33). During this period of early vaccine roll-out, most countries prioritised vaccine delivery firstly to healthcare workers due to the high risk of exposure, then to clinically vulnerable individuals and the elderly population (> 65 years) (13-15). As of 29 January 2022, the total number of vaccines administered globally is approximately 9,949 billion doses (25). Though the prevalence of SarsCov2 infection is low in Africa compared to the rest of the world, the impact is disproportionately huge primarily due to lack of adequate trained health workers, poor health infrastructure and exacerbated by weak fiscal policy (16). To ensure equitable vaccine distribution, the COVAX initiative, a coalition co-led by GAVI (previously, the Global Alliance for Vaccines and Immunization), WHO, the Vaccine Alliance and the Coalition for Epidemic Preparedness Innovation (CEPI), aimed to provide 1.8 billion doses of the vaccine to 92 countries (Low- and middle-income countries) in 2021 (34). On Feb 24 2021, Ghana was the first country to take delivery of vaccines under the COVAX initiatives (35).

The South African government procured the Johnson and Johnson and Pfizer vaccine for its national COVID-19 vaccination programme, which commenced in February 2021 (36). These vaccines have high efficacy against the 501Y.V2 variant of SARCOV2, which is prevalent in the South African population (37). Like most other countries, the COVID-19 vaccination roll-out programme in South Africa was implemented in a phased manner in line with the national prioritisation framework. Phase 1 focused on healthcare workers (this was a general global consensus); Phase 2 targeted essential workers (e.g. Police, Teachers), persons older than 60 years, adults with medical conditions with co-morbidities, and individuals in congregate environments, e.g. old age homes and prisons. Phase 3 was aimed at all other remaining adults >18 years not included in Phases 1 or 2 (36, 38). A considerable

amount of effort has been directed towards vaccinating many people. As of 29 January 2022, the total doses administered in South Africa were approximately 19.72 million for individuals aged 12 years and older (25). However, a sufficient proportion of the population needs to be vaccinated to achieve population (Herd) immunity, which helps to protect vulnerable individuals further (39, 40). The COVID-19 vaccination program intended to vaccinate at least 67% of the South African population of 60 million to enable the country to return to a near-normal pre-pandemic situation (36). The COVID-19 vaccination programme would have been considered largely successful and would have scored a good public health outcome if there had been a high rate of acceptance, a positive public attitude and perception of the programme (41, 42). However, in the early phase of the global COVID-19 vaccination campaign, the issues of major concern were inequitable vaccine access and vaccine nationalism. Ten high-income countries administered three-quarters of the one billion global COVID-19 vaccine by April 2021 to their populations (16). The World Health Organization now considers vaccine hesitancy as a substantial threat to global health (43, 44).

Vaccine hesitancy is the disinclination or refusal to vaccinate despite the availability of vaccines and vaccination services. This hesitancy has significantly affected vaccination programmes and invariably prolonged adequate vaccine coverage (45, 46). A successful vaccine campaign depends on high vaccine uptake. However, the recurrent emergence of infectious diseases like measles and poliomyelitis is often due to poor vaccine coverage in some regions of the world and is inevitably linked to an anti-vaccine stance of certain groups of people or individuals (47). A survey reflective of the US population revealed that less than 60% of adults indicated the intention to receive a COVID-19 vaccine. Biodemographic variables like younger age, low educational attainment, black race, and not receiving the previous year's influenza vaccine were linked to a lack of intent to vaccinate (21). Although there are no data linking those factors mentioned above or other factors to COVID-19 vaccine hesitancy among immigrant communities in the US, previous strong hesitancy towards H1N1 vaccines among immigrants from the Latinx community was found to be related to concerns over vaccine novelty and safety (19).

In another study to evaluate the COVID-19 vaccine attitudes among Arab-American healthcare professionals, it was reported that vaccine hesitancy was higher among allied healthcare workers, respondents who declined influenza vaccine in the preceding five years, but less likely among respondents earning more than $150,000 annually among men and married individuals (48). The concern about the side effects of the COVID-19 vaccine was the most common reason for vaccine hesitancy among Arab-speaking health professionals in the US (48). In a further study assessing attitudes toward COVID-19 vaccination in South Korea, 55.3% of the immigrants indicated they would definitely get COVID-19 vaccination, and only 36.7% of the immigrants indicated that they believed that the COVID-19 vaccines were safe. However, 72.6% showed high acceptance, while 27.4% showed low acceptance towards the vaccine (17). Hence, concerns over the safety of the COVID-19 vaccine were the main predictors of vaccine hesitancy (17). Studies have shown that individuals with a poor knowledge base about the virus are more likely to show concerns about the safety of vaccines and are often less likely to seek vaccination (32). There is an established correlation between concerns about the safety of the vaccine, low academic attainment and poor socioeconomic status; hence, this highlights the need for appropriate dissemination of health information in a manner that takes into consideration the socioeconomic status and level of education of the recipient (32).

A recent study in China examined factors attributed to acceptance and willingness to pay for the COVID-19 vaccine in Shanghai among migrants. The study found that sociodemographic factors showed no significant association with vaccine acceptance, although confidence in vaccine safety, effectiveness and importance revealed a strong positive association with vaccine acceptance (47). The lack of information and confidence about the vaccine were the major reasons for hesitancy, although findings also showed that high costs and reservations about vaccine safety and efficacy impeded vaccine uptake (47). A similar cross-sectional study on COVID-19 vaccine hesitancy in Turkish and German immigrants found they had a reasonably high score for their knowledge base of COVID-19. However, they did not show an appreciable inclination towards getting vaccinated due to reservations about vaccine safety and concerns surrounding the promptness with which the vaccine was developed (49). The

study also revealed that some participants with a migratory history are less concerned about dying from COVID-19 than being vaccinated and are optimistic their faith will save them during the pandemic. Moreover, the study found that 30.6% of the participants who are migrants believe COVID-19 was a ground plan to manipulate the world, while 12.6% of the same migrant cohort think that COVID-19 is fictional (49).

In another study on COVID-19 vaccine hesitancy and attitudes in Qatar among the migrant population, it was noted that Qataris within the productive age range are more hesitant (42.2%) to accept the COVID-19 vaccine than their counterpart immigrants of other nationalities in the same cohort (16.71%) (29). The study also indicated that 92.1% of the participants believed that exposure to the disease-causing organism confers a more reliable, safer immunity to diseases. This viewpoint is significantly associated with vaccination hesitancy (29). Other sociodemographic variables found to be positively associated with vaccine hesitancy are being native Qatari, being of an older age group, being single, female, and retired or self-employed. Moreover, concerns about the novelty of the vaccine, the hastiness of the vaccine production, and the belief that the vaccination programme is driven by financial interest are direct causes of hesitancy (29). The prevalence of COVID-19 is low in Africa, which constitutes 17% of the world population, but the impact of the pandemic was enormous due to the deplorable state of the healthcare system in most parts of the continent, coupled with the presence of other pre-existing burdens of preventable diseases (16).

In a survey in Ghana assessing the knowledge and attitudes of adults towards receiving COVID-19 vaccines, it was observed that age, gender, and primary sources of information were key factors influencing hesitancy toward COVID-19 vaccination. The study revealed decreasing hesitancy regarding the COVID-19 vaccination with increasing age, as 66% of respondents who were > 55 years old indicated they were willing to take the vaccine compared to 40% of respondents within the ages of 15-25 years (50). This is in keeping with findings in previous literature that the elderly, who are likely to have other co-morbid medical conditions due to an advanced age, are at risk of severe cases of COVID-19 and may be a reason for wanting to get vaccinated (51). The participants with high educational levels and with more access to reliable sources of information like journals and official publications have a better knowledge

base about COVID-19 and show less hesitancy towards vaccination. Also, male participants were found to be more willing (56%) to be vaccinated than female participants (46%) (50). The reasons given by participants who were willing to get vaccinated were that they believed in the efficacy of the vaccine and their sense of duty towards helping to combat the further spread of the disease. In contrast, participants who were hesitant to be vaccinated had doubts about the safety and efficacy of the vaccine (50).

