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FACTORS AFFECTING COVID-19 VACCINE ACCEPTANCE AMONG RESIDENTS OF ADENTA, ABOKOBI AND FRAFRAHA

BY

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DECLARATION

I, **Williet Aromah Adade** declare that except for references to other people's investigations which have been duly acknowledged, this dissertation is the result of my own research and that this dissertation either in whole or part has not been presented for another degree elsewhere.

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DEDICATION

This work is dedicated to my late father, Mr. Wilberforce Adade, for his immense love, support, and prayers.

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ABSTRACT

Background: Vaccination is an important part of public health, and an important way of preventing the spread of contagious, dangerous, and deadly diseases thus saving lives. The introduction of COVID-19 vaccines has been a game changer in reducing hospitalization, death, and risk of severe complications from COVID-19. Success of vaccination programs is not only dependent on efficacy and safety of vaccines, but critically dependent on public perception and acceptability of the vaccines. Therefore, vaccine acceptance among the public and healthcare workers appears to be critical determinant on successful deployment and control of pandemics. Therefore, it is important to understand the factors that determine acceptability of the COVID-19 vaccine among the public.

Objective: The objective of this study was to determine factors associated with COVID-19 vaccine acceptance among residents in the Adenta, Frafraha and Abokobi communities.

Methods: A quantitative cross-sectional study using structured questionnaire was conducted to collect data on factors or determinants of COVID- 19 vaccine acceptance among residents of Adenta, Frafraha and Abokobi.

Result: Most of the study participants agreed that there is currently no effective treatment for COVID-19 disease (n=252 (58.3%)) and are aware many people are taking the COVID-19 vaccine (n=263 (60.9%)). Generally, 19.4% of community members had high knowledge on COVID-19 vaccine. An estimated 38.7% and 41.9% had moderate / low Knowledge and awareness on COVID-19 disease and COVID-19 vaccine respectively. Acceptance of COVID-19 vaccine was high (63.4%) in the Adenta community as compared to Frafraha (29%) and Abokobi (6.5%). There was a significant association between marital

status and acceptance of COVID-19 vaccine ($\chi 2=12.140$: p=0.002). There was also a significant association between religion ($\chi 2=6.971$: p=0.031), ethnicity ($\chi 2=10.533$: p=0.005) and acceptance of COVID-19 vaccine.

Conclusion: About 6 in 10 community members accepted the COVID-19 vaccine. Acceptance of COVID-19 vaccine was highest among residents of Adenta, an urban community compared to Frafraha and Abokobi. There is inadequate knowledge on COVID-19 vaccine in the communities studied.

Recommendation: Public education should be conducted by the relevant stake holders in the three communities to improve vaccine information awareness and knowledge. Health practitioners, media personnel, government officials, community representatives, political groups, and the local assembly must all take the COVID-19 vaccine publicly. Communities aware of the acceptance of the vaccine by role models were more likely to accept the vaccine as compared to those who were unaware of acceptance.

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LIST OF ACCRONYMS

ACCRONYM		MEANING
COVID-19	-	Coronavirus Disease of 2019
CDC	-	Center of Disease Control
EPI	-	Expanded Program on Immunization
SARS COV-2	-	Severe Acute Respiratory Syndrome Coronavirus 2
GAVI	-	Global Alliance for Vaccines and Immunization
GVAP	-	Global Vaccine Action Plan
VPD's	-	Vaccine Preventable Diseases
WHO	-	World Health Organization
NHIS	-	National Health Insurance Scheme

DEFINITON OF TERMS

Vaccines

Vaccines are biological preparations that are used to boost the immune system's response to illnesses. Vaccines are often given through needle injections; however, some can also be given orally or through the nose.

Vaccine acceptance:

Vaccine acceptance is described as an individual's or a group's decision to take or decline vaccination when given the opportunity to vaccinate

Vaccination

Vaccination is the administration of a vaccine to stimulate an individual's immune system to develop specific immunity to a disease-causing organism.

Pandemic

A disease outbreak that spreads across countries or continents

Infodemic

A situation in which a lot of false information is being spread in a way that it is harmful

Anti-vaxxers

A group of people who oppose to vaccination.

Herd Immunity

Herd immunity also known as population immunity is the indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Coronaviruses are a type of enclosed, single-stranded RNA viruses which are members of the Coronaviridae family. Coronaviruses can be divided into four categories based on their serological patterns: alpha, beta, gamma, and delta. In the past years, coronavirus-related illnesses have produced numerous epidemic and pandemic outbreaks. A number of coronaviruses, including 229E, OC43, NL63, HKU1, SARS-CoV, and MERS-CoV, have been implicated in human outbreaks (Kaul, 2020). Severe acute respiratory syndrome (SARS) outbreak caused by SARS-CoV during 2002 in Guangdong, China affected 8098 individuals and killed 774 individuals in 29 different countries before COVID-19. (Zumla et al., 2016) . Few years later, in 2012, the Middle East respiratory syndrome (MERS) outbreak brought on by the MERS-CoV in the Middle East stunned the world (Cui et al., 2019). MERS-CoV infected 2468 people between 2015 and 2020, and resulted in 851 deaths (Killerby et al., 2020). Another coronavirus, known as SARS-CoV-2, arose in Wuhan when scientists were still looking into the mechanisms to discover therapeutic approaches against MERS (Khan et al., 2020)

In December 2019, the first case of a new severe acute respiratory syndrome (SARS) was detected in the Wuhan region of China, caused by a novel coronavirus, SARS CoV-2. In February 2020, the World Health Organization (WHO) named the new disease COVID-19, and in March 2020 declared a pandemic (Wang et al., 2020). The Coronavirus disease (COVID-19) pandemic has become a global threat (Ilesanmi et al., 2020). SARS-CoV-2 belongs to the same Beta coronavirus genus as the coronaviruses responsible for the severe acute respiratory syndrome (SARS-CoV) and Middle East respiratory syndrome (MERS-CoV) respectively) (Corman et al., 2019), SARS

and MERS were associated mainly with nosocomial spread, whereas SARS-CoV-2 is much more widely transmitted in the community (Liu et al., 2020).

