DETERMINANTS OF COVID-19 VACCINE UPTAKE AMONG HEALTHCARE WORKERS IN LOWER JUBA REGION, JUBALAND STATE, SOMALIA: A MULTI-FACTORIAL ANALYSIS OF SOCIODEMOGRAPHIC, BEHAVIORAL, AND POLICY INFLUENCES

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DECLARATION AND APPROVAL

Declaration

This thesis/project is my original work and has never been presented for any academic award in any institution.

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DEDICATION

This thesis is dedicated to everyone who supported me throughout my studies. Special dedication to my father who believed in me and supported me throughout.

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ABSTRACT

The world was faced with the COVID-19 pandemic that initially began as pneumonia of unknown origin in China and later spread global. The vaccination programs initially targeted those in the high-income nations and those that were manufacturing. It was later cascaded to low- and middle-income nations. Decades of war have undermined Somalia's health services, which were further exacerbated by the corona virus pandemic that struck the country along with other countries. Despite the COVID-19 various vaccines availability, the general public and, strangely, medical professionals seemed reluctant to get the shot. This has made the task of achieving herd immunity difficult. Several studies done across the world have shown higher acceptance rates in the high- income nations as compared to Sub Saharan Africa countries. This study set out to assess and determine the factors that contribute to healthcare professionals' adoption of the COVID-19 vaccine in the Lower Juba Region of Jubaland State, Somalia. In order to characterize, examine, and pinpoint the elements that influence vaccine uptake and the characteristics that motivate healthcare personnel in the lower Juba region of Jubaland state, Somalia, tThe research study employed a quantitative descriptive design. The research targeted the healthcare workers in lower Juba region with 189 participants sampled from a population of 359 HCWs. Stratified and quota sampling methods were used. The sampled population completed an online questionnaire to acquire primary data. The data was collected and keyed in a Microsoft computer excel sheet and later analyzed for descriptives and inferential using SPSS version 21. All the tests for significance were conducted with two tails, and the threshold for statistical significance was set at P less than 0.05. There was a vaccination coverage rate of 46.6% overall. Males made up 51.5% (52) of the vaccinated group, whereas 55.1% (49) received the astrazeneca vaccine and 52.8% (47) received two doses. There was statistically significant variation in vaccine uptake among different age groups (p=0.002). However, the observed variations in COVID vaccination uptake by gender, education, and job experience were not statistically significant, according to regression analysis. The participants' decision to have a COVID vaccination was influenced most by their belief in the vaccinations' ability to protect them (61.5%) and their influence from friends and family (55.1%). According to this study, about half of the participants had received the COVID-19 vaccine. Fear from punishments and government were said to have negatively affected vaccine uptake but this was not statistically proven. Increasing vaccine trust, enlisting the help of friends and family, and making vaccinations easily accessible are all considered strategies to increase vaccination uptake. As indicated by majority of the respondents, the most used and trusted media platform was the information from peers and Source verified platforms were indicated to be least trusted. Social media users had the highest vaccination rates (OR= 2.44). Finally, it is recommended that a similar study with a large sample size be carried out to determine the exact associations of these variables with vaccine uptake and also generalize the results to inform policy changes.

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AOGs- Armed Opposition Groups

CDC - Center for Diseases Control and Prevention

CP - Community participation

FGS - Federal government of Somalia

HCWs - Health care workers

MOH- Ministry of Health

NDVP - The Somalia National Deployment and Vaccination Plan

SARs-severe acute respiratory syndrome

VE - Vaccine effectiveness

VH - Vaccine Hesitancy

VPD - vaccine-preventable diseases

CHAPTER ONE

INTRODUCTION

Introduction

The study backdrop, problem statement, general and particular objectives, research questions, justification/significance, scope, constraints, delimitations, and study assumptions will all be included in this chapter. There is also a definition of words used in the study.

Background of Study

COVID-19

In late winter 2019-2020, unidentified pneumonia cases emerged in Hubei, China. COVID-19 was later described as the causal culprit. In the weeks and months that followed, the virus became a global pandemic. It was initially considered as pneumonia of unknown cause. It spread faster, within China and the rest of the world. On the January 30th 2020, the WHO proclaimed an international concern in the public health emergency, then on the 11th of March 2020, they declared it a pandemic (2). As of 10th March 2022, there were more than 451 million cases in the world with more than 6 million deaths worldwide (Alah, Abdeen, & Kehyayan, 2020).

Between June and August of 2021, the third wave of COVID-19 infections occurred in the African region, with seven nations still experiencing a revival at that time. Infections among health care workers (HCW) are still being reported, which is concerning since it puts an excessive amount of strain on the health system's ability to treat the illness; therefore, it is necessary to protect their personal safety. COVID-19 infections among healthcare workers providing clinical care have been reported on

multiple occasions. As of August 8, 2021, 116,457 COVID-19 infections among healthcare workers had been reported on the African continent, with 48% of these infections originating from the first and second waves occurring in South Africa. However, as of January 16, 2022, there were 150,387 COVID-19 infections among HCWs across Africa, with the highest percentage of HCW infections per nation at that time being in Tanzania (11%), Algeria (5.3%), Liberia (5.0%), Chad (5.0%), and Niger (4.2%).

The Somali government first case was announced on March 16th, 2020, which occurred in the capital of Mogadishu. The first death was reported on April 8 same year. As of 10th March 2022, the country has recorded 26,400 cases and 1,348 deaths. There is a weak infrastructure in Somalia's healthcare; The Health Security Global Index puts Somalia 194th out of 195 countries (3).

The effects of the virus were enormous, ranging from loss of lives to restriction of movements. According to Wahed et al. (2020) most people experienced mild symptoms, and some were even asymptomatic. Severe disease was initially reported in the young children, the elderly, those with immunocompromised systems and those with chronic illnesses. As the virus mutated, even the young were not spared by the severe disease requiring hospitalisation and ICU care.

In the fight against the pandemic, HCW are on the front lines. Throughout the pandemic, numerous healthcare workers have died from infections caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). More than 10,000 HCWs in Africa have been infected with this coronavirus, according to a recent report from the World Health Organization's (WHO) African Regional Office in Brazzaville. The WHO Pan American Regional Office in Washington, DC, announced on September 2 that COVID-19 had killed 2500 healthcare workers and infected 570,000

others (PanAmerican Health Organization (PAHO)/World Health Organization (WHO), 2020b). At the September 17, 2020, WHO Health Worker Safety Charter announcement, WHO Director-General Dr. Tedros Adhanom Ghebreyesus emphasized that "thousands of health workers have died worldwide from COVID-19 infection" (WHO Geneva, 2020c).

No cure was found but several supportive treatments were tried with some successes (4). The development of vaccine was also hastened by COVAX, a global initiative aimed at ensuring that the vaccine of COVID-19 is equitably accessible. A number of different vaccine types were approved for use globally including but not limited to Oxford Astrazeneza, Moderna, Pfizer-BioNtech, Johnson and johnson and Sputnik V ("WHO coronavirus (COVID-19).

When it comes to information sharing and tracking their adoption behavior once the COVID-19 vaccination became available, populations have turned to health care workers for guidance. According to studies, health care workers are seen as trustworthy information sources, and those who work directly with patients have taken on and still do the role of vaccine advocates (Alah, Abdeen, & Kehyayan, 2020). Research showed a high correlation between health care workers' opinions on vaccines and the vaccines they recommend to patients, even prior to the global COVID-19 epidemic. Normative vaccination policies among healthcare workers were concerning, nevertheless, as certain Somalia research found that HCWs had low vaccination uptake, particularly for influenza (WHO, 2022).

In order to safeguard healthcare workers from infection, infection prevention and control (IPC) procedures must be followed. However, the risk of infection for these healthcare workers is increased in many clinical settings due to the absence or insufficiency of personal protective equipment (PPE). The risk of infection among

HCWs has been linked to several factors, and the absence of IPC implementation, insufficient personal protection for healthcare workers, treatment pressure, high job intensity, and lack of rest. Regarding the COVID-19 rate of attack infection, there is no discernible difference between clinical and non-clinical healthcare workers.

Corona Virus Vaccination

Global COVID-19 Vaccine Uptake

Vaccines offer the greatest protection to public health, but only when used extensively. Data from the ongoing COVID-19 pandemic illustrate that broad vaccination coverage will be needed not only to require indirect public protection, but to return communities to normal as well as reopen the economies of nations across the globe. Similar to immunity in the community and a crucial aspect for herd immunity, the vaccination of a large percentage of the population can not only decrease the extent of the infection but, more importantly, reduce the risk of infection in the caregivers (the health workers, and the general public most susceptible to transmission (Simione et al. 2020).

Population herd immunity is determined by the proportion of the general population that has received vaccinations against covid-19, the efficacy of the vaccine and the infectivity of the coronavirus. Estimates of the virus's infectivity suggest that, if a vaccine were taken to be 100% effective against the coronavirus, 67% of the population would need to be vaccinated. (Yadav S. et al 2020).

Herd immunity's level of indirect protection will differ based on immunological and epidemiological parameters, such as population size, differences in transmission dynamics between groups, and decreasing immunity. Therefore, while considering the creation of herd immunity within communities, these factors need to be considered. Two strategies could be used to achieve broad SARS-CoV-2 immunity: (1) a widespread

vaccination program, which necessitates the creation of a safe and effective vaccine; or (2) the virus gradually infecting populations across the world. The latter, however, would have far-reaching and severe effects—millions of people would die from the virus, and a significant portion of the human population would have to contract it. Therefore, developing herd immunity should not be the end goal in the absence of a vaccination program. Although it should not be the main goal, policies that safeguard the most susceptible groups should be prioritized in the hopes that herd immunity would eventually be attained as a result of such actions (Randolph H. 2020).

Vaccine administration to the public began on 8th December 2020 with priority given to countries that were manufacturing or those who could afford. COVID-19 vaccination doses totaling over 10 billion were given worldwide with 4 billion fully vaccinated representing 137 and 56.16 per 100 population respectively (WHO | World Health Organization, 2021).

As of 11th March 2022, almost a year later, 1.84 million doses were administered with 938,000 being fully vaccinated. This means 5.9% of the targeted people were vaccinated, far lower than the global average of 56.16%. The vaccination exercise targeted those at-risk groups and other frontline staff like the healthcare workers, elderly (above 65), those with chronic illnesses, teachers and the security forces. Later, due to availability, the vaccination exercise was made open for all. (Alah, Abdeen, & Kehyayan, 2020).

The COVID-19 pandemic, which emerged in late 2019, led to an unprecedented global health crisis, prompting the rapid development and deployment of vaccines. By late 2020, vaccines such as Pfizer-BioNTech, Moderna, and AstraZeneca were granted emergency use authorization. Global vaccination campaigns began in early 2021, with

high-income countries initially leading in coverage due to better healthcare infrastructure, vaccine supply chains, and public health policies.

Despite global efforts, disparities in vaccine distribution emerged, with low-income countries experiencing delays due to limited access, logistical challenges, and vaccine hesitancy. The World Health Organization (WHO), through initiatives such as COVAX, aimed to address these inequalities by ensuring equitable vaccine access. However, vaccine hesitancy, misinformation, and distrust in vaccines remained significant barriers to achieving high uptake levels in various parts of the world.

As of 2024, while many developed countries have achieved high vaccine coverage, some regions continue to face challenges due to emerging variants, vaccine fatigue, and concerns over booster doses.

COVID-19 Vaccine Uptake in Africa

The global disparities in covid vaccine distribution highlighted the inequities existing in the world. While a significant portion of the population in the developed world have been vaccinated, only a fraction of the population in Africa have received the vaccine. Africa faced considerable challenges in COVID-19 vaccine distribution and uptake due to limited vaccine supply, weak healthcare infrastructure, and misinformation. Initially, the continent relied on vaccine donations through COVAX, the African Vaccine Acquisition Task Team (AVATT), and bilateral agreements.

Vaccine hesitancy was a major challenge in many African countries, driven by factors such as historical mistrust in Western medicine, concerns about side effects, and misinformation spread through social media. Additionally, logistical barriers such as

cold chain storage limitations, difficulties in reaching rural populations, and weak healthcare systems slowed vaccine deployment.

The COVID-19 outbreak put many African nations in a difficult situation where they had to choose between two extremes. Strict lockdown regulations can worsen the pandemic's already serious social, economic, and health effects. The ongoing lockdown put further strain on the already precarious healthcare infrastructure and had an impact on ordinary medical care, including basic health services.

In the vaccine supply, 56.9% had been used as of January 2, 2022, and 13.65%, 9.11%, and 0.31% of Africans had gotten one, two, and the booster dose of the COVID-19 vaccine, respectively. Every African nation has received and started receiving the COVID-19 vaccine, according to the Africa Centers for Disease Control and Prevention vaccine dashboard.

Despite these challenges, significant progress was made as governments and health organizations implemented awareness campaigns, mobilized community leaders, and engaged in mass vaccination drives. Countries such as Morocco, South Africa, and Rwanda achieved relatively higher vaccination rates, while others, particularly in conflict-affected regions, lagged behind. By mid-2023, Africa's overall vaccine coverage remained lower than the global average, with some countries struggling to reach the WHO-recommended 70% vaccination target.

COVID-19 Vaccine Uptake in Somalia

Somalia faced unique challenges in COVID-19 vaccine uptake due to its fragile healthcare system, ongoing conflict, and humanitarian crises. The country's vaccination campaign began in March 2021, with the arrival of AstraZeneca doses through the

COVAX initiative. However, vaccine rollout was hindered by insecurity, weak health infrastructure, and vaccine hesitancy among the population.

The first corona virus vaccinations arrived in Somalia from China on April 11, 2021. The Chinese ambassador delivered the 200,000 dosages. 10 days later, the COVAX program sent Somalia 300,000 Oxford-AstraZeneca vaccine doses. Healthcare workers given priority in the mass vaccination exercise. If health professionals are not safeguarded, health care systems will likely be overburdened, and the most vulnerable children and women in the states will continue to be denied access to essential services, jeopardizing decades of growth and causing the children from poor to fall farther behind (Peres et al., 2020).

Misinformation, religious beliefs, and low risk perception contributed to vaccine hesitancy among different groups, including healthcare workers. Accessibility was another major barrier, as rural and hard-to-reach communities had limited access to vaccination centers. Despite these challenges, the Federal Government of Somalia and its partners, including UNICEF and WHO, worked to increase vaccine uptake through community engagement, mobile vaccination teams, and public awareness campaigns.

The vaccine uptake among the high-risk populations including pregnant women is low. Somalia's population is characterized by a significant youth demographic, including 38% females of reproductive age who exhibit a high fertility rate of 6.2 children per woman (UNFPA 2020). Research indicates COVID-19 prevalence among pregnant women in Mogadishu reached 34% in 2022, a figure comparable to the 44.8% seroprevalence observed in the general population during 2021 (Adam et al. 2020). While nationwide COVID-19 vaccination data for Somalia's general public remains unavailable, studies among healthcare workers reveal uptake rates varying widely from 20% to 54.3%. This

disparity in healthcare worker vaccination acceptance prompts critical consideration of the potential implications for vaccine uptake among pregnant Somali women.

In Jubaland State, where Lower Juba is located, the uptake of COVID-19 vaccines among healthcare workers has been influenced by factors such as awareness levels, government policies, vaccine availability, and personal perceptions of risk and benefits. Understanding these factors is crucial for designing strategies to improve vaccination rates and strengthen the overall healthcare response to infectious diseases in Somalia.

This study aims to assess COVID-19 vaccine uptake among healthcare workers in Lower Juba and identify key determinants influencing their vaccination decisions. The findings will provide valuable insights for policymakers and health stakeholders to enhance vaccine coverage in Somalia.

Statement of the problem

No one is more at danger of catching communicable disease or transmitting them than those who work in the healthcare industry. Patients are encountered on a frequent basis by those who deal with the sick as part of their work. Disease-causing microorganisms can move easily from the patients to healthcare staff and to anyone around the hospital if the environment is not sterilized. When this happens, it results in a group of medical employees being absent and unable to perform their duties, as well as several patients being diagnosed with an illness they did not previously have when admitted (Wahed et al., 2020).