Another recent study that examined communicating COVID-19 vaccine safety, knowledge and attitude among residents of South-Eastern Nigeria revealed that participants have negative attitudes toward the COVID-19 vaccine and their knowledge about the safety of the COVID-19 vaccine was low (2). The majority (91%) of the participants in the study were between 18 and 27 years of age; 42.4% of the respondents had doubts about the safety of the COVID-19 vaccine, and only 26.1% of the respondents believed that the vaccine was safe for human use (2). Meanwhile, in a recent study that assessed factors influencing the uptake of the COVID-19 vaccine among Nigerian adults, 63.9% of the respondents were female, and the average age of respondents was 40.8 years ± 12.2 years (52). Sixty-four per cent of the respondents showed sufficient knowledge about COVID-19 vaccination, and this was higher among healthcare workers and those of the Christian and Islamic faiths. Also, 44.2% of the respondents were deeply concerned about the hastiness with which the vaccine was produced and rolled out for human use (52).

The South African government rolled out the COVID-19 vaccination programme in a prioritised stepwise fashion to ensure an adequate number of people living in South Africa were vaccinated to achieve much-desired herd immunity. There are estimated to be 4 million African immigrants living in South Africa, which is just less than 10% of the total South African population (20). This figure is relatively high, and any COVID-19 vaccination programme that does not consider this component of the general population may deter the timely attainment of herb immunity. As of now, there is a paucity of data elucidating the knowledge, attitudes and perceptions of African immigrants living in South Africa regarding the COVID-19 vaccination.

Given the context above, a need was identified for a study that would lay the groundwork for future research that may lead to targeted interventions and policies. This approach could form part of a larger strategy to not only improve vaccination rates but also enhance the overall well-being of the immigrant population amid the ongoing pandemic. This study aimed to explore issues that impacted vaccine hesitancy among African migrants living in South Africa by assessing their knowledge, attitudes, and perceptions towards the COVID-19 vaccination.

CHAPTER 2

METHODS

2.1 INTRODUCTION

In the preceding chapter, a literature review was conducted on the research topic, wherein relevant scientific publications were examined, revealing a gap in knowledge that the proposed study intended to address. The present chapter outlines the research methodology employed in conducting the study, together with the ethical considerations, scope, and limitations of the study.

2.2 AIM OF THE STUDY

The overarching aim of this research was to determine the knowledge, attitudes, and perceptions of African migrants toward COVID-19 vaccination in an urban South African setting.

2.3 OBJECTIVES OF THE STUDY

The objectives of the study were:

1. To assess the level of knowledge regarding COVID-19 vaccination among African migrants attending an urban private medical practice in Cape Town
2. To describe their attitudes towards COVID-19 vaccination
3. To describe the perceptions of COVID-19 vaccination among the participants
4. To identify the source of participants' knowledge regarding COVID-19 vaccination

2.4 STUDY DESIGN AND SETTING

The research method was quantitative in nature, and a cross-sectional descriptive research design was employed to conduct the study using two private primary care medical centres situated within the Southern peri-urban areas of Cape Town, South Africa. One of the medical centres was a private healthcare facility in Parkland, an area that is found within the middle-class community of Cape Town. The other medical facility was a private healthcare facility in Du Noon, a working-class area with high unemployment levels. Both areas have sizeable African migrant populations, and

many of these people have chosen the two medical centres described above as their preferred healthcare service providers.

2.5 STUDY POPULATION AND SAMPLING

The study population was comprised of all the migrant persons who identified as non-South Africans within the study setting. Participation was opened to all patients who self-identified as African migrants attending the medical facilities mentioned above, were willing to complete questionnaires in English, and were not confirmed as COVID-19 positive. Participants were recruited using a convenience sampling technique upon arrival at the participating private health facilities. After the medical consultation, the research assistant invited the patients to complete the questionnaire. The inclusion criteria used to recruit and screen participants were self-identified as African migrants, 18 years of age or older, no current COVID-19 infection, and able to speak or read the English language.

The sample size was estimated using Statcalc (Epi Info™). The calculation was based on a 5 % margin of error at 95% CI, the expected frequency of 85%, with a Design Effect of 1; therefore, the calculated minimum sample size was N0 = 198. Given the possibility of incomplete questionnaires or non-response by the participants, the minimum sample size was adjusted based on the anticipated response rate of 90%. Therefore, N1 = N0/0.9 = 198/0.9 = 220. Based on the adjusted sample size, the total number of participants (N1) required is 220.

2.6 DATA COLLECTION

The research instrument used for data collection in the current study was a close-ended self-administered questionnaire. It was modified and adapted to the study settings for use after an extensive literature search of available, validated COVID-19 questionnaires (53, 54, 55). The questionnaire underwent a two-step validation process. Firstly, content validation involved a review by experts in family medicine, public health, and related fields, as well as consideration of relevant literature to ensure alignment with study objectives. Input from the literature further enhanced content validity. Secondly, face validation occurred through a pilot study with a subset of the target population, assessing the questionnaire's clarity and functionality.

Participant feedback guided refinements, ensuring it was clear, comprehensible, and suitable for the study population. This iterative process aimed to enhance the questionnaire's reliability and suitability for the study.Convenient sampling was employed as patients walked into any of the participating health facilities. A research assistant, who was also an African migrant and fluent in English, was trained on how the data collection procedure worked. The assistant approached and recruited participants who self-identified as African immigrants after they had been seen by the physicians using the inclusion criteria stated above. The participants completed paper questionnaires after written informed consent was obtained from them, and they were subsequently reassured of the protection of their privacy and confidentiality, emphasising that the study had no bearing on their immigration status in South Africa. At no point was their immigration status or passport/ID mentioned or requested as part of the requirements for participating in the research. The recruitment took one month, and 220 participants were finally sampled.

The raw data from the questionnaire was later transferred to an Excel spreadsheet prior to descriptive analysis. All collected data was stored in a locked cupboard in an office only accessible to the research team, and the electronic data on the researcher's laptop was encrypted and password protected.

2.7 DATA ANALYSIS

The data extracted from the questionnaires were entered into a Microsoft Excel spreadsheet after the data was cleaned and checked for errors. It was then exported into the Statistical Program for the Social Sciences (SPSS) version 27 for statistical analysis (56). The Shapiro-Wilks test was performed to determine if the data set variables were normally distributed. Continuous variables were expressed in terms of their means and standard deviations. Categorical variables were represented with frequencies and percentages. Statistical significance was considered when the p-value was less than 0.05.

2.8 VARIABLES

The variables accommodated by the data tool are refelected in two sections:

Section A–Biodemographic information—mainly including the following:

- Respondents' age

- Gender
- Occupation
- Estimated annual income of the respondents
- Education level

Section B of the questionnaire dealt with knowledge, attitude and perception influencing vaccine hesitancy as follows:

- Vaccine safety (“side effects”, “adverse reactions”)
- Vaccine effectiveness
- Misinformation (source of information)
- Willingness to take the vaccine
- Factors influencing vaccine uptake

2.9 ETHICAL CONSIDERATIONS

2.9.1 GENERAL

All ethical standards for medical research were considered during this study, upholding the World Medical Association’s Declaration of Helsinki 2013. The study was conducted in accordance with the principles of the South African Good Clinical Practice guidelines 2020. The study proposal was reviewed and approved by the University of Cape Town’s Human Research Ethics Committee (reference number: 029/2023).

