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Factors Influencing Intention and Uptake of COVID-19 Vaccines on the African Continent: A Scoping Review

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PLAGIARISM DECLARATION

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ABBREVIATIONS

CDC – Centres for Disease Control and Prevention

CHW – Community Healthcare Worker

COVID-19 – Coronavirus disease 2019

DRC – Democratic Republic of the Congo

HCW – Health Care worker

HIV/AIDS – Human immunodeficiency virus/acquired immunodeficiency syndrome

IDVI – Infectious Disease Vulnerability Index

MERS-Cov – Middle East respiratory syndrome coronavirus

PRISMA-ScR – Preferred Reporting Items for Systematic reviews & Meta-Analyses extension for Scoping Reviews

SARS-CoV – Severe acute respiratory syndrome

SARS-CoV-2 – Severe acute respiratory syndrome coronavirus 2

TB – Tuberculosis

UNICEF – United Nations Children's Fund

VH – Vaccine Hesitancy

VPD – Vaccine-preventable diseases

WHO AFRO – World Health Organization African Region

WHO – World Health Organization

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The novel Coronavirus 2019, termed COVID-19, is a highly transmissible and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Harapan et al., 2020; Hu et al., 2020; Al-Jayyousi et al., 2021). In December 2019, the causative pathogen novel SARS-CoV-2 (previously called 2019-nCoV) was first identified in Wuhan, Hubei province, China (Li & Lu, 2020; Allagoa et al., 2021). Due to the rapid spread of the SARS-CoV-2 outbreak, the World Health Organization (WHO) declared COVID-19 as a public health emergency of international concern and later a pandemic after affecting over 213 countries and regions (WHO, 2020). The COVID-19 pandemic is a major threat worldwide, disrupting several sectors of human life and causing unprecedented challenges to public health, food security, socio-economic stability, industry, and trade, including Africa (David et al., 2020; Hagan Jr et al., 2021; Tobin et al., 2021).

According to Moore et al. (2017), the Infectious Disease Vulnerability Index (IDVI) accounts for 22 of the 25 countries most vulnerable to infectious diseases in Africa. The African continent constitutes nearly 20% of the world's population. COVID-19 has spread rapidly to 47 countries in the African region (WHO AFRO, 2021b). On February 12, 2020, the first COVID-19 case in Africa was recorded in Egypt (Ilesanmi et al., 2021). Chronic disease patients are more vulnerable to severe illness and death from COVID-19 (WHO AFRO, 2021d). Cardiovascular disease, chronic respiratory diseases and diabetes are three of Africa's most common co-morbidities associated with poor COVID-19 outcomes (WHO AFRO, 2021b). Besides facing the COVID-19 pandemic, Africa has the highest rates of malaria, tuberculosis (TB) and human immunodeficiency virus (HIV/AIDS) in the world (WHO AFRO, 2021d). COVID-19 has already placed additional strain on Africa's already overburdened healthcare systems, resulting in poor health outcomes and high mortality rates associated with the triple burden posed by these diseases (Dzinamarira et al., 2021). Africa consists of 213 million people infected with malaria, 71 million with hepatitis B or C, 26 million with HIV and 2.5 million with TB (Lone & Ahmad, 2020). Lone and Ahmad (2020) hypothesised that the majority of Africa's population would be at greater risk of contracting COVID-19 as a result of their immunocompromised state.

Preventive measures are an essential part of the global effort to mitigate the pandemic's consequences, including its health and socio-economic impact. As a result, enormous resources have been dedicated to developing effective and safe SARS-CoV-2 vaccines (Sallam, 2021). Vaccination is the primary biomedical preventive measure that has the potential of saving millions of lives against COVID-19 (Kwok et al., 2021; Wolff, 2021). Although vaccine research has progressed rapidly, vaccination uptake is critical in combating COVID-19 (Bai et al., 2021). Public bias and negative attitudes expressed on social media may severely influence the progression towards acquiring active immunity through vaccinations (Kwok et al., 2021). As of November 2021, Africa had received 333 million vaccine doses, accounting for approximately 2% of total global vaccinations (WHO AFRO, 2021g). The rate of obtaining vaccinations is far slower, and the continent as a whole is falling behind in obtaining sufficient amounts of vaccines to sustain mass immunisation (Omilola, 2021). The fourth wave of the COVID-19 pandemic impacts Egypt, Kenya, Somalia, Benin, Mauritius, Tunisia, and Algeria, while the third wave currently affects 43 African countries. The total number of cases is 8.1 million, with 204,821 fatalities and more than 7.4 million recoveries (Getachew, 2021).

1.2.   Outline of the research problem

A comprehensive understanding of the factors influencing intention and uptake of COVID-19 vaccines in the African context seems absent. A scoping review in this regard will be critical, given Africa's most extensive vaccination program against the COVID-19 pandemic. A slow rate of COVID-19 vaccine uptake may pose significant challenges in the fight against the COVID-19 pandemic and in preventing new variant outbreaks. The uptake of COVID-19 vaccinations is dependent on various factors to reduce infection-related morbidity and mortality and COVID-19-related disparities. This review will explore various factors, i.e., psychosocial and contextual factors affecting intention and uptake of COVID-19 vaccines. The present study is helpful as it sheds light on the existing literature in understanding the factors that influence people's decisions to vaccinate or not to vaccinate against COVID-19.

The review will assist in guiding information, communication, and education (IEC) interventions directed at motivating the uptake of COVID-19 vaccines within the African context.

1.3.   Research Objectives

- To explore the literature regarding the various factors affecting intention and uptake related to COVID-19 vaccines among people in Africa.
- To provide a more in-depth and nuanced understanding of how various factors in Africa influence the intentions and behaviours related to its uptake of COVID-19 vaccines.
- To provide guidelines for interventions directed to motivate the uptake of COVID-19 vaccination in the African context.

1.4.   Research questions

1. What are the perceptions and attitudes regarding COVID-19 vaccines among people in Africa?
2. What are the facilitating factors associated with COVID-19 vaccine uptake?
3. What barriers are associated with COVID-19 vaccine uptake?
4. What possible guidelines for interventions to improve the uptake of COVID-19 vaccination?

1.5.   Structure of the dissertation

Chapter One: A brief introduction of the research study is provided in this chapter. It establishes the context for this review and highlights the objectives and the critical questions this review intends to address.

Chapter Two: This chapter presents an overview of the vaccine literature, focusing on the African continent. Furthermore, it provides insight into the factors that encourage vaccine uptake and the barriers that limit vaccination uptake in various circumstances.

Chapter Three: This chapter consists of a journal manuscript with an introduction, methodology section, presentation of the data and a discussion of the available literature and conclusion.

Chapter Four: This chapter presents recommendations for IEC interventions directed at motivating the uptake of COVID-19 vaccines within the African context.

CHAPTER 2

LITERATURE REVIEW & METHODOLOGY BACKGROUND

Introduction

In this chapter, existing literature is reviewed to provide an overview of vaccines. Furthermore, this chapter refers to two social cognitive theories which provide insight into factors influencing vaccine uptake at individual, socio-cultural, and contextual levels. This chapter concludes with a background literature review of the research methodology employed in this dissertation.

2.1.1. History of vaccines

Vaccines have been in use since 1796 when Edward Jenner developed the first smallpox vaccine (Ndwandwe & Wiysonge, 2021). Vaccines have been used to eliminate and dramatically reduce the incidence of diphtheria, measles, smallpox, tetanus, poliomyelitis, rubella, and other infectious diseases globally (Pardi et al., 2018; Al-Jayyousi et al., 2021; Dzinamarira et al., 2021). Vaccines can be used in preventing and treating diseases, including cancer and allergies (Zhang et al., 2019).

Vaccines are recognised as a critical tool for achieving public health success in the fight against communicable infectious diseases (Yaqub et al., 2014; Zhang et al., 2019; Puri et al., 2020; Chen et al., 2021). It is the most effective instrument in biomedical science and public health (Kata, 2010; Chen et al., 2021). Vaccines prevent millions of infections and save approximately two to three million lives (Delany et al., 2014; Pardi et al., 2018; WHO, 2019). Despite significant advancements, additional breakthroughs are required. Approximately three million people die each year from vaccine-preventable diseases (VPD) (Heaton, 2020). In low-income countries, infectious diseases account for six of the top ten leading causes of death: "diarrheal diseases, HIV/AIDS, TB, lower respiratory infections, and those associated with preterm birth" (Heaton, 2020, p.1).

2.1.2. How vaccines work

Vaccines trigger an immune response, causing it to produce antibodies that aid in the body's fight against a specific infectious agent. Vaccination is the process of administering an antigen to induce immunity. The term "immunisation" refers to the process of acquiring immunity (Shukla & Shah, 2018). Immunisation is critical in preventing communicable infectious

diseases (Puri et al., 2020). Vaccines work by injecting a weakened form of an infectious virus into our bodies and instructing our immune systems to form a memory for it. Our immune system will detect and combat it before it causes harm to us (UNICEF, 2020). There are various types of vaccines; many alternatives to traditional vaccines have been developed (Iwasaki & Omer, 2020). Vaccines developed in the modern era include nucleic acid-based (mRNA, DNA), virus-like particles, subunit protein, and viral vector vaccines (Iwasaki & Omer, 2020; Chavda et al., 2021). The manufacturing of non-viral delivered nucleic acid-based vaccines (mRNA), known as messenger RNA or mRNA vaccines, is safe and efficient (Zhang et al., 2019). Rather than introducing antigens, mRNA vaccines provide our bodies with the genetic code required to allow our immune systems to manufacture the antigen themselves (UNICEF, 2020). Scientists have been working on mRNA vaccine technology for decades. mRNA vaccines do not contain live viruses and are therefore not dangerous to human DNA (UNICEF, 2020).

2.1.3. Vaccines in Africa

In recent years, significant progress has been made in immunisation. More than 40 African countries have eradicated neonatal and maternal tetanus, and vaccines significantly impact diseases like Ebola, cervical cancer, and hepatitis (WHO AFROa, 2021). Africa achieved a historic milestone in August 2020 when it was declared free of wild polio. This historic milestone was critical in achieving vaccination programs that reach up to 220 million African children each year (WHO AFROe, 2021). Despite this, approximately nine million children in Africa continue to miss out on life-saving vaccines each year. One in every five children is unprotected against VPD, which kills over 500 thousand children under the age of five each year (WHO AFROf, 2021). The United Nations Children's Fund (UNICEF) data in Africa had the highest proportion of unvaccinated children in 2019 (Williams et al., 2021). The COVID-19 pandemic has hampered planned vaccination campaigns. Since January 2020, over 16 million African children have missed measles vaccine doses in fifteen African countries (WHO AFROa, 2021).

2.1.4. COVID-19 vaccines

The CoV family poses a severe threat, as evidenced by the 2003 SARS-CoV epidemic, the 2012 MERS-CoV epidemic, and the 2019 SARS-CoV-2 pandemic. Clinical trials for a SARS-CoV vaccine have been halted due to the virus's disappearance and a lack of potential patients (Zhao et al., 2020). In phase one clinical trials, the MERS-CoV vaccine has only been tested

in humans (Zhao et al., 2020). The knowledge gained from the previous work on vaccines for SARS-CoV and MERS-CoV serves as a foundation for COVID-19 vaccine development because SARS-CoV is 80% identical to SARS-CoV-2 (Zhao et al., 2020).

The development of COVID-19 vaccines has accelerated at an extraordinary speed in vaccination history (Ndwandwe & Wiysonge, 2021). WHO has approved several vaccines against COVID-19, which are now distributed globally in various regions (Islam et al., 2021). According to the AFRO WHO (2021c), vaccines that have been approved or authorised for use are Oxford-AstraZeneca, Johnson & Johnson, Moderna, Pfizer/BioNTech, Sinopharm, and Sinovac. According to Aroh et al. (2021), every medication, treatment, and vaccine has potential side effects. Although the side effects of the various COVID-19 vaccines may differ, the most frequently reported adverse effects are fever, nausea, fatigue, headache, and muscular pain (Aroh et al., 2021; Chen et al., 2021).

COVID-19 vaccines do have rare adverse reactions. It has been reported that there may be a link between thrombosis with thrombocytopenia syndrome (unusual blood clots) and low blood platelets after receiving the Oxford-AstraZeneca and the Johnson & Johnson COVID-19 vaccines (Mahase, 2021). Myocarditis (inflammation of the heart) has also been reported as a rare side effect of mRNA vaccines, particularly in young adults and adolescents (Bozkurt et al., 2021; Haaf et al., 2021). Some governments, including South Africa, have temporarily halted using the Johnson & Johnson vaccine based on reports of blood clotting in the United States and Europe (AfricaNews, 2021; Aroh et al., 2021; Ebrahim, 2021). Following a comprehensive safety review, the Food and Drug Administration (FDA) and Centres for Disease Control and Prevention (CDC) have lifted the recommended pause on the use of the Johnson & Johnson COVID-19 vaccine (Weiland et al., 2021). However, the benefits of vaccination continue to outweigh the risks associated with vaccines (Aroh et al., 2021; Bozkurt et al., 2021; Haaf et al., 2021; Mahase, 2021).

Africa CDC recommends that at least 70% of the continent's population be immunised to build community immunity to protect the African continent and the rest of the world (Seydou, 2021). Vaccines bridge the gap between an individual's decision and community immunity (Ekwebelem et al., 2021). Once a sufficient proportion of the community has been immunised, unvaccinated people have a lower risk of contracting the infection, a phenomenon known as herd immunity (Badur et al., 2020). Those who cannot receive the vaccine would be protected through herd immunity, e.g., young children and individuals with compromised immune

systems (Al-Jayyousi et al., 2021). Vaccine efficacy is determined by public acceptance and willingness to be immunised, as well as accessibility and uptake (Al-Jayyousi et al., 2021). Public acceptance is critical for avoiding vaccine-preventable outbreaks (Puri et al., 2020). In light of the COVID-19 pandemic achieving herd immunity is unlikely due to various factors, e.g., VH, the emergence of new variants, vaccine roll-out disparities, and the delayed arrival of vaccinations for children and adolescents (Aschwanden, 2021; Govender et al., 2022). On the other hand, developing active immunity through vaccinations would prevent severe disease and death (Govender et al., 2022).

Due to vaccine diplomacy and nationalism, Africa and other low- and middle-income countries (LMICs) have low COVID-19 vaccine coverage (Mutombo et al., 2022). As a result, the COVAX global initiative was established to ensure equitable and timely access to vaccines worldwide (Afolabi & Ilesanmi, 2021). The COVAX facility aims to increase the equity of COVID-19 vaccine distribution, regardless of income level (Handebo et al., 2021). Since February 2021, the COVAX programme has assisted in distributing vaccines in many African countries (Aroh et al., 2021). Africa has lagged behind other regions; however, much progress has been made to increase vaccine shipments to many countries such as Angola, Côte d'Ivoire, Kenya, Ghana, Nigeria, South Africa, and Zimbabwe (Seydou, 2021). COVAX was scheduled to deliver 620 million doses of the COVID-19 vaccine to Africa by the end of 2021, enabling African countries to distribute a variety of vaccines (WHO, 2021c). However, COVID-19 strains some countries' health systems, and only 10% of Africa is fully vaccinated (WHO, 2021h). COVID-19 cases in Africa surpassed 8.9 million in early December 2021, with deaths reaching a weekly high of over 3000 (WHO, 2021h).

2.2. Factors influencing vaccine uptake

Globally, vaccination rates have declined significantly in recent years due to informal vaccination refusal rather than a lack of resources (Eritsyan et al., 2017), thus resulting in disease resurgence (Sadique et al., 2013). Although vaccinations are currently an effective way to improve global health, many individuals still doubt the importance of vaccination in various regions of the world (Chen et al., 2021). Increasing vaccine coverage is more complicated than simply informing people about the advantages of vaccination (Thomson et al., 2018).

There are numerous barriers and drivers that influence vaccination intention and uptake, ranging from individual psychological, socio-cultural, and environmental factors that influence people's willingness to be vaccinated (Thomson et al., 2018; Gallant et al., 2020; Mills et al.,

2020; Al-Jayyousi et al., 2021; Tankwanchi et al., 2021). This section provides an overview of the most important factors influencing vaccine uptake drawing on health behaviour models.