During the vaccine program, the priority was given to those working in the healthcare field. However, despite this emphasis on vaccination, considerable vaccine reluctance has been documented among healthcare personnel. Because healthcare

practitioners are expected to encourage public acceptance of the vaccination, the reduced uptake has put the vaccine's acceptability in jeopardy (Simione et al. 2020).

Vaccination is crucial in mitigating the effects of the Covid infection. The low vaccination rate leads to increased spread of the covid infection, increased mortality and collapse of the health system. There are significant health risks associated with the global COVID-19 epidemic. In order to stop the COVID-19 pandemic, vaccination is crucial, especially for healthcare workers (HCWs). There is little information available regarding vaccination among healthcare workers in Somalia, despite global data on vaccination uptake.

The reluctance to uptake is much more widespread in the African continent, which already suffers from inadequate healthcare infrastructure and a shortage of medical professionals. The World Health Organization (WHO) announced in November 2021 that only 27% of health workers in Africa had received the full COVID-19 vaccination. This means that the majority of the workforce that is working on the frontlines of the pandemic is not protected. Based on an analysis of the data that was submitted by 25 nations, the findings indicate that only 1.3 million health workers as of March 2021 can be classified as fully vaccinated (Wahed et al., 2020). Countries that have reached 90% or more were only six, while those with less than 40% of their health workers full vaccinated were nine countries. In stark contrast, the World Health Organization (WHO) conducted a global assessment of 22 nations, the majority of which have high incomes, and found that more than 80 percent of their healthcare staff are fully vaccinated (WHO | World Health Organization, 2021). In Somalia, by 2023 only 7-10% of the population had received at least one dose of the covid vaccine with healthcare workers' vaccination rate being below 30%.

The public's approval of the COVID-19 vaccine was just marginally above normal, according to a research done in Jordan. As demonstrated by the uptake of the HPV and flu vaccines, vaccine hesitancy is the primary cause of low vaccination acceptance, according to numerous research carried out in different nations. Less than half of the population targeted received the vaccine, according to the majority of countries. As a result, vaccine reluctance persisted among healthcare professionals and the general public worldwide. Public health officials must therefore implement methodical strategies to reduce vaccination reluctance and boost vaccine acceptability. Studies in the United States, the United Kingdom, Vietnam, and Saudi Arabia have demonstrated that despite being the most susceptible groups in society, health care personnel have a poor level of acceptability of the COVID-19 vaccine.

The majority of nations believe that the creation of a secure and efficient COVID-19 vaccine will be the long-term remedy for the pandemic. In light of growing disinformation, vaccine hesitancy, and a lack of faith in science, mass vaccination will be a crucial step in putting an end to the epidemic.

Hospitals have tried several methods to raise worker vaccination rates. Some hospitals employ circulating carts to deliver immunizations to staff briefing or nursing stations. Vaccine decliners may be required to sign waivers admitting the danger they are taking for their patients and themselves, or to wear protective suits during this this season. All of these methods are intended to make vaccination as easy as feasible, and avoidance as difficult. Unfortunately, even though these measures to attain voluntary compliance have been shown to enhance vaccine uptake slightly, vaccination rates remain below 50%. Somalia, with a healthcare that suffered decades of destruction is not equipped to withstand increased covid infection and mortality. This makes it crucial to increase vaccine uptake among the health workers and the

population by extension. This study shall therefore seek to find out the COVID-19 vaccination uptake and the contributing factors associated with healthcare workers in Lower Juba region of Jubaland state in Somalia. (Dahie et al., 2022).

Purpose of the study

This study's primary goal was to evaluate COVID-19 uptake among healthcare workers in Lower Juba region of Jubaland state in Somalia.

Objectives of the study

General Objectives:

The primary objective of this research was to assess levels of COVID-19 vaccine uptake among healthcare workers in Lower Juba, Somalia, and examine how this uptake is influenced by socio-demographic characteristics, levels of awareness, personal and motivational factors, and system related factors (including government policies and vaccine-related factors).

Specific Objectives:

The following specific objectives served as a guide for the investigation***:***

I. Determine the rates of uptake by healthcare workers of the 1st and 2nd doses of COVID-19 vaccination in Lower Juba region.
II. Investigate the influence of Sociodemographic factors and awareness levels on covid-19 vaccine uptake among the healthcare workers.
III. Examine the role of personal factors (Barriers and motivators) in influencing covid-19 vaccine uptake.
IV. Analyze how system related factors (government policies and vaccine related factors) affect covid-19 vaccination among healthcare workers in the region.

1.6 Research questions

The research offers responses to the following queries:

i. What is the level of uptake of the 1st and 2nd doses of COVID-19 vaccine among health care workers in lower juba region since the start of the covid-19 outbreak?

ii. Do sociodemographic factors and vaccine awareness levels influence healthcare workers COVID-19 vaccine uptake?

iii. What are the barriers and motivators to covid-19 vaccine uptake by the healthcare workers?

iv. To what extent do system related factors (government policies and vaccine related factors) influence covid-19 vaccine uptake?

Justification of the study

Globally, healthcare workers face the heightened risk of COVID-19 infection, yet is Africa, only less than 26% of the population has been vaccinate by late 2022 (WHO, 2023). Somalia recorded one of the lowest vaccination rates with only 7-10% of the population vaccinated (WHO, 2023). Among the Somalia healthcare workers, studies done show alarming rates as only less than 30% of them have been fully vaccinated (Dahie et al. 2022).

This study is of the utmost importance to the Somalia Health ministry, policymakers and global public health practitioners as it addressed the challenge of the under-researched topic of low covid vaccine uptake. It will help the Ministry of health evaluate how the policies they employ contribute to the improvement in the vaccination against COVID-19 in the lower Juba region of Jubaland state in Somalia.

It is vital to understand the system related factors influencing vaccine uptake in order to provide useful information to policymakers and to develop effective intervention approaches. There was little studies done in the continent and Somalia on COVID-19 vaccine uptake when the study was planned. This study would provide

important insights in the covid vaccine uptake situation in lower Juba and the barriers to uptake to inform on measures to increase vaccine uptake.

The findings of this research study would be helpful to researchers and academics in the sense that they would provide a foundation upon which additional research might be conducted. In addition, it will add to the pool of knowledge since it will highlight the vaccine hesitancy and contributing factors among healthcare workers in Somalia. As a result, it would expand to the canon of scholarly reference materials (Wahed et al., 2020).

Study Scope

The research study assessed the levels of uptake of COVID-19 vaccination. It covered healthcare workers (those providing direct care to patients like doctors, nurses, midwives, laboratory technologists and their assistants) in lower Juba region of Jubaland state, Somalia. The study covered a sample size of 191 healthcare workers to be interviewed over a 1-month period. The inclusion criteria was any health worker (providing direct care) stationed at a health facility in lower Juba region and anyone outside this group is excluded. The study was done using online survey tools and this ensures the participation of all eligible participants.

Study limitations

First, the study focused on COVID-19 vaccine uptake and the contributing factors among healthcare staff in lower Juba region Somalia. The study was limited to the lower Juba region of Jubaland state, Somalia.

Secondly, since respondents (Healthcare workers) are self-reporting, this made independent verification difficult.

Lastly, the geographical differences in the level of education (cities and regions) and the small sample size made generalization in the rest of the country difficult.

Study delimitations

The study was limited to the healthcare workers due to their roles in awareness creation. The target population was the 359 healthcare workers where a sample of 191 was interviewed over a period of months. The research was carried out within lower Juba region of Somalia.

Study Assumptions

The study operates under several assumptions critical to interpretation of the findings. First, the researcher assumed that all country-specific environmental and political elements will continue to be the same throughout the time period that the research study will be ongoing. He was able to draw honest and precise recommendations and conclusions by assuming that the data collected was accurate and true. It was also assumed that when filling out the questionnaires, respondents cooperated and answered questions truthfully. The researcher also made the assumption that all the variables selected were comprehensive enough to explain the drivers of the covid vaccine uptake in this context. These assumptions lay the foundation for the validity of this study findings and generalizability in similar fragile context.

Operational definition of key terms

COVID-19 - is a viral contagious infection caused by SARS-Cov-2

Healthcare worker - is one who provides services and cares for the ailing and sick directly as nurses, doctors, midwives, and their assistants or indirectly as pharmacy technicians and laboratory technologists.

Vaccine hesitancy - An acceptance delay or rejection of vaccines notwithstanding the immunization services availability.

Vaccine Uptake Level - is the percentage of a population of interest who receive a particular dose of the vaccine in a specified amount of time.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Literature review entails an evaluation and in-depth review of prior studies. The objective of a literature review is to communicate to the reader the findings of previous research that has been conducted on topics that are highly relevant to the study that is now being presented. A framework shall be provided by the literature review for determining the significance of a study based on the findings of other research. The theoretical review, the discussion of variables, the empirical review, and the conceptual framework are the subtopics that have been covered in this chapter.

Empirical Literature Review

COVID-19 vaccine uptake

The general COVID-19 vaccination acceptance rates among adult populations were determined to be greater than 70 percent after a thorough evaluation of vaccine acceptance rates (Baden, 2021). At the level of the country, the countries with the greatest acceptance rates amongst adults of COVID-19 vaccine were Indonesia (93.3%), China (91.3%), Ecuador (97.0%), and Malaysia (94.3%). In contrast, the countries of Jordan (28.4 percent), Kuwait (23.6 percent), Italy (53.7 percent), Poland (56.3 percent), Russia (54.9 percent), France (58.9%) and the United States of America (56.9 percent) had the lowest percentages of vaccination acceptability (Wahed et al., 2020).

The multiple regression models findings showed, however, that there was a significant amount of heterogeneity in vaccine reluctance depending on factors such as education, sex, income, employment and other variables. In the Sub-Saharan Africa region, the percentage of South Africans who said they would not get the COVID-19

vaccine was 52 percent.

Even among healthcare staff, who, prior to this, one would have thought to be the most likely to take COVID-19 vaccines, there are variable levels of acceptance. For instance, Dahie et al., (2022) discovered that 75 percent of HCWs intended to get COVID-19 vaccine. However, there were significant variances within occupational categories in terms of vaccination intentions. However, in the developing countries context, Agyekum (2021) discovered that 39 percent of 234 HCWs planned to accept the vaccines of COVID-19. This percentage varied depending on the healthcare worker's category and gender and they voiced concerns regarding the vaccines safety and side effects (Ahmed et al., 2021).

The vast majority of healthcare workers are staunch proponents of being vaccinated. On the other hand, some of them could have reservations about getting vaccinated. A recent research project findings that was carried out in the Quebec province of Canada, by Dube et al. (2012) have demonstrated that a substantial number of the 540 healthcare personnel who were questioned had reservations regarding vaccination. In point of fact, a third of respondents believed that the young ones are receiving an excessive vaccines numbers (37 percent of respondents agreed with this statement), and that having a healthy lifestyle can reduce the requirement for vaccine uptake (36 percent agreed). The hesitation of a considerable fraction of healthcare personnel to be vaccinated against flu despite advice and numerous reminders to do so and vaccines being accessible freely at the hospital in many nations is another good illustration of the vaccine hesitancy that exists among healthcare workers (Mohamoud et al., 2021).

Vaccination is regarded as the most significant accomplishments in the field of public medical health. Vaccination programs have been attributed with the Americas

eradication of poliomyelitis and the global smallpox elimination. These VP have also contributed to the drop in mortality and morbidity associated with a

variety of highly infectious diseases (CDC, 2019). Vaccination programs are dependent on a high uptake rate in order to become successful in decreasing the incidence and prevalence of diseases that can be prevented via vaccination (Baden, 2021).

Yosef Wassihun et al. (2021) conducted a cross-sectional study to evaluate the uptake of the COVID-19 vaccine and related factors among healthcare workers in a selection of health facilities in the Somali area of Ethiopia. The study indicated that the uptake of the COVID-19 vaccine was low among healthcare professionals in the Somali region.

Dahie et al., (2022) conducted a cross-sectional study to assess the COVID-19 immunization coverage and associated variables among Somali healthcare personnel. The poll found that medical professionals' relatively low COVID-19 immunization coverage was primarily due to accessibility, security concerns, and literary skill. More efforts must be made to enhance vaccination uptake in order to raise the COVID-19 immunization coverage. Although the Somali government intends for HCWs to be the first cadres to receive the vaccine because they are the first to come into contact with patients who have COVID-19 infections, the survey revealed that the coverage of the COVID-19 vaccine among health professionals was relatively low (38%). One of the most important elements of the foundation for Somalia's health system transformation is the health workforce. Their adoption of the COVID-19 vaccination can have an impact on the general public, and they are a trustworthy source of health information.

In addition to offering persons who have been vaccinated a direct kind of protection, a high coverage rates of vaccination induces an indirect protection for the

community at large, also known as herd immunity. This occurs when the transmission and spread of VPD is slowed, which in turn reduces the infection risk for those in the general populace who are vulnerable to infection but have not been vaccinated (Fine & Heymann, 2017).

Immunization programs in African nations have challenges due to vaccine hesitancy, which reflects a continuity between vaccine refusal and acceptance. Despite these advances, vaccination programs in African countries face challenges. I n Africa people have been delaying or refusing prescribed vaccinations for their children or themselves, even when vaccines were accessible, as a result of several vaccination issues that have arisen in recent years. Because of this, communities became more vulnerable to infectious diseases, which ultimately resulted in numerous outbreaks of disease (Fine & Heymann, 2017). One of the most dramatic example is the polio vaccine boycott that occurred in Nigeria in 2003–2004. This boycott, which was driven by distrust and rumors, resulted in a quintupling of the polio incidence in Nigeria in the years 2006 and 2002 and did contribute to polio outbreaks on three different continents. Additional evidence suggests that a trend of vaccine hesitancy is rising in Africa (Dube et al., 2012). The individual who is apprehensive about getting vaccinated as well as the community as a whole is putting himself and others in significant danger. As a result of vaccination refusals or delays, communities are unable to attain the herd immunity which in turn raises the likelihood of an epidemic occurring within that society should a vaccine-preventable pathogen begin to circulate there (Ahmed et al., 2020).

The population's openness to receiving the vaccine is a critical factor in determining whether or not COVID-19 vaccination programs are successful in reducing disease morbidity, transmission, and mortality. Although vaccination

services are readily available, there is a possibility that certain subsets of the population will either refuse to be vaccinated or postpone receiving a safe vaccine (Dube, 2012). This phenomenon is most generally referred to as vaccination hesitancy.

When it comes to vaccination promotion and campaigning, HCWs are the major target audience. HCWs were given higher priority by the Centers for Disease Control and Prevention (CDC) and the WHO to get the vaccine against COVID-19, especially in cases where there were concerns regarding limited resources. HCWs have the highest risk of becoming infected with the disease as well as being the ones to pass it on to others (Gómez-Ochoa., 2021). According to Nguyen., (2020), HCWs have a risk of becoming COVID-19 infected that is three times higher than that of the general population. Because patients have a high trust level in vaccinators, it is essential to win over the support of medical professionals in order to increase public backing for vaccines. The unwillingness of some health care workers creates obstacles that threaten the efficiency of the accelerated mass COVID-19 immunization (Paterson, 2016).

Sociodemographic factors and vaccine uptake

This anxiety is also frequently voiced by people who have been vaccinated against the disease. Conspiracy theories, particularly those disseminated through social media platforms, are particularly effective at adding fuel to the fire of vaccine skepticism around the world. Hesitancy regarding vaccination is a global public health concern, particularly due to the fact that it has a significant possibility of leading to refusal of vaccination (Skowronski & De Serres, 2021).

There are variations according to occupational classifications, with the prevalence being highest among nurses as opined by Gagneux-Bruno, (2020), the study results of COVID-19 and its effect on the acceptance rate of influenza vaccinations have been

shown to be inconsistent, which is an interesting discovery (Domnich et al., 2020).

In a study by Khatiwada et al. 2024 on understanding COVID-19 Vaccine Acceptance among Healthcare Workers in Indonesia: Lessons from Multi-Site Survey, males were found to be more likely to accept the vaccines which was similar to other studies conducted in the US (Shekhar, 2021), Lebanon (Youssef, 2023) and Zambia (Mudenda, 2023).

Some studies have outlined a higher risk for COVID-19-related complications and deaths among men, which may have increased risk perception among the male participants, leading to a higher willingness to be vaccinated against COVID-19. In contrast to this study, other studies found that certain sociodemographic characteristics, such as age and occupation (nurse, physician), were significant predictors of vaccine acceptance. Therefore, identification of socio-demographic characteristics can play a vital role in devising and implementing tailored interventions to improve vaccine uptake among specific groups/sub-groups.