2.9.2 BENEFITS

The benefit of the study was to enable researchers to identify the factors that influence vaccine hesitancy among African immigrants, educate and create awareness among the population. In doing this, it is assumed that it will improve the reception and uptake of the COVID-19 vaccine, therefore improving patient outcomes and subsequently ensuring a safe community. Additionally, the outcome will also assist future studies on how to design vaccine programmes targeting hard-to-reach populations.

Non-Maleficence

This study posed no risk of adverse effects to patients as there were no invasive techniques or interventions. It did not affect or influence patient care in any way.

2.9.3 PATIENT AUTONOMY AND INFORMED CONSENT

Informed consent was sought from all the participants, and the aggregate data was strictly managed to maintain patient confidentiality. The data was anonymised at the time of collection to ensure that the collected data could not be directly linked or traced to any of the participants.

2.9.4 CONFIDENTIALITY AND PRIVACY

Patient confidentiality was maintained throughout the study by de-identifying all data at the time of collection. The data extraction forms were scanned and stored in an electronic format on a secure password-protected external storage device, which is being kept in a secure location by the principal investigator. The original paper data and electronic data forms will be kept for a period of five years after the degree has been awarded. After that, they will be destroyed. Data will be entered manually into a Microsoft Excel spreadsheet to which only the study investigators will have access. No identifiable details of patients or healthcare workers were captured at any stage of data collection and analysis.

2.9.5 STRENGTHS AND LIMITATIONS

The study included migrants, a hard-to-reach population, which posed unique challenges in research engagement. Recognising the inherent trust barriers that often hinder participation in research activities among this demographic, the researcher implemented targeted strategies to foster trust and facilitate meaningful engagement. Establishing culturally sensitive communication channels, collaborating with community leaders, and leveraging trusted community organisations were integral components of these efforts. Additionally, the research team prioritised transparency and cultural competence to create a conducive environment for open participation, ensuring that the unique perspectives of this hard-to-reach population were effectively captured in the study's findings

CHAPTER 3

RESULTS

3.1 INTRODUCTION

In the previous chapter, the research design employed in this study was discussed in addition to the processes followed to ensure that a sound scientific approach was followed in data collection and analysis. The current chapter is about the study findings and their interpretations. The results are presented by means, proportions, and percentages accordingly, and some are represented with charts and tables.

3.2 SOCIODEMOGRAPHIC CHARACTERISTICS

A total of 202 participants were included in the study, with a mean age of 31.6 years (SD = 8.6). The youngest was 18 years old, and the oldest was 80 years of age. Most (42.5%) of the participants fall within the 26-33 years age group, and many of them were aged thirty-three years or younger (65%). There were more males (60%) than females among the sampled participants, with nearly half (49.5%) of them born in Zimbabwe, followed by Malawi with 31 (15.8%), and Nigeria with 20 (10.2%).

The majority (68.53%) of participants have not experienced COVID-19 symptoms; some of them (12.69%) reported having symptoms, but they were never tested, and nearly half (47%) of the participants have not received any dose of COVID-19 vaccination as at the time of this research. Almost all of them had at least a secondary school education (86%), were gainfully employed or self-employed (80%), and reported having some support structure within South Africa (88.5%). In terms of their current financial situation, most of them (63.4%) reported that their current financial situation meets their needs. The information described above is shown in Table 1 and Figure 1 below.

Table 1: Characteristics of study participants

Variables	Frequency	Percentage
Age-group (n=200)		
18-25	47	23.50
26-33	85	42.50
34-41	41	20.50
42-49	21	10.50
≥50	6	3.00
Gender (n=185)		
Male	111	60.00

Variables	Frequency	Percentage
Female	74	40.00
Country of Birth (n=196)		
Congo DRC	15	7.65
Malawi	31	15.82
Nigeria	20	10.20
Zambia	15	7.65
Zimbabwe	97	49.49
South Africa	2	1.02
Mozambique	4	2.04
Lesotho	6	3.06
Algeria	1	0.51
Angola	1	0.51
Gabon	1	0.51
Tanzania	1	0.51
Swaziland	2	1.02
Employment Status (n=196)		
Employed	87	44.39
Self-employed	69	35.20
Unemployed	40	20.41
Educational Level (n=194)		
None	2	1.03
Primary	25	12.89
Secondary	89	45.88
Tertiary	78	40.21
Support structure in South Africa (n=192)		
Family	137	71.35
Friends	22	11.46
Colleagues	11	5.73
None	22	11.46
Financial Situation (n=191)		
Meeting needs	106	55.50
Not making ends meet	70	36.65
Have more than needed	15	7.85
Estimated Annual Income (n=190)		
Above R15000	37	19.47
Less than R3000	69	36.32
R10001-R15000	18	9.47
R3000-R5000	31	16.32
R5001-R10000	35	18.42
Have you had COVID-19 Symptoms (n=197)		
No	135	68.53
Yes, probably, but I haven't been tested	25	12.69
Yes, and I have been tested	37	18.78
Have you taken COVID-19 Vaccine (n=198)		
Yes (1st dose)	17	8.59
Yes (2 doses) for Johnson & Johnson	49	24.75
Yes, three doses for Pfizer	39	19.70
No	93	46.97

3.3 PARTICIPANTS' GENERAL KNOWLEDGE OF COVID-19 VACCINE

The participants' knowledge regarding the eligibility and requirements for COVID-19 vaccination is shown in Table 2 below. Most of the participants (63.57%) were aware that taking the COVID-19 vaccine is not legally mandatory and that infants are not routinely considered for the vaccine (73.4%). Nearly all of them (82%) indicated that adults aged 18 years and older were eligible for the COVID-19 vaccine.

Table 2: Knowledge of Eligibility for COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
It is legally mandatory to take COVID-19 vaccine (n=140)		
Yes	28	20.00
No	89	63.57
Don't know	23	16.43
Group of People Who May or May Not Be Eligible for Taking Covid-19 Vaccine		
Infant < 1 years (n=199)		
Eligible	24	12.06
Not Eligible	146	73.37
Don't know	29	14.57
Children and adolescent < 18 years (n=198)		
Eligible	142	71.72
Not Eligible	40	20.20
Don't know	16	8.08
Adult ≥ 18 years (n=200)		
Eligible	164	82.00
Not Eligible	22	11.00
Don't know	14	7.00
Pregnant and lactating ladies (n=198)		
Eligible	58	29.29
Not Eligible	91	45.96
Don't know	49	24.75
Patient with chronic diseases like diabetes, hypertension, and heart disease (n=192)		
Eligible	113	58.85
Not Eligible	38	19.79
Don't know	41	21.35
Person having active COVID infection (n=193)		
Eligible	77	39.90
Not Eligible	65	33.68
Don't know	51	26.42
Person recovered from COVID infection (n=191)		
Eligible	126	65.97
Not Eligible	28	14.66
Don't know	37	19.37
Immunocompromised patients (n=188)		
Eligible	120	63.83
Not Eligible	27	14.36
Don't know	41	21.81

Many believed persons who had recovered from COVID-19 infection were eligible for the vaccine (65.97%), and some indicated that patients with active COVID-19 infection were also eligible for vaccination (40%). Table 3 describes participants' knowledge regarding the effectiveness of the COVID-19 vaccine. Furthermore, 80.10% of

participants believed that the COVID-19 vaccines are administered free of charge, about one-third (29.8%) said the vaccines were not effective at preventing COVID-19 infection, but just about half (56%) believed the vaccines do prevent serious illness.