Vaccine acceptance factors have been studied extensively in recent years, beginning with various theoretical frameworks, and progressing to individual, social, and contextual factors influencing vaccine acceptance (Luz et al., 2019). According to the literature, vaccine behaviour and uptake are influenced by various factors, including socio-economic, demographic, and psychosocial factors (Bricout et al., 2019; Milošević ĐOrđević et al., 2021; Toll & Li, 2021). Social psychologists refer to attitudes as an individual's tendency to evaluate stimulus objects, subjects, events, and other people favourably or negatively (Haddock & Maio, 2007; Tomas & Campos, 2021). Attitudes are crucial to research because they influence individuals' perceptions of the world and their behaviour (Haddock & Maio, 2007). Understanding vaccine attitudes has emerged as a global priority (Mesesle, 2021).

According to Simpson (2015), theories and models of health behaviour help understand why individuals and communities behave in a particular way. Each behavioural change theory or model focuses on various factors (Simpson, 2015). Aligned to the research findings, the social-cognitive theories of behaviour change provide us with a good understanding of some of the key factors that influence the intention of uptake and uptake of vaccines (Gerend & Shepherd, 2012; Vermandere et al., 2016; Chu & Liu, 2021; Zampetakis & Melas, 2021). These include knowledge, beliefs, attitudes and perceptions, trust in healthcare systems, disease severity perceptions, and safety concerns (Gerend & Shepherd, 2012; Bricout et al., 2019).

According to social cognitive and health behaviour theories (HBT), people's attitudes toward and beliefs about health practices also influence their intention to adopt them. They are frequently characterised as perceived benefits and barriers in the Health Belief Model (HBM) (Rosenstock et al., 1988). According to Chu and Liu (2021) over the last two decades, the HBM has been broadened relative to other frameworks and applied to interventions aimed at changing health behaviour (Glanz et al., 2008).

The HBM was designed to strengthen preventative health research (Muchow, 2021) and can help understand these factors (Kaur, 2021). This conceptual framework has been used to explain, predict, and affect the behaviour of individuals or groups in regard to health-related problems (Mahmud et al., 2021). Additionally, the HBM is commonly used as a conceptual framework in vaccination-related research, especially in Ebola, Hepatitis B, Swine flu and, influenza (Botha et al., 2021; Zampetakis & Melas, 2021; Hossain et al., 2021). According to

Rosenstock et al. (1988; Glanz et al., 2008), the HBM consist of six constructs which include "perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and, self-efficacy" (p. 48). The first four constructs were included in the initial HBM, whereas the final two were added as HBM research progressed (Mohammadi Pelarti et al., 2019; Wong et al., 2020).

The HBM offers a framework for understanding how subjective cognitive responses influence behaviour however, it is also vital to investigate the effects of other psychological and external (socio-cultural and institutional) factors which influence health beliefs and behaviours and, thus, health outcomes (Muchow, 2021). In order to improve the intention to receive vaccines, researchers have recently begun including other moderating and mediating variables in studies using the HBM (Muchow, 2021). Moderating and mediating variables that are more frequently found in the HBM studies include demographic parameters (such as age, gender, sex, and education level), health literacy, and motivational factors (Muchow, 2021). These factors have been integrated into the HBM studies to better account for individual variability in the adoption and performance of health-promoting behaviours. The HBM has undergone numerous modifications, but the core framework still maintains that individuals' health beliefs are composed of a set of fundamental constructs listed above (Muchow, 2021).

The PEN-3 model serves as a foundation adapted from an African perspective to better understand socio-cultural and contextual factors. According to Airhihenbuwa and Webster (2004), Western theories present limitations for understanding Africa and its people compared to a cultural model. Culture is a key component for social and behavioural scientists in understanding health behaviour (Airhihenbuwa & Webster, 2004). The PEN-3 model is a unique model because it focuses on culture's role in health behaviour (Shumaker & Ockene, 2009). The cultural model enables researchers to understand and value ongoing cultural practices (Martin & DiMatteo, 2013).

The PEN-3 model consists of three components that are dynamically interconnected and interdependent (Bracht,1999). Each with an acronym of PEN: "(1) health education (person, extended family, and neighbourhood); (2) educational diagnosis of health behaviour (perceptions, enablers, nurturers); and (3) cultural appropriateness of health behaviour (positive, exotic, and negative)" (Sharma, 2016, p. 266). According to Martin and DiMatteo (2013), the PEN-3 model promotes health education programs to empower people and promote positive health behaviours in individuals and society. Certain predisposing beliefs or attitudes

in an individual or community could affect the adoption of an intervention. Societal or contextual influences can either encourage or prevent behaviour changes (Martin & DiMatteo, 2013). Positive behaviours are beneficial for individuals that may be used to empower the participants in the intervention. In comparison, negative behaviour damages the individuals' health and should be targeted by the intervention (Martin & DiMatteo, 2013).

Aligned to the HBM and PEN-3 cultural model, vaccine-related behaviours vary in form and intensity (Milošević ĐOrđević et al., 2021). While individuals make decisions to achieve their goals, the population's acceptance rate and decision-making process may differ (Tomas & Campos, 2021). Individuals' intention to vaccinate is complex and multifaceted because social, cultural, and political factors influence decisions (Niankara et al., 2020; Nigeria Health Watch, 2021). HBT contain various elements (such as attitudes, beliefs, and perceived barriers) that seek to explain why certain behaviours are more likely to occur (Vermandere et al., 2016). Understanding the components of these theories aids researchers in identifying factors that influence vaccine uptake and unwillingness to include them in vaccination campaigns (Vermandere et al., 2016).

The individual, social and contextual factors that play a determining role in the intention and uptake of vaccines will be outlined below.

2.2.1 *Individual-level influencing factors: knowledge, attitudes, beliefs, and perceptions*

Various information sources shape the general public's vaccine knowledge, and these sources strongly influence vaccination attitudes, perceptions, and uptake (Tabacchi et al., 2016). Many studies have shown that individuals who lack adequate knowledge about vaccines or VPDs are more prone to harbour a negative attitude towards vaccination (Kestenbaum & Feemster, 2015; Talarek et al., 2021).

Inadequate information makes it extremely difficult for the general public to understand the potential burden of diseases and thus the importance of protection (Verelst et al., 2019).

It seems that complacency implies a lack of awareness of the disease's risk, and for its uptake, better information is required (Faezi et al., 2021).

Misinformation and conspiracy theories have exacerbated VH in Africa (Tankwanchi et al., 2021). Vaccine-related myths have spread across the African continent in the last two decades, resulting in people avoiding uptake of recommended vaccines even if they are readily available (Tankwanchi et al., 2021). As a result, people's susceptibility to infectious diseases increased,

leading to an increase in outbreaks and the resulting loss of life and resources (Tankwanchi et al., 2021). According to Tankwanchi et al. (2021), the widespread belief that childhood vaccines were used to sterilise girls hampered Cameroon's immunisation efforts in the 1990s. With reports of cholera vaccination efforts in Mozambique and concerns about other vaccinations in West and East Africa, VH and its risks are rising (Tankwanchi et al., 2021). Rumours can undermine public trust in vaccines. Vaccines may be avoided due to myths about allergies, mental health problems, infertility agents and pathogen transmission, such as HIV(Merten et al., 2013; Islam et al., 2021). Historically, damaging allegations about vaccine effectiveness have obstructed vaccination uptake. As a result of the polio vaccine boycott, polio cases increased in Nigeria, Pakistan, and Afghanistan (Islam et al., 2021). Multiple factors contributed to Nigeria's vaccine boycott, including a lack of confidence in medical science, religious beliefs, views of deception by the government, rejection by rich and wealthy citizens and corporate entities, as well as misinformation and inadequate dissemination of scientific information (Adepoju, 2021).

Misinformation was argued to significantly impact vaccination uptake (Nigeria Health Watch, 2021). According to the WHO, there has been a massive infodemic of accurate and inaccurate media reporting on COVID-19 (Ayandele et al., 2020). The term "infodemic" is used when there is a rapid spread of information due to an epidemic (Ayandele et al., 2020). Many African governments and public health experts have attributed public mistrust in the African continent's COVID-19 outbreak response to delayed response activities (Afolabi & Ilesanmi, 2021). The African governments did nothing to refute social and mainstream media that the continent was immune to COVID-19 due to climatic factors. Many Africans distrust the government because of the COVID-19 revelations (Afolabi & Ilesanmi, 2021). The WHO and CDC Africa, COVID-19 vaccines donated by COVAX, and other donors were rapidly distributed to African countries (Adepoju, 2021).

However, Doctors Without Borders warns that misinformation has slowed progress in the DRC since the COVID-19 outbreak began in 2020 (Adepoju, 2021). A recent study discovered that social media exposure to vaccine-related information resulted in more misinformation and a greater reluctance to vaccinate (Islam et al., 2021). Misinformation is exacerbated by doubts about the seriousness of the COVID-19 pandemic in comparison to Ebola and other leading causes of death in the DRC (Adepoju, 2021).

Perceptions are defined in literature as beliefs about a phenomenon, whereas attitudes are expressed by evaluating an object, people, or events favourably or unfavourably (Lyu & Forsyth, 2021). Because attitudes influence people's decisions and behaviour, they have been extensively researched in psychology (Fischer, 2017) to understand people's behaviour (Pickens, 2005). Attitudes are complex combinations of factors such as beliefs, personality, values, behaviours, and motivations (Pickens, 2005). Attitudes and perceptions are closely related (Lyu & Forsyth, 2021). Hence these terms are frequently used interchangeably in literature (Pickens, 2005). Attitudes have a cognitive core because they are based on beliefs or how we perceive a situation, a person, or an event (Downie & Macnaughton, 2007). As a result, attitudes are sometimes referred to as beliefs and are a key concept in psychology (Sturm & Bohndick, 2021).

Vaccine attitudes and acceptance vary significantly across countries and communities (WHO, 2014). Attitudes towards vaccines appear on a continuum, ranging from total acceptance to complete rejection (Niankara et al., 2020; Mesesle, 2021). According to Toll and Li (2021), negative attitudes towards vaccines place populations at increased danger, but vaccine attitudes and behaviours are not always consistent. Studies have found that various scientific, psychological, and socio-political factors were strongly associated with anti-vax attitudes, demonstrating that such attitudes are frequently associated with inadequate knowledge, misinformation, low levels of education, ideological and bias identification (Baeza-Rivera et al., 2021; Benegal, 2018; Hornsey et al., 2018; Roberts et al., 2022).

Additional studies further explored how anti-vax attitudes may result from overconfidence, a process wherein individuals lacking information,

 prefer to exaggerate their knowledge and authority compared to experts (Benegal, 2018). A hesitant attitude is distinct from outright vaccine refusal. However, vaccinated individuals may express hesitations about certain aspects of vaccination (Yaqub, 2014). VH exists in various degrees between these two extremes and along the continuum (Niankara et al., 2020). According to Shapiro et al. (2018), the factors contributing to VH are likely to vary according to the vaccine, the individuals, social and environmental influences. Individuals who are vaccine averse exhibit a spectrum of attitudes. These individuals may choose to reject certain immunizations while accepting others or delay vaccination altogether (Shapiro et al., 2018; Mesesle, 2021). VH has been defined as both an attitude and behaviour (Shapiro et al., 2018). VH is described as a delay in accepting or refusing vaccination in spite of vaccine supplies

(MacDonald, 2015). However, researchers argue that VH should be classified as a psychological state that describes indecisive individuals or uncertainty about vaccine uptake. In contrast, vaccination refusal should be classified as a decision to reject vaccination (Toll & Li, 2021). Furthermore, Toll and Li (2021) make a clear distinction indicating the latter definition makes a clear distinction between consistent and inconsistent attitudes and behaviours toward vaccination.

Additionally, it has been illustrated that vaccines' specific beliefs and social meanings influence their acceptance (Toll & Li, 2021). Beliefs influence people's intentions (Sanders et al., 2021). According to Faezi et al. (2021), beliefs that contribute to vaccine uptake include trust in the safety and efficacy of vaccinations and healthcare systems' competence to provide adequate information for vaccines. Their beliefs and intentions may change from time to time, depending on their circumstances (Sanders et al., 2021). It should also be noted that individuals frequently seek information that confirms their pre-existing beliefs—as such, accessing various information sources may serve to reinforce rather than alleviate hesitancy (Kestenbaum & Feemster, 2015). Individuals' intentions to vaccinate are influenced by their perceptions of risk and severity (Butter et al., 2021). Risk perceptions are frequently assessed in terms of the perceived probability of developing a disease and the perceived severity of its symptoms (Karlsson et al., 2021). According to existing literature, risk perceptions are also influenced by the way risk is communicated, for example, through government organisations and the media, and disinformation can contribute to detrimental, inaccurate perceptions about vaccines (Butter et al., 2021).

2.2.2 *Socio-cultural level influencing factors*

According to social science research on vaccine decision-making should be viewed within a broader socio-cultural context (Dubé et al., 2013). Vaccination is part of a "broader social world," which implies that a complex array of context-specific factors drives vaccination behaviour (Dubé et al., 2013; Yale Institute of Global Health et al., 2020). These factors vary among cultures, as individuals adapt to their environment, influenced by social and cultural factors (Regmi, 2014; Yale Institute of Global Health et al., 2020). According to existing literature, numerous socio-cultural factors which impact vaccination decision-making in individuals and communities are due to cultural, historical, political, philosophical, and religious considerations (Luz et al., 2019; Dubé et al., 2021; Milošević ĐOrđević et al., 2021).

The motivation to vaccinate, sometimes referred to as intention, is a powerful predictor of health behaviours, including vaccination uptake (Brewer, 2021). Social networks impact people because of contagion, which is when ideas and behaviours spread across groups of people (Brewer, 2021). Social norms are developed by observing what most people do and expect others to do and by social preferences and expectations (Brewer, 2021). Hence vaccination uptake is influenced by societal norms and preferences (Brewer, 2021).

A key motivator of vaccine acceptability is the perception of vaccination as a social norm (Dubé et al., 2013). Dubé et al. (2013) stated that societal norms could exert social pressure on individuals to accept vaccination. Alternatively, social responsibility, or viewing vaccination as a responsibility of individuals to acquire activate immunity, may be associated with vaccine uptake (Dubé et al., 2013). Culture influences how individuals interpret perceived risks and trust in health professionals with similar cultural backgrounds to their own (Regmi, 2014). Additionally, it has been reported that ethnicity can also influence vaccination decisions by influencing individuals' perceptions of vaccines (Regmi, 2014). Vaccination refusal is occasionally associated with philosophical or moral convictions about health and immunity, such as a preference for "natural" over "artificial" medications (Dubé et al., 2013). Vaccination refusal has also been connected to deep-seated religious beliefs (Dubé et al., 2013). Religious leaders are held in high regard, and their influence can persuade community members to accept or reject vaccination (Regmi, 2014). According to the HBM, socio-cultural constructs, culture, religion, and spirituality influence beliefs of perceived susceptibility and severity to infection (Regmi, 2014).

2.2.3. *Contextual level influencing factors*

According to recent research, communities with low vaccine coverage are more vulnerable to outbreaks with high case fatality rates (Luz et al., 2019). Disease outbreaks can occur for a variety of reasons, such as but not limited to vaccine shortages, lack of access to vaccines, travelling long distances to immunisation clinics, road networks, physical barriers such as rivers, ineffective vaccine programme communication or the emergence of new variants (Milošević ĐOrđević et al., 2021; Vyas et al., 2018).

Studies found that adequate supply, convenience, and the development of successful vaccination structures are necessary to increase vaccination uptake (Mills et al., 2020). According to Mills et al. (2020), vaccination convenience is important, including accessibility via public transportation and consideration of the financial and time constraints that certain

people would incur if they were to get vaccinated or take time off work. Furthermore, studies reported on deterrents for vaccination were concerns surrounding distribution and supply (Mills et al., 2020). Even though many vaccinations are provided free of charge to healthcare institutions, the indirect costs of vaccination due to logistics and illegal charges by HCWs limit vaccine availability to individuals (Akwataghibe et al., 2019).

Another key element influencing vaccination behaviour is confidence, which can be expressed as trust in individual vaccines or trust in the health care systems (Milošević ĐOrđević et al., 2021). Vaccine confidence comprises three aspects: trust in the vaccine, trust in the healthcare system, and trust in the government (Hausenkamph, 2021). The ability to comprehend and believe in the safety and effectiveness of vaccinations is one of the most powerful indicators of intention and behaviour in relation to vaccination uptake (Mills et al., 2020). According to studies, when people believed the vaccine was efficient, they were more inclined to get vaccinated (Mills et al., 2020). Individuals who mistrust healthcare systems and governmental organisations are less likely to follow recommended public health initiatives (Hausenkamph, 2021). Due to a lack of trust in the authorities and widespread misinformation, people are much less likely to accept vaccines (Hausenkamph, 2021). Community and individual elements influence public trust in vaccination programmes (Ozawa et al., 2016; Sturgis et al., 2021). According to a study conducted by Sturgis et al. (2021), trust in science and scientists is strongly correlated with vaccine confidence in countries with high levels of social consensus than in countries with lower levels of social consensus.