Compared to those with a medical degree, those with a diploma had a lower acceptance rate for the vaccine. This demonstrates how participants with more medical training have a greater understanding of vaccines and vaccinations from their training or experience practicing medicine.

In a study by Nzaji et al. (2023), on factors associated with COVID-19 vaccine uptake and hesitancy among healthcare workers in the Democratic Republic of the Congo, Older HCWs (e.g., ≥40 years) demonstrated higher vaccine uptake compared to younger cohorts. This aligns with the Health Belief Model (HBM), as older individuals may perceive greater susceptibility to severe COVID-19 outcomes. Male HCWs were more likely to accept vaccination than females, contrasting with global trends where women often show higher health-seeking behaviors. This disparity may reflect cultural

norms, caregiving roles, or gender-specific misinformation in the DRC context. Healthcare Workers with advanced education (e.g., postgraduate training) were also found to be more likely to vaccinate, underscoring the role of health literacy in addressing misinformation and emphasizing vaccine efficacy.

Similar high-risk population groups like pregnant women have also shown hesitance to vaccine uptake. A study in Sub-Saharan African countries reported a low COVID-19 vaccine uptake, and this might explain several factors including limited access to vaccines, infrastructure deficiencies, including inadequate storage facilities and healthcare resources, COVID-19 hesitancy driven by misinformation, distrust in healthcare systems, and socioeconomic factors that might contribute lower vaccination rates (Ayieko et al. 2023).

Awareness levels and covid vaccine uptake

On the awareness level as a motivator for vaccine uptake, according to Tharwat (2022), Conspiracy theories and false information are a major contributing cause to the low acceptance of vaccines. The effectiveness of immunization campaigns may be hampered by reluctance to receive the COVID-19 vaccine. The COVID-19 vaccine's rapid development, registration, and distribution in less than a year has also increased reluctance in Africa. In order to implement focused and successful health communication initiatives, public trust in vaccinations necessitates extensive community engagement and comprehension of contextual elements influencing vaccine uptake.

In another study by Mbele W et al. 2024 on COVID-19 vaccination uptake among healthcare workers in Ghana: A comprehensive analysis of knowledge, attitude, perceived vaccine effectiveness, and health belief model constructs, it was found that

over three-quarters (85.9%) of individuals had received at least one dose of the COVID-19 vaccine, indicating an exceptional vaccination uptake among healthcare workers. Ghana's high percentage of COVID-19 immunization among healthcare workers was comparable to high rates among other researchers, including 72.1% in Zambia, 77.0% in China, 82.5% in Malawi, and 70.5% in Egypt.

In the univariable analysis, the study found a strong correlation between immunization uptake and knowledge about the COVID-19 vaccine. It has previously been determined that one of the key factors influencing vaccination among healthcare workers is their level of knowledge about COVID-19 vaccines.

This study also demonstrated that vaccination uptake was significantly influenced by attitudes of the COVID-19 vaccine. Vaccine uptake was independently predicted by higher positive opinions regarding COVID-19 immunization. Cues to action and attitude toward COVID-19 vaccination were the only significant predictors of COVID-19 vaccine uptake in the adjusted model after controlling for the impact of other variables. While knowledge about COVID-19 vaccination, perceived susceptibility, perceived effectiveness, and perceived benefit may have influenced vaccine uptake through attitude toward vaccination and cues to action, cues to action and attitude toward COVID-19 vaccination had a direct impact on vaccine uptake. Cues to action have the biggest impact on vaccine acceptance, according to earlier research.

Barriers and motivators of covid vaccine uptake

The worry that vaccination could be used as a way of surveillance or tracking by the government and the religious beliefs were two of the primary reasons why so many people in South Africa were reluctant to get the vaccine. In addition to this, 50% of Zimbabweans said they would be open to receiving the vaccination, with 30% and 20%, respectively, expressing uncertainty and a categorical opposition to the vaccine (Baden,

2021).

Vaccine hesitation can be explained by various factors, including fears or concerns regarding the vaccines safety, skepticism or uncertainties regarding the vaccines benefits, moral and religious convictions, societal pressure and norms from society, and so on (Baden, 2021).

To ensure the vaccination campaigns effectiveness, it is essential that providers who are vaccine-resistant be identified, the reasons for their reluctance to deliver vaccinations be determined, and methods be designed to address the concerns of these providers. Diverse factors may contribute to health care workers' reluctance to get vaccinated, which suggests that it is essential to take into account barriers to vaccination that are specific to various cultural contexts and subgroups of HCWs (Hollmeyer, 2009). According to Vasilevska, (2014) the incorrect opinion held by HCWs stemmed from the widespread belief that vaccines would be dangerous and would not be effective against the diseases they were designed to ward off. A study by Hollmeyer et al., (2009) on influenza vaccine concern was expressed on the potential harmful and adverse side effects. There has been some resistance among HCWs to becoming vaccinated against COVID-19, which has been documented.

In a study carried out by Tharwat (2022) on COVID-19 vaccination acceptance among hemodialysis patients, the researchers found that the COVID-19 vaccination most commonly reported motivators were infection fear and having a high infection risk. On the other hand, only a small patients percentage picked disease transmission avoidance to others, not worrying about the side effects, free vaccine, and the vaccine efficacy trust as the motivators for the individuals participating in various research are motivated to get vaccinated against COVID-19 by a number of different means. However, worry about contracting an illness continues to be a concern in each of these trials (Fine &

Heymann, 2017).

An additional study on vaccination attitude and perception among Egypt healthcare workers was carried out by Fares et al (2021). The researchers found that the vaccine acceptance main reasons were COVID-19 risks (93%), the vaccine effectiveness (56.25%) and the COVID-19 vaccine safety (57.5%). Both a lack of sufficient clinical trials (92.4% of respondents) and an adverse reactions fear to the COVID-19 vaccine (91.4% of respondents) were cited as reasons for reluctance to get vaccinated. Obtaining sufficient and correct information about the many vaccinations that are already on the market was the most important aspect that may boost participants vaccination acceptance. The participants' responses showed that they have a high mean degree of concern for the safety of vaccines of COVID-19 (3.8 out of 5), which considerably varies among the three study groups (Mohamoud et al., 2021). According to a cross-sectional study conducted in Pakistan, the main justifications for vaccination refusal were the notions that COVID-19 was a conspiracy, that it wasn't a serious threat, and that they didn't need the shot (Warsame, 2022).

Omotoso's (2022) continental study of vaccine acceptance and hesitation against COVID-19 found that the most common reasons for vaccine acceptance were fear of contracting the virus, getting infected, and seeing verified COVID-19 cases. Similarly, vaccination uptake was strongly correlated with having an infected friend or relative.

System related factors and covid vaccine uptake

In the study by Yosef Wassihun et al. (2021), the availability of the COVID-19 vaccine and the type of occupation were found to be important factors in determining HCWs' vaccination uptake.

Vaccine hesitancy is also highly dependent on factors that are specific to vaccines; as a

result, particular vaccines, as opposed to profiles of the individual, could also be aligned along two axes. Rather than focusing on whether individuals have a vaccine hesitancy, we should investigate whether a particular circumstance or vaccine contributes to the development of this tendency.

In addition, the extent to which the media covers ongoing debates about the possible adverse effects of a particular vaccine is certainly a major factor in determining the level of confidence that people have in health authorities concerning that vaccine (Fine & Heymann, 2017).

Vaccine hesitancy as a result of Vaccine Related Factor is likely to consist of a greater complicated interaction of psychological and structural influences than it does in high income countries because most of the African nations face huge obstacles in the 'access-supply edge' of vaccination (Troiano & Nardi, 2021). Recent research reveals that vaccine hesitation is driven by complacency, confidence, convenience, communal responsibility and risk calculation. The models are based on studies in Western, Industrialized, educated, Democratic and rich nations, and Somalia lacks practical data to adapt, test, and potentially apply them to Somalia. Somalia must understand the context-specific implications and causes of vaccine hesitancy in diverse African settings and separate it from other reasons why people aren't (fully) vaccinated in the area (Ahmed, 2020).

Research studies done around the globe opines that approved vaccines of SARS-CoV-2 are highly protective against infections. According to Voysey, (2021) show that 70.4% of vaccine effectiveness (Oxford-AstraZeneca; AZD1222) of ChAdOx1 nCoV-19, Baden, (2021) states that there is 94.1% vaccine efficacy of (Moderna) vaccine mRNA-1273, Palacios., (2020) opines that 50.7% vaccine efficacy of the inactivated Covid-19 absorption of (CoronaVac) vaccine and Skowronski and De Serres, (2021) a 95%

vaccine efficacy of Pfizer-BioNTech Covid-19 vaccine BNT 162b2 mRNA (Fine & Heymann, 2017).

VE from the actual world has been the subject of a number of research, which have documented their findings. After receiving a second dose of the BNT162b2 vaccine, a statewide mass immunization setting in Israel demonstrated a 92 percent efficacy rate for preventing reported infections (Dagan et al., 2021). After one dosage of the BNT162b2 vaccine, a study revealed a VE of 51.4 percent against SARS-CoV-2 infection (Chodick, 2021). This led the United Kingdom's government to propose a plan that would delay the administration of the second dose in order to enhance the vaccination coverage. In a separate piece of research, Bernal, 2021 discovered that administering ChAdOx1 vaccine as a single dose to older people in England resulted in a 73 percent reduction in the COVID-19 infections numbers among those individuals. After the first dosage of the Sinovac vaccine, which was administered to the wider public in Chile aged 16 years, the efficiency of the vaccine was measured at 16.13 percent, and after the second dose, it was measured at 66.96 percent (Ministerio de Salud, 2021).

One of the most significant difficulties we have in Somalia is a shortage of vaccines; the country has a critical need for additional vaccines ("Ministry of health Somalia," 2021). Additionally, the nation requires assistance to guarantee that it has a sufficient number of healthcare staff in place to boost their vaccination efforts, as well as assistance to increase adoption of the vaccines among groups that are unwilling to do so. As of right now, just 35 percent of the supply has been used up; the risk education and community engagement initiatives that have been done have not been able to sufficiently dispel the myths around the Covid-19 immunization (Itiakorit et al., 2020). The Covid-19 vaccinations have a short shelf life and must be stored at an extremely

low temperature. The hospitals in the state of Jubaland do not have adequate refrigerators to preserve the small amount of vaccine that is available. Each dose of a vaccine represents an opportunity to save a life, and the health department must seek to regain the trust of those who work in the medical field in order to encourage them to get vaccinated (Salmon et al., 2015).

The majority of vaccinations are administered in urban areas, and they are not directed at health personnel located in remote or difficult-to-reach areas. It is imperative that armed opposition organizations no longer have influence over the distribution of vaccines. People who live in areas that are controlled by armed opposition groups (AOGs) in Somalia, as well as health personnel, have to decide whether or not they will take the Covid-19 vaccination in addition to other vaccines, or they run the possibility of rejecting the AOGs' commands (Itiakorit et al., 2020).

The AU acting through the African Vaccine Acquisition Trust (AVAT), has signed a 220 million doses purchase contract of the single-shot vaccine manufactured by Johnson & Johnson, with the option to procure an additional 180 million doses of the vaccine (Fine & Heymann, 2017). It is anticipated that around 6 million doses will be provided in the month of August of this year; however, the availability of cash to acquire doses through the AU facility continues to be an issue for many nations, including Somalia.

As the global economy continues to recover from the pandemic caused by the coronavirus, governments and businesses alike are looking into ways to increase the amount of people who receive vaccines through imposing vaccine related policies (Mathieu, 2021). Israel, which has distinguished itself as a world leader in the administration of Covid-19 vaccines, was one of the first countries around the globe to give financial incentives to individuals who were prepared to be immunized. Hong Kong officials announced that they were exploring "vaccine bubbles" that would enable

vaccinated persons more exemption and freedom of movement from some social distancing laws. In spite of the fact that a number of nations and governments have provided financial incentives to citizens who get vaccinated, others have adopted a somewhat more stringent strategy (Fine & Heymann, 2017). Those who choose not to get vaccinated against the COVID-19 virus in Indonesia's capital Jakarta have been informed that they may have to pay fines or be denied government assistance. People in South Korea have been advised that they will be moved to the back of the line if they refuse to get vaccinated, while officials in Singapore have vowed that vaccine stockpiles will not be kept for people who reject or delay their vaccination visits (Hwang, Kim, & Heo,2022).

The policies of Somalia regarding COVID-19 are designed to ensure the efficient allocation of the vaccines through the cold chain systems management; vaccinators training to administer/oversee vaccines in a safe manner; the tracking of the vaccine uptake, particularly by eligible and vulnerable populations; and the encouragement of the vaccine uptake and the continued existence of the life-saving, critical preventive COVID-19 behaviors in communities (Warsame, 2022).

Theoretical Framework

The study findings were interpreted using the **health belief model** (**HBM**). The health belief model is a psychological health behavior change model developed to explain and predict health-related behaviors, particularly regarding the uptake of health services. According to the model, the adoption (or lack thereof) of health behaviours by the people is explained by their beliefs about the health behavior, their perceived benefits and barriers to the health behaviors and their level of self-efficacy. The health-promoting behavior must also be triggered by a stimulus or a cue to action. The model suggests that people weigh the benefits and negative effects of a certain behavior before

adopting it. For example, if they feel that the COVID vaccine will protect them against the infection, they will take up the vaccine. On the other hand, if they are uncertain of its protection or fear its harm, they will not get vaccinated.

The Health Belief Model consists of the following constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy all of which influence an individual's likelihood of taking a specific action to prevent illness.

- ✓ Perceived susceptibility- An individual's belief about the likelihood of experiencing health condition or risk e.g "If I don't do social distancing, will I get COVID infection?"
- ✓ Perceived Severity- A belief about the seriousness of a health condition or its consequences e.g "if I don't get treated, will I die of diabetes?"
- ✓ Perceived benefits- Belief in the effectiveness of a recommended intervention to reduce the risk of severity of a health condition. Individuals will accept a health action if they feel its beneficial e.g "If I get vaccinated, I will not be at risk of a severe covid illness"
- ✓ Perceived barriers- Perception of the obstacles associated with a health action. High barriers reduce adoption of the action e.g "the vaccine has severe side effects"
- ✓ Cues to action- Internal (symptoms, fear) or external (advice from family, media campaign) triggers that prompt action.
- ✓ Self-efficacy- Confidence in one's ability to successfully perform the recommended health action.

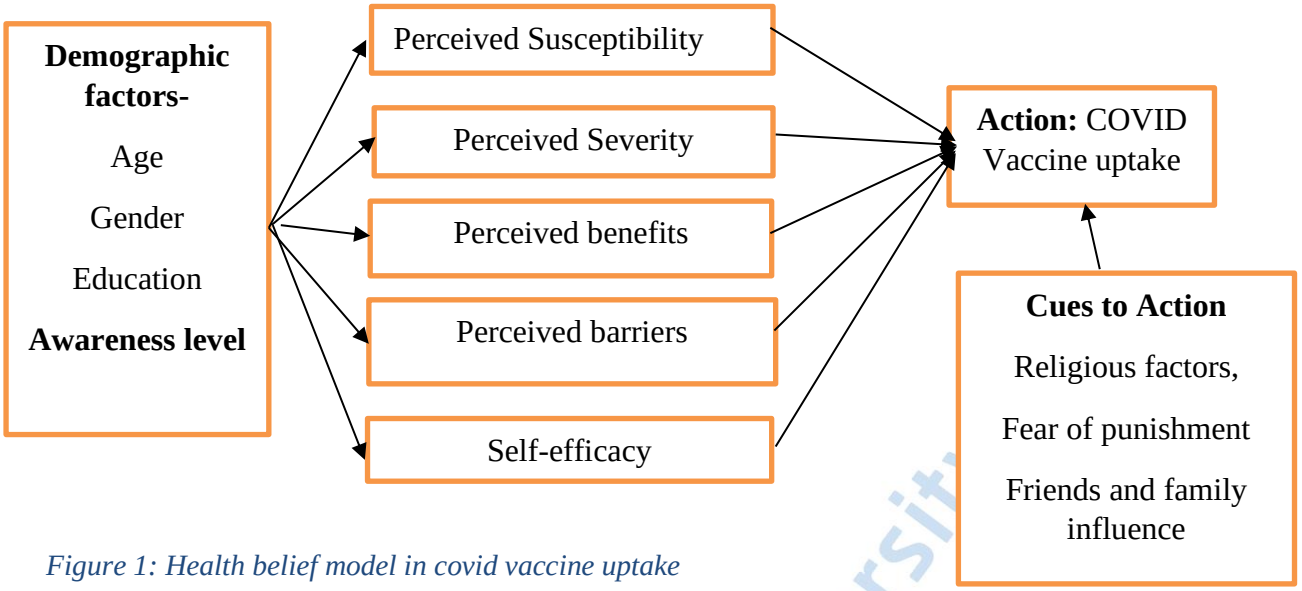

Figure 1: Health belief model in covid vaccine uptake

For the adaptation of the health belief model, motivators for vaccine uptake were considered as intrinsic factors that facilitated their acceptance of the covid vaccine. Cues to action are considered the people, events or other factors that pushed the individuals to change their decisions to vaccinate or not. In this study, religious factors, fear of punishment and influence from family and friends are considered the cues to action.