Table 3: Knowledge of Effectiveness of COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
COVID-19 vaccines are effective at keeping you from getting COVID-19 (n=191)		
True	112	58.64
False	57	29.84
Don't know	22	11.52
The vaccine will keep you from getting seriously ill even if you get COVID-19 (n=194)		
True	109	56.19
False	55	28.35
Don't know	30	15.46
After full vaccination one can resume all stopped activities before the pandemic (n=193)		
True	83	43.01
False	73	37.82
Don't know	37	19.17
COVID-19 vaccines are given free (n=191)		
True	153	80.10
False	28	14.66
Don't know	10	5.24
Like all other vaccines, this vaccine has the potential for some side effect (n=195)		
True	125	64.10
False	44	22.56
Don't know	26	13.33
Side effects due to COVID-19 vaccination normally go away in a few days (n=195)		
True	106	54.36
False	51	26.15
Don't know	38	19.49
The COVID-19 vaccine can create infertility (n=195)		
True	30	15.38
False	106	54.36
Don't know	59	30.26
The COVID-19 vaccine can create long term physical problems (n=193)		
True	38	19.69
False	95	49.22
Don't know	60	31.09

When asked about possible side-effects of the vaccine, a few (19.69%) of the respondents believed the COVID-19 vaccine could result in long-term physical problems and infertility (15.4%). Table 4 focuses on the participants' knowledge of the COVID-19 vaccine. Specifically, it examines their understanding of how to book

an appointment for vaccination, where the vaccine can be obtained, and the timeframe required to achieve protective immunity after vaccination. Some of the participants did not know where to get the vaccine (15.3%) and how to book an appointment for vaccination (20.1%). Many of the participants (40%) said the first vaccine dose is enough to confer immunity on the recipient.

Table 4: Knowledge of Accessibility of the COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
How do you book an appointment for vaccination (n=184)		
Online	89	48.37
Phone call	30	16.30
Hospital	28	15.22
I don't know	37	20.11
Where you can get the vaccine (n=180)		
Clinic	68	37.78
Pharmacy	44	24.44
Hospital	44	24.44
I don't know	24	13.33
Protective immunity against COVID-19 infection will be achieved after (n=185)		
First dose of vaccination	74	40.00
Second dose of vaccination	14	7.57
Fourteen days after first dose of vaccination	24	12.97
I don't know	73	39.46

In Table 5, participants were asked about factors influencing their opinions about the COVID-19 vaccination. The information sources that have shaped participants' perspectives on COVID-19 vaccination were explored. The most influential source was discussion among friends, with 54.2% reporting that it had a "very significant effect" on their perspective. This factor was closely followed by social media (Facebook, Instagram, and WhatsApp), which the participants reported as having a very significant effect on their opinion about the vaccine (46,3%).

Table 5: Sources influencing participants regarding COVID-19 Vaccine (n=202)

Variables	Frequency	Percentage (%)
How have your opinion been influenced regarding vaccination by the following factors?		
a) News from National TV/Radio (n=193)		
Insignificant	76	39.38
Somewhat significant effect	46	23.83

Variables	Frequency	Percentage (%)
Very significant effect	71	36.79
b) Government agencies (n=189)		
Insignificant	81	42.86
Somewhat significant effect	45	23.81
Very significant effect	63	33.33
c) Social media (Facebook, Instagram, and WhatsApp) (n=188)		
Insignificant	49	26.06
Somewhat significant effect	52	27.66
Very significant effect	87	46.28
d) Discussion amongst friends and family (n=190)		
Insignificant	45	23.68
Somewhat significant effect	42	22.11
Very significant effect	103	54.21
e) Healthcare provider (n=189)		
Insignificant	89	47.09
Somewhat significant effect	22	11.64
Very significant effect	78	41.27
f) Others please specify (n=32)		
Insignificant	9	28.13
Somewhat significant effect	10	31.25
Very significant effect	13	40.63

The participants' performance was summed up based on the number of correct questions they answered. Table 6 below indicates that responses from the seventeen (17) questions based on their knowledge of the COVID-19 vaccine, where each correct answer was assigned a score of 1 and incorrect or unknown answers received a score of zero. Participants scoring 12 or higher were classified as having good knowledge; those scoring 6-11 had fair knowledge, and those scoring below or equal to five points were considered to have poor knowledge. Based on Table 6, the findings revealed that most participants (46.04%, 93) had fair knowledge (scoring 6 to 11 points) regarding the COVID-19 vaccines, followed by those with good knowledge (29.70%, 60). Conversely, a smaller proportion (24.26%, 49) demonstrated a poor knowledge (scoring five and below). These results indicate that most of the participants had fair to good knowledge about COVID-19 Vaccination.

Table 6: Overall knowledge of COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
Overall knowledge of COVID-19 Vaccine		
Poor (≤5 marks)	49	24.26
Fair (6-11 marks)	93	46.04

Good (12-17 marks)	60	29.70

3.4 ATTITUDE OF PARTICIPANTS TOWARDS COVID-19 VACCINE

Table 7 below describes the participants' attitudes toward COVID-19 vaccination and specifically provides insights into their willingness to take the vaccine. The responses are categorised into levels of agreement, ranging from "strongly agree" to "strongly disagree." Findings show that more than half (53.33%) of the participants expressed their strong willingness to take the COVID-19 vaccine, with very few (30.41%) preferring to acquire immunity naturally. Recommendations for vaccination varied, with 39.15% strongly agreeing to recommend the vaccine to family and friends, and the majority (63.5%) affirming that they have already received the vaccine.

Table 7: Attitude towards COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
I am willing to take the COVID-19 vaccine (n=195)		
Strongly agree	104	53.33
Agree	16	8.21
Undecided	14	7.18
Disagree	17	8.72
Strongly disagree	44	22.56
I prefer to acquire immunity against COVID-9 naturally rather than by vaccination (n=194)		
Strongly agree	59	30.41
Agree	38	19.59
Undecided	35	18.04
Disagree	46	23.71
Strongly disagree	16	8.25
I will recommend my family and friends to get the COVID-19 vaccination (n=189)		
Strongly agree	74	39.15
Agree	28	14.81
Undecided	24	12.70
Disagree	7	3.70
Strongly disagree	56	29.63
Have already taken the vaccine? (n=145)		
Yes	92	63.45
No	53	36.55

The participants were presented with four (4) attitudinal questions. Responses that signified a positive attitude were assigned a score of 1, while those signifying a negative attitude received a score of 0. The scores were then summed up. Participants

scoring three or higher were classified as having a positive attitude, and those scoring two and below were considered to have a negative attitude. The attitudes of the participants towards the COVID-19 vaccine were classified as either 'poor' or 'good', as depicted in Table 8 below and summarised in Figure 1 below, which shows that most of the participants (58.91%) had a negative attitude regarding the COVID-19 vaccine.

Table 8: Overall attitude towards COVID-19 Vaccine (n=202)

Variables	Frequency
Overall attitude towards COVID-19 Vaccine	
Negative Attitude (≤2)	119
Positive Attitude (3-4)	83