Those infected with COVID-19 have symptoms varying from asymptomatic to a common cold like illness to severe pneumonia, severe acute respiratory distress syndrome, neurologic and hepatic disease, and death. The most common symptoms of SARS CoV-2 infected patients are fever, cough, shortness of breath, fatigue, mental confusion, sore throat, (Adhikari et al., 2020; De Oliveira Lima, 2020; Rothan & Byrareddy, 2020). COVID-19 has an incubation period of 2-14 days. All age groups are vulnerable to SARS CoV-2 with age greater than 60 years old being even at higher risk with males and females equally at risk (Khan et al., 2021).

The COVID-19 pandemic is continuously spreading in these extraordinary times. There are over 422 million confirmed cases and nearly 5.8 million deaths worldwide as of January 31, 2022 (GitHub, 2022). Africa's first case of COVID-19 was identified in Egypt on February 14, 2020, while the first case from Sub-Saharan Africa was recorded in Nigeria on February 27, 2020 (WHO 2020; NCDC 2020). Africa's CDC reported 11,064,898 documented cases, 245,237 deaths, and 10,205,894 recuperations as of February 18th, 2022 (Africa CDC, 2022).

Vaccines are the optimal public health strategy for disease prevention and one of the greatest public health achievements in the 20th century. However, in the last decade, there has been a drop in vaccination rates in some regions of the world leading to not just deaths in adults, but also children dying from childhood diseases like measles and pertussis (Piltch-Loeb & Diclemente, 2020; Shetty, 2020.) Vaccine hesitancy, defined as the reluctance in accepting or outright rejection of vaccines, has become one of the ten dangers to health, according to a World Health Organization assessment (Aranda, 2019).

Since the approval of the first COVID-19 under emergency approval, more than 10.42 billion

doses have been administered including over 4.31 billion fully vaccinated individuals (Ritchie et al., 2022). But with a global population of nearly eight billion, that's only a small first step (Felter, 2021) The deployment and uptake of COVID-19 vaccines will be determined not just by therapeutic potential, but also by public and health-care provider acceptance (Sallam, 2021). With 145 countries participating, the WHO, the Global Alliance for Vaccines, and Immunizations (GAVI), and other international partners (COVAX) established a global access facility for vaccines with the goal of ensuring fair and equal access to COVID -19 vaccines for all countries, irrespective of their economic status (World Health Organization, 2020).

The refusal of vaccine acceptance and uptake delays the time taken to reach herd immunity (Jacobson et al., 2015). This study seeks to find out factors that influence COVID-19 vaccine acceptance.

1.2 Problem Statement

Since the first incidence of COVID-19 was discovered in Ghana in March 2020, 158,000 Ghanaians have contracted SARS-Cov-2, with 1,433 deaths and counting. After the first incidence of COVID-19 was recorded in Ghana, the authorities took many efforts to prevent the disease from spreading, including the lockdown of the capital, Accra. In addition, several infection-prevention initiatives were publicly stated, including the suspension of all mass gatherings, the wearing of face masks in public spaces, social distancing, and the implementation of infection control practices, such as washing hands with soap under running water and using alcohol-based hand sanitizers, as recommended by WHO.

Even though these public health interventions have reduced the transmission of COVID- 19, it has become evident that mass vaccination of at least the adult population in Ghana, with the aim of reaching "herd immunity" is the only way continuous spread of COVID-19 among the population

can be controlled (Randolph & Barreiro, 2020). The first consignment of AstraZeneca COVID - 19 vaccines from COVAX landed in Ghana in March 2021, followed by Sputnik V, then Pfizer and Moderna. Since then, various frontline workers, at risk groups and general population have been vaccinated (Agyekum et al., 2021a). COVID-19 immunizations require high uptake to achieve maximal efficiency in the population, and new evidence shows that vaccine uptake can drastically mitigate COVID-19 admissions (Cascini et al., 2021). However, aversion to receiving a COVID-19 vaccine continues to be a major risk that could jeopardize strategies to lessen COVID-19's long-term impact. As a result, it's critical to identify and comprehend the fundamental aspects that influence public acceptability of vaccinations (Vasileiou et al., 2021; Crawshaw et al.., 2021), less educated individuals and those in peri-urban and rural communities. This is especially significant given COVID-19's disparate health, financial, and psychological effects on various populations.

Vaccine hesitancy among populations tend to decrease vaccine coverage and could lead to an increase in outbreak of vaccine-preventable diseases (VPD's) and epidemics (Taylor et al., 2013). Vaccine hesitancy is linked to a variety of factors, including the mandatory nature of vaccines, lack of familiarity with vaccine-preventable diseases, poor leadership in corporations and public health organizations, religious reasons, personal views, and safety issues stemming from widespread misconceptions about vaccines, such as the link between vaccines and autism, brain injury, and other conditions (Mckee & Bohannon, 2016; Salmon et al., 2015). There has been mixed response on the acceptance or rejection of the COVID-19 vaccine by Ghanaians since