We explored their perceived benefits and perceived barriers to vaccination through their thoughts on what prevented them from getting vaccinated and how do they see getting vaccinated will benefit them. Some of the perceived barriers can be physical (lack of access) or psychological. Perceived susceptibility was explored through asking about their belief in the protection by natural immunity.

The HBM components are affected by demographic factors [V Galasso et al 2020].

According to earlier research employing the health belief model, vaccination intention is correlated with age and socio-economic status. Men above 55 years are more likely to be vaccinated unlike younger men who will decline vaccination. According to another study, vaccine's country of origin, efficacy and side effects affect people's decision to take it. This study hypothizes that perceived susceptibility, severity,

benefits, and barriers are influenced by gender, age, income, education, and awareness levels. In turn, these components of the HBM predict people's intention to take the COVID-19 vaccine.

This study is important because, despite the effectiveness of vaccination's in fighting COVID-19, some patients are hesitant to accept it. This study provides important information for public health policy actions targeted at increasing vaccination uptake by exposing the factors that influence people's decisions to get the COVID-19 vaccine.

Conceptual Framework

Bell and Waters (2018), cites that a conceptual framework enables the reader to gain a clearer understanding of the study's proposed links between the various variables more rapidly. In the next part, we will outline the conceptual framework that will be used to analyze VH and the motives of health workers in the Lower Juba region of the Jubaland state in Somalia. The conceptual framework is made up of an independent variable as well as a dependent variable. According to Zina (2021), the variables are what are meant to be thought of as the fundamental components of theory. VH about receiving a vaccination served as the study's dependent variable. The actual uptake of the first and second vaccine doses, perceived effectiveness of the vaccination, vaccine and system related factors were the independent variables. These ideas are diagrammatically depicted as seen in figure 2.4 below, and the variable has a significant effect on the vaccine hesitancy (the dependent variable).

Independent variables **Intervening variable** **Dependent Variable**

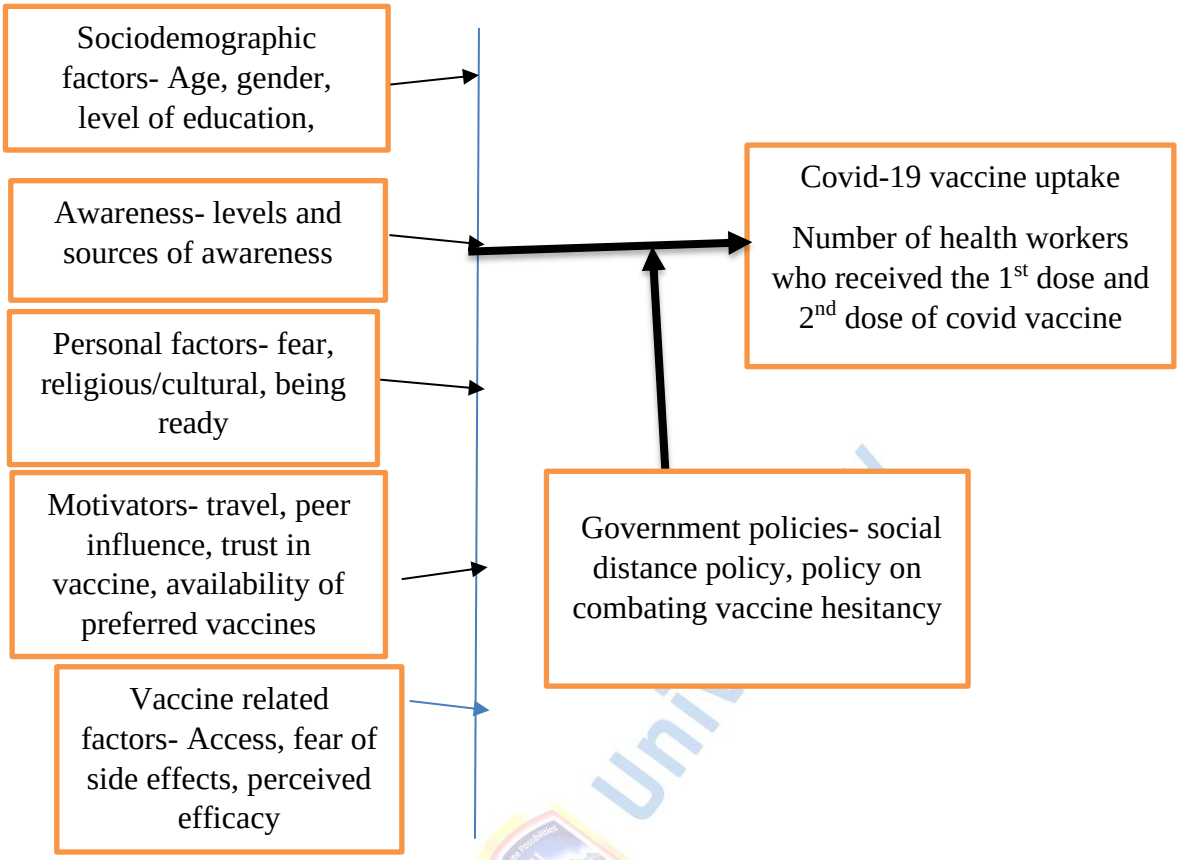

Figure 2: Conceptual framework

Source: Researcher (2023)

Moderating Variable - Government Policies

The moderator modifies both the strength and the direction of the interactions between both dependent and independent variables. Covid-19 vaccine uptake are not adequately protected by policies in countries with weak health system governance, and there are few means of accountability. It is expected that the respondents' functional characteristics will modify and impact the investigation's course.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter provides an overview of the research methodology and design that were utilized in the course of carrying out the study, as well as the study's location, target population, size sample & sampling technique, data collection instruments and procedure, research instruments, procedures and analysis method of the data, reliability, validity, and ethical considerations.

Research design

The research study design is the blueprint for how the investigation will be carried out (FitzPatrick, 2019). The study used a descriptive research design because it required investigation in which descriptive analyses concerning health workers subgroups will be reported applying percentages and proportions and using statistics of chi-square to examine differences among health workers sub-groups. Descriptive studies are typically structured and in order to investigate the factors that can predict vaccination hesitancy, a logistic regression was carried out with vaccination hesitancy serving as the criterion variable, and the independent variables were included in the analysis. Vaccine uptake served as the study's dependent variable. The actual uptake of the first and second doses, vaccine-related and system related factors were the independent variable.

Study Location

The Lower Juba region of the Jubaland state located in the Somalia region served as the location of this study's data collection. In southern Somalia is located the administrative region known as Lower Juba. Lower Juba is bordered to the north by Middle Juba and Gedo, to the west by Kenya, to the north-east by Middle Juba, and to the east by the Indian Ocean. There are four districts in this region, and their names are Badhaadhe, Afmadow, Jamaame,

and Kismaayo. (United Nations OCHA, 2012) (Appendix 3). The study was carried out in the three accessible districts of Kismayo, Afmadhow and Badhadhe. It was carried out at the health facilities in these 3 districts.

Target population

The population target will be 359 healthcare workers. There are 21 health facilities in lower Juba region of Jubaland state in Somalia with a total of 359 health care workers as shown in table 3.1 below (Jubaland ministry of health database). All the people who work in healthcare across Lower Juba's four districts were included in this study's population as participants. There are 359 HCW involved in the delivery of medical services. These healthcare workers include doctors, midwives, nurses, pharmacy technicians and laboratory technicians, as well as assistants who were in-charge for the day-to-day operations of the 21 medical facilities.

Table 1: Target population frame

Population structure	Population size	Population percent
Kismayo	208	57.9%
Afmadhow	122	34%
Badhaadhe	29	8.1%
Total population	**359**	**100%**
Male	192	53.5%
Female	167	46.5%

Source: ("Ministry of health database- Health facilities in lower Juba, Somalia," 2021).

Sample size determination

The number of the sample respondents was calculated using the Slovin's formula for known population with a population of 359, a confidence interval at 95 percent and setting the margin of error at 5 percent.

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{359}{1 + 359 \times 0.05^2}$$

$$n = \frac{359}{1.8975} = 189$$

Following the application of the formula, the final sample size consisted of 189 (103 males, 86 females) respondents spread proportionately across the 3 districts. The respondents in each district will be selected using a non-random sampling technique until the quota for each district (cluster) is reached. The researchers splitted the population into smaller groups known as clusters based on 3 districts in order to conduct cluster sampling. To create a sample, they then choose at random from each of these (districts) clusters. Once the quota for that location and gender is reached, response receiving will be stopped.

Sampling technique

Stratified and quota sampling procedures were used to allocate the respective quota for each district out of the 191 sample sizes. Sample sizes were first allocated to districts based on the proportion of health workers in that district. Within each district, they were further allocated by gender based on the proportion of health workers in that district per gender. The quota for that district was then interviewed till their limit was reached. The sample includes doctors, nurses, midwives, laboratory technicians, pharmacy technicians, and their assistants.

Table 2: Sampling population frame

Population structure	Population size	Sample size
Kismayo	208	111
Afmadhow	122	64
Badhaadhe	29	16
Total	**359**	**189**
Males	192	103
Females	167	86

Source: ("Hospital at lower Juba, Somalia," 2021).

Construction of research instruments

Data Collection Method and Instruments

For this study, primary data was utilized, and it was gathered utilizing an online close-ended and structured questionnaire. The WHO BeSD model for HCWs' vaccination uptake was modified for the survey guide. The researcher developed a poll that was completed anonymously online. An invitation to participate in the survey along with the questionnaire web link was distributed by utilizing Google Forms and sending it to the selected participants through email or WhatsApp. This was done through the District Medical officers in each district.

The questionnaire which was monitored real time assessed demographic characteristics (age, gender, cadre, workstation), vaccine perception of the risk, COVID-19 vaccine willingness to take, vaccine dose taken and why (1^{st} & 2^{nd} doses), motivation factors and awareness level and health related factors hindering their vaccine uptake (vaccine and system related).

Testing for reliability and validity

Reliability Establishing

- A pilot test was conducted with 20 healthcare workers in Dhobley, a similar context to the study districts. Adjustments were made on the questionnaires based on this pilot and the feedback.
- Established likert scales were used for constructs like level of trust, perceived influence etc as this are accepted in global health and ensure comparability.
- For multi-item scales, Cronbach's alpha was calculated. A value of $\alpha > 0.7$ indicated acceptable internal consistency. All the α values were >0.78.

Establishing the Instruments Validity

- The questionnaire was reviewed by the supervisors, fellow public health practitioners in Somalia to ensure relevance to local context. Questions were also aligned with the health belief model and previous studies on vaccine uptake ensuring coverage of key constructs.
- Logistic regression models showed that variables like *trust in vaccine protection* (OR = 4.48, $p < 0.001$) significantly predicted uptake, aligning with global evidence (e.g., Mbele et al., 2024).
- Stratified random sampling and quota sampling ensured representation across the districts and rural/urban health facilities.

Data Collection and management.

The researcher gave the self-administered questionnaire to selected participants and asked them to complete it. The researcher developed a poll that can be completed

anonymously online. An invitation to participate in the survey along with the questionnaire web link was distributed by utilizing Google forms and sending it to the selected participants through email or WhatsApp. This took advantage of the relatively high percentage of health workers in Lower Juba who use the internet. The incorporation of a reliable "gold standard" of measurement was done whenever it was possible. This took the form of the incorporation of "established" negative and positive controls that provided plausible upper limits on the specificity and sensitivity of the experimental measurements. The purpose of this was to protect the reproducibility and quality of the online data that has was collected (FitzPatrick, 2019).

Data analysis techniques

The majority of the data from the study was descriptive. The researcher coded the data as soon as they received the filled questionnaire. First, the data was checked for any potential errors, then incompleteness or inappropriate data. The cleaned data was loaded and imported onto an SPSS version 21 software. The data was analysed through different methods. Through chi square tests, the contingency tables were created and Odds ratios and p values calculated. Categorical data was analysed through mean, mode and standard deviation.

Ethical considerations

The researcher sought the necessary approvals from the university and government before conducting the research. Before data collection, several ethical issues were considered including consent, safety of the participants, anonymity, voluntary participation, conflicts of interest and cultural sensitivity. To address these issues, the researcher ensured to get their consent prior to answering through inclusion as the first stage in the online questionnaire, as required by the standards of medical ethics. A concise explanation of the study was provided at the very beginning of the questionnaire in order to provide the respondents with further background information. The outcome was not utilized for any purpose other than the one that had been indicated. The researcher ensured that they never interfered with the normal operations of the

health facilities. If any respondent had questions or concerns about the questionnaire, they were given the researcher's contact information, including their telephone number for any assistance. The research was done online and did not contain any identifiers to avoid harm to the participants. The culture and religious norms were respected and the researcher did not accept any funding for the research. The data was stored securely and access was granted to the authorized assistants only.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

Introduction

The main purpose of the research was to assess COVID-19 uptake and the contributing factors among healthcare workers in Lower Juba region of Jubaland state in Somalia. The data analysis, findings, discussions, and findings interpretation are all presented in this part. The organization of this chapter is deduced from the solutions to the research questions that were presented in the previous chapter.

Response Rate

One hundred and ninety-five questionnaires were distributed by the researcher electronically to the study participants, and 191 of those surveys were successfully completed and returned. A response rate of 97.9 % was achieved (see figure 4.1 below). The researcher's emphasis on how important the study was using emailing, social media and calling to reach the respondents played a role in the exceptionally high response rate received.

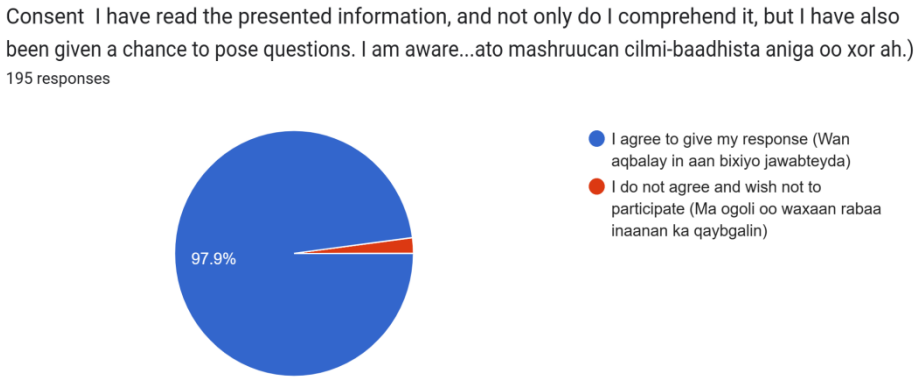

Figure 3: Response rate

Source: Researcher (2023)

Respondents Age

It was asked of the responders to indicate their age groupings. The findings of the distribution age be found summarized in table 4.1 below.