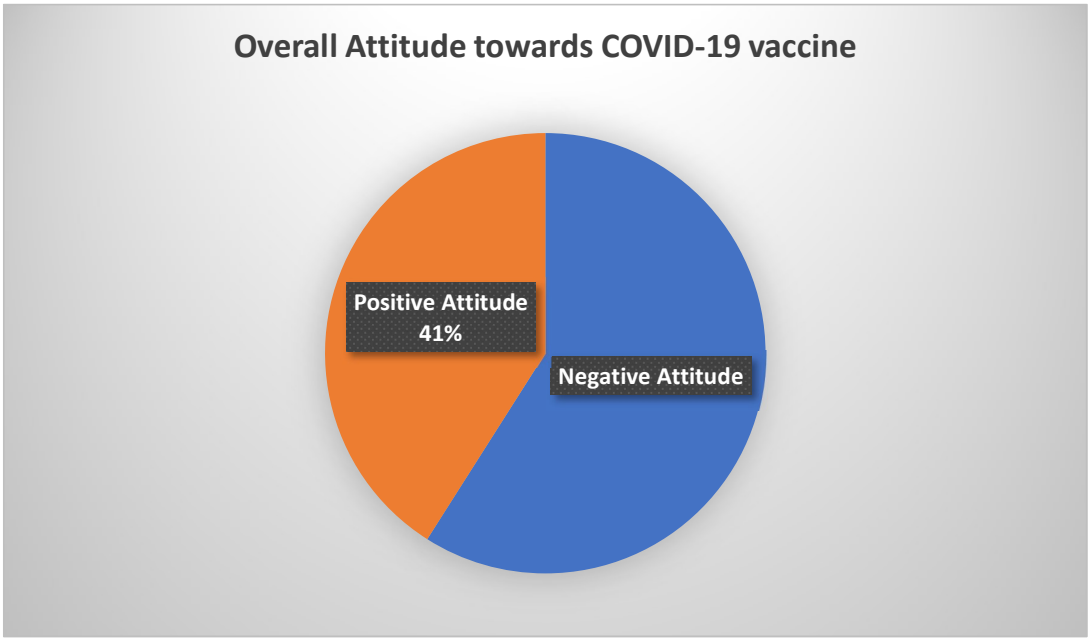

Figure 1: Overall attitude towards COVID-19 Vaccine (n=202)

3.5 PARTICIPANTS' PERCEPTION OF THE COVID-19 VACCINE

Table 9 depicts the responses given with regard to participants' perceptions of the COVID-19 vaccine. When asked about their motivations for vaccine acceptance, a substantial portion strongly believes in the vaccine's harmlessness (45.36%), while a

comparable number express strong confidence in its ability to provide protection against COVID-19 (41.36%). Economic factors come into play, with a significant majority firmly asserting that the vaccine is free (61.14%). In evaluating the risk-benefit dynamics, some of the participants also contend that the benefits outweigh the risks (38.14%). Societal perspectives vary, as evidenced by responses indicating a significant number who strongly agree that taking the vaccine is a societal responsibility (22.80%). Some (31.4%) of participants exhibit confidence in the scientific evidence supporting the vaccine's effectiveness and safety, with some strongly agreeing. Social influence appears to be a factor, with a considerable number strongly agreeing that many people are taking the vaccine (29.84%). However, perceptions regarding the vaccine's role in eradicating COVID-19 show a more varied response. The influence of role models is apparent, but opinions differ, with a significant number strongly disagreeing that their role models have taken the vaccine (36.46%).

Table 9: Perception towards COVID-19 Vaccine (n=202)

Variables	Frequency	Percentage (%)
I took or will take the COVID-19 vaccine because		
There is no harm in taking the vaccine (n=194)		
Strongly agree	88	45.36
Agree	27	13.92
Undecided	16	8.25
Disagree	22	11.34
Strongly disagree	41	21.13
The vaccine will protect me against COVID-19 (n=191)		
Strongly agree	79	41.36
Agree	36	18.85
Undecided	17	8.90
Disagree	23	12.04
Strongly disagree	36	18.85
The vaccine is free (n=193)		
Strongly agree	118	61.14
Agree	43	22.28
Undecided	17	8.81
Disagree	10	5.18
Strongly disagree	5	2.59
The benefit of the vaccine outweighs the risk (n=194)		
Strongly agree	74	38.14
Agree	43	22.16

Variables	Frequency	Percentage (%)
Undecided	25	12.89
Disagree	21	10.82
Strongly disagree	31	15.98
Taking the vaccine is a societal responsibility (n=193)		
Strongly agree	44	22.80
Agree	34	17.62
Undecided	51	26.42
Disagree	27	13.99
Strongly disagree	37	19.17
There is scientific evidence that the vaccine is effective and safe (n=194)		
Strongly agree	61	31.44
Agree	50	25.77
Undecided	32	16.49
Disagree	23	11.86
Strongly disagree	28	14.43
Many people are taking the vaccine (n=191)		
Strongly agree	57	29.84
Agree	57	29.84
Undecided	42	21.99
Disagree	18	9.42
Strongly disagree	17	8.90
It will help in eradicating the COVID-19 infection (n=191)		
Strongly agree	55	28.80
Agree	56	29.32
Undecided	22	11.52
Disagree	30	15.71
Strongly disagree	28	14.66
My role models have taken the vaccine (n=192)		
Strongly agree	22	11.46
Agree	26	13.54
Undecided	32	16.67
Disagree	42	21.88
Strongly disagree	70	36.46

The data above indicates that the participants display a spectrum of concerns related to the COVID-19 vaccine. The participants express apprehension regarding the availability of the vaccine, with a few of them strongly agreeing (17.86%) and agreeing (10.71%) that it might not be easily accessible. A few of them also expressed their concerns about serious side effects, with some participants ‘strongly agreeing’ (28%) and ‘agreeing’ (17.4%) regarding the potential for side effects. Perceptions of the vaccine’s rapid development and approval also showcase raised concerns, with

33.86% strongly agreeing and 29.63% agreeing, while 10.05% disagree and 12.70% strongly disagree. Concerns about potential serious side effects are also prominent, as indicated by 28.06% strongly agreeing and 17.35% agreeing, while 29.08% express disagreement and 14.29% strongly disagree. Scepticism regarding commercial promotion by pharmaceutical companies is apparent, with 36.27% strongly agreeing and 20.73% agreeing, although a notable contingent (12.95%) strongly disagrees. Lastly, views on the impact of vaccination on preventive measures vary, with 6.15% strongly agreeing and 7.69% agreeing that post-vaccination preventive measures are unnecessary, while a substantial 41.54% strongly disagree, emphasising the continued importance of such measures.

Table 10: Perception towards COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
I am concerned that		
The vaccine might not be easily available to me (n=196)		
Strongly agree	35	17.86
Agree	21	10.71
Undecided	18	9.18
Disagree	62	31.63
Strongly disagree	60	30.61
The vaccine might have serious side effects (n=196)		
Strongly agree	55	28.06
Agree	34	17.35
Undecided	22	11.22
Disagree	57	29.08
Strongly disagree	28	14.29
The vaccine may be faulty (n=194)		
Strongly agree	46	23.71
Agree	37	19.07
Undecided	25	12.89
Disagree	57	29.38
Strongly disagree	29	14.95
The vaccine was rapidly developed and approved (n=189)		
Strongly agree	64	33.86
Agree	56	29.63
Undecided	26	13.76
Disagree	19	10.05
Strongly disagree	24	12.70
The vaccine might have some unforeseen future effects (n=196)		
Strongly agree	54	27.55
Agree	34	17.35
Undecided	36	18.37
Disagree	42	21.43

Variables	Frequency	Percent (%)
Strongly disagree	30	15.31
The vaccine is being promoted for commercial by pharmaceutical companies (n=193)		
Strongly agree	70	36.27
Agree	40	20.73
Undecided	38	19.69
Disagree	20	10.36
Strongly disagree	25	12.95
After taking the COVID-19 I don't need to follow preventive measures such as wearing a mask, hand sanitation and social distancing (n=195)		
Strongly agree	12	6.15
Agree	15	7.69
Undecided	43	22.05
Disagree	44	22.56
Strongly disagree	81	41.54

The participants were presented with sixteen (16) perception questions, with the responses shown in Tables 9 and 10, where responses that signify a positive perception were assigned a score of 1, and those signifying a negative perception received a score of 0. The scores were then summed UP, with scores of agree and strongly agree counting as indicating a positive perception, and disagree and strongly disagree indicating a negative perception of the question. Participants scoring nine or higher were classified as having a positive perception towards the COVID-19 vaccine, and those scoring eight and below were considered to have a negative perception. According to Table 11, about half of the participants (52%) had a negative perception regarding the COVID-19 vaccine.