According to Nigeria Health Watch (2021), studies conducted in African urban and peri-urban areas identified barriers to vaccination uptake such as mistrust of Western medicine, distance to health services, poverty, and perceptions of vaccine accessibility. A history of medical experimentation has caused significant mistrust of Western medicine in Africa (Aroh et al., 2021). Mistrust of Western medicine fuelled by socio-political issues, which are founded on historical and contemporary racism, has eroded vaccine trust (Akwataghibe et al., 2019; Carson et al., 2021). The Pfizer meningitis vaccination trial in Kano State, Nigeria, has highly distrusted Africa for vaccines (Aroh et al., 2021). Another incident included the HIV vaccine trials being abruptly halted in South Africa in the early 2000s due to many recipients developing increased susceptibility to infectious diseases (Aroh et al., 2021).

Anti-vaccination movements have existed for a long time and continue to pose a risk (Al-Jayyousi et al., 2021), resulting in a further decrease in vaccination coverage as disease

outbreaks surface around the world (AlShurman et al., 2021). The anti-vaccination movement receives greater attention than the number of vaccine refusers (Viswanath et al., 2021). The influence of anti-vaccination movements drives agenda that brings uncertainty to the benefits of vaccines by the refutation of scientific research and the shifting of their hypothesis (Milošević ĐOrđević et al., 2021). People who support the anti-vaccine movement or are sceptical of vaccine safety, in general, are more likely to refuse the COVID-19 vaccine (Motta et al., 2021). Concerns about the efficacy and safety of a vaccine are produced at an unprecedented rate, as well as ongoing efforts by anti-vaccine activists to sow doubt in the general public (Motta et al., 2021).

Conclusion

Vaccination refusal endangers populations because new geographical variants of the virus may emerge and reintroduce it into protected areas (Kothari et al., 2021). In order to assist policymakers in developing effective measures to increase vaccination acceptance and uptake, the ability to identify, understand, and address vaccine intention and acceptance is a helpful step towards ensuring the rapid and necessary uptake of the COVID-19 vaccines (Al-Jayyousi et al., 2021; Kothari et al., 2021). As a result, increasing public trust in vaccines is an essential first step toward accepting and sufficient uptake of safe COVID-19 vaccines.

A critical issue is identifying gaps and public misconceptions concerning COVID-19 immunisation (Handebo et al., 2021). It is evident that a slow uptake poses significant risks to individuals and the larger community. If people refuse or postpone getting the COVID-19 vaccine, the country may not mitigate the effects of the pandemic and the emergence of new variants (Cooper et al., 2021).

To avoid high rates of mistrust, the current efforts in Africa to successfully roll out the COVID-19 vaccine should be carefully planned (Ekwebelem et al., 2021). Since the announcement of the COVID-19 vaccine, there has been much misinformation. This misinformation makes it more challenging to reduce COVID-19 transmission and increase vaccine uptake (Aroh et al., 2021).

The WHO recommends a multi-dimensional approach to dispelling COVID-19 myths and vaccine scepticism. In order to reach the most vulnerable members of society, African governments and public health institutions must collaborate with faith-based organisations and communities (Aroh et al., 2021). Potential barriers must be addressed in Africa by engaging community leaders through culturally and linguistically competent communication methods,

debunking vaccine misinformation and educating at grassroots levels (Ekwebelem et al., 2021). To successfully implement COVID-19 vaccine programs in Africa, governments must address concerns through unrestricted access to information and collaborative efforts (Bajpai & Wadhwa, 2021). These approaches, including positive messaging, storytelling, and drama, are critical for vaccinating people safely and without fear (Bajpai & Wadhwa, 2021).

3.   Methodology background of a scoping review

According to Grant and Booth, in 2009, fourteen different types of literature reviews were identified. A scoping review was one of these review types (Peters et al., 2015). Scoping reviews have been in existence for approximately sixteen years and are becoming increasingly popular (Cacchione, 2016). The most commonly used term is "scoping review," however alternative terms include "scoping study," "systematic mapping," "mapping reviews," and "scoping exercise" (Verdejo et al., 2021). The lack of a universal definition or definitive scoping review method could explain the differences in terminology (Cacchione, 2016). Arksey and O'Malley developed the first scoping review framework in 2005 (Sucharew & Macaluso, 2019). Scoping reviews are advantageous for assessing evidence when a topic has not been thoroughly reviewed or when the topic is complex or diverse (Peters et al., 2015; Pham et al., 2014). A scoping review may be performed for a variety of reasons (Peters et al., 2015). Scoping reviews aim to provide a map of existing literature on a specific topic, clarify critical concepts or definitions in the literature, organise key characteristics or factors related to a concept, and analyse gaps in the research knowledge base. Scoping reviews are conducted flexibly, allowing them to be tailored to the specific needs of decision-makers (Sucharew & Macaluso, 2019; Lv et al., 2020; McGowan et al., 2020).

Scoping reviews enable researchers to "scope" the literature on a particular topic, indicating the amount of literature and studies available and a summary of the topic's focus (Munn et al., 2018; Khalil et al., 2020). Scoping reviews may be used to generate "policy maps," which are produced by identifying and mapping evidence from policy papers and reports that address and inform practice in a specific field (Peters et al., 2015). These reviews are suitable for evidence synthesis because they describe multiple sources of information, which frequently include results from different study designs and methods (Sucharew & Macaluso, 2019; Pollock et al., 2021). The scope of a scoping review is broader because the inclusion criteria are less stringent (Peters et al., 2015). Scoping reviews necessitate extensive and systematic literature searches to optimise important information gathering, provide reproducible results, and reduce potential

bias from poor implementations (Sucharew & Macaluso, 2019). It operates methodically and transparently to ensure that the results are reliable (Munn et al., 2018). Scoping reviews are now recognised as a valid review approach because they rapidly review evidence in emerging fields or topics (Munn et al., 2018). Identifying and analysing knowledge gaps is a common and valuable reason to conduct one (Munn et al., 2018).

Academics, health researchers, and policymakers may benefit from scoping reviews if they want to create baseline data on the availability of research on a topic or plan for future research and reviews (Lockwood et al., 2019). The majority of scoping reviews are in the disciplines of health and social sciences (Verdejo et al., 2021). The COVID-19 outbreak has sparked a surge in interest among all types of researchers, including those involved in evidence synthesis (McMaster Health Forum, 2020). Scoping reviews are becoming more prevalent in evaluating health research evidence (Levac et al., 2010).

The next chapter will provide further details, e.g. the five-stage analytic framework of Arksey and O'Malley, which was adopted for conducting this scoping review.

CHAPTER THREE

JOURNAL MANUSCRIPT

Factors Influencing Intention and Uptake of COVID-19 Vaccines on the African

Continent: A Scoping Review

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ABSTRACT

The COVID-19 pandemic is a severe concern worldwide, particularly in Africa. Vaccines are crucial in the fight against the COVID-19 pandemic. This scoping review examined existing literature on factors influencing intention and uptake of COVID-19 vaccines in Africa. Arksey and O'Malley's five-stage methodological paradigm was applied. A comprehensive search was undertaken from October 1st to 13th, 2021, using EBSCOhost, PubMed, Web of Science, and Google Scholar regarding the factors influencing intention and uptake of COVID-19 vaccines for studies conducted in Africa. A total of fifty published academic articles were reviewed, with many conducted in Nigeria and Ethiopia. The data analysis revealed five themes: attitudes & perceptions towards COVID-19 vaccines, intention to uptake COVID-19 vaccines, factors associated with acceptance/non-acceptance, socio-demographic determinants affecting the intention and uptake, and information sources for COVID-19 vaccines. The intention for uptake ranged between 21% and 90.1 %. Factors that promoted vaccine acceptance included confidence in the COVID-19 vaccine and the desire to protect vulnerable people. Age and sex were the most common factors significantly associated with vaccine acceptance. In contrast, most studies revealed that respondents' primary reasons for non-acceptance were safety and effectiveness concerns. The primary source of knowledge for the COVID-19 vaccines came from mass and social media. The vast majority of studies examined revealed that considerable barriers to vaccine uptake exist in Africa, contributing to the public's apprehension in this regard and resulting in a suboptimal uptake intention. To encourage vaccine uptake, governments should pay attention to refuting misinformation through integrated community-based approaches.

Keywords: attitudes, perceptions, intention, barriers, uptake, facilitators, COVID-19 vaccines, Africa, scoping review

Introduction

The novel Coronavirus 2019, termed COVID-19, is a highly transmissible and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Al-Jayyousi et al., 2021; Harapan et al., 2020; Hu et al., 2020). In December 2019, SARS-CoV-2 was first identified in Wuhan, China (Allagoa et al., 2021; Li & Lu, 2020). Egypt recorded the first COVID-19 case in Africa on February 12th, 2020. (Ilesanmi et al., 2021). The COVID-19 pandemic is a major threat worldwide, disrupting several sectors of human life, causing unprecedented challenges to public health (Liu et al., 2020), food security (World Health Organization [WHO], 2020), socio-economic stability (C N et al., 2020; Shah et al., 2020; Chakraborty & Maity, 2020), industry, and trade (Tobin et al., 2021; United Nations [UN], 2021) an upheaval for both developed and developing countries (David et al., 2020; Hagan Jr et al., 2021). This is particularly evident in the African continent (Cilliers et al., 2020; Yaya et al., 2020; Enaifoghe, 2021), which constitutes nearly 20% of the world's population. COVID-19 has spread rapidly to 47 countries in the African region (WHO AFRO, 2021). Africa's CDC reported that 62% of COVID-19 cases reported in Africa are attributed to the following countries: South Africa (35%), Morocco (10%), Tunisia (7%), Libya (4%) and Ethiopia (4%) (Africa CDC, 2022). On the African continent, the Delta variant has been reported in 42 countries, while the Omicron variant has been reported in 36 countries (WHO AFROa, 2022). According to Africa's CDC (2022), as of January 2022, Africa accounts for approximately 3.3% of global cases and 4.2% of global deaths and only 10% of Africa's population is fully vaccinated. Africa has received around 500 million doses of the COVID-19 vaccine and has administered 327 million doses (WHO AFROb, 2022).

Vaccines are recognised as a critical tool for achieving public health success in the fight against infectious diseases (Yaqub et al., 2014; Puri et al., 2020). Every year, vaccines prevent millions of infections and save approximately two to three million people (Pardi et al., 2018; WHO, 2020). Vaccines have been used to eliminate and dramatically reduce the incidence of diphtheria, measles, smallpox, tetanus, poliomyelitis, rubella, and other infectious diseases globally (Dzinamarira et al., 2021; Al-Jayyousi et al., 2021; Pardi et al., 2018). The development of COVID-19 vaccines has accelerated at an unprecedented rate in vaccination history (Ndwandwe & Wiysonge, 2021). WHO has approved several vaccines against COVID-19, which are now distributed globally in various regions (Islam et al., 2021).

According to Aroh et al. (2021), every medication, treatment, and vaccine has potential side effects. The most frequently reported adverse reactions to the COVID-19 vaccines are fever, nausea, fatigue, headache, and muscular pain (Aroh et al., 2021; Chen et al., 2021). Recent studies reported that COVID-19 vaccines do have rare adverse reactions such as thrombosis with thrombocytopenia syndrome (unusual blood clots), low blood platelets and myocarditis (inflammation of the heart) (Mahase, 2021; Bozkurt et al., 2021; Haaf et al., 2021). Some governments, including South Africa, have temporarily halted using the Johnson & Johnson vaccine based on reports of blood clotting in the United States and Europe (Aroh et al., 2021; Ebrahim, 2021; AfricaNews, 2021). Following a comprehensive safety review the Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) have lifted the recommended pause on the use of the Johnson & Johnson COVID-19 vaccine (Weiland et al., 2021).

Africa CDC indicated that at least 70% of the continent's population must be immunised to build community immunity to protect the African continent (Seydou, 2021). Once a sufficient proportion of the community has been immunised, unvaccinated people have a lower risk of contracting the infection, a phenomenon known as herd immunity (Badur et al., 2020). In light of the COVID-19 pandemic achieving herd immunity is unlikely due to various factors, e.g., VH, the emergence of new variants, vaccine roll-out disparities, and the delayed arrival of vaccinations for children and adolescents (Aschwanden, 2021; Govender et al., 2022). On the other hand, developing active immunity through vaccinations would prevent severe disease and death (Govender et al., 2022). Vaccine efficacy is determined by public acceptance and willingness to be immunised, as well as accessibility and uptake (Al-Jayyousi et al., 2021). Public acceptance is critical for avoiding vaccine-preventable outbreaks (Puri et al., 2020).

Vaccine acceptance factors have been studied extensively in recent years, beginning with various theoretical frameworks, and progressing to individual, social, and contextual factors influencing vaccine acceptance (Luz et al., 2019). According to the literature, vaccine behaviour and uptake are influenced by various factors, including socio-economic, demographic, and psychosocial factors (Bricout et al., 2019; Toll & Li, 2021; Milošević ĐOrđević et al., 2021). According to research scholars' theories and models of health behaviour help understand why individuals and communities behave in a particular manner and identify key behavioural determinants critical to address in interventions (Rejeski & Fanning, 2019; Hilliard et al., 2018; Simpson, 2015). Aligned to the research findings, the social-cognitive theories of behaviour change provide us with a good understanding of some of the key factors

that influence the intention of uptake and uptake of vaccines (Gerend & Shepherd, 2012; Chu & Liu, 2021; Vermandere et al., 2016; Zampetakis & Melas, 2021). These include knowledge, beliefs, attitudes and perceptions inclusive of disease severity and risk perceptions, social influence, trust in healthcare systems and vaccine safety concerns (Bricout et al., 2019; Gerend & Shepherd, 2012).

Vaccine attitudes and acceptance vary significantly across countries and communities (WHO, 2021). Attitudes towards vaccines appear on a continuum, ranging from total acceptance to complete rejection (Mesesle, 2021; Niankara et al., 2020). Barriers linked to vaccination uptake include access to vaccines through supply and logistics (Malande et al., 2019; Wilf-Miron et al., 2021; Cooper et al., 2018), cultural and social norms (Luz et al., 2019), a lack of confidence in vaccines and accompanied vaccine hesitancy (VH), scepticism and refusal (Miko et al., 2019; Dubé et al., 2013).

Various information sources shape the general public's vaccine knowledge, and these sources strongly influence vaccination attitudes, perceptions, and uptake (Tabacchi et al., 2016). Many studies have shown that individuals who lack adequate knowledge about vaccines or VPDs are more prone to harbour a negative attitude towards vaccination (Kestenbaum & Feemster, 2015; Talarek et al., 2021). Vaccine-related myths have spread across the African continent in the last two decades, resulting in people avoiding uptake of recommended vaccines even if they are readily available (Tankwanchi et al., 2021). As a result, people's susceptibility to infectious diseases increased, leading to an increase in outbreaks and the resulting loss of life and resources (Tankwanchi et al., 2021). Misinformation and conspiracy theories have exacerbated VH in Africa (Tankwanchi et al., 2021; Ekwebelem et al., 2021; Ayandele et al., 2020). It has been argued that the degree to which a person believes in misinformation is determined by their risk perception and health literacy level (Islam et al., 2021). The influence of anti-vaccine movements in VH should not be underestimated as it jeopardises efforts to end the COVID-19 pandemic (Khan et al., 2020; Al-Jayyousi et al., 2021). According to the Nigeria Health Watch (2021), studies conducted in African urban and peri-urban areas identified barriers to vaccination uptake such as low education or health literacy, mistrust of Western medicine, distance to health services, poverty, and perceptions of vaccine accessibility.

Vaccination refusal endangers populations because new geographical variants of the virus may emerge and reintroduce it into protected areas (Kothari et al., 2021). In order to assist policymakers in developing effective measures to increase vaccination acceptance and uptake

(Al-Jayyousi et al., 2021), it is vital to identify, understand, and address vaccine acceptance, hesitancy, and resistance to ensure the rapid and necessary uptake of the COVID-19 vaccines (Kothari et al., 2021). This review is an attempt to explore factors influencing the intention and uptake of COVID-19 vaccines on the African continent. The present study is helpful as it sheds light on the existing literature in understanding factors that influence people's decisions to vaccinate or not to vaccinate against COVID-19.