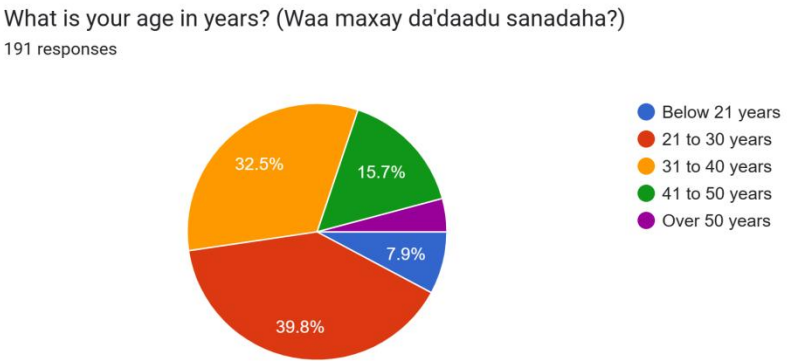

Figure 4: Respondents' age distribution

Source: Researcher (2023)

The majority of respondents (figure 4.2 above) were above 21 years (39.8 %, were aged 21- 30, 52.3 % were 31 years or older), indicating that they were mature, with high levels of experience and expertise in topics pertaining to health. According to the statistics, 47.7% of the young people (those less than 30 years old) were appropriately represented in the health centers. A study finding by Peres (2020) concludes that age is independently connected to the desire to receive the COVID-19 vaccine.

Gender

It was required of the respondents that they identify their gender. According to the examination of the collected data, 101 out of the 191 people who responded to the question were male. This accounted for 52.9 % of responses, with 90 female respondents accounting for the remaining 47.1% (figure 4.3 below).

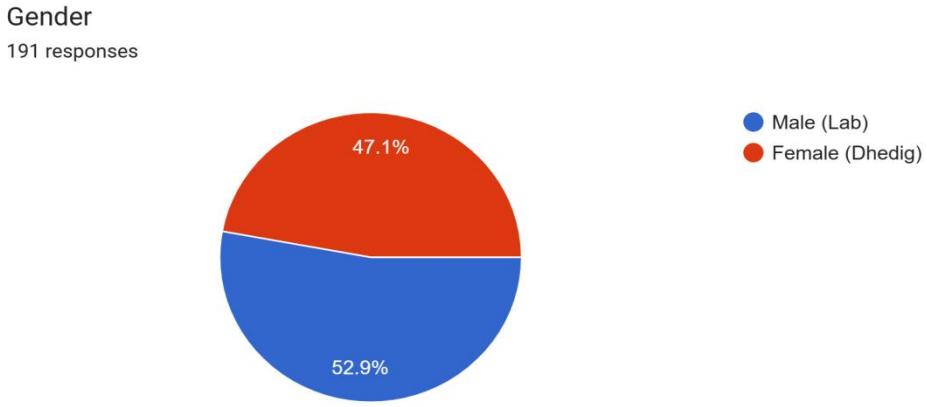

Figure 5: Respondents' gender

Source: Researcher (2023)

Gender was used as a measure of the staff's diversity. While examining COVID-19 vaccine hesitancy, gender as well as sex within the research is a component of analysis that has a crucial impact on the effectiveness and outcomes of the study. Findings by Peretti-Watel (2020) study concludes that vaccine hesitancy strong differences were noted based on respondents' gender.

Workstation

The participants were requested to state their working station. The data collected indicated that the majority of the respondents representing 107 (56%) worked in Kismayo, 68 respondents representing 35.6% worked in Afmadhow and the remainder 16 respondents (8.48%) worked in Badhadhe (see fig.4.4) below.

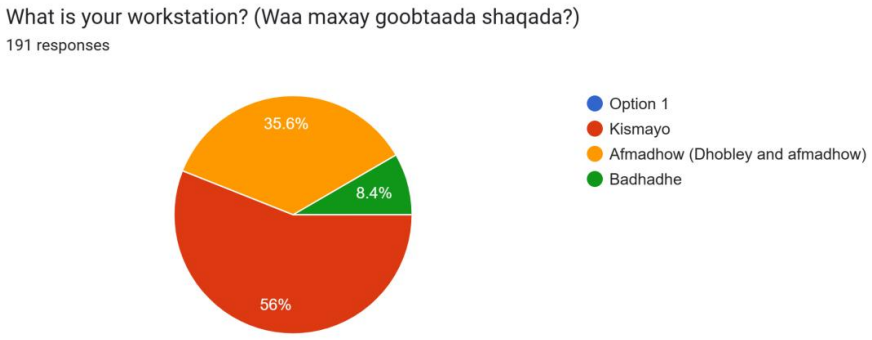

Figure 6: Respondents' working station.

Source: Researcher (2023)

Based on the population structure, the sampled responses were reflective of this which allows for the generalization of the results findings.

Work Experience

To understand the respondents baseline demographic, the study participants were requested to state their health-related jobs experience. Data analysis indicated that among the 191 respondents, majority, 130 respondents representing 68.1% had a work experience of more than 2 years as shown in figure 4.5 below, 48 respondents representing 25.1% had a work experience of between 1 and 2 years and the remainder 13 respondents (6.8%) had a work experience of less than 1 year.

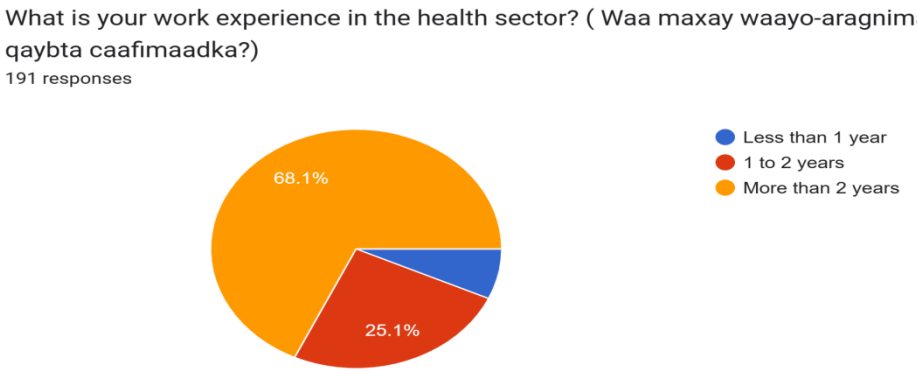

Figure 7: Respondents' working experience.

Source: Researcher (2023)

Working experience is viewed as an indicator for informed decision making. The findings indicates that the city has majority of its staff with good experience. According to Mohamoud (2021) the high turnover rate in the public sector in quest of better opportunities abroad or in the private sector is what has led to this situation.

Education Level

It was requested of the respondents that they specify their education level, which may be anything from high school to professional qualification. The participants distribution with relation to their education level is displayed in Table 4.2 and figure 4.6 below.

Table 3: Education level

Education Level	n	Percentage
High school	13	6.8%
Diploma	63	32.9%
Undergraduate	66	34.6%
Professional (Masters, PHD, PGdip)	49	25.7%

Source: Researcher (2023)

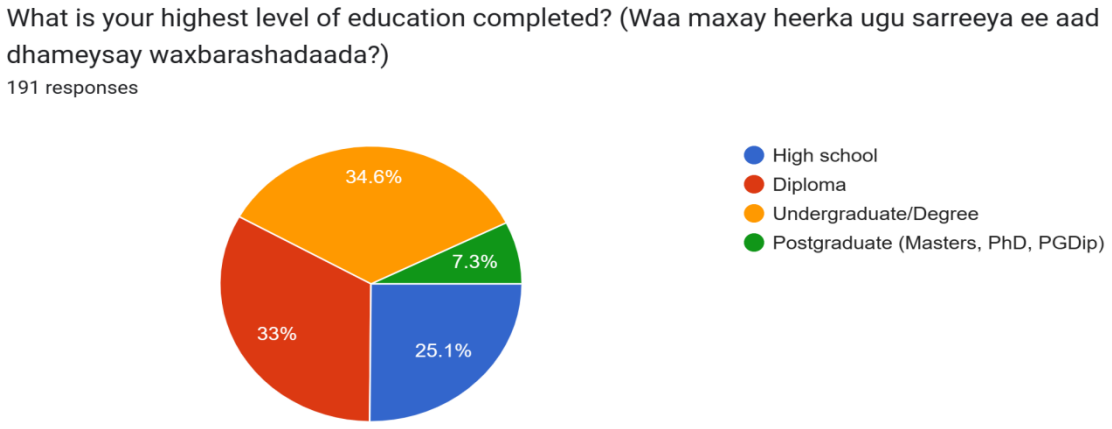

Figure 8: Respondents' education level

Source: Researcher (2023)

The majority of the 191 respondents who completed the questionnaire, 66, or 34.6%, had a degree. In addition, 63 respondents, or 32.9%, indicated that they had a diploma, while 13 respondents, or 6.8%, had high school education. The remaining 49 respondents, or 25.7%,

indicated that they had postgraduate qualifications. This demonstrates that study participants were all educated, which enabled them to understand and offer the pertinent data the study was looking for. Nowadays, the degree of education has a greater impact on people's readiness to get the vaccine. Findings by Mathieu (2021) finds that the least reluctant respondents to take Covid-19 vaccines were those who held master's degrees, while the most reluctant were those who held doctoral degrees.

Respondents Monthly Income

The research aimed to ascertain the respondents baseline demographic, they were asked to state their monthly income. The data analysis is as shown below in figure 4.7:

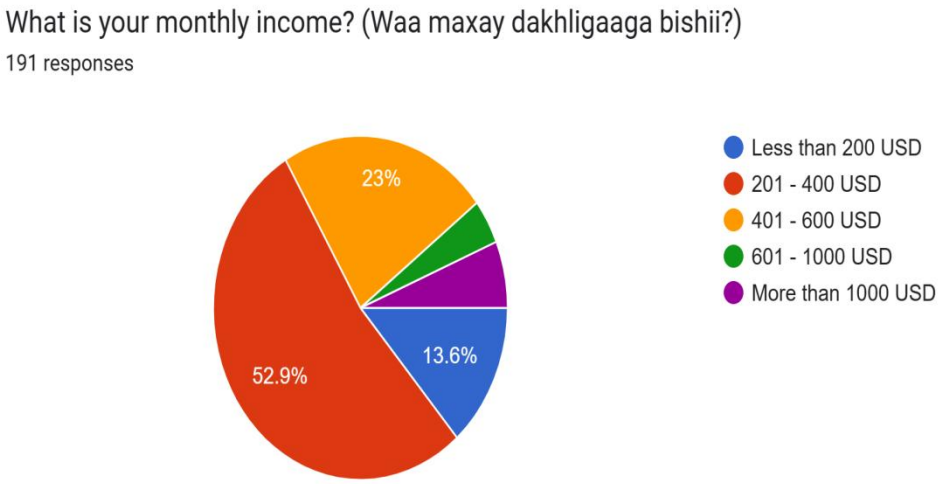

Figure 9: Respondents' monthly income

Source: Researcher (2023)

The data analysis indicates that majority of the respondents 52.9% earns around 201-400 USD. The least 20 respondents representing 10.5% earn in the range above 600 USD. A study finding by Fares (2021) on intentions and perceptions on uptake of covid-19 vaccines demonstrates that the income variable influences vaccine uptake where those with high incomes

had high vaccination rates. Another study by Jeana et al., (2022) finds that hesitancy to get vaccinated was more prevalent among those whose income was lower than the median.

4.2 Objective One: Rates of uptake by healthcare workers of the 1st and 2nd doses of COVID-19 vaccine.

This section adheres to the first study objectives to establish the rates of uptake by HCWs of the 1st and 2nd doses of COVID-19 vaccination in lower juba region and presents findings in an effort to address the first research question. The majority of the questions were in Likert scale format, and the following are the summaries of those results:

Respondents' willingness and if received Covid-19 Vaccination

Respondents were asked to state if they had received covid-19 vaccination and were willing to be vaccinated. The findings are analyzed as shown in fig. 4.11 below :

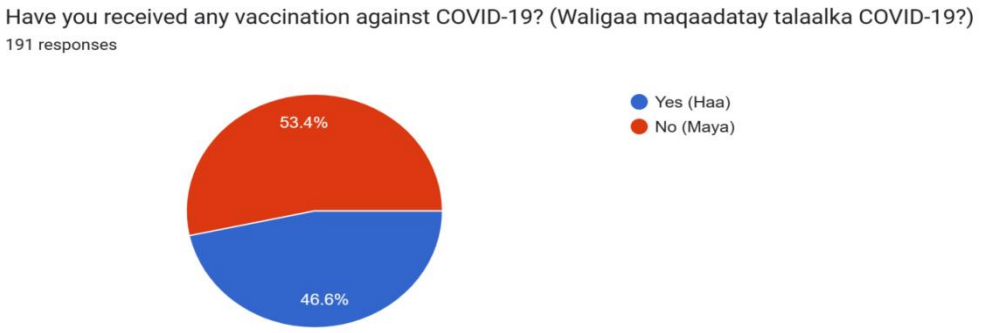

Figure 10: Respondents who have been vaccinated against covid-19

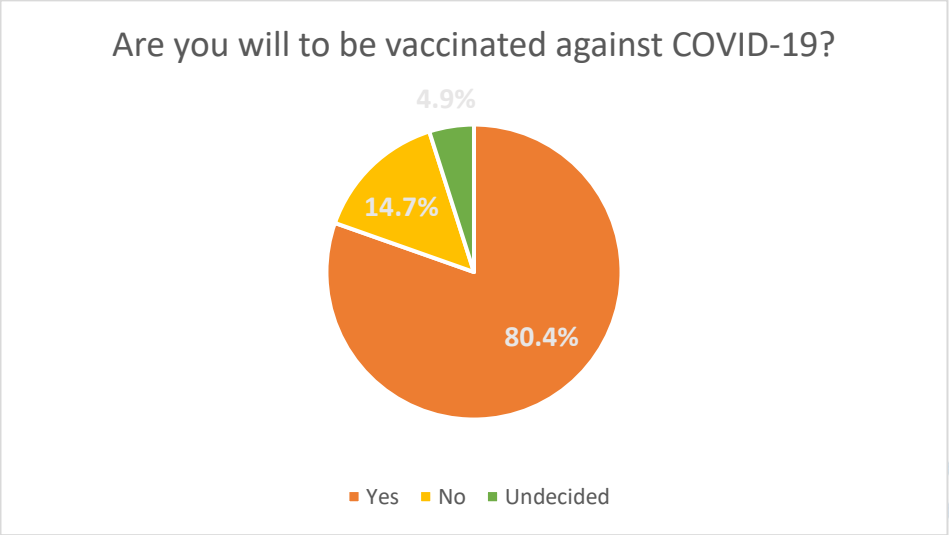

Figure 11: Respondents who are willing to be vaccinated against covid-19.

Source: Researcher (2023)

According to the figure, 89 of the respondents representing 46.6% of the interviewees have been vaccinated against Covid-19 while the remaining 102 (53.4%) respondents haven't. Males 51 (57.3%) were more than females 38 (42.7%) among the vaccinated group. According to a related study, 46.3% of the 5,100 HCWs polled had received at least one dose of the COVID-19 vaccine. This rate was comparable to the level identified for the entire African continent in a 2022 meta-analysis by Ackah et al.

Of those respondents who indicated not to be vaccinated, according to the data analysis 80.4% (82) indicated that they are willing to be vaccinated while 14.7% (15) respondents indicated unwillingness to take the vaccination, and the remaining 5 respondents were undecided. According to a study by Khatiwada M. et al. (2024), 80.39% of the 2732 participants said they would accept the COVID-19 vaccination, while 19.61% said they would be reluctant to get it. These results are comparable to that study. The participants' primary reasons for refusing the COVID-19 vaccine were their worries about its safety profile and possible adverse effects following inoculation. The study findings are also contrary to a study Shekhar et al. 2021 on

Vaccine acceptance among healthcare workers in the US which found that only about one third (1247, 36%) of the respondents were willing to take a COVID-19 vaccine.

The study findings are similar to a study by Khubchandani (2021) which concludes that only 48% of the healthcare workers had gotten the vaccine against covid-19. The healthcare workers perception and attitudes towards vaccination mirrors the country's rest of the population.

Types of Covid-19 vaccines taken, and number of doses taken.