Table 11: Overall Perception towards COVID-19 Vaccine (n=202)

Variables	Frequency	Percent (%)
Overall Perception towards COVID-19 Vaccine		
Negative Perception (≤8)	105	52%
Positive Perception (9-16)	97	48%

CHAPTER 4

DISCUSSION AND CONCLUSIONS

4.1 INTRODUCTION

In the previous chapter, all the results of the current study were described and presented in tables and figures with some narratives. This chapter discusses the study findings in the context of the relevant literature, and it also includes the conclusion section and recommendations that emanate from the study.

4.2 DISCUSSION

Overall, the result of the current study provides valuable insights into the participants' understanding and acceptance of the COVID-19 vaccine. The demographic profile of the study participants reveals a predominantly young and diverse population with significant representation from various African countries. This diversity reflects the multicultural nature of the immigrant population within the study setting. Demographic factors have been known to influence knowledge and attitudes towards desired health behaviour. A study among some immigrant communities in the United States revealed that influenza vaccine uptake is often predicted by the demographics of the people (21). In addition, this profile of predominantly young adults aligns with the general age distribution of immigrants in many regions. Sociodemographic factors have been consistently shown to have a strong association with COVID-19 vaccine knowledge and acceptance (21, 47, 50). With regards to knowledge, the participants' knowledge about the vaccine was generally fair to good, indicating a basic understanding of the vaccine's eligibility and requirements. Notably, most of them were aware of the eligibility and requirements for COVID-19 vaccination, which is consistent with studies conducted in other parts of the world and sub-Saharan Africa where participants demonstrated good knowledge of the vaccine (32, 49, 50). However, there were some misconceptions, particularly regarding the eligibility of patients with active COVID infection and the effectiveness of the vaccines, which are evidence of poor understanding of the corona virus and its vaccine.

According to previous studies, there is a varied level of knowledge and understanding with regard to the COVID-19 vaccine, which has been linked to safety concerns;

therefore, individuals with a poor knowledge base about the virus tend to demonstrate safety concerns and subsequently vaccine hesitancy (2, 32, 47). Interestingly, even though nearly half of the participants in the current study had not received any dose of the COVID-19 vaccine at the time of the study, there was a strong willingness to get vaccinated. This finding resembles some of the previous studies that reported on participants' willingness to get vaccinated (32, 49, 50). This, therefore, suggests that factors other than knowledge and awareness, such as accessibility and availability of vaccines, may be influencing individuals' wiliness to vaccinate (50). Nevertheless, these findings underscore the need for targeted educational interventions to address knowledge gaps among the population of interest, as suggested by previous research where low knowledge levels were reported (2, 50, 52). These could include educational interventions to address knowledge gaps and misconceptions, as well as strategies to leverage social influence and address attitudinal barriers to vaccination. Further research is needed to explore these factors in more depth and develop effective interventions for improving vaccine acceptance and uptake among this population. This study's findings align with the recommendations of previous studies, which have emphasised the need for health education programmes and initiatives to improve knowledge and attitudes towards COVID-19 vaccination

Even though less than half of the participants demonstrated a strong attitude towards the vaccine, their overall attitudes towards the COVID-19 vaccine were generally positive, considering that most of them expressed their willingness to take the vaccine. However, some participants preferred to acquire immunity naturally. This preference could be due to misconceptions about natural immunity being more effective or safer than vaccine-induced immunity, which needs to be addressed in public health communications (19,49). Furthermore, this attitudinal disposition appears like another study in which willingness and knowledge did not influence vaccine uptake. This type of complex issue has been noted in other studies, therefore suggesting that willingness to get vaccinated does not necessarily translate into positive attitudes towards the vaccine (48, 49).

Participants' perceptions of the vaccine were varied. While a substantial portion believed in the vaccine's harmlessness and its ability to protect against COVID-19,

there were also concerns about the vaccine's availability, potential side effects, and the rapid development and approval process. The importance of these findings in the context of the study setting is that they reveal a spectrum of concerns related to the COVID-19 vaccine among the study participants. These concerns echo those found in the broader literature on vaccine hesitancy (19,48,49). Participants expressed apprehensions regarding the availability of the vaccine, which aligns with research highlighting accessibility as a key factor influencing vaccine uptake.

Concerns about potential serious side effects were also prominent, reflecting findings from other studies that fear of side effects is a common barrier to vaccination (19, 48, 49). Perceptions of the vaccine's rapid development and approval also raised concerns among participants. This concern is consistent with literature indicating that the speed of COVID-19 vaccine development has led to increased scepticism and hesitancy (52).

Interestingly, scepticism regarding commercial promotion by pharmaceutical companies was apparent among participants, which underscores the need for transparent communication about the vaccine development process to build trust (47, 52). Besides, a significant number of participants believed that the benefits of vaccination outweigh the risks and that taking the vaccine is a societal responsibility. However, there were misconceptions about the role of the vaccine in eradicating COVID-19 and the influence of role models in vaccination decisions. Concerns like these could potentially affect the uptake of the vaccine (19, 48, 49), and thus it must be addressed through transparent communication about the vaccine development and approval process, as well as the measures taken to ensure the safety and efficacy of the vaccine. Despite these concerns, the study found that about half of the participants had a positive perception of the COVID-19 vaccine. These perceptions suggest that while concerns exist, they may not necessarily translate into vaccine refusal (49). However, the fact that about half of the participants had negative perceptions regarding the vaccine indicates a need for targeted interventions to address these concerns and improve perceptions of the vaccine. Essentially, these findings

underscore the complexity of vaccine acceptance and highlight the need for multifaceted strategies to improve vaccine uptake.

The study also revealed the significant influence of social networks and social media on participants' opinions about the vaccine. Discussions among friends and social media platforms had a significant effect on shaping participants' perspectives on COVID-19 vaccination. These findings support the growing body of literature highlighting the role of social media in shaping public health behaviours and attitudes. This finding underscores the power of social influence in shaping vaccine acceptance and the potential of these platforms in disseminating accurate and persuasive information about the vaccine (18, 29). Previous studies have suggested the role of social media and other influences in vaccine acceptance and the need to leverage these platforms for disseminating accurate information about the vaccine. Views on the impact of vaccination on preventive measures varied among participants, with a substantial proportion emphasising the continued importance of such measures post-vaccination. These views align with public health messaging stressing that vaccination is a complement to, not a replacement for, existing preventive measures.

In conclusion, the findings of this study support much of what already exists in the literature regarding knowledge, attitudes, and perceptions towards COVID-19 vaccination (19, 29, 48, 49). Furthermore, the study highlights the complex interplay of knowledge, attitudes, and perceptions in shaping COVID-19 vaccination behaviours among African immigrants in the study setting. It underscores the need for nuanced and targeted public health interventions to address misconceptions, manage concerns, and promote vaccine acceptance. Considering the ongoing COVID pandemic, further research is imperative to explore innovative strategies for enhancing public understanding and acceptance of the COVID-19 vaccine and develop effective interventions for improving vaccine acceptance and uptake among this population, ultimately paving the way towards a COVID-free world.

4.3 RECOMMENDATIONS

Based on the findings of this study on the overall participants' knowledge, attitudes, and perceptions toward the COVID-19 vaccine, several recommendations emerge to inform public health strategies and interventions within the study setting. If these recommendations were to be implemented, it would go a long way in contributing to a more informed and positively inclined community that is a positive response to COVID-19 vaccination, and which could ultimately advance the goals of disease prevention and health promotion within the setting of this research.

1. **Tailored Educational Campaigns within the study setting:** Based on the identified gaps in knowledge, it is recommended that tailored educational campaigns be designed and implemented. These campaigns should address specific areas such as vaccine eligibility, requirements, and the timeframe for achieving protective immunity. Utilising diverse channels, including social media and community forums, can enhance the reach and effectiveness of these educational initiatives.