Methods

This study utilised a scoping review approach because of its ability to identify trends and gaps in an existing knowledge base to inform research, policy, and practice (Westphaln et al., 2021). This scoping review was conducted following the analytic framework of Arksey and O'Malley (2005). Arksey and O'Malley developed a five-stage methodological framework to guide researchers in conducting scoping reviews (Arksey & O'Malley, 2005). "The following five-stage framework proposed were as follows: (1) Identifying the research questions, (2) Searching for relevant studies, (3) Selecting studies, (4) Charting the data, and (5) Collating, summarising, and reporting the results" (Arksey & O'Malley, 2005, p.22). Furthermore, this review was structured under the Preferred Reporting Items for Systematic Review and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) guidelines to ensure each step in the scoping review process is standardised (Tricco et al., 2018). A review protocol for ethical clearance was submitted to the University of KwaZulu-Natal (UKZN) Humanities and Social Sciences Research Ethics Committee (HSSREC).

1. **Identifying the research questions**

    i. What are the perceptions and attitudes regarding COVID-19 vaccines among people in Africa?

    ii. What are facilitating factors associated with COVID-19 vaccine uptake?

    iii. What barriers are associated with COVID-19 vaccine uptake?

2. **Searching for relevant studies**

A systematic search was conducted utilising the relevant electronic databases such as EBSCOhost, PubMed, Web of Science and Google scholar. The search followed a process to identify studies that addressed the research questions outlined above. These four electronic databases were searched from the 1st to October 13th, 2021, for studies published in the English

language. The following restrictions were placed on all four databases to produce the relevant studies needed for this scoping review. Studies were searched from 2020 to 2021.

The COVID-19 pandemic was the motivating factor behind this timeline. Additional limiters were placed to only search for full-text studies conducted on the African continent. The following search terms were included "COVID-19 vaccines", "COVID-19", "SARS-CoV-2 vaccines", "perceptions", "attitudes", "barriers", "drivers", "acceptance", "hesitancy", "Africa", "vaccine uptake", "vaccine refusal". The final search strategies for EBSCOhost and PubMed can be found in the Appendix section for search terms.

3. Study selection

After conducting a complete title and abstract screening in the databases mentioned above, studies were screened using the PCC framework to establish their eligibility for this review, as shown in table 1. After assessing the eligibility of the studies, the researcher excluded all studies that did not answer the review's research questions mentioned earlier.

Criteria	*Determinant*
Population	All population targets
Concept	Articles focusing on various factors, i.e., psychosocial, and contextual factors influencing intention and uptake of COVID-19 vaccines
Context	Africa

Table 1. The PCC framework

Furthermore, the selection of full-text studies was guided by the inclusion and exclusion criteria to determine which studies were most appropriate to include in this review. Table 2 provides a detailed account of the inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Literature type:	**Literature type:**
Academic/published journals (peer-reviewed journals).	Grey literature (unpublished journals, reports and documents, conference papers, memoranda, theses, letters, and protocols).

Language: Studies that were published in the English language.	**Language:** Studies that were published in languages other than English.
Timeline: Studies that were conducted between 2020 and 2021.	**Timeline:** Studies that were conducted before the COVID-19 pandemic.
Location: Studies conducted in Africa.	**Location:** Studies were conducted in countries other than the African continent.
Vaccines: COVID-19 vaccines.	**Vaccines:** Other than COVID-19 vaccines (e.g., HPV, Influenza, Measles, non-human vaccines).
Populations: All population targets.	
Study designs: Quantitative; Qualitative; or Mix-methods	
Studies that specifically address research on the following: Attitudes; Beliefs; Barriers, Perceptions; Acceptance; Intentions; Concerns; Uptake; Hesitancy towards COVID-19 vaccines	

Table 2. Inclusion and exclusion criteria

4. Charting data

A standardised data extraction sheet in Microsoft Excel was used to collate and chart the data into themes as well as summarise studies and reporting (See table 3). The following headings were used to extract detailed information for the included studies: authors and year of publication, study setting, i.e., country and data collection period, and methodology. The methodology section comprised of the study characteristics, i.e., study design, population target and sample size.

Due to the heterogeneity of studies, a narrative synthesis approach was used to collect, synthesise, and map the literature. This approach comprised both a quantitative analysis of research characteristics and a qualitative analysis. The following categories were used to categorise the studies: 1) attitudes and perceptions towards COVID-19 vaccines, 2) intention to take the COVID-19 vaccines, 3) reasons for acceptance or non-acceptance, 4) determinants affecting the vaccine-related outcome (significantly associated), 5) information sources for COVID-19 vaccines. The researcher applied thematic narratives to report all data.

5. Results

The relevant resulting themes are discussed and explored in this section to provide an overview of the factors affecting vaccination intention and uptake of COVID-19 vaccinations, i.e.,

psychosocial and contextual factors. The results include the study's selection process and study characteristics (study design, country of focus, and population).

The key theme findings include attitudes and perceptions toward COVID-19 vaccines, factors associated with COVID-19 vaccine uptake, barriers to COVID-19 vaccine uptake, socio-demographic determinants of COVID-19 vaccine intention and uptake, and information sources for COVID-19 vaccines.

Study selection

In the initial search, 342 studies were identified from database searching, EBSCOhost (n=247), PubMed (n=41), Web of Science (n=43), and Google scholar (n=11). After removing duplicates with EndNote (V.X9), 230 studies were screened by title and abstract to find those that met the initial screening criteria. One hundred and forty-four (n=144) studies were excluded because they were irrelevant to the research question yielding 86 studies for full-text review. Following the inclusion and exclusion assessment criteria, studies were further excluded because they did not address research questions (n=11), a summary of studies (n=one), focusing only on VH (n=one), non-peer-reviewed articles (n=7), research reports and documents (n=16), resulting in 50 published articles for the final analysis. The PRISMA follow diagram illustrates the selection process in Figure 1.
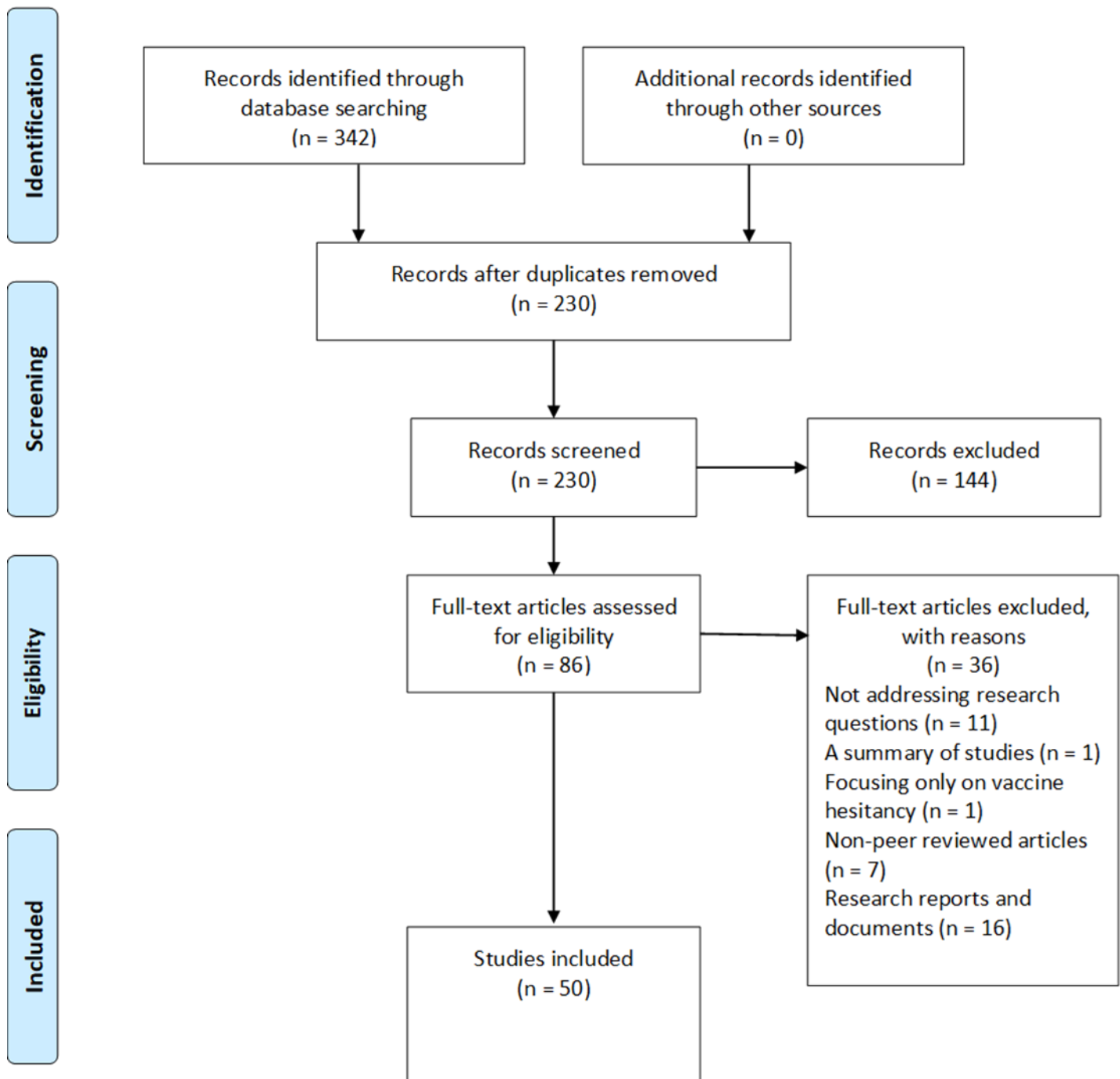
Figure 1. PRISMA flow diagram: Selection of included studies. Adapted from Moher et al. (2009).

Study design of included studies

The overall majority of studies (*n*=49) employed quantitative research approaches. Most of those studies (*n*=46) adopted a cross-sectional design. Only one study (*n*=1) employed a qualitative research approach.

Country of focus

Figure 2 illustrates the countries of focus. In this review, 98% of studies (*n*=49) were undertaken in a single country. In contrast, one research study (*n*=one) was conducted in multiple low-and middle-income countries (LMIC), as shown in Table 3. However, Nigeria and Ethiopia were the focus of most studies (*n*=13 and *n*=12, respectively) that were conducted regarding the determinants of intention and uptake of COVID-19 vaccines. A few studies were conducted in South Africa, Egypt, Ghana (*n*=four each), Uganda and the Democratic Republic of Congo (*n*=three each). Kenya and Somalia reported only two studies each, while Mozambique, Libya and LMIC reported only one study in each country (*n*=one, each).
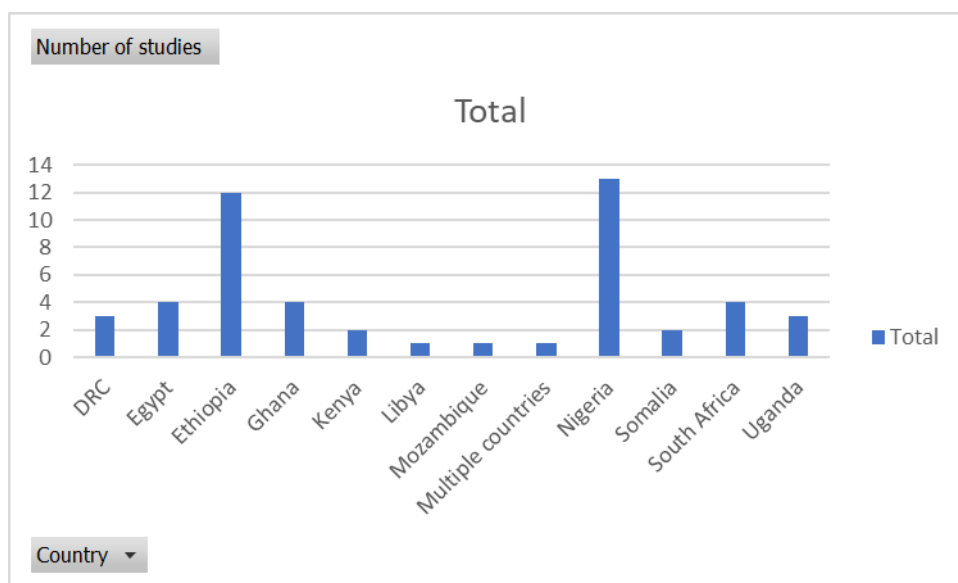
Figure 2. Country distribution of included studies

Participant characteristics

The population target for studies included in this review is depicted in Figure 3. The general adult population (aged ≥18 years) (*n*=18) made up the majority of the study sample, followed by HCW (*n*=14), the general population (*n*=six), patients (*n*=four), medical students, pregnant women, and high-risk population (n=two each), and university students and youth (*n*=one each). The sample sizes ranged from 14 to 15087 respondents.

Male respondents comprised a range of 18.5% to 91.7%, while female respondents were 8.3% to 81.5%. Additional baseline characteristics of the selected studies are listed in Table 3.
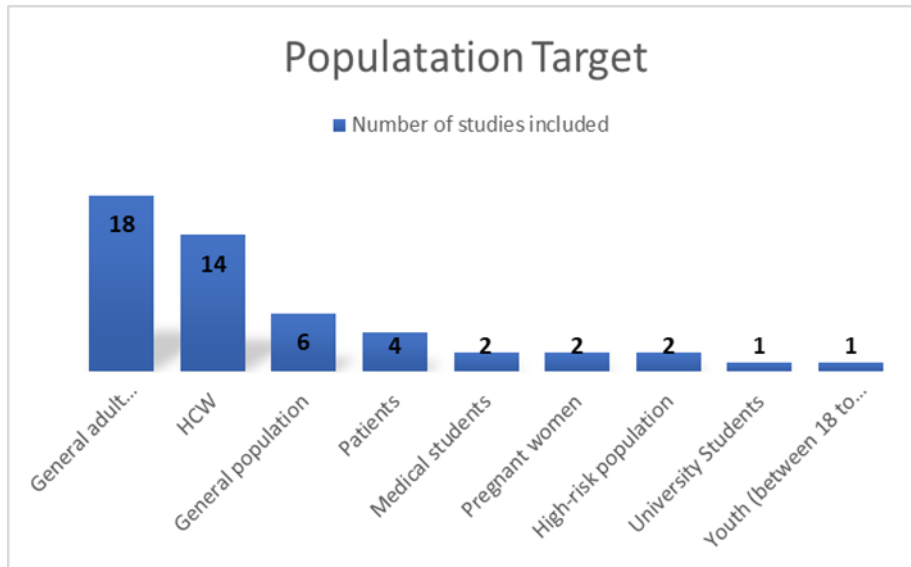
Figure 3. Population target

Table 3. Characteristics & description of included studies

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
1.	Abebe et al., 2021	Ethiopia March 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=492) Age: 27.3 years (SD: 4.8) Sex: ♂ 55.7% & ♀ 44.3%	Overall, a negative attitude towards the COVID-19 vaccine.	Just over three-fifths (62.6%) of the participants indicated that they were prepared to accept the COVID-19 vaccine.		**#Acceptance:** Age (≥ 46 years) Education level (secondary and above) Presence of chronic illness Having a good knowledge of COVID-19	Interpersonal relationships Mass media (e.g., radio, TV, newspaper, magazine) Social media
2.	Acheampong et al., 2021	Ghana February 2021	Study design: A quantitative cross-sectional study Population target: General population Sample size: (N=2345) Majority aged: 26 to 35 years Sex: ♂ 52 & ♀ 48%	Respondents reported a hesitant attitude towards the COVID-19 vaccine.	Slightly over half (51%) of the respondents were willing to accept the COVID-19 vaccine. Just over one-fifth (21%) were unwilling, and (28%) were undecided on taking the vaccine.	**#Acceptance:** Desire to protect vulnerable people Confidence in COVID-19 vaccine Public health responsibility **#Non-acceptance:** Safety concerns Perceived lack of information Effectiveness concerns	**#Acceptance:** Age (older) Sex (female)	Academic journals articles Mass media Social media Interpersonal relationships