The research aimed to ascertain which vaccine type has the participants taken and how many doses. The results are represented as shown in fig 4.14 and 4.15 below:

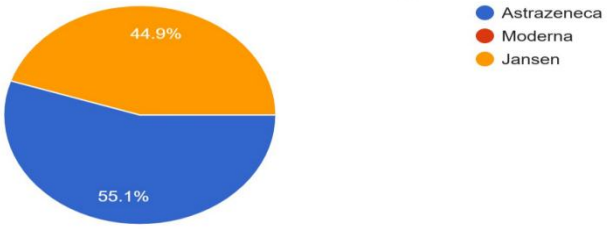

Figure 12: Types of covid-19 vaccines taken

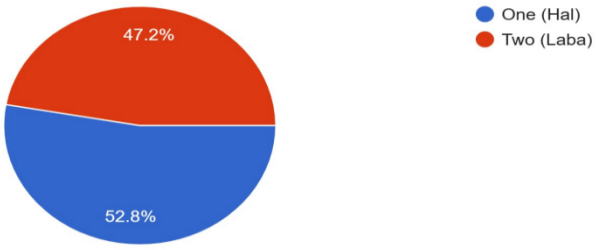

Figure 13: Number of doses of covid-19 vaccine taken by the respondents.

Source: Researcher (2023)

According to the findings, only Astrazeneca and Jansen vaccines were taken by the respondents. Respondents who took Astrazeneca vaccine were 49 representing 55.1% while Jansen vaccine was taken by 40 respondents representing 44.9%. Most of the respondents (47) representing 52.8% had received two doses while the remaining 42 respondents representing 47.2% had taken

one dose only. According to Ahmed (2021) the popularity of the Astrazeneca vaccine was because it was the first to be approved for mass vaccination use by the Federal Republic of Somalia MOH.

Objective two: Sociodemographic factors and awareness levels on covid-19 vaccine uptake.

Sociodemographic factors and vaccine uptake

Table 4: Distribution of respondents across sociodemographic factors and vaccination status

	Vaccinated	**Unvaccinated**	**Total**
Age bracket (years)			
Below 21	4	11	15
21-30	24	52	76
31-40	37	25	62
41-50	21	9	30
Above 50 years	3	5	8
Total	**89**	**102**	**191**
Gender			
Male	52	49	101
Female	37	53	90
Total	**89**	**102**	**191**
Education			
High School	3	10	13
Diploma	27	36	63
Undergraduate	34	32	66
Masters	25	25	50
Total	**89**	**102**	**191**

Variable	Chi Statistic	P-value	Interpretation
Gender	2.11	0.146	No significant association
Age	27.13	<0.001	Strong association.
Education	4.33	0.229	No significant association

Table 5: Bivariate analysis of sociodemographic factors and vaccination status

As indicated above the majority of those vaccinated were above 30 years. The proportion of the respondents who were vaccinated increased with age. The respondents who were aged 30 years and below had 30.8% vaccinated while those above 30 years reported a 61% vaccination rate. As revealed by the bivariate analysis, there is strong association between vaccine uptake and increasing age. The age group 41-50 have a 70% chance of being vaccinated compared to 32% in the 21-30 years age group. Similarly, the 31-40 age group have a 3.32 times higher of being vaccinated than those below 21 years.

A related study found that 46.3% of the 5,100 healthcare workers surveyed had at least one administration of the COVID-19 vaccine. This rate was similar to Ackah et al.'s 2022 meta-analysis which found, for the whole African continent, the estimated pooled vaccine acceptance was 48% for healthcare workers, and 34% for the healthcare students.

The respondents gender as shown in the above table was a factor in the vaccine uptake. Males had higher vaccination rate (51.5%) than females (41%). Males comprised of 53% of the total respondents but made up 57% of those vaccinated. Males have 1.52 times higher odds of being vaccinated than females. However, with a P value of 0.146, this difference is not statistically significant meaning gender alone does not predict vaccine uptake in this sample. The results were comparable to those of a study by Amyn et al. (2020) on the factors that influence the acceptance of the COVID-19 vaccine in the United States where it was found that males had a higher acceptance rate (72%) than females (63%).

The respondents' vaccination status was analyzed against their education level. Increasing education level was shown to increase the covid-19 vaccine uptake. 23% of high school leavers were vaccinated while the undergraduate and Masters/Postgraduate degree holders had a 51% vaccination rate. Those holding Masters degrees have a 2.34 times higher odds of being vaccinated than high school graduates. However, while trends suggested higher education correlated with higher vaccine uptake, no statistically significant association was found between education and vaccine uptake.

This was comparable to a study by Gram et al. (2023), which discovered that the groups with the highest rates of non-vaccination were younger people, immigrants or their descendants, and those with lower levels of education.4.3.4 Respondents' covid-19 Awareness Level

The respondents were asked if they have received awareness on COVID-19 vaccines. The responses are also analyzed and represented in the chart below and a tabulation in terms of gender and region is also provided.

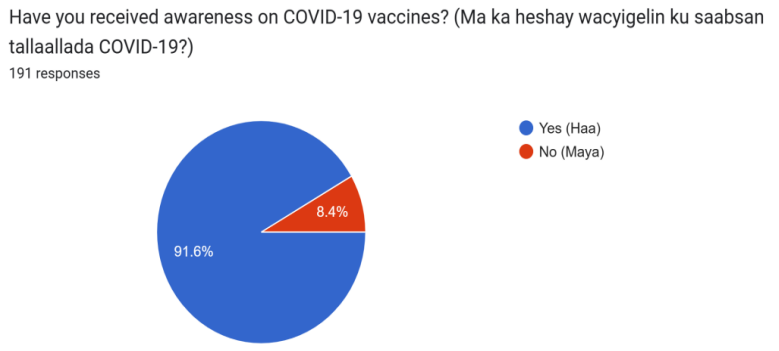

Figure 14: Respondents who have received covid-19 awareness.

Table 6: Tabulation in terms of gender

Received awareness on Covid-19 vaccines?	Vaccinated	Unvaccinated	Total
Yes	81	94	175
No	7	9	16
Total	88	103	191

Majority of the respondents (91.6%) have received awareness on Covid-19 vaccine (figure 4.9). Vaccination rates were nearly identical between those who received awareness (46.3%) and those who did not (43.8%). Those who received awareness had 1.11 times higher odds of being vaccinated compared to those who did not. However, with a p value of 0.819, this difference was not statistically significant meaning the awareness campaigns did not meaningfully affect vaccine uptake.

Source of Covid-19 Vaccine Awareness Knowledge.

The researcher aimed to ascertain the source of covid-19 vaccine awareness knowledge.

Table 7: Descriptive analysis of information sources

Source	**Total Respondents**	**Vaccinated**	**Unvaccinated**	**Vaccination Rate**
Social Media	146	81 (55.5%)	65 (44.5%)	55.5%
Training	56	28 (50.0%)	28 (50.0%)	50.0%
Ministry of Health (MoH)	144	69 (47.9%)	75 (52.1%)	47.9%
WHO Updates	85	38 (44.7%)	47 (55.3%)	44.7%

Table 8: Bivariate analysis of sources of awareness data

Source	Vaccination Rate	OR	p-value
Social Media	55.5%	2.44	0.0015
Training	50.0%	1.16	0.592
Ministry of Health	47.9%	1.23	0.526
WHO Updates	44.7%	0.88	0.624

Data analysis indicate that social media is the highest source of knowledge on covid-19 vaccine while training was the least used source. Social media had a 55.5% vaccination rate. Respondents who got their information from social media had 2.44 times higher odds of vaccination. With a p value of 0.0015, there was a strong positive association between being informed through social media and vaccine uptake.

Respondents Level of Trust of The Media Platform

The study sought to find out the level of trust of the listed media platform for vaccine related information. The responses 1-never, 2-sometimes and 3-always are tabulated in table 4.8 below:

Table 9: Level of trust in the media platforms

	Never	Sometimes	Always
Information from peers	31 (16.2%)	66 (34.6%)	94 (48.9%)
Social media/blogs/online forums	46 (24.1%)	68 (35.6%)	77 (40.4%)
Source verified platforms	49 (25.7%)	66 (34.6%)	76 (39.8%)
Government officials or institutions	46 (24.1%)	58 (30.4%)	87 (45.5%)

Source: Researcher (2023)

Most respondents rated their trust in all the listed platforms with majority trusting always (39-48.9%). The most used and trusted media platform was the information from peers (48.9%) and followed by government officials/institutions. Source verified platforms was cited by most respondents (49) as never being trusted. These findings are similar to a study by Dubé & MacDonald (2020) on the evaluation of factors which are associated with Covid-19 Vaccine Hesitancy concludes that perception of trust in government officials and institutions information source was crucial in building the vaccine confidence.

Objective three: Barriers and Motivators to covid-19 vaccine uptake.

The researcher sought to identify the barriers and motivators for COVID-19 vaccine uptake. This was determined by the completion of multiple test items, which will be covered in further detail below.

Barriers to COVID-19 vaccine uptake

The respondents who were not vaccinated were asked to rate the influence of listed barriers on their lack of vaccine uptake. The scale of 1-5 (1- no extent 2- little extent, 3-moderate extent, 4-large extent, 5-very large extent) was given to the respondents to specify.

Table 10: Rating of barriers to COVID-19 vaccine uptake by respondents

	Ratings				
	1	2	3	4	5
Negative influence from friends, family and media	13	11	32	32	14
Religious or cultural factors	33	16	20	13	20
Fear of punishment by AOGs	46	26	16	10	4

Just not yet ready	13	11	29	21	28

Table 11: Analysis of barriers to COVID-19 vaccine uptake

Barrier	**Mean**	**Median**	**Mode**	**Std. Dev.**	**% High Influence (4–5)**
Negative influence from friends/family	3.35	3	3, 4	1.28	46.0% (46/102)
Religious factors	2.93	3	1	1.54	32.4% (33/102)
Fear of punishment by AOGs	1.98	2	1	1.16	13.7% (14/102)
Just not yet ready	3.42	4	5	1.34	48.0% (49/102)

Source: Researcher (2023)

The majority of the respondents indicated that negative influence from friends and family (mean= 3.35) and them not being ready (mean= 3.42) significantly contributed to healthcare workers low uptake of COVID-19 vaccine. Almost half of the participants (46% and 48% respectively) said they influenced their decision not to take the vaccine. The least influential barrier was fear of punishment by AOGs with only 14% of the respondents rating it as highly influential.

Motivators influencing Covid-19 vaccination decisions.

The respondents who received the vaccine were asked to rank listed motivators in terms of influencing their decision to get the COVID-19 vaccine. The scale of 1-3 (with 1-no influence, 2-moderate influence and 3-high influence) was given to the respondents to specify. The table 4.5 and figure 4.15 below shows the investigation results:

Table 12: Motivations for covid-19 vaccine uptake

	1(No influence)	2(Moderate Influence)	3(High Influence)
Vaccine availability	17 (19.1 %)	25 (28.1%)	47 (52.8%)
Trust in vaccine protection	17 (19.1 %)	19 (19.3%)	53 (61.5%)
Friends and family influence	24 (27%)	16 (18%)	49 (55.1%)
Inferiority of natural immunity	41(46.1%)	19 (21.3%)	29 (32.6%)
For travel purposes	29 (32.6%)	15 (16.9%)	45 (50%)

Table 13: Descriptive analysis of motivators for covid vaccine uptake

Motivator	**Mean**	**Median**	**Mode**
Trust in Vaccine Protection	2.40	3	3
Vaccine Availability	2.34	3	3
Friends/Family Influence	2.28	3	3
Travel Purposes	2.18	3	3
Belief in Inferiority of Natural Immunity	1.87	1	1

Majority of the respondents rated Trust in the protection of vaccines (mean= 2.40) and availability of the vaccines (mean= 2.34) as the factors that highly influenced their decision to get vaccinated. Friends/Family Influence (mean= 2.28) and Travel Purposes (mean= 2.18) also played significant roles, with more than 50% rating them as highly influential. Belief in the inferiority of the natural was the least of the influencers on vaccine uptake as almost half of the respondents (46.1%) stated that it has no influence in their decision. This is similar to Agyekum (2021) study findings which

concluded that “as a result of lack of trust in the vaccine, more community members doubted vaccinations and postponed or refused to receive them”. According to this study, safety, side effect fear, and efficacy are the primary causes of vaccine hesitation among healthcare workers. This is consistent with other findings, such as a scoping assessment of 12 research conducted in 2022 by Ackah et al., which found that safety, adverse events, or side effects were the main causes of vaccine reluctance in every study.4.5 Objective four: System related factors’ (Government policies and vaccine related factors) contribution to covid-19 vaccine uptake.

The research aimed to ascertain whether or not the Federal Government of Somalia National Government Policies had an impact on the Covid-19 vaccine uptake. It contained test items that were closed-ended and one open-ended question as options for response.

System related factors and COVID vaccine uptake

Influence of government policies on Vaccine uptake.

Table 14: Overall efficiency of government policy in vaccine uptake

Rating	Vaccinated Count	%	Unvaccinated Count	%
1	6	6.7%	5	4.9%
2	15	16.9%	19	18.6%
3	36	40.4%	33	32.4%
4	19	21.3%	18	17.6%
5	13	14.6%	27	26.5%
Mean	3.30		3.50	
High Influence	4-5	35.9%	4-5	45.1%

The majority of the respondents (146) representing 76.4% opined that the Somalia national policies facilitated the vaccine acceptance amongst the health workers from moderately to a large extent. Unvaccinated respondents rated government policies as more influential (mean = 3.50) than vaccinated respondents (mean = 3.30). 45.1% of unvaccinated individuals rated policies as having a "large/very large" influence vs. 35.9% of vaccinated). These findings are similar to a study by Dubé, Vivion, and MacDonald, (2020) which concludes that there is an increase in health worker vaccine acceptance if a supportive government policy which facilitates vaccine acceptance is implemented.

The Significance of the Covid-19 Vaccine Related Factors

The research aimed to ascertain the significance of the Covid-19 vaccine related factors which prevents a health worker from taking the Covid-19 vaccine. The Likert scale 1-no extent to 3-large extent was used.

Table 15: Vaccine related factors

	No extent	Little extent	Large extent
Lack of access to the vaccines	18.3%	41.4%	40.3%
Fear of the vaccine side effects	20.9%	31.4%	46.6%
Perceived efficacy of the vaccines available	17.9%	34.6%	47.7%
Unavailability of preferred types of vaccines	29.8%	30.9%	39.3%

Table 16: Descriptive analysis of vaccine related factors

Factor	Mean	Median	Mode	% Large Influence (3)	% Little/No Influence (1–2)
Fear of Vaccine Side Effects	2.27	3	3	47.6% (91/191)	52.4% (100/191)
Perceived Vaccine Efficacy	2.28	2	3	48.7% (93/191)	51.3% (98/191)
Unavailability of Preferred Vaccines	2.27	2	3	45.5% (87/191)	54.5% (104/191)
Lack of Access to Vaccines	2.22	2	3	40.3% (77/191)	59.7% (114/191)

According to the results findings from data analysis, majority of the respondents at 82.3% indicated that perceived efficacy (mean= 2.28) of the available vaccines contributes to their lack of covid-19 vaccine uptake. This was closely followed by unavailability of the preferred types of vaccines and fear of the vaccine side effects (mean= 2.27). Nearly half of the respondents cited doubts in the safety (47.6%) and efficacy (48.7%) of the available vaccines as deterrents. This study findings are similar to a recent poll of health care professionals in the United States found that 48% had not yet been vaccinated, and among those who had not been vaccinated, 18% did not intend to receive a COVID-19 vaccine due to worries regarding the potential for adverse effects and the newness of the vaccine (Skowronski & De Serres, 2021).

The results also supported those of a multi-site survey conducted by Khatiwada et al., (2022) which indicated that most (52%) of the respondents were motivated to be vaccinated by their coworkers. Approximately 40% of participants thought that natural preventative measures were superior to vaccinations. A sizable percentage of participants (55%) voiced worries about

potentially dangerous side effects linked to the COVID-19 vaccination. Participants were generally concerned about safety; 44% expressed concern about the COVID-19 vaccine's safety.

Regression Analysis

In addition, a logistic multivariable regression study was carried out in order to investigate potential determinants of vaccine uptake among the healthcare professionals. The HCWs who had not been immunized at the start of this research study were classed as unvaccinated. This was the case regardless of whether or not the HCWs intended to get vaccinated at a later stage.

The findings of the multinomial logistic regression model, which estimated the chances ratio of a HCWs being vaccinated as opposed to not being vaccinated, are presented in the table below, titled "Table 4.14" When other confounding factors were taken into account, the following HCW characteristics were shown to be more likely to have a higher oddity as compared to having no immunization at all: age of respondents, trust in the protection of the vaccine and being informed through the social media.

Table 17: Multinomial logistic regression

Variable	Odds Ratio	95% C.I	*p* Value
Sociodemographic			
Gender	1.56	0.86 to 2.69	0.146
Age (31-40 vs <21)	3.32	1.55 to 7.10	0.002
Education (Masters vs H. Sch)	2.34	1.21 to 4.53	0.229
Awareness and trust in Information sources			
Awareness levels	1.11	0.40 to 3.11	0.819
From Social media	2.44	1.38 to 4.32	0.0015
From training	1.16	0.64 to 2.11	0.592
From MoH communication	1.23	0.64 to 2.37	0.526
From WHO updates	0.88	0.51 to 1.53	0.624
Trust in government officials	1.42	0.74 to 2.72	0.243
Trust in Social Media	1.47	0.7 to 3.11	0.333
Trust in Peers	1.60	0.77 to 3.34	0.206
Barriers and Motivators			
Trust in Vaccine protection	4.48	2.6 to 7.72	<0.001
Fear of the vaccine side effects	0.50	0.26 to 0.97	0.040
System Related factors			
Government Policies	0.71	0.39 to 1.30	0.131

The results show that males have 1.56 times higher odds of vaccination than females. However, with a p-value of 1.46, there is insufficient information to draw the conclusion that male and female vaccination rates differ statistically significantly. Similar conclusions were reached regarding education level where holders of Masters degrees are 2.34 times more likely to accept vaccination than high school graduates.

This was comparable to a study conducted in Lebanon by Youssef et al., 2022, which discovered no appreciable variations in vaccine acceptance by participant gender after controlling for a number of demographic factors. The results are also similar to a Saudi Arabian study by Elharake

et al., 2021 that discovered that female healthcare workers were less likely than males to accept a COVID-19 vaccination. Because there is insufficient information on how the COVID-19 vaccination affects pregnancy risks, the WHO and KSA MoH advise pregnant women not to get the vaccine, which could account for the gender gap in COVID-19 vaccine acceptability (Gulf Insider Report, 2021; World Health Organization, 2021b). Furthermore, a number of studies have shown that males are more likely than females to be hospitalized, infected, and die from COVID-19, which may make them more receptive to the vaccination.

There is a significant association between age and vaccine uptake as shown above. Vaccine uptake is seen to increase with increasing age. The age group 31-40 years are 3.32 times more likely to accept the vaccine than those less than 21 years.

Participants who were aware of covid vaccine have not been determined to be more vaccinated as there was no statistically significant association between vaccine uptake and awareness levels. Participants who got their information from social media are more likely (2.44 times) to accept vaccination that those who did not. Trust in any of the information sources was not associated with vaccine uptake.

On vaccination barriers and motivators, trust in the protection of the vaccine was shown to be highly influential in the vaccine uptake (OR= 4.48, P-value <0.001). However, though government policies (0.71) and fear of the side effects of the vaccine (0.50) were seen as reducing vaccine uptake, there was no statistically significant data to make an association with vaccine uptake.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This section gives a general summary of the most important findings from the investigation's results, as well as the most important conclusions taken from the research findings. In addition, this chapter presents some recommendations and proposals for additional investigation.

The Study Summary

Assessing COVID-19 vaccination uptake and related factors among HCWs in the Lower Juba region of Jubaland state, Somalia, was the primary goal of the study. Results from this study show that 46.6% of the participants had been vaccinated against Covid-19. Astrazeneca vaccine was the more popular among the respondents with majority also receiving at least 2 doses.

From this study, data analysis leads us to the conclusion that among HCWs who have gotten the COVID-19 vaccination, there is statistically significant difference in the vaccine uptake among the different age groups. However, there is no statistically significant difference in vaccination status in gender, education level, or work experience.

The study found out that, though religious and cultural beliefs is a determining factor in many other activities, it had the least impact when it came to deciding to get the covid-19 vaccine. Trust in the protection of the vaccines was statistically significant in positively influencing vaccine uptake among the healthcare workers. However, availability of the vaccines, friends and family influences and fear of punishment were not found to have an influence on the health workers' uptake of covid-19 vaccine.

For the national government policies and vaccine related factors, though more than half the respondents indicated that they had the ability to eradicate vaccine hesitancy among health workers, this was not statistically proven as the calculated p values were higher than 0.005.

Conclusions

The following conclusions are drawn regarding the four independent variables of the topic in light of the investigation's results.

Nearly half of the study participants had received the COVID-19 vaccine, according to the report, which is significantly lower considering that these individuals are healthcare professionals who are frequently exposed to the virus. This could be explained by low trust in information from the government officials and institutions, and the facilitation through the Somalia national policies implemented.

Several studies cited above have shown there is a significant difference in the vaccination status of different age groups, education level, gender and work experience. However, analysis of the data from this study has indicated that, with the exception of age, there is no statistically significant difference in the other variables. A similar study with a larger sample size needs to be conducted to bring out the effect of these variables on vaccination status.

The study concludes that the trust in the protection of the vaccine to a large extent contributed to the vaccine uptake by the healthcare workers of COVID-19 vaccine. The MOH can eliminate or reduce these fears though intensification of the vaccine awareness.

Though fear of the side effects, fear of punishment by armed opposition groups and negative influence by friend and family were seen to be lowering the odds of vaccine, this was not statistically significant and a larger study may bring out that difference well.

In identification of the motivators for the healthcare workers vaccine uptake, the study concludes that trust in the protection of vaccines was the major influencing factor on their decision to get vaccinated followed by the availability of vaccines.

The study also concludes that national government policies and the trusted communications from government officials and institutions is not statistically proven to influence the vaccine uptake by the healthcare workers. Vaccine factors like availability of preferred types of vaccines and doubts about the efficacy of the vaccines were influential in vaccine uptake.

Recommendations

First the investigation recommends that the Federal Government of Somalia should approve more types of covid-19 vaccines. A wider choice of vaccine type will improve the vaccine uptake.

The federal government needs to intensify creation of trust among the healthcare workers as this was shown to be associated with increased vaccine uptake.

The information channels like social media were highly used and there was high vaccination rate among the participants. These channels should be targeted for spreading vaccine related information.

Lastly, the study recommends that the health officials in the region should try and build trust while disseminating Covid-19 vaccine information. When it comes to spreading awareness about COVID-19 vaccinations, trust can't be manufactured on demand. This can be achieved by being true to their words and following it through with actions.

Suggestions for Further Research

This investigation was restricted to the Lower Juba Region of Jubaland State in Somalia, and its primary focus was on the investigation of Covid-19 vaccine uptake among HCWs. To

determine whether the findings are going to be similar in other Somalia states, other studies along these lines have to be carried out.

Generalization of findings to other fragile settings is limited and a comparative analysis needs to be done to compare vaccine hesitancy drivers in Lower Juba with other conflict-affected regions (e.g., South Sudan, Yemen) to identify universal vs. context-specific factors.

When looking at income level and vaccine uptake, structural poverty was implied but not explicitly measured as a barrier. It is suggested that a study be done to quantify how lost wages (due to side effects) or travel costs to vaccination sites deter uptake among HCWs.

Trust deficits were a vaccine barrier identified in this study. A qualitative research needs to be conducted to investigate why distrust in government and international institutions persists among healthcare workers (HCWs) in conflict zones, and how clan/community leaders shape vaccine perceptions.

A study to offer solutions to the vaccine and system related factors which were identified to be influencing vaccine hesitancy to attain vaccine efficacy is also proposed.

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APPENDICES

Appendix 1: Research tools- Questionnaire, consent

Ahmed Noor Shuriye
P.O. Box 1523-70100, Garissa.

Dear Sir/Madam,

Re: Request to complete the Research Questionnaire

I'm now pursuing a master's degree in public health epidemiology at Mount Kenya University. The university requires me to turn in a research project as part of this course in order for me to receive my degree.

In order to do this, I am conducting research on the healthcare professionals' reluctance to receive the COVID-19 vaccine in the Lower Juba region of Jubbaland state, Somalia. Please take a moment to complete the questionnaire that is enclosed. The information you provide will be kept private and used exclusively for this study's objectives.

Your participation in making this study a success is much appreciated. I appreciate your cooperation in advance.

Yours faithfully, Ahmed Noor
Shuriye

Informed Consent

Researcher

Name: Dr Ahmed Noor Shuriye

School: School of Public Health, Mount Kenya University

Email : shuriye99@gmail.com Mobile No: +254723720567

Study Purpose

The main purpose of this research shall be to assess COVID-19 VH and the contributing factors among healthcare workers in Lower Juba region of Jubaland state in Somalia.

Procedures

The researcher will give the self-administered questionnaire to selected participants and ask them to complete it. The researcher will develop a poll that can be completed anonymously online. An invitation to participate in the survey along with the questionnaire web link shall be distributed by utilizing Google forms and sending it to the selected participants through email or WhatsApp.

Time Duration

If you opt to take part in this research project, your participation will be required for a total of about one hour.

Risks and Discomforts

There are no foreseeable dangers connected to the research at this time.

Benefits

This study is of the utmost importance, primarily to the Somalia Health ministry because it will help them evaluate how the policies they employ contribute to the improvement in the vaccination against COVID-19 in the lower Juba region of Jubaland state in Somalia.

It is vital to have an understanding of the system related contibuting factors to VH in order to provide useful information to policymakers and to develop effective intervention approaches.

The findings of this research study would be helpful to researchers and academics in the sense that they would provide a foundation upon which additional research might be conducted. In addition, it will add to the pool of knowledge since it will highlight the vaccine hesitancy and contributing factors among healthcare workers in Somalia. As a result, it would expand to the canon of scholarly reference materials

Confidentiality

We ask that you not write anything that could be used to identify you.

The researcher will take every precaution to protect your privacy and confidentiality, which will include the following measures:

- Giving participants numbers and code names that will be used on all of the research papers and notes.
- Placing all of the researcher's notes, questionnaires, and any other information that could be

used to identify a participant in a secure filing cabinet that is only accessible to the researcher.

- ❖ Except in cases when the researcher is compelled by law to reveal specific incidents, the information that participants offer will remain anonymous. Although they are not limited to those, these scenarios entail maltreatment and potential suicidal thoughts.

Compensation

The study is not funded by any organisation or individual therefore participating in this research project will not result in any payment of any kind being made to you.

Contact Information

You are encouraged to get in touch with the researcher, whose contact details can be found on the opening page of the document, in the event that you have any concerns at any time regarding the research or if you encounter any negative consequences as a consequence of participation in this study. If you have any questions about the rights that you have as a participant in the study or if you experience any problems that you do not believe you can talk about with the Primary Researcher right away, please contact us at this telephone number (_____) or at the email address that follows (_____).

Participation is Voluntarily

You are under no obligation to participate in the study. The decision to participate in this research is entirely up to you. If you decide to engage in this research project, you will be required to sign a consent form. You are free to withdraw from the study at any time without having to give a reason, even after you have signed the permission form. Any rapport you may already have with the researcher will not be impacted in any way by your decision to withdraw from the study. We will either return your information or data to you or remove it if you decide to leave the research study before data collection is complete.

Consent

I've read the material and not only understand it, but I've also had an opportunity to ask questions. I understand that participating in this study is completely voluntary and that I can leave at any moment, for any reason, and without incurring any further costs. I understand that I will eventually receive a printed copy of this permission form. I voluntarily give my consent to participate in this study.

Questionnaire

Section one: Consent and Biodata

Consent

I confirm that I have read the introduction and understood what is required of me. I understand that my response will be anonymous. I am participating out of my free will, and I have the right to withdraw my responses at any time without giving reasons and without any consequences. By proceeding, I hereby give my consent to participate in this study on vaccine hesitancy among the healthcare workers in lower juba region.

Signed…… Date…….

Kindly fill your responses in the space given and tick appropriately.

Bio data

1. Age

Below 21 years [ ] 21 – 30 years [ ]

31 – 40 years [ ] 41 – 50 years [ ]Over 50 years [ ]

2. Sex

Male [ ] Female [ ]

3. Workstation Afmadhow

[ ]

Badhaadhe [ ] Kismayo

[ ]

4. Working experience in the medical sector.

Less than one year [ ]

1-2 years [ ]

2 years and above [ ]

5. Level of education

High school level	[ ]	Diploma	[ ]
Undergraduate	[ ]	Post graduate	[ ]
Professional	[ ]		

Section two: Actual Uptake of the 1st And 2nd Doses of Covid-19 Vaccine

a) Have you ever been infected with COVID-19? Yes…. No……

b) Have you received awareness on COVID-19 vaccines? Yes… No…..

c) If yes to above question, what was the source? Training ( ) Social Media ( ) Communication from the MoH ( ) WHO updates ( ) Friends and family ( ) Others ( )

d) What is your level of agreement with the statement "there is enough vaccines for both uptake for 1st And 2nd Doses of Covid-19 Vaccine in the country".

Strongly agree		Agree		Neutral		Disagree		strongly disagree	

h) Have you received any vaccination against COVID-19? Yes…. No…….

If **Yes,** proceed to **section four**….

If **No**, answer question (d) below

i) Are you willing and ready to be vaccinated against COVID-19? Yes ( ) No ( )

Proceed to **sections five**

Section three: Motivators for Acceptance of COVID-19 vaccine

a) Which vaccine type have you taken? Astrazeneca ( ) Moderna ( ) Jansen ( ) Other ( ) please state ……

b) How many doses of COVID-19 vaccine have you received? One ( ) Two ( )

c) How would you rank these motivators in terms of influencing your decision to get the COVID-19 vaccine? Use the scale of 1-4 where 1-least influencing and 4-highly influencing

- Availability of the vaccine ( )
- Trust in the protection of the vaccine ( )

- Pressure/influence from friends and family ( )
- For travel purposes ( )
- Inferiority of natural immunity ( )
- Fear of significant others being infected by the virus ( )
- Trust in health officials dissemination of vaccine related information ( )
- Others ( ) please state…….