2. **Engagement with Influential Sources:** Given the significant impact of discussions among friends and social media on participants' perspectives, interventions should focus on engaging with these influential sources. Collaborations with community leaders, influencers, and healthcare professionals can facilitate accurate information dissemination and contribute to building a supportive environment for COVID-19 vaccination.

3. **Transparent Communication on Vaccine Safety:** To address concerns related to vaccine safety and side effects, public health communication should emphasize transparency. Clear and accessible information about the scientific evidence supporting the vaccine's safety and the rigorous approval processes can help alleviate apprehensions and build trust in the community.

4. **Community Engagement Initiatives:** Implementing community engagement initiatives, including town hall meetings, webinars, and interactive workshops, can foster a sense of community involvement in vaccination efforts. These initiatives

can provide a platform for addressing specific concerns, dispelling myths, and encouraging open dialogue between healthcare providers and the community.

5. **Monitoring and Evaluation of Intervention Impact:** Following the implementation of interventions, it is crucial to conduct ongoing monitoring and evaluation to assess their impact on knowledge, attitudes, and perceptions. This iterative process will enable the adjustment of strategies based on real-time feedback and contribute to the continuous improvement of public health communication initiatives.

6. **Collaboration with Local Health Authorities:** Collaboration with local health authorities and community health workers is essential for the success of interventions. Leveraging existing healthcare infrastructure can enhance the dissemination of accurate information and ensure that the community receives consistent and reliable guidance on COVID-19 vaccination.

According to Sobierajski, Rzymski and Wanke-Rytt (56), incorporating recommendations that will improve attitudes and perceptions toward vaccinations into public health initiatives, it is possible to enhance vaccine awareness, foster positive attitudes, and address concerns within the community, ultimately contributing to improved COVID-19 vaccination rates and public health outcomes. Additionally, there is a need for longitudinal Insight with regard to the research topic. The cross-sectional design of the study limits its ability to capture the dynamic nature of knowledge, attitudes, and perceptions over time. Future research employing a longitudinal approach would provide a more comprehensive understanding of how these factors evolve in response to changing public health narratives.

4.4 LIMITATIONS OF THE STUDY

1. **Sampling Challenges and Generalisability:** The inclusion of migrants, a hard-to-reach population, introduces inherent challenges in research engagement due to trust barriers. The non-random sampling methodology employed in this study could have resulted in selection bias, limiting the representation of diverse views. Additionally, the study's focus on a specific geographic area (patients attending two

practices) may restrict the generalisability of findings to a broader population, necessitating a larger and more diverse sample for enhanced external validity.

2. **Potential for Confirmation Bias and Influences:** The reliance on quantitative questionnaire measures may introduce confirmation bias, as participants may respond in a manner they perceive as socially desirable. Although efforts were made to mitigate bias through training and piloting, the influence of the research assistant on participant responses cannot be entirely ruled out.

3. **Scope Limitations of Quantitative Approach:** The quantitative nature of the questionnaire, with pre-selected items, limits the depth and breadth of data collection. The study's scope could have been enriched through the incorporation of qualitative research methods, such as focus group discussions or interviews, providing participants with more freedom for nuanced self-expression and offering a more comprehensive understanding of their perspectives.

4. **Temporal Dynamics and Longitudinal Insights:** The cross-sectional design of the study offers a snapshot of participants' knowledge, attitudes, and perceptions at a specific point in time. A longitudinal approach is recommended for future research to capture the dynamic nature of these factors. This approach would allow for the exploration of changes over time in response to evolving public health narratives, policy adjustments, and advancements in scientific understanding.

5. **Enhanced Understanding through Qualitative Exploration:** While the study provides valuable quantitative insights, a complementary qualitative exploration is recommended. Qualitative methods, such as focus group discussions or interviews, can offer deeper insights into the reasons behind participants' attitudes. Exploring personal experiences, perceptions, and the impact of social influences can inform targeted interventions and provide a more holistic understanding of the studied population.

6. **Setting cut-off points for good or poor knowledge**: It is difficult to set up a cut-off point on overall items considered to assess Knowledge, Attitude and Practice (KAP) levels in Likert scale-based questionnaires to decide whether the overall knowledge of the respondents is adequate or not, their overall attitude is positive or negative, and their overall practice is satisfactory or unsatisfactory. Cut-off points

for good/fair and poor knowledge was set up for discussion purposes, and no specific recommendations have been based on these classification as such. The important information regarding knowledge is situated in understanding which questions were poorly answered, indicating where there were weaknesses in the particpants knowledge..

4.5 CONCLUSION

In conclusion, the study's comprehensive examination of knowledge, attitudes, and perceptions among African immigrants in a suburban area provides valuable insights that could be used for public health interventions aimed at increasing COVID-19 vaccination acceptance and coverage among immigrant and minority populations. Specifically, the findings highlight specific areas where targeted educational efforts and communication strategies can enhance vaccine acceptance, addressing both knowledge gaps and underlying attitudes and perceptions. This kind of understanding is crucial for tailoring interventions that resonate with the diverse perspectives within the studied community, ultimately contributing to improved vaccine coverage and positive public health outcomes. This study also serves as a foundation for future research and evidence-based interventions to promote vaccine acceptance within this kind of population. However, despite the generally positive attitudes towards the vaccine, the study found that a significant proportion of participants had poor knowledge about the vaccine. This lack of knowledge suggests that while awareness and positive attitudes are important, they are not sufficient to ensure high levels of vaccine uptake. Comprehensive strategies that address knowledge gaps, attitudinal barriers, and practical barriers to vaccination are needed. This recommendation is in line with the recommendations of previous studies, which have emphasised the need for health education programmes and initiatives to improve knowledge and attitudes towards COVID-19 vaccination.

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APPENDICES

5.1 APPENDIX I: QUESTIONNAIRE

A survey of knowledge, attitude and perception of COVID-19 vaccination amongst African immigrants. In order to properly meet your health needs, we would like to hear your opinion on the COVID-19 vaccination. The information provided here is anonymous and will be treated as confidential.

Please mark the correct answer (s) X

SECTION A (Biodemographic information)

1. **Gender:** (a) Female [ ] (b) male [ ]

2. **Age**……..

3. **Country of birth**…….

4. **Have you had COVID-19 symptoms?** (a) No [ ] (b) Yes probably but I haven't been tested [ ] (c) Yes and I have been tested [ ]

5. **Have you taken the COVID-19 vaccine?** (a) Yes (1st dose) [ ] (b) Yes (two doses) in the case of Johnson and Johnson [ ] (c) Yes three doses in case of Pfizer [ ] (d) No [ ]

6. Employment status: (a) Employed [ ] (b) Self-employed [ ] (c) Unemployed [ ]

7. Highest level of education: (a) Tertiary [ ] (b) Secondary [ ] (c) Primary [ ] (d) None [ ]

8. Support structure in South Africa: (a) Family [ ] (b) Friends [ ] (c) Colleagues [ ] (d) none [ ]

9. Financial situation:(a) Not making ends meet [ ] (b)Meeting needs [ ] (c)Have in excess of need[ ]

10. **What's your estimated annual income**: (a) Less than R3000 [ ] (b) R3000-R5000 [ ] (c) R5001-R10000 [ ] (d) R10001-R15000 [ ] (e) Above R15000 [ ]

SECTION B (Knowledge)

1. It is legally mandatory to take COVID-19 vaccine (a) Yes [ ] (b) No [ ] (c) Don't know [ ]

2. We have mentioned a group of people who may or may not be eligible for taking COVID-19 vaccine. Please mark your opinion by checking the most appropriate option.