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
3.	Adebisi et al., 2021	Nigeria August 2020	Study design: A quantitative cross-sectional study Population target: General population Sample size: (N=517) Majority aged:16 to 30 years Sex: ♂ 56.9% & ♀ 43.1%		Almost three-quarters (74.5%) of the respondents were willing to accept the COVID-19 vaccine. About a quarter (25.5%) were unwilling to take the vaccine.	**#Non-acceptance:** Perceived scientific uncertainty Belief in one's immune system Safety concerns	**#Acceptance:** Age Geographical region **#Non-acceptance:** Age Education level	
4.	Adejumo et al., 2021	Nigeria October 2020	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=1470) Age: 40 years (SD: 6) Sex: ♂ 64.3% & ♀ 35.7%	More than half of HCWs had a positive perception of the vaccine.	Just over half (55.5%) of the respondents were willing to accept the COVID-19 vaccine.		**#Acceptance:** Positive perception towards COVID-19 vaccine Perceived risk of contracting COVID-19 Education level Occupation (within the medical field) Work experience (within the medical field)	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
5.	Adeniyi et al., 2021	South Africa November to December 2020	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=1380) Majority aged: 26 to 55 years Sex: ♂ 18.5% & ♀ 81.5%	Overall, a positive attitude towards the COVID-19 vaccine.	The majority (90.1%) of participants were willing to accept the COVID-19 vaccine.	**#Acceptance:** To end the pandemic Confidence in the COVID-19 vaccine	**#Acceptance:** Education level Occupation (within the medical field)	
6.	Agyekum et al., 2021	Ghana January to February 2021	Study design: A quantitative cross-sectional study Population target: HCW Size:(N=234) Majority aged: 30 to 39 years Sex: ♂ 36.8% & ♀ 63.2%		About two-fifth (39.3%) of participants were willing to accept the COVID-19 vaccine. About three-fifths (60.7%) were unwilling to the vaccine once available.	**#Non-acceptance:** Safety concerns Perceived lack of information Effectiveness concerns Perceived scientific uncertainty Low perceived risk of the disease Already tested positive for COVID-19 Prior adverse reactions to vaccines	**#Acceptance:** Sex (male) Occupation (within the medical field)	
7.	Ahmed et al., 2021	Somalia December 2020 to January 2021	A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=4543) Age: 23.5 years		Just over three-quarters (76.8%) of participants were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Effectiveness concerns Safety concerns Belief in one's immune system Doubts about the	**#Non-acceptance:** Sex (female)	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			(SD: 6.4) Sex: ♂ 62.4% & ♀ 37.6%			seriousness of the pandemic		
8.	Allagoa et al., 2021a	Nigeria April 2021	Study design: A quantitative cross-sectional study Population target: Doctors Sample size: (N=182) Sex: ♂ 52.6% & ♀ 48.4%	Over two-fifths of respondents reported a hesitant attitude towards the COVID-19 vaccine.	Just above half (55.5%) of the respondents accepted the COVID-19 vaccine. Almost half (44.5%) refused the vaccine.	**#Non-acceptance:** Safety concerns Lack of trust in stakeholders Perceived scientific uncertainty Religious beliefs	**#Acceptance:** Sex (male) Age (36 to 45 years) Presence of chronic illness Tested positive for COVID-19	
9.	[1]Allagoa et al., 2021b	Nigeria January to February 2021	Study design: A quantitative cross-sectional study Population target: Patients Sample size: (N=1000) Majority aged: 26 to 35 years Sex: ♂ 34.9% & ♀ 65.1%		Almost one-fourth (24.6%) of the respondents were willing to accept the COVID-19 vaccine. The majority (75.4%) were unwilling to take the vaccine.	**#Non-acceptance:** Lack of trust in stakeholders Safety concerns Perceived scientific uncertainty Religious beliefs **#Acceptance:** Presence of chronic illness Previous history of loss of smell and taste Contact with COVID-19 patient	**#Acceptance:** Sex (male) Marital status (single) Presence of chronic illness **#Non-acceptance:** Education level (secondary & tertiary)	

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[1] Allagoa et al., 2021b & Oriji et al., 2021b use the same population sample however report on different aspects.

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
						Loss of someone from this disease		
10.	Alle & Oumer, 2021	Ethiopia February to March 2021	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=319) Majority aged: 30 to 39 years Sex: ♂ 63.6% & ♀ 36.4%	Overall, a negative attitude towards the COVID-19 vaccine.		**#Non-acceptance:** Lack of trust in stakeholders	**#Acceptance:** Age (≥30) Occupation (within the medical field) Religion Ethnicity	
11.	Angelo et al., 2021	Ethiopia March 2021	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=405) Majority aged: >30 Sex: ♂ 50.4% & ♀ 49.6%	Slightly over half of respondents reported a hesitant attitude towards the COVID-19 vaccine.	Close to half (48.4%) of the respondents were willing to accept the COVID-19 vaccine. Just over half (51.6%) were unwilling to take the vaccine.	**#Acceptance:** High perceived risk of disease Presence of chronic illness	**#Acceptance:** Occupation (within the medical field – doctor) Presence of chronic illness Having a positive attitude towards the COVID-19 vaccine Perceived risk of contracting COVID-19 Good preventive practices	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
12.	Annan et al., 2021	Ghana	Study design: A quantitative cross-sectional study Population target: Junior doctors Sample size: (N=305) Majority aged: 25 to 30 years Sex: ♂ 46.6% & ♀ 53.4%	Overall, a positive perception towards the COVID-19 vaccine.	Slightly more than two-thirds (66.9%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Safety concerns Subscribing to misinformation or conspiracies **#Acceptance:** Desire to protect vulnerable people Needed for future travel Self-protection	**#Acceptance:** Testing positive for COVID-19	
13.	Belsti et al., 2021	Ethiopia February to March 2021	Study design: A quantitative study Population target: General adult population (aged ≥18 years) Sample size: (N=1184) Age: 28.8 years (SD: 3.9) Sex: ♂ 91.7% & ♀ 8.3%	Overall, respondents reported a hesitant attitude towards the COVID-19 vaccine.	Roughly one-third (31.4%) of the respondents were willing to accept the COVID-19 vaccine Almost half (47.3%) were unwilling, and (21.3%) were undecided on taking the vaccine.	**#Non-acceptance:** Safety concerns	**#Acceptance:** Sex (female) Age (<30) Marital status Residence Occupation Religion (Muslim) Education level (tertiary)	
14.	Berihun et al., 2021	Ethiopia May 2021	Study design: A quantitative cross-sectional study Population target: Patients (with chronic disease) Sample size: (N=416) Sex: ♂ 49.6% & ♀ 50.4%	Overall, a positive attitude towards the COVID-19 vaccine.	Less than two-thirds (59.4%) of the respondents were willing to accept the COVID-19 vaccine. About two-fifths (40.6%) were	**#Acceptance:** Presence of health insurance High perceived risk of disease A positive attitude towards COVID-19 vaccine	**#Acceptance:** Having health insurance Knowing someone who tested positive for COVID-19 Having a good knowledge of the COVID-19 vaccine	Interpersonal relationships HCWs Mass media Social media

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
					unwilling to take the vaccine.		Having a positive attitude towards the COVID-19 vaccine	
15.	Bongomin et al., 2021	Uganda

March to April 2021 | Study design: A quantitative cross-sectional study
Population target: High-risk population (living with diabetes, HIV, or cardiovascular diseases)
Sample size: (N=317)
Age: 51.5 years (SD: 14.1)
Sex: ♂ 39.5 % & ♀ 60.5 % | | Just under three-quarters (70.1%) of the respondents were willing to accept the COVID-19 vaccine. | **#Acceptance:** Self-protection HCWs and government recommendation
#Non-acceptance: Safety concerns Subscribing to misinformation or conspiracies Low perceived risk of the disease | **#Acceptane:** Sex (male)
#Non-acceptance: History of VH for their children | Interpersonal relationships Social media |
| 16. | Bono et al., 2021 | DRC Benin, Uganda, Malawi, Mali

December 2020 to February 2021 | Study design: A quantitative cross-sectional study
Population target: General adult population (aged ≥18 years)
Sample size: (DRC: N=219), (Benin: N=159), (Uganda N=107) (Malawi N=81), (Mali N=55)
Age: | | Overall, the willingness to accept the COVID-19 vaccine among African countries at 90% effectiveness ranged between 22.6% to 65.4%. At 95%, effectiveness ranged between 48.4% to 88.8%. Uganda has the | **#Non-acceptance:** Safety concerns Subscribing to misinformation or conspiracies | **#Acceptance:** Efficacy of 90% and above | |

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			DRC: 35.2 years (SD: 9.0), Benin: 28.5 years (SD: 10.2), Uganda: 33.8 years (SD: 8.8), Malawi: 37.8 years (SD: 8.6), Mali: 37.4 years (SD: 9.0) Sex: (DRC: ♂ 77.2% & ♀ 22.8 %), (Benin: ♂ 70.4% & ♀ 29.6%), (Uganda: ♂ 51.4% & ♀ 48.6%), (Malawi: ♂ 43.2% & ♀ 56.8%), (Mali: ♂ 85.5% & ♀ 14.5%)		highest intention for uptake, and Benin has the lowest intention for uptake.			
17.	Chauke et al., 2021	South Africa	Study design: A qualitative study Population target: Youth (between 18 to 35 years) Sample size: (N=14)	Respondents displayed opposing attitudes towards the COVID-19 vaccine.	Some of the respondents were willing to accept the COVID-19 vaccine.	**#Acceptance:** Desire to protect vulnerable people Open up the economy by taking the COVID-19 vaccine **#Non-acceptance:** Lack of trust in stakeholders		
18.	Chiedozie et al., 2021	Nigeria	Study design: A quantitative study Population target: General adult population (aged ≥18 years) Sample size: (N=499)	Respondents reported a hesitant attitude towards the COVID-19 vaccine.	About half (51%) of respondents were willing to accept the COVID-19 vaccine. Less than one-third (30%) were unwilling, and	**#Acceptance:** Confidence in COVID-19 vaccine **#Non-acceptance:** Subscribing to misinformation or conspiracies		

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
					(18%) were undecided on taking the vaccine.			
19.	Ditekemena et al., 2021	Democratic Republic of Congo August 2020 to September 2020	Study design: A quantitative cross-sectional study Population target: General population Sample size: (N=4160) Sex: ♂ 31.6% & ♀ 68.4%		Over half (55.9%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Subscribing to misinformation or conspiracies Safety concerns Effectiveness concerns	**#Acceptance:** Income (middle-and high-level) Tested positive for COVID-19	Interpersonal relationships Social media Mass media Religious or traditional leaders
20.	Dula et al., 2021	Mozambique March 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=1878) Majority aged: 18 to 35 years Sex: ♂ 60% & ♀ 40%		Almost three-quarters (71.4%) of the respondents were willing to accept the COVID-19 vaccine.	**#Acceptance:** Confidence in COVID-19 vaccine **#Non-acceptance:** Effectiveness concerns Safety concerns Subscribing to misinformation or conspiracies		
21.	Echoru et al., 2021	Uganda July to September 2020	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=1067) Majority aged: 31 to 40 years Sex: ♂ 73.2% &		Slightly more than half (53.6%) of the respondents were willing to accept the COVID-19 vaccine. Just under half (46.4%) were unwilling to take the vaccine.	**#Non-acceptance:** Safety concerns	**#Acceptance** Age (18 to 20 years) Education (primary) Occupation Religion (Christian) Marital status (married) Residence (Rural area)	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			♀ 26.8%				Income	
22.	Ekwebene et al., 2021	Nigeria	Study design: A quantitative study Population target: General adult population (aged ≥18 years) Sample size: (N=445) Sex: ♂ 65.6% & ♀ 34.4%	Slightly less than half of the respondents reported a hesitant attitude towards the COVID-19 vaccine.	More than half (53.5%) of respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Safety concerns Religious beliefs **#Acceptance:** Confidence in COVID-19 vaccine		
23.	Elhadi et al., 2021	Libya

December 2020 | Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) (including medical students & HCW) Sample size: (N=15087) Age: 30.6 years (SD: 9.8) Sex: ♂ 44.7% & ♀ 55.3% | Overall, a positive attitude towards the COVID-19 vaccine. | Almost four-fifths (79.6%) of the respondents were willing to take the COVID-19 vaccine with 90% or more efficacy. Furthermore, three-fifths (60.6%) of the respondents were willing to accept the COVID-19 vaccine with 70% or more efficacy. | **#Acceptance:** Confidence in the COVID-19 vaccines **#Non-acceptance:** Subscribing to misinformation or conspiracies | **#Acceptance:** Age (31 to 50 years) Marital status (married) Geographical region Testing positive for COVID-19 Knowing someone who tested positive for COVID-19 Efficacy of 70% and above **#Non-acceptance:** Loss someone to this disease | Mass media Social media Internet |

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
24.	El-Sokkary et al., 2021	Egypt January 2021	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=308) Age: 37.6 years (SD: 10.1)	A positive perception of the vaccine.	Slightly over a quarter (26%) were willing to accept the COVID-19 vaccine. Just under one-third (32.1%) were unwilling to take the vaccine.		#Acceptance: Sex (male) Age Education level (tertiary) Income Work experience (<5 years, within the medical field) Having a positive attitude towards the COVID-19 vaccine Having a positive perception towards COVID-19 vaccine	Internet Mass media Social media
25.	Eniade et al., 2021	Nigeria December 2020	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=368) Age: 29.4 years (SD: 9.7) Sex: ♂ 41.1% & ♀ 58.9%		Two-fifths (40.5%) of the respondents were willing to accept the COVID-19 vaccine.	#Non-acceptance: Lack of trust in stakeholders Safety concerns	#Acceptance: Age (≥40) High perceived risk of disease	Social media Mass media Interpersonal relationships
26.	Fares et al., 2021	Egypt December 2020 to January 2021	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=385)	Over half of respondents reported a hesitant attitude towards the	Over one-fifth, (21%) of the respondents were willing to accept the COVID-19 vaccine.	#Acceptance: High perceived risk of disease Confidence in COVID-19 vaccine Needed for future	#Acceptancce: Sex (female) Dealing directly with COVID-19 patients Recommending the	Interpersonal relationships Social media Academic

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			Majority aged: 17 to 35 years Sex: ♂ 18.7% & ♀ 81.3%	COVID-19 vaccine.	Just over a quarter (28%) were unwilling, and (51%) were undecided on taking the vaccine.	travel **#Non-acceptance:** Safety concerns Perceived scientific uncertainty	COVID-19 vaccine for family, friends, or patients	journals articles
27.	Guangul et al., 2021	Ethiopia	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=668) Majority aged: 18 to 44 years Sex: ♂ 69.3% & ♀ 30.7%		Almost three-quarters (72.2%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Safety concerns Effectiveness concerns Perceived scientific uncertainty	**#Acceptance:** Trust in science	
28.	Hoque et al., 2020	South Africa September to October 2020	Study design: A quantitative cross-sectional study Population target: Pregnant women Sample size: (N=346) Age: 26.7 years (SD: 6.8)		Almost two-thirds (63.3%) of the respondents were willing to accept the COVID-19 vaccine.		**#Acceptance:** Age Parity Marital Status Education level Employment status	
29.	Hoque et al., 2021	South Africa September to October 2020	Study design: A quantitative cross-sectional study Population target: Patients Sample size: (N=345) Majority aged: 18 to 37 years	Overall, a positive attitude towards the COVID-19 vaccine.	Just over three-fifths (61.4%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Safety concerns Effectiveness concerns Low perceived risk of the disease		

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			Sex: ♂ 49% & ♀ 51%					
30.	Ilesanmi et al., 2021	Nigeria

September 2020 | Study design: A quantitative cross-sectional study
Population target: General population
Sample size: (N=440)
Age: 37.2 years (SD: 15.4) | Overall, a positive perception towards the COVID-19 vaccine | | | | Mass media
Social media |
| 31. | Josiah & Kantaris, 2021 | Nigeria

December 2020 | Study design: A quantitative cross-sectional study
Population target: General adult population (aged ≥18 years)
Sample size: (N=401)
Majority aged: 20 to 29 years
Sex: ♂ 53.9% & ♀ 46.1% | | Just under half (48.6%) of the respondents were willing to accept the COVID-19 vaccine.
Over half (51.4%) of the respondents were unwilling to take the vaccine. | #Non-acceptance: Doubts about the seriousness of the pandemic
Non-acceptance from a Western nation
Perceived scientific uncertainty
#Acceptance: Vaccine from an African nation
Vaccine from a Muslim nation | #Acceptance: Sex
Education level
Religious beliefs
Employment status
Income
High perceived risk of disease
Trust in government | |

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
32.	Kanyike et al., 2021	Uganda March 2021	Study design: A quantitative cross-sectional study Population target: Medical students Sample size: (N=600) Sex: ♂ 62.8% & ♀ 37.2%	Almost one-third of respondents reported a hesitant attitude towards the COVID-19 vaccine.	Almost two-fifths (37.3%) of the respondents were willing to accept the COVID-19 vaccine. Over three-fifths, (62.7%) of the respondents were unwilling to take the vaccine.	**#Non-acceptance** Safety concerns Subscribing to misinformation or conspiracies	**#Acceptance:** Sex (male) Single High perceived risk of disease Belief of getting COVID-19 in the future or having already had it Receiving any vaccine in the past five years COVID-19 vaccine hesitancy	Social media Interpersonal relationships Mass media Politicians Religious or traditional leaders
33.	Lamptey et al., 2021	Ghana October to December 2020	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=1000) Sex: ♂ 33.2% & ♀ 66.8%		A little above half (54.1%) of the respondents were willing to accept the COVID-19 vaccine.		**#Acceptance:** Age Marital status Education level Occupation	
34.	Mesesle, 2021a	Ethiopia March to April 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=425) Age: 29.2 years (SD:9.8) Sex: ♂ 50.8% &	Overall, a positive attitude towards the COVID-19 vaccine. However, respondents displayed a negative			Mass media

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			♀ 49.2%	perception of the vaccine.				
35.	Mesesle, 2021b	Ethiopia April 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=415) Age: 28.2 years (SD: 7) Sex: ♂ 55.6% & ♀ 44.4%		Less than half (45.5%) of the respondents were willing to accept the COVID-19 vaccine. While more than half (54.5%) were unwilling to take the vaccine.	**#Non-acceptance:** Perceived lack of information Safety concerns **#Acceptance:** Access to the media	**#Acceptance:** Sex Education level Use of mass media Received any vaccine during childhood Knowing someone who tested positive for COVID-19	Mass media
36.	Mohamud et al., 2021	Somalia October to December 2020	Study design: A quantitative cross-sectional study Population target: General population Sample size: (N=500) Sex: ♂ 44.8% & ♀ 55.2%	Overall, a negative attitude towards the COVID-19 vaccine.	Almost two-fifths (36.8%) of the respondents were willing to accept the COVID-19 vaccine. Just over three-fifths (63.2%) were unwilling to take the vaccine.	**#Non-acceptance:** Safety concerns Effectiveness concerns Perceived scientific uncertainty		
37.	Mose & Yeshaneh, 2021	Ethiopia January 2021	Study design: A quantitative cross-sectional study Population target: Pregnant Women Sample size: (N=396)	Overall, a positive attitude towards the COVID-19 vaccine.	Almost three-quarters (74.7%) of respondents were willing to accept the COVID-19 vaccine Almost one-third (29.3%) were	**#Non-acceptance:** Safety concerns Effectiveness concerns Preferred alternative treatment to COVID-19 vaccine	**#Acceptance:** Age (34 to 41 years) Educational level (primary) Having a good knowledge of COVID-19	Mass media HCWs

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
					unwilling to take the vaccine.		Good practice of preventive measures against COVID-19	
38.	Nkodila et al., 2021	Democratic Republic of Congo January to March 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=11971) Age: 35.1 years (SD: 10.4) Sex: ♂ 79.4% & ♀ 20.6%	Overall, negative perception of the COVID-19 vaccine.		**#Non-acceptance:** Effectiveness concerns Safety concerns Subscribing to misinformation or conspiracies		
39.	Nzaji et al., 2020	Democratic Republic of Congo March to April 2020	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=613) Age: 40.3 years (SD: 11.7) Sex: ♂ 50.9% & ♀ 49.1%		Over a quarter (27.7%) of the respondents were willing to accept the COVID-19 vaccine.		**#Acceptance:** Sex (male) Occupation (doctor) Having a positive attitude towards COVID-19	
40.	Ocholla et al., 2021	Kenya March 2021	Study design: A quantitative cross-sectional study Population target: General population Sample size: (N=171) Sex: ♂ 60.2% &		Over half (52.4%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Safety concerns	**#Acceptance:** Occupation	Mass media Social Media Interpersonal relationships HCWs

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
		♀ 39.2%						
41.	Omar & Hani, 2021	Egypt January to March 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=1011) Age: 29.4 years (SD: 10.8) Sex: ♂ 41.2% & ♀ 58.8%	Overall, a negative attitude towards the COVID-19 vaccine.	A quarter (25%) of the respondents were willing to accept the COVID-19 vaccine. Over one-fifth (21%) of the respondents were unwilling, and more than half (54%) hesitated about the COVID-19 vaccine.	#Non-acceptance: Safety concerns	#Non-acceptance: Sex (female) Residence (urban) Education level (tertiary) Marital status (married) Those who never had the flu vaccine Lack of trust in stakeholders	
42.	Orangi et al., 2021	Kenya February 2021	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=4136) Sex: ♂ 35.9% & ♀ 36.8%	Over one-third of respondents reported a hesitant attitude towards the COVID-19 vaccine.		#Acceptance: High perceived risk of disease #Non-acceptance: Safety concerns Effectiveness concerns Religious beliefs	#Non-acceptance: Residence (rural) Safety concerns Effectiveness concerns Hard to access vaccination sites Religious beliefs	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
43.	Oriji et al., 2021a	Nigeria April 2021	Study design: A quantitative cross-sectional study Population target: HCW (other than Doctors) Sample size: (N=182) Sex: ♂ 25.3% & ♀ 74.7%	Overall, respondents reported a hesitant attitude towards the COVID-19 vaccine.	Just over a quarter (27.4%) of the respondents accepted the COVID-19 vaccine. Slightly under three-quarters (72.5%) refused the vaccine.	#Non-acceptance: Perceived scientific uncertainty Safety concerns Wanted to see what would happen to those who received the vaccine Lack of trust in stakeholders Religious beliefs Preferred alternative treatment to COVID-19 vaccine	#Acceptance: Occupation (within the medical field) Tested positive for COVID-19 History of loss of sense of smell and taste Suspected infection Contact with a COVID-19-positive person Loss someone to this disease	
44.	Oriji et al., 2021b	Nigeria January to February 2021	Study design: A quantitative cross-sectional study Population target: Patients Sample size: (N=1000) Age: 35.9 years (SD:10.6) Sex: ♂ 34.9% & ♀ 65.1%	Overall, negative perception of the COVID-19 vaccine.	Around a quarter (24.6%) of the respondents were willing to accept the COVID-19 vaccine. Three-quarters (75.4%) were unwilling to take the vaccine.	#Non-acceptance: Lack of trust in stakeholders Safety concerns Effectiveness concerns Preferred alternative treatment to COVID-19 vaccine Religious beliefs		
45.	Robinson et al., 2021	Nigeria December 2020 to	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=1094)	Almost one-third of respondents reported a hesitant attitude towards the	Almost half (48.8%) of the respondents willing to accept	#Non-acceptance: Effectiveness concerns Safety concerns		Mass media Internet Social media

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
		January 2021	Sex: ♂ 56.7% & ♀ 43.3%	COVID-19 vaccine. Almost half of the respondents had a positive perception of the vaccine.	the COVID-19 vaccine. About two-fifths (39.7%) of the respondents were unwilling to take the vaccine.			
46.	Saied et al., 2021	Egypt January 2021	Study design: A quantitative cross-sectional study Population target: Medical students Sample size: (N=2133) Age: 20.2 years (SD: 1.8) Sex: ♂ 34.8% & ♀ 65.2%	Almost half of the respondents reported a hesitant attitude towards the COVID-19 vaccine.	Just over one-third (34.9%) of the respondents were willing to accept the COVID-19 vaccine. Almost one-fifth (19.4%) were unwilling, and almost half (45.7%) were hesitant. Just under three-quarters (71%) intend on taking the vaccine but will postpone it. About one-eighth (13%) expressed a willingness to receive it immediately.	#Non-acceptance: Safety concerns Effectiveness concerns #Acceptance: Desire to protect vulnerable people Self-protection	#Non-acceptance: Occupation (juniors' doctors) Education level (graduates)	Social media Mass media HCWs Internet

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
47.	Taye et al., 2021	Ethiopia January 2021	Study design: A quantitative cross-sectional study Population target: University Students Sample size: (N=423) Age: 24.2 years (SD: 1.7) Sex: ♂ 66.4% & ♀ 33.6%		Over two-thirds (69.3%) of the respondents were willing to accept the COVID-19 vaccine.	**#Non-acceptance:** Low perceived risk of the disease Effectiveness concern Safety concern Perceived lack of information Religious beliefs Belief in one's immune system	**#Acceptance:** Studying in the medical health field Having family members practising COVID-19 prevention methods Having a good knowledge of COVID-19	
48.	Tobin et al., 2021	Nigeria July 2020 to August 2020	Study design: A quantitative cross-sectional study Population target: General adult population (aged ≥18 years) Sample size: (N=1228) Age: 32.8 years (SD: 10.4) Sex: ♂ 51.7% & ♀ 48.3%		About half (50.2%) of the respondents were willing to accept a COVID-19 vaccine.	**#Acceptance:** Self-protection Desire to protect vulnerable people Recommendation by HCW Presence of chronic illness **#Non-acceptance:** Safety concerns Effectiveness concerns Doubts about the seriousness of the pandemic Afraid of needles	**#Acceptance:** Age (≥24 years) Religion (Muslim) Sex (male) Trust in stakeholders (government & public health authorities) Confidence in vaccine developers Willing to pay for and travel for a vaccine Vaccination during an outbreak	Social media Internet Mass media HCWs Interpersonal relationships
49.	Zewude & Belachew, 2021	Ethiopia June 2021	Study design: A quantitative cross-sectional study Population target: HCW Sample size: (N=232)	Overall, a negative attitude towards the COVID-19 vaccine.	Nearly two-thirds (63.4%) of respondents accepted the first dose of the	**#Non-acceptance:** Safety concerns Effectiveness concerns Religious beliefs	**#Acceptance:** Being a parent Previous interaction with someone infected	

	Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
			Sex: ♂ 39.2% & ♀ 60.8%		COVID-19 vaccine. Almost two-fifths (36.6 %) refused the vaccine. Followed by more than a quarter (28%) of the respondents who indicated they were unwilling to receive the second dose of the COVID-19 vaccine, and about less than one-eight (10.3%) was undecided.	Preferred alternative treatment to COVID-19 vaccine Belief in one's immune system **#Non-acceptance for the second dose:** Sufficient immunity with the first dose Safety concerns Experiences of discomfort while receiving the first dose	the perception that COVID-19 causes a severe illness Experience of receiving the first round of COVID-19 vaccine	
50.	Zewude & Habtegiorgis, 2021	Ethiopia March 2021	Study design: A quantitative cross-sectional study Population target: People at most risk (schoolteachers & bank employees) Sample size: (N=319) Sex: ♂ 69% & ♀ 31%	Overall, a negative attitude towards the COVID-19 vaccine.	Almost half (46.1%) of the respondents were willing to accept the COVID-19 vaccine. This study found that roughly two-thirds of respondents agreed only to take the vaccine if it becomes compulsory by law.	**#Non-acceptance:** Safety concerns Perceived scientific uncertainty Perceived lack of information Belief in one's immune system Religious beliefs Against vaccines in general Being infected with COVID-19 is	**#Acceptane:** Attitude towards the vaccine Belief that COVID-19 exists Trust in stakeholders (the perception that prevalence and death rate reports of the government are accurate) Presence of chronic illness	

Author(s) & Publication Year	Country & Data Collection Period	Methodology	Attitudes & Perceptions towards COVID-19 vaccines	Intention to take the COVID-19 vaccine	Reasons for acceptance/non-acceptance	Determinants affecting the vaccine-related outcome (significantly associated)	Information sources for COVID-19 vaccines
					better than taking the vaccine	Knowing someone who tested positive for COVID-19	

HCW – Healthcare Worker

♂ - Male ♀ - Female

Results Section:

The findings of the six themes are discussed in this section.

Attitudes and perceptions regarding COVID-19 vaccines among people in Africa

In this review, thirty-one studies (*n*=31) reported on attitudes or perceptions of the COVID-19 vaccines in Africa. In total, twelve studies (*n*=12) found that the participants had a hesitant attitude toward the vaccine [2, 8, 11, 13, 18, 22, 26, 32, 42, 43, 45, 46]. Furthermore, six studies reported either a positive [5, 14, 23, 29, 34, 37] or a negative [1, 10, 36, 41, 49, 50] attitude toward the vaccine. The qualitative study's [17] findings discovered opposing attitudes among respondents regarding the vaccines.

Five of the 31 studies reported a positive perception [4, 12, 24, 30, 45] of the vaccine, while three studies reported an overall negative perception [34, 38, 44] of the vaccine. According to the findings, two studies were diametrically opposed regarding attitudes and perceptions towards the vaccine. The study among HCWs by Robinson et al. (2021) in Nigeria discovered that approximately one-third of respondents expressed a hesitant attitude towards the vaccine, while nearly half expressed a positive perception of the vaccine. A study conducted by Mesesle (2021a) on the general adult population in Ethiopia discovered an overall positive attitude toward the vaccine. However, respondents also expressed a negative perception of the COVID-19 vaccines. Research scholars believe the relationship between attitude and behaviour is not always consistent (Sekiguchi & Nakamaru, 2011; Stangor et al., 2022). Behaviours are influenced by attitudes and various other factors (Frymier & Nadler, 2007; Ajzen & Fishbein, 2018), impacting one's decision or willingness to uptake vaccines.

Intention to uptake COVID-19 vaccines

According to the findings, forty-five studies (*n*=45) examined respondents' intention to take the COVID-19 vaccines. The intention for uptake ranged from 21% to 90.1%. Only nineteen studies (*n*=19) reported a lower-than-average rate (i.e., below 50%). In comparison, twenty-six studies (*n*=26) illustrate an intention rate of 50% or higher. (See table 3. for a detailed intention rate). The country with the lowest intention rate was reported in Egypt (21%) by Fares et al. (2021) among HCWs. In contrast, the country with the highest intention rate was reported in South Africa (90.1%) by Adeniyi et al. (2021) among HCWs.

Among the general adult population (aged ≥18 years), ten studies (n=10) reported an intention to accept the vaccine [1, 7, 16, 18, 20, 21-23, 33, 48], indicating an acceptance rate greater than

50%. While the general population of five studies reported an intention for uptake, one study [36] reported an intention rate of less than 50%. In this review, the two studies [28, 37] indicated an above-average acceptance rate between 63.3% to 74.7% among pregnant women. Among patients the intention for uptake ranged from 24.6% to 61.4% [9, 14, 29, 44]. A study conducted by Taye et al. (2021) indicated a 69.3% intention for uptake among university students in Ethiopia. Bongomin et al.'s (2021) conducted a study among a high-risk population (people living with diabetes, HIV, or any cardiovascular disease) in Uganda. They found that 70.1% of them intended to take the vaccine.

The qualitative study conducted in South Africa by Chauke et al. (2021) among 14 youth participants (aged 18 to 35 years) did not statistically report the intention to accept the COVID-19 vaccine however revealed mixed feelings among the young people. Some young people considered it necessary to take the vaccine to mitigate the effects of the pandemic. Others, on the other hand, believe that the vaccine should only be used as a last resort because it negatively affects their genetic makeup, including their reproductive system. Furthermore, these participants believed that once they are vaccinated, their daily activities will be monitored through a microchip in the COVID-19 vaccine.

Seven of the twelve studies' sample populations of HCWs reported a lower-than-average intention for vaccine uptake [6, 11, 24, 26, 39, 43, 45]. The following three studies, Allagoa et al. (2021a), Oriji et al. (2021a), and Zewude and Belachew (2021), reported on participants who received the COVID-19 vaccine. All studies were conducted among HCWs because they were the first to receive the COVID-19 vaccine after it was approved. Allagoa et al. (2021a) conducted a study in Nigeria, while Zewude and Behachew (2021) conducted a study in Ethiopia. Both studies reported an above-average acceptance rate of above 50%, while Oriji et al. (2021a) conducted a study in Nigeria and reported a lower acceptance rate of 27.4%. The study conducted by Zewude and Belachew (2021) further depicted the intention to accept the second dose. Approximately 28% of HCWs were unwilling to accept the second dose, with 10.3% remaining undecided.

Medical students reported a low acceptance rate of 34.7% to 37.3 %. A study by Saied et al. (2021) in Egypt among medical students reported a disappointing low acceptance rate of 34.9%. The majority of respondents, 45.7%, were hesitant about accepting the vaccine. Furthermore, 71 % intended to take the vaccine but would postpone doing so to see how it would react to those who initially accepted the vaccine.

Bono et al. (2021) examined nine low-and middle-income countries. However, only the five African countries surveyed were considered. According to the data presented, the intention to accept the vaccines at an effective rate of 90% ranged between 22.6% to 65.4%, and the intention to accept at an effective rate of 95% raged between 48.4% to 88.8%. Among the five African countries, Ugandan participants were reported to have the highest intention for uptake at both levels of effectiveness. On the other hand, Benin was found to have the lowest intention for uptake at both levels of effectiveness.

Factors associated with COVID-19 vaccine uptake

Factors that promoted the intention for vaccine uptake were reported by eighteen studies (*n*=18). These were grouped as confidence in the COVID-19 vaccine (*n*=8) [2, 5, 18, 20, 22, 23, 26; 39]; the desire to protect vulnerable people (*n*=5) [2, 12, 17, 46, 48]; high perceived risk of COVID-19 (*n*=4) [11, 14, 26, 42]; for self-protection (*n*=4) [12, 15, 46, 48]; and living with chronic illness (*n*=3) [9, 11, 48]. Less common reasons were the need for travel requirements [12, 26]; access to the media [35]; to end the pandemic [5]; having a positive attitude towards the COVID-19 vaccines [39]; and the vaccine being recommended by HCWs and governmental officials [15, 48].

An interesting finding in the study by Josiah and Kantaris (2021) among the general population in Nigeria was the acceptance of COVID-19 vaccines when obtained from an African or Muslim country rather than Western countries.

Barriers to the uptake of the COVID-19 vaccine

Thirty-nine studies (*n*=39) highlighted the barriers associated with COVID-19 vaccine uptake. Thirty-three studies (*n*=33) cited that the main reason for non-acceptance was safety concerns (e.g., fear of side effects of the vaccine is unsafe for humans) [2, 3, 6-9, 12, 13, 15, 16, 19, 20-22, 25-27, 29, 32, 35-38, 40-46, 48-50]. Seventeen studies (*n*=17) reported concerns regarding the vaccine's effectiveness (e.g., the vaccine is ineffective from protecting against COVID-19) [2, 6, 7, 19, 20, 27, 29, 36-38, 42, 44-49], resulting in a general apprehension to be vaccinated. Ten studies (*n*=10) mentioned scientific uncertainty as a barrier for non-acceptance (e.g., mistrust in science or the vaccine, the vaccine has not gone through enough clinical trials, or the quality of COVID-19 vaccines sent from Western countries was not effective against COVID-19 in Africa) [6, 8, 9, 26, 27, 31, 36, 43, 50]. Perceptions based on conspiracies about the COVID-19 vaccine were found to pose a barrier to vaccine uptake in nine studies (n=9)

(e.g., the vaccine was designed to kill people in Africa, the vaccine was designed to sterilise the African population, and the vaccine causes COVID-19) [12, 15, 16, 18, 19, 20, 23, 32, 38].

Religious beliefs were another aspect reported in nine studies (*n*=9) that negatively influenced vaccine uptake (e.g., the vaccine contains the mark of the beast) [8, 9, 22, 42, 43, 44, 47, 49, 50]. Lack of trust in stakeholders (e.g., vaccine manufacturers and the government) were cited in seven studies [8-10, 17, 25, 43, 44]. Five studies each mentioned barriers associated with vaccine uptake were attributed to a perceived lack of information to make informed decisions about its uptake [2, 6, 35, 47, 50] and having the belief that their immune system would protect them from contracting COVID-19 [3, 7, 47, 49, 50]. According to four studies, respondents had a low perceived risk of disease [6, 15, 29, 47], which resulted in a lack of adoption of the COVID-19 vaccine. Findings from four studies revealed that respondents preferred alternative treatments to the COVID-19 vaccine (e.g., drugs such as Hydroxychloroquine, Azithromycin, and Ivermectin) [37, 43, 44, 49].

Two studies yielded some interesting results [49, 50]. According to Zewude and Belachew (2021), among HCWs in Ethiopia, the reasons for non-acceptance of the second dose were primarily due to HCWs believing they have adequate immunity with the first dose, safety concerns, and experiencing discomfort while receiving the first dose. In Ethiopia, Zewude and Habtegiorgis (2021) found that people at high risk of infection (e.g., schoolteachers and bank employees) preferred being infected with COVID-19 to receiving the COVID-19 vaccine.

Socio-demographic determinants affecting the intention and uptake of COVID-19 vaccines

Thirty-nine studies (*n*=39) reported socio-demographic determinants influencing COVID-19 vaccine intention and uptake. Thirty-four studies (*n*=34) found a statistically positive relationship between socio-demographic characteristics and vaccine uptake [1-6, 8-10, 12-16, 19, 21, 23-29, 31-33, 35, 37, 39, 40 43, 47-50]. Age [1-3, 8, 10, 13, 21, 23-25, 28, 33, 37, 48] and sex [2, 6, 8, 9, 13, 15, 21, 24, 26, 31, 32, 35, 39, 48] were shown to be the most common significant predictors of vaccination uptake (*n*=14). Of those studies, it was shown that men (*n*=8) [6, 8, 9, 15, 24, 32, 39, 48] and older adults of 30 years and older (*n*=5) [1, 8, 10, 23, 25, 37] were more likely to accept the vaccine than their counterparts.

Eleven studies (*n*=11) suggested that education level [1, 4, 5, 13, 21, 24, 28, 31, 33, 35, 37] was a predictor of vaccine uptake. Furthermore, three studies indicated that a higher level of education was related to increased intention for uptake (e.g., secondary and tertiary) [1, 13,

23]. In contrast to those findings, Allagoa et al. (2021b) indicated that those with a higher level of education were significantly associated with the non-acceptance of the COVID-19 vaccine. Twelve studies (*n*=12) [4-6, 10, 11, 13, 21, 33, 39, 40, 43, 47] reported occupation as a determining factor associated with vaccine uptake. Of those, seven studies (*n*=7) [4-6, 10, 11, 39, 43] found that those working in the medical field were significantly more likely to receive the COVID-19 vaccines. While Taye et al. (2021) reported among university students in Ethiopia studying in the medical health field were significantly associated with vaccine uptake. However, Saied et al. (2021) discovered that junior doctors in Egypt were significantly less likely to uptake the vaccine.

Furthermore, four studies indicated other socio-demographic determinants, such as testing positive for COVID-19 [8, 12, 19, 23] and having a high-risk perception for contracting COVID-19 [11, 25, 31, 32], while three studies each indicated having a chronic illness [2, 11, 50]; being married [21, 23, 41] and religious affiliation [13, 21, 34] of which being of the Muslim faith [13, 48] and of the Christian faith [21]. Additionally, two studies showed that having middle to higher income levels [19, 21] was significantly associated with the uptake of the COVID-19 vaccines. Other significant predictors of vaccine acceptance reported by one study was having access to health insurance [14], having good preventive practices towards COVID-19 [11], having a positive attitude towards the COVID-19 vaccine [11] and another study belonging to the Amhara ethnic group [10].

According to Hoque et al. (2020), one of the determinants that promoted vaccine acceptance among pregnant women in South Africa was parity (the number of pregnancies carried by a woman for at least 20 weeks). In contrast, the study conducted by Elhadie et al. (2021) in Libya found that the death of a loved one to COVID-19 significantly decreased the likelihood of COVID-19 vaccine uptake in Libya.

Information sources for COVID-19 vaccines

A total of eighteen studies (*n*=18) reported on information sources [1, 2, 14, 15, 19, 23-26, 30, 32, 34, 35, 37, 40, 45, 46, 48] regarding COVID-19 vaccines. Figure 4 below illustrates the information sources regarding COVID-19 vaccines found in the included studies. The most common source of information about COVID-19 vaccines was from mass media (n=16) [1, 2, 14, 19, 23-25, 30, 32, 34, 35, 37, 40, 45, 46, 48] which included radio, TV, newspapers, and magazines– followed by social media (*n*=15) [1, 2, 14, 15, 19, 23-26, 30, 32, 40, 45, 46, 48], and interpersonal relationships (*n*=10) [1, 2, 14, 15, 19, 25, 26, 32, 40, 48], which included

information from family, friends, neighbours, and colleagues. Five studies (*n*=5) reported on respondents receiving information from HCWs [14, 37, 40, 46, 48].

While another five studies (*n*=5) reported on participants who received their information from the internet [23, 24, 45, 46, 48], which included sites such as Centres for Disease Control and Prevention (CDC), Nigeria Centre for Disease Control (NCDC) and World Health Organization (WHO). Two studies (*n*=2) reported participants receiving their information from academic journals [2, 26], religious and traditional leaders [19, 32], respectively. One study (*n*=1) reported receiving information from governmental officials [32], i.e., politicians.
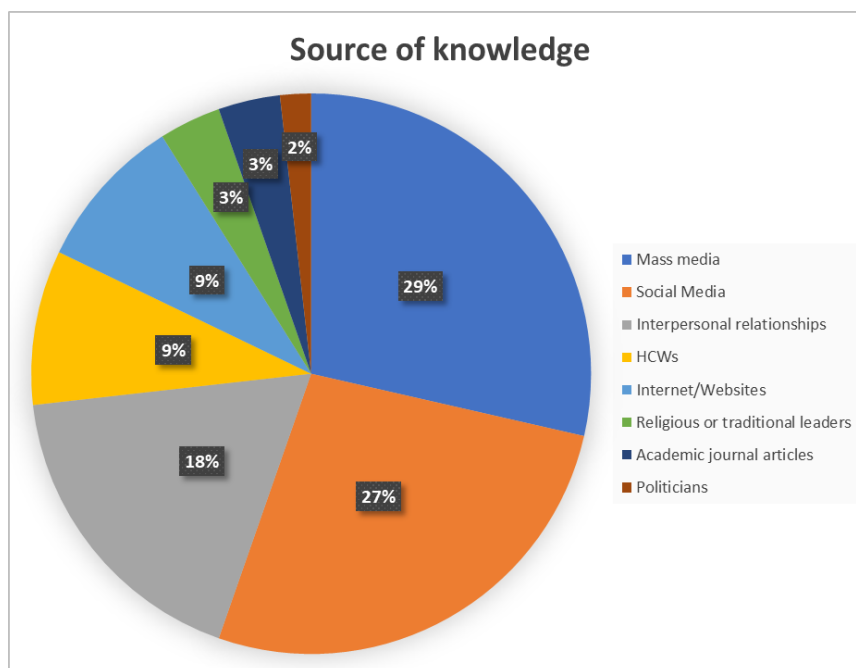

Figure 4. Information sources regarding COVID-19 vaccines

Discussion

The success of Africa's extensive COVID-19 pandemic vaccination program (WHO AFRO, 2021) is dependent on high vaccination rates. As a result, vaccination uptake and acceptance are critical in the fight against COVID-19 (Bai et al., 2021). To increase vaccine acceptance it is necessary to gain a better understanding of the factors that influence vaccine intention and uptake of COVID-19 vaccines.

Fifty published academic journal articles were reviewed to gain a more in-depth and nuanced understanding of how various factors, such as psychosocial and contextual factors, influence COVID-19 vaccine uptake intentions and behaviours among people in Africa. The majority of

the studies included in this review were quantitative cross-sectional studies conducted in Nigeria and Ethiopia. Many of the studies included were conducted among the general adult population and HCWs. The findings of this review revealed a varied response in people's perceptions and attitudes regarding COVID-19 vaccines. Indicating a general hesitancy regarding the uptake of COVID-19 vaccines. Many of these concerns have been argued to stem from a lack of information or misinformation and conspiracy theories (Bono et al., 2021). As a result, 58% of studies reported a higher-than-average intention to uptake the COVID-19 vaccines.

HCWs had the lowest and highest acceptance scores for COVID-19 vaccines among the study population groups included in this review. According to Adeniyi et al. (2021), a high intention rate of 90.1 % to accept the COVID-19 vaccine was reported among HCWs in South Africa. This is significantly higher than previously reported vaccine intention rates among HCWs in other countries. Shaw et al. (2021) reported a slightly above-average rate of 57.5 % among HCWs in the United States. According to another study conducted in France by Gagneux-Brunon et al. (2021), 75% of HCWs were willing to accept the COVID-19 vaccine, while 25% were hesitant. Additionally, Papagiannis et al. (2021) reported a 78.5 % acceptance rate in Greece. A study by Verger et al. (2021) reported that 72.4 % of HCWs in parts of Belgium and Canada were willing to accept the vaccine.

However, the remaining studies among HCWs revealed a lower-than-average acceptance rate, with four studies indicating a rate of less than 30% [23, 26, 39, 43]. According to Allago et al. (2021a), HCWs who are hesitant to accept the COVID-19 vaccine would not recommend it to the public. Additionally, they would transfer their hesitant attitude and negative perceptions of the vaccine to the public, influencing their decision to get vaccinated. The low intention rate is due to the rapid development of COVID-19 vaccines, concerns about the vaccines' safety and effectiveness, and mainly reports on the adverse side effects (Belsti et al., 2021; Eniola & Sykes, 2021; Nzaji et al., 2020). This is exacerbated by misinformation, which has fostered distrust in government officials, regulatory agencies, and pharmaceutical companies (Agyekum et al., 2021; Eniola & Sykes, 2021).

Although it is commonly assumed that HCWs would have a positive attitude toward COVID-19 vaccines because of their expertise, Verger et al. (2021) and El-Sookkary et al. (2021) point out that HCWs are not a homogeneous group and that the vast majority are not immunization

experts. The development of COVID-19 vaccines clearly exposed a lack of knowledge in immunology among HCWs (El-Sookkary et al., 2021).

Therefore, governments, public health agencies, and private health care systems should collaborate in making educational resources available to inform HCWs about the vaccines' safety, importance, and the negative consequences of refusing or delaying vaccination. This delay is likely to hamper the vaccines' general acceptance rate (Berihun et al., 2021).

The intention to accept COVID-19 vaccines was much lower among medical students in Egypt [46] and Uganda [32] (34.9% and 37.3%, respectively). In contrast to the findings of this review, a study conducted in Romania by Bălan et al. (2021) found a high (88.5%) intention to accept the COVID-19 vaccine. According to Kanyike et al. (2021), the low intention rate in Egypt and Uganda may have resulted from negative information and unsubstantiated rumours on social media, as well as a low perceived risk of the disease that has swayed them to delay vaccination.

The two studies included in this review found that pregnant women had an above-average intention rate (63.3 % to 74.7 %). Similarly, Tao et al. (2021) conducted a study in China and found a high intention rate of 77.4 %. In contrast to these findings, a study in Turkey by Goncu Ayhan et al. (2021) reported a low (37%) intention to receive the COVID-19 vaccine.

The most frequently cited demographic factors influencing COVID-19 determinants of vaccine intention and uptake in this review were respondents' age and sex. Men and older adults aged 30 years and older are more likely to accept the vaccine, similar to a study conducted in Slovenia by Petravi et al. (2021), who reported the two most common factors positively associated with COVID-19 vaccine uptake were male and being middle-aged. This may stem from beliefs of vulnerability and the negative consequences of contracting COVID-19. Therefore, vaccination will be accepted by those who perceive themselves to be at a higher risk of contracting COVID-19 (Eniade et al., 2021; Fares et al., 2021; Nzaji et al., 2021).

Numerous significant barriers to COVID-19 vaccine uptake in Africa have been identified in this review. Safety concerns were cited as the main reason for the non-acceptance of the COVID-19 vaccines. In line with these findings, Magadmi and Kamel (2021) reported safety concerns about the COVID-19 vaccines among the general population in Saudi Arabia. Additionally, Magadmi and Kamel (2021) stated that increasing people's trust in COVID-19 vaccines may result in increased vaccine uptake.

Most studies emphasized the importance of stakeholders educating and raising the level of awareness among the general public, including HCWs, about COVID-19 vaccines. It is now up to various stakeholders and policymakers to take effective action to provide as much information as possible to the people of Africa in order to increase vaccine acceptance and thus address the pandemic's negative health and socio-economic consequences.

Strengths and limitations

This review focused on a broad range of respondents to get a more in-depth perspective on the factors influencing intention and uptake of COVID-19 vaccines by the population of Africa. Although this study adopted an inclusive approach, many articles were not qualitative, which means that further in-depth research is needed to understand better the factors influencing intention and uptake of COVID-19 vaccines on the African continent. This review did not undertake a quality assessment of the included studies. Only studies published in English were considered for this review.

Conclusion

As many African countries enter the fourth and fifth waves of the pandemic, the uptake of COVID-19 vaccines is critical in combating the pandemic. According to the literature, vaccines are the most effective prevention method against severe COVID-19 complications and hospitalisation. While the feeling of apprehension lingers in the air, the COVID-19 pandemic continues to create psychosocial and economic hardships in Africa.

The majority of the studies reviewed reported that significant barriers for uptake exist in Africa, resulting in a suboptimal uptake intention of COVID-19 vaccines. The role of social media has exacerbated the effects of misinformation and conspiracy theories, resulting in divided communities where some support and others oppose COVID-19 vaccines.

It is therefore critical to improve general health literacy and knowledge about COVID-19 vaccines among the populations in Africa to increase the uptake. The main source of information was cited from mass media and social media. It is up to governments and stakeholders to combat the effects of misinformation by providing easily accessible grassroot level of information to the general public through multiple platforms.

This paper calls on the government and various stakeholders to train and create opportunities for CHWs to engage with the public through information dissemination and motivation to adopt positive perceptions and attitudes towards COVID-19 vaccines.

A combined effort is required in stemming the negative health and socio-economic consequences of the COVID-19 pandemic and promoting COVID-19 vaccines across Africa for informed decision making on its uptake.

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Author's contribution

Damian Naidoo, the first author, was responsible for the conceptualization and design of this research paper. He gathered data for the study, conducted data analysis, and authored the article. Supervised by Professor Anna Meyer-Weitz, who reviewed and provided constructive feedback. The review forms part of the research requirement for the degree in Master of Social Science in Health Promotion

Abbreviations

CDC – Centres for Disease Control and Prevention

CHW – Community Healthcare Worker

COVID-19 – Coronavirus disease 2019

DRC – Democratic Republic of the Congo

HCW – Health Care Worker

HIV/AIDS – human immunodeficiency virus/acquired immunodeficiency syndrome

IDVI – Infectious Disease Vulnerability Index

MERS-Cov – Middle East respiratory syndrome coronavirus

PRISMA-ScR – Preferred Reporting Items for Systematic reviews & Meta-Analyses extension for Scoping Reviews

SARS-CoV – Sever acute respiratory syndrome

SARS-CoV-2 – Severe acute respiratory syndrome coronavirus 2

TB – Tuberculosis

VH – Vaccine Hesitancy

VPD – Vaccine preventable diseases

WHO AFRO – World Health Organization African Region

WHO – World Health Organization

CHAPTER FOUR

Introduction

Many African citizens were hesitant to accept the COVID-19 vaccines for various reasons detailed in the previous chapter. The following guidelines for interventions were cited in the included studies directed at local governments and stakeholders to increase COVID-19 vaccination uptake in Africa. A key issue relates to Information, Education and Communication (IEC) to the general public and specific target audiences like HCWs. Participatory engagement with the communities and key stakeholders was viewed as an important strategy in addressing the challenges of COVID-19 vaccines that are being experienced.

Information, Education and Communication (IEC):

Workshops for HCWs and other health officials

HCWs inform the decision of the general public. Much attention needs to be placed on educating and training HCWs on the importance and safety of COVID-19 vaccines. Additionally, ongoing workshops are required to keep HCWs confident in the effectiveness and safety of the COVID-19 vaccines (Saied et al., 2021). Such information needs to be provided to HCWs so they can advocate for vaccine acceptance. In Addition, ongoing engagement with significant stakeholders should address concerns expressed by HCWs. HCWs also need to provide updated and factual information to the public (Berihun et al., 2021).

Increase health literacy (vaccine education)

Many citizens cannot make informed decisions on accepting the COVID-19 vaccine because they lack adequate information (Chiedozie et al., 2021). Health education and community-based programmes need to be adopted, especially in rural communities with poor access to information (Elhadi et al., 2021; Hoque et al., 2021). The adoption of health education programmes keeps the public updated on merging information, increasing their knowledge on the COVID-19 pandemic and vaccines (Allagoa et al., 2021). Furthermore, the public needs to be adequately educated and trained on COVID-19 and the prevention methods.

Additionally, these programmes need to inform the public about the COVID-19 vaccines by using toolkits to provide information on how vaccines work, the development and manufacturing of vaccines, and the different types of COVID-19 vaccines (e.g., mRNA

vaccines), on the safety and side effects of the COVID-19 vaccines. Health promoters and significant stakeholders need to create educational campaigns to inform the public about the importance of getting vaccinated and that the benefit outweighs minor side effects (Allagoa et al., 2021b). Schools should also adopt this approach as young children are now eligible for the COVID-19 vaccine.

Combating misinformation and conspiracy theories

Misinformation and disinformation have caused a significant concern regarding the acceptance of COVID-19 vaccines. With the use of social media, vaccine myths have spread like wildfire across the continent. Misinformation, conspiracy theories and disinformation need to be debunked on all platforms by trusted officials (Acheampong et al., 2021). Governments and authorities should do more to combat disinformation against vaccines. They should note what myths have been circulating in the public domain and provide effective fact-checking myth busters to counteract the effects of misinformation. Further clear, tailored information and education programmes should be provided for each myth debunked (Belsti et al., 2021). The use of media platforms (e.g., TV, radio, newspapers, social media, websites) needs to have an ongoing debunking of myths and reasons for acceptance and advocate for behavioural changes (Acheampong et al., 2021; Saied et al., 2021).

Community engagement

From the onset of the COVID-19 pandemic, there has been a need for community engagement. Community engagement is the most effective way to promote the uptake of COVID-19 vaccines (Adebisi et al., 2021). Various stakeholders (e.g., local authorities and governments) need to adopt an integrated community-based approach. Stakeholders need to engage with communities at a grassroot level by monitoring and evaluating tailor-made techniques and engaging with the public by acknowledging and addressing any concerns about the COVID-19 vaccines (Ekwebene et al., 2021). Local communities need to be actively engaged when developing vaccination strategies to promote acceptance (Echoru et al., 2021). The government needs to instil trust in the COVID-19 vaccines by improving the vaccine's confidence through reporting on the effectiveness and safety of the vaccines developed.

Furthermore, the government and various stakeholders need to gain the public's trust through reporting transparent and accurate information. A non-judgemental approach when engaging with those who are hesitant. Their concerns should be met with empathy through open

dialogue. Furthermore, to increase trust in the local public, authorities should go into local communities and vaccinate the public.

Engagement of CHWs and health promoters with communities

There has been a dire need for CHWs and health promoters to engage with vulnerable populations across Africa. CHWs and health promoters play a critical role in communities by providing consistent and tailored information to the public. Tailor-made education programmes to be led by CHWs, health promoters, and other health officials acknowledge concerns and provide adequate information and support to adopt a positive attitude and perception towards the COVID-19 vaccine (Robison et al., 2021). Health promoters bridge the gap between stakeholders and the public. A grassroots approach would allow health promoters to reach rural communities and provide simple yet effective information regarding the vaccine (Ekwebene et al., 2021).

Engagement by vaccine ambassadors

Stakeholders need to collaborate with different sectors and social influencers. Vaccine ambassadors need to elect to advocate for vaccine uptake. Vaccine ambassadors (e.g., celebrities, community and faith-based leaders, politicians and traditional healers) influence the greater public to encourage and adopt a positive behavioural change towards the vaccines (Agyekum et al., 2021; Echoru et al., 2021). Firstly, vaccine ambassadors require to be educated and trained on the COVID-19 vaccine before motivating for the acceptance of COVID-19 vaccines. Traditional healers, community and faith-based leaders are the gateway to promoting vaccine acceptance in rural communities as they are seen as respected individuals (Allagoa et al., 2021). Celebrities have a significant influence, especially among the younger population, who can promote vaccine uptake. Local TV shows can also adopt an educational approach by providing information about the COVID-19 vaccines and the benefits for uptake (e.g., characters can be seen advocating for vaccines and getting vaccinated on the show) (Acheampong et al., 2021; Ocholla et al., 2021).

Suggested Guidelines for Interventions: In summary, the following guidelines for interventions to motivate the uptake of COVID-19 vaccination

Information:

Workshops for HCWs and health officials – providing HCWs with the necessary tools and information to promote COVID-19 uptake.

Education:

Increase health literacy – promoting and implementing health education programmes across the continent.

Combating misinformation and conspiracy theories – debunking myths and other false information around the COVID-19 vaccine as well as the COVID-19 pandemic.

Communication:

Community engagement – creating an enabling environment through communicating transparent and accurate information effectively to the public.

Employing CHWs and health promoters - adopting tailor-made community outreach campaigns among vulnerable populations.

Adopting vaccine ambassadors – engaging with various sectors and social influencers (e.g., celebrities, traditional healers, community, politicians, and faith-based leaders).

Conclusion

As many African countries enter the fourth and fifth wave of the pandemic, the uptake of COVID-19 vaccines is critical in combating the pandemic. According to the literature, vaccines are the most effective prevention method against severe COVID-19 complications and hospitalisation. While the feeling of apprehension lingers in the air, the COVID-19 pandemic continues to create psychosocial and economic hardships in Africa.

Factors associated with uptake of the COVID-19 vaccines included people's desire to protect themselves as well as their loved ones against the virus. Many people experienced the severity of COVID-19 through ill health and, in some instances, the death of loved ones and have therefore become more aware of the perceived risks of the virus.

The majority of the studies reviewed reported that significant barriers for uptake exist in Africa, resulting in a suboptimal uptake intention of COVID-19 vaccines. The role of social media has exacerbated the effects of misinformation and conspiracy theories, resulting in divided communities where some support and others oppose COVID-19 vaccines. However, people in Africa generally seem to be hesitant about the uptake of COVID-19 vaccination. This is not at all surprising as VH is not a new phenomenon that is understood to result from a lack of knowledge as well as a misunderstanding of science. The low level of trust in COVID-19 vaccines and the concerns about the long-term efficacy of the vaccines, as well as the possible long-term side effects associated with the vaccine uptake, play a role in decision making regarding vaccination.

It is therefore critical to improve general health literacy and knowledge about COVID-19 vaccines among the populations in Africa to increase the uptake. The main source of information was cited from mass media and social media. It is up to governments and stakeholders to combat the effects of misinformation by providing easily accessible grassroot level of information to the general public through multiple platforms

This paper calls on the government and various stakeholders to train and create opportunities for CHWs to engage with the public through information dissemination and motivation to adopt positive perceptions and attitudes towards COVID-19 vaccines. A combined effort is required in stemming the negative health and socio-economic consequences of the COVID-19 pandemic and promoting COVID-19 vaccines across Africa for informed decision making on its uptake.

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APPENDIX

Appendix 1: Search Strategy

Search ID#	Search Terms	Search Options	Actions
S5	(Attitude and perception towards COVID-19 vaccine) AND SU africa OR TI (vaccine hesitancy or vaccine refusal or vaccine acceptance or vaccine uptake)	Limiters - Full Text; Published Date: 20200101-20211231; Hidden NetLibrary Holdings Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	(247)

Table 4. EBSCOhost search strategy.

Keyword search	Search engine	Number of publications retrieved
	PubMed	**41**

Search: (((((((("covid 19 vaccines"[MeSH Terms] OR ("covid 19"[All Fields] AND "vaccines"[All Fields]) OR "covid 19 vaccines"[All Fields] OR "sars cov 2 vaccine"[All Fields]) AND ("percept"[All Fields] OR "perceptibility"[All Fields] OR "perceptible"[All Fields] OR "perception"[MeSH Terms] OR "perception"[All Fields] OR "perceptions"[All Fields] OR "perceptional"[All Fields] OR "perceptive"[All Fields] OR "perceptiveness"[All Fields] OR "percepts"[All Fields])) OR ("attitude"[MeSH Terms] OR "attitude"[All Fields] OR "attitudes"[All Fields] OR "attitude s"[All Fields]) OR ("covid 19 vaccines"[MeSH Terms] OR ("covid 19"[All Fields] AND "vaccines"[All Fields]) OR "covid 19 vaccines"[All Fields] OR "covid 19 vaccines"[All Fields])) AND ("nigeria"[MeSH Terms] OR "nigeria"[All Fields] OR "nigeria s"[All Fields])) OR ("south africa"[MeSH Terms] OR ("south"[All Fields] AND "africa"[All Fields]) OR "south africa"[All Fields]) OR ("ethiopia"[MeSH Terms] OR "ethiopia"[All Fields] OR "ethiopia s"[All Fields]) OR (("vaccin"[Supplementary Concept] OR "vaccin"[All Fields] OR

"vaccination"[MeSH Terms] OR "vaccination"[All Fields] OR "vaccinable"[All Fields] OR "vaccinal"[All Fields] OR "vaccinate"[All Fields] OR "vaccinated"[All Fields] OR "vaccinates"[All Fields] OR "vaccinating"[All Fields] OR "vaccinations"[All Fields] OR "vaccination s"[All Fields] OR "vaccinator"[All Fields] OR "vaccinators"[All Fields] OR "vaccine s"[All Fields] OR "vaccined"[All Fields] OR "vaccines"[MeSH Terms] OR "vaccines"[All Fields] OR "vaccine"[All Fields] OR "vaccins"[All Fields]) AND ("accept"[All Fields] OR "acceptabilities"[All Fields] OR "acceptability"[All Fields] OR "acceptable"[All Fields] OR "acceptably"[All Fields] OR "acceptance"[All Fields] OR "acceptances"[All Fields] OR "acceptation"[All Fields] OR "accepted"[All Fields] OR "accepter"[All Fields] OR "accepters"[All Fields] OR "accepting"[All Fields] OR "accepts"[All Fields])) OR (("vaccin"[Supplementary Concept] OR "vaccin"[All Fields] OR "vaccination"[MeSH Terms] OR "vaccination"[All Fields] OR "vaccinable"[All Fields] OR "vaccinal"[All Fields] OR "vaccinate"[All Fields] OR "vaccinated"[All Fields] OR "vaccinates"[All Fields] OR "vaccinating"[All Fields] OR "vaccinations"[All Fields] OR "vaccination s"[All Fields] OR "vaccinator"[All Fields] OR "vaccinators"[All Fields] OR "vaccine s"[All Fields] OR "vaccined"[All Fields] OR "vaccines"[MeSH Terms] OR "vaccines"[All Fields] OR "vaccine"[All Fields] OR "vaccins"[All Fields]) AND ("hesitance"[All Fields] OR "hesitancies"[All Fields] OR "hesitancy"[All Fields] OR "hesitant"[All Fields] OR "hesitate"[All Fields] OR "hesitated"[All Fields] OR "hesitating"[All Fields] OR "hesitation"[All Fields] OR "hesitations"[All Fields])) AND ("africa"[MeSH Terms] OR "africa"[All Fields] OR "africa s"[All Fields] OR "africas"[All Fields]) OR ("sudan"[MeSH Terms] OR "sudan"[All Fields] OR "sudans"[All Fields] OR "sudan s"[All Fields])) AND (("driver"[All Fields] OR "driver s"[All Fields] OR "drivers"[All Fields]) AND ("barrier"[All Fields] OR "barrier s"[All Fields] OR "barriers"[All Fields])) Filters: from 2020 – 2021

Table 5. PubMed search strategy.

Appendix 2: Letter of Ethical Clearance

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

21 February 2022

Mr Damian Naidoo (219052761)
School Of Applied Human Sc
Howard College

Dear Mr Damian Naidoo,

Original application number: 00013262
Project title: Attitudes and perceptions towards COVID-19 vaccines on the African continent: A scoping review
Amended title: Factors influencing intention and uptake of COVID-19 vaccines on the African continent: A scoping review

Exemption from Ethics Review

In response to your **amendment** application received on 01 Jan 2022   , your school has indicated that the amendment has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

Prof Johannes John-Langba
Academic Leader Research
School Of Applied Human Sc

UKZN Research Ethics Office
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Website: http://research.ukzn.ac.za/Research-Ethics/

Founding Campuses: ■ Edgewood   ■ Howard College   ■ Medical School   ■ Pietermaritzburg   ■ Westville

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