Section Four: Vaccine related factors

1. Indicate the significance of the impact of the following Vaccine related factors which prevents a healthworker from taking the Covid-19 vaccine. (use 1=no extent, 2=little extent, 3= moderate,4=large extent, 5=very large extent)

Vaccine and System related factors	Ratings				
	1	2	3	4	5
Lack of access to the vaccines					
Fear of the side effects of the vaccine					
Perceived efficacy of the vaccines available					
Unavailability of preferred types of vaccines					

Section Five: System related factors

2. Indicate the significance of the impact of the following Vaccine and System related factors which prevents a healthworker from taking the Covid-19 vaccine. (use 1=no extent, 2=little extent, 3= moderate,4=large extent, 5=very large extent)

System related factors	Ratings				
	1	2	3	4	5
Unavailability of preferred types of vaccines					
Negative influence from friends, family and media					
Religious or cultural factors					
Fear of punishment by AOGs					
Just not yet ready					

3. Whats your level of trust of the listed media platform for vaccine related information?

Details	Ratings				
	Never (1)	Seldom(2)	Sometimes(3)	Frequently (3)	Always(4)
Information from peers					
Social media/blogs/online forums					
Source verified platforms					
Government officials or institutions					

Section six: National Government Policies

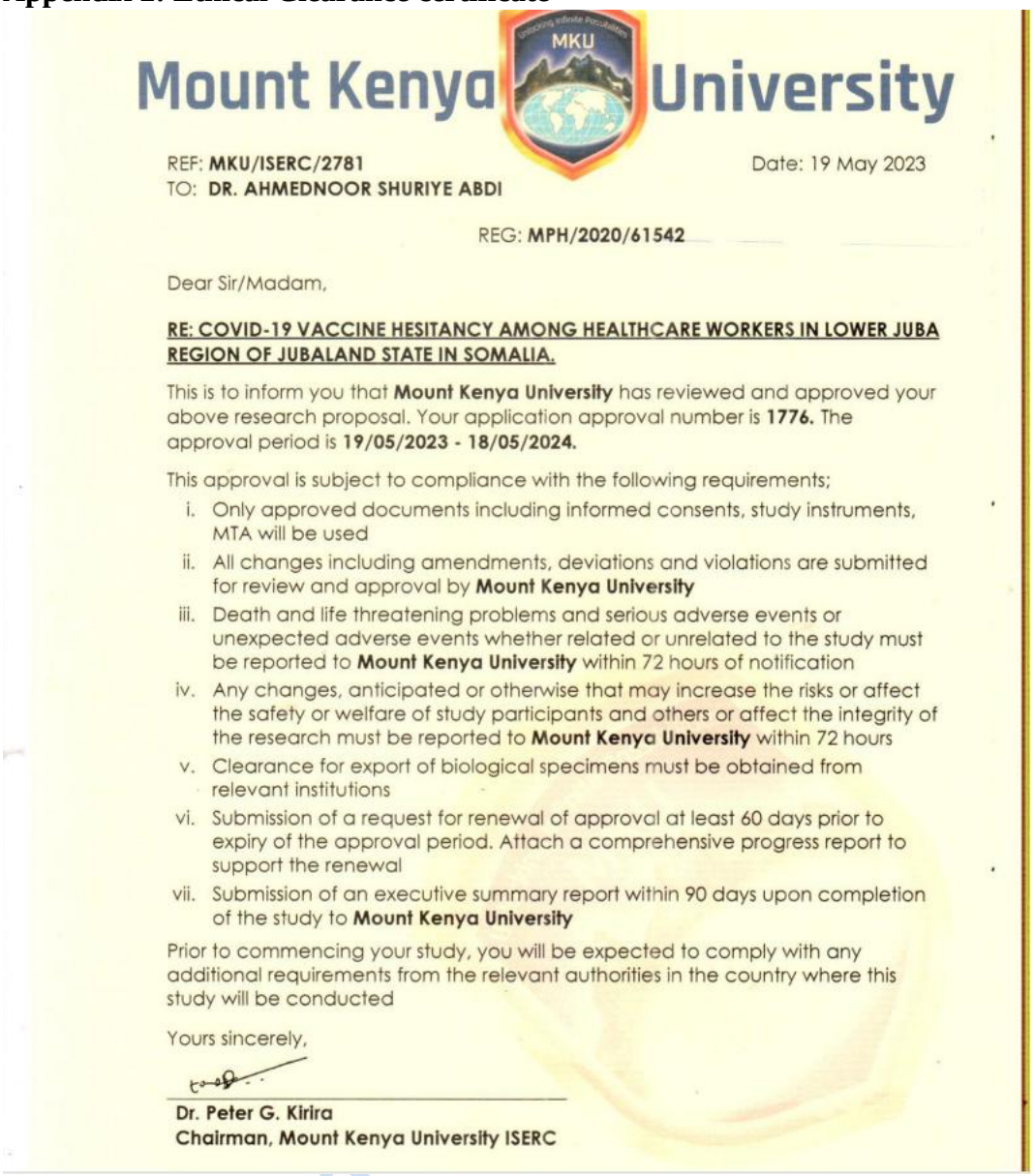
1. How can you rate the following national government policies ability in eradicating vaccine hesistancy among healthworkers?

National government policies	Rating		
	Low	Average	High
Policies ensuring efficient allocation of vaccines			
Policies on tracking 1st And 2nd Doses of Covid-19 Vaccine uptake			
Policies to eradicate vaccination fears			
Policies presenting approaches to aid in combating vaccine hesitancy			
Policies on strict social distance protocols			
Policies on pandemic mitigation protocols			
Policies on vaccinators training			

4. In your independent judgment has the above national government policies facilitated vaccine acceptance amongst the health workers in Lower Juba Region of Jubaland State In Somalia? (1=very small extent, 2=small extent, 3= moderate,4=large extent, 5=very large extent)

Thank you…The End

Appendix 2: Ethical Clearance certificate



Mount Kenya University

REF: **MKU/ISERC/2781** Date: 19 May 2023
TO: **DR. AHMEDNOOR SHURIYE ABDI**

REG: **MPH/2020/61542**

Dear Sir/Madam,

RE: COVID-19 VACCINE HESITANCY AMONG HEALTHCARE WORKERS IN LOWER JUBA REGION OF JUBALAND STATE IN SOMALIA.

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1776.** The approval period is **19/05/2023 - 18/05/2024.**

This approval is subject to compliance with the following requirements;

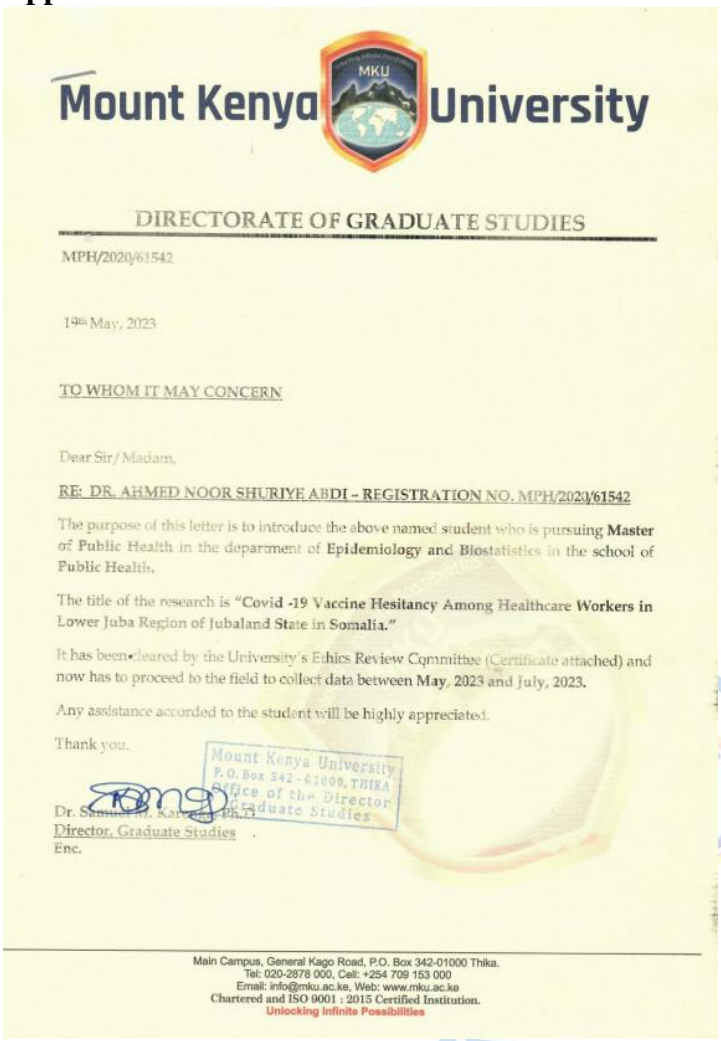
i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to comply with any additional requirements from the relevant authorities in the country where this study will be conducted

Yours sincerely,

Dr. Peter G. Kirira
Chairman, Mount Kenya University ISERC

Appendix 3: Introduction letter



Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2020/61542

19th May, 2023

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: DR. AHMED NOOR SHURIYE ABDI - REGISTRATION NO. MPH/2020/61542

The purpose of this letter is to introduce the above named student who is pursuing **Master** of **Public Health** in the department of **Epidemiology and Biostatistics** in the school of **Public Health.**

The title of the research is **"Covid -19 Vaccine Hesitancy Among Healthcare Workers in Lower Juba Region of Jubaland State in Somalia."**

It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **May, 2023 and July, 2023.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P.O. Box 342-01000, THIKA
Office of the Director
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Dr. Samuel M. Kariuki, Ph.D
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Appendix 4: Research permit by Jubaland MoH

DOWLAD GOBOLEEDKA JUBALAND
EE SOOMAALIYA
WASAARADA CAAFIMAADKA
Xafiiska Agaasimaha Guud

JUBALAND STATE OF SOMALIA
MINISTRY OF HEALTH
Office of the Director General

دولة إقليم جوبالاند الصومالية
وزارة الصّحة
مكتب المدير العام

REF: JSS/MOH /ODG/021/05/2023 **Date: 23/05/2023**

Dear Dr Ahmed Noor Shuriye,

RE: APPROVAL TO UNDERTAKE STUDY IN LOWER JUBA AMONG HEALTHCARE WORKERS

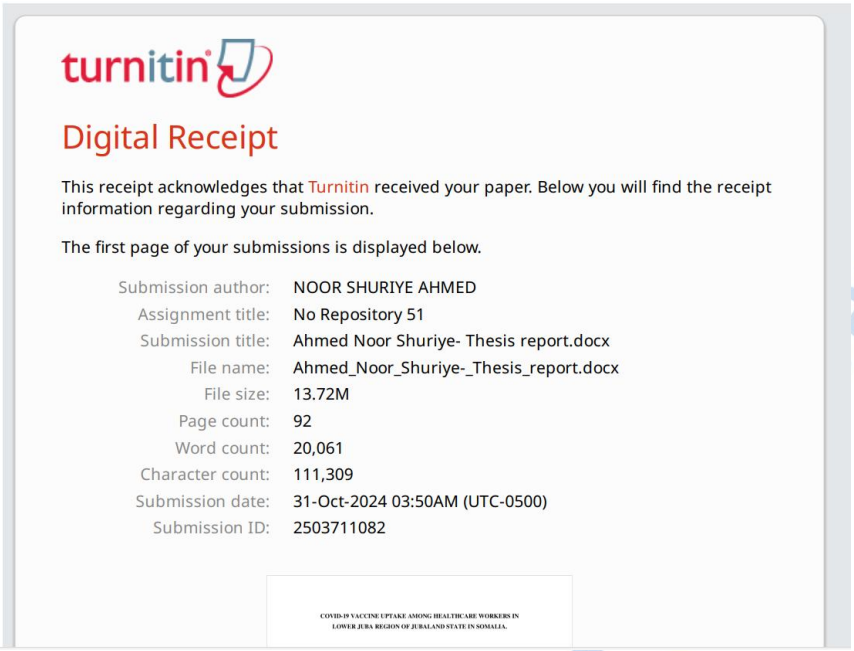
I am in receipt of your request to conduct a study on "COVID-19 vaccine hesitancy among healthcare workers in Lower Juba region of Jubaland state in Somalia". Your intention to conduct a study on the above subject in Kismayo, Afmadhow and Badhaadhe is noted.
I am convinced that your study findings will assist with our efforts to increase covid vaccination among the healthcare workers. Upon review, your request to conduct the study has been approved.
Kindly maintain confidentiality of the information collected at all times. This approval will also serve as your introduction to the facility in-charges at the facilities where your study takes place.
Please keep us abreast of any developments during your study and we will provide any other support you may require.

Yours sincerely,

Hussein Ali Maalim
Director General
Ministry of Health-Jubaland

Appendix 5: Plagiarism report

Ahmed Noor Shuriye- Thesis report



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Page count:	92
Word count:	20,061
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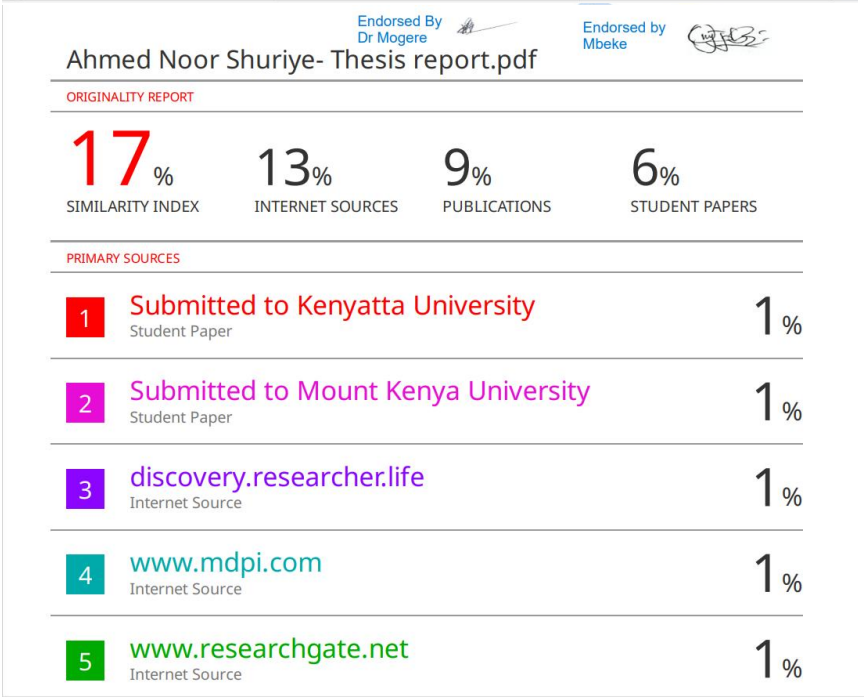
COVID-19 VACCINE UPTAKE AMONG HEALTHCARE WORKERS IN LOWER JUBA REGION OF JUBALAND STATE IN SOMALIA.



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Appendix 6: Map of Lower Juba

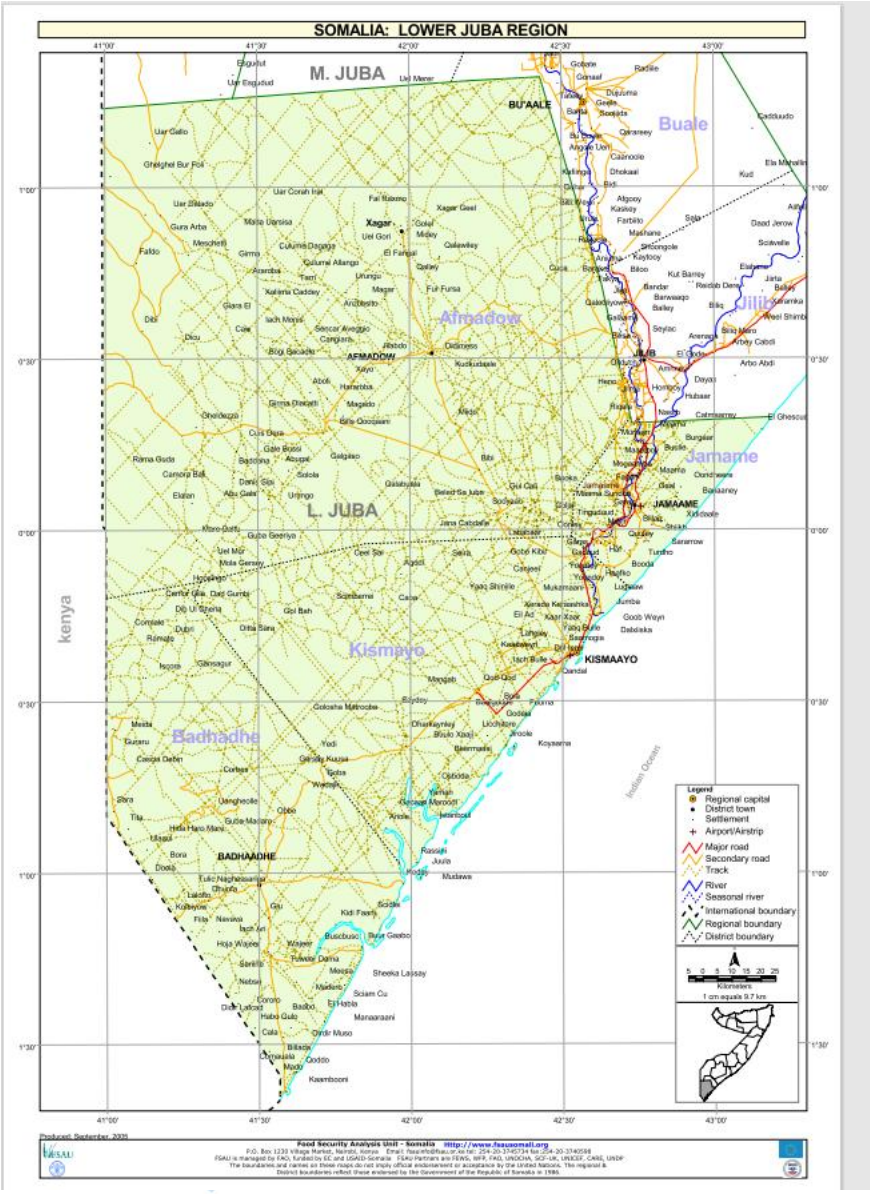

Figure 4.19: Map of lower Juba region

Source Food Security and Nutrition Analysis Unit-Somalia