	Eligible	**Not Eligible**	**Don't know**
(a) Infant < 1 years	**[ ]**	**[ ]**	**[ ]**
(b) Children and adolescent < 18 years	**[ ]**	**[ ]**	**[ ]**
(c) Adult ≥ 18 years	**[ ]**	**[ ]**	**[ ]**

(d) Pregnant and lactating ladies	**[ ]**	**[ ]**	**[ ]**
(e) Patient with chronic diseases like diabetes, hypertension, and heart disease	**[ ]**	**[ ]**	**[ ]**
(d) Person having active COVID infection	**[ ]**	**[ ]**	**[ ]**
(e) Person recovered from COVID infection	**[ ]**	**[ ]**	**[ ]**
(f) Immunocompromised patients	**[ ]**	**[ ]**	**[ ]**

3. The statements below assesses your knowledge of COVID-19 Vaccine. Please mark your opinion by checking the most appropriate option.

	True	**False**	**Don't know**
(a) COVID-19 vaccines are effective at keeping you from getting COVID-19	**[ ]**	**[ ]**	**[ ]**
(b) Getting a COVID-19 vaccine will also help keep you from getting seriously ill even if you get COVID-19	**[ ]**	**[ ]**	**[ ]**
(c) People who have been fully vaccinated can start to do some things that they had stopped doing because of the pandemic	**[ ]**	**[ ]**	**[ ]**
(d) COVID-19 vaccines are given free			
(e) Like all other vaccines, this vaccine has the potential for some side effects	**[ ]**	**[ ]**	**[ ]**
(f) If there are side effects due to COVID-19 vaccination, they normally go away in a few days	**[ ]**	**[ ]**	**[ ]**
(g) The COVID-19 vaccine can create infertility	**[ ]**	**[ ]**	**[ ]**
(h) The COVID-19 vaccine can create long term physical problems	**[ ]**	**[ ]**	**[ ]**

4. How do you book an appointment for vaccination; (a) hospital [ ] (b) phone call [ ] (c) online [ ] (d) I don't know [ ]

5. Where you can get the vaccine: (a) Hospital [ ] (b) Clinic [ ] (c) Pharmacy [ ] (d) I don't know [ ]

6. Protective immunity against COVID-19 infection will be achieved after:

(a) First dose of vaccination [ ]

(b) Second dose of vaccination [ ]

(c) Fourteen days after first dose of vaccination [ ]

(d) Don't know [ ]

7. How significantly the following sources of information have influenced your opinion regarding vaccination.

Please mark/tick the response which best explains your opinion regarding a particular statement:

Sources of information	Insignificant	Somewhat significant effect	Very significant effect
News from National TV/Radio	**[ ]**	**[ ]**	**[ ]**
Government agencies	**[ ]**	**[ ]**	**[ ]**
Social media (Facebook, Instagram, and WhatsApp)	**[ ]**	**[ ]**	**[ ]**
Discussion amongst friends and family	**[ ]**	**[ ]**	**[ ]**
Healthcare provider	**[ ]**	**[ ]**	**[ ]**

Others please specify:……

SECTION C (Attitude)

Please mark/tick the response which best explains your opinion regarding a particular statement:

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
I am willing to take the COVID-19 vaccine	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
I prefer to acquire immunity against COVID-9 naturally rather than by vaccination	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**

I will recommend my family and friends to get the COVID-19 vaccination	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**

Have already taken the vaccine Yes [ ] no [ ]

SECTION D (Perception)

1. If you have taken the vaccine, what factors motivated you to do so?

I took/will take the COVID-19 vaccine because

	Strongly agree	**Agree**	**Undecided**	**Disagree**	**Strongly disagree**
(d1) There is no harm in taking the vaccine	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d2) The vaccine will protect me against COVID-19	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d3) The vaccine is free	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d4) The benefit of the vaccine outweighs the risk	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d5) Taking the vaccine is a societal responsibility	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d6) There is scientific evidence that the vaccine is effective and safe	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d7) Many people are taking the vaccine	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d8) It will help in eradicating the COVID-19 infection	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d9) My role models have taken the vaccine	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**

Concerns about the COVID-19 vaccine. Please mark/tick the response which best explains your opinion regarding the particular statement.

I am concerned that

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
(d11) The vaccine might not be easily available to me	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d12) The vaccine might have serious side effects	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d13) The vaccine may be faulty	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d14) The vaccine was rapidly developed and approved	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d15) The vaccine might have some unforeseen future effects	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**
(d16) The vaccine is being promoted for commercial by pharmaceutical companies	**[ ]**	**[ ]**	**[ ]**	**[ ]**	**[ ]**

2. After taking the COVID-19 I don't need to follow preventive measures such as wearing a mask, hand sanitation and social distancing

a. Strongly agree [ ]
b. Agree [ ]
c. Undecided [ ]
d. Disagree [ ]
e. Strongly disagree [ ]

5.2 APPENDIX II: PATIENT INFORMATION AND INFORMED CONSENT FORM

Study Title: Knowledge, Attitude and Perception of African Immigrants toward Covid-19 Vaccination in a Suburban South African Setting

Researcher: Dr. Shedrach I. Ohiagu

You are invited to take part in a research study about what you feel about the COVID-19 vaccine. Please take some time to read the information presented here, which will explain the details of this project. Please ask the research assistant if you have any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do initially agree to take part.

This study has been approved by the Health Research Ethics Committee at University of Cape Town (Approval number: ??) and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

Purpose of the Study

The purpose of the study is to understudy the knowledge, attitude and perception of African migrants towards COVID-19 vaccination in an urban South African setting.

Suitably qualified research assistant will approach you for consent to participate in the study after you have seen the physician, if you consent you be required to complete a survey questionnaire asking about basic information on age and sex, what you think about vaccine safety ("side effects", "adverse reactions), vaccine effectiveness, if you will be willing to take vaccine and the factors that may influence this decision. Completion of the questionnaire will take approximately ten (10) minutes of your time.

Participation

Your participation in this research project is voluntary. You may choose not to participate. If you choose to participate, you may also withdraw at any point. You will not be penalized, in any way, for any of the above choices.

Reimbursement for Participation

Participants of this study will not be compensated financially or otherwise.

Benefits

The benefit of the study is to assist us identify the factors that discourage African immigrants from taking vaccines. In doing this we hope to improve the reception and uptake of COVID-19 vaccine better thus improving patient outcomes and subsequently ensuring a safe community. The results may also assist in designing vaccine programme targeted at hard-to-reach population.

Risks

There will be no risks to your health, immigration status and your answers will be strictly confidential. There will be no financial cost to you, only ten minutes of your time.

Privacy and Confidentiality

The data you provide will be completely anonymous and de-identified, such that your responses cannot be linked to you. Only the principal investigator will have access to your responses. All your responses given will be treated with strict confidentiality. These data extraction forms (questionnaire) will be scanned and stored in an electronic format on a secure password protected external storage device which will be kept in a secure location by the principal investigator.

Contact

If you have any questions regarding this study, you may contact me, via phone (+27)781138580), or via email sohiago@yahoo.com, or you can also contact University of Cape Town Human research ethic committee (HREC) via (+27)214066338 or via email hrec-enquiries@uct.ac.za.

Consent Form

1. I, _____ (participant name), confirm that this research project has been explained to me, and that my questions have been answered to my satisfaction. I voluntarily and freely make my own decision to participate in this project. I understand that I can withdraw at any time, with no disadvantage to me.

   Name: _____

   Signature: _____

   Date: _____

2. I, _____(investigator name), confirm that I have explained the project to this participant, and answered all questions to the best of my ability. The participant has freely and voluntarily agreed to participate in this project, and retains the right to withdraw at any stage, with no disadvantage to him/her.

   Name: _____

   Signature: _____

   Date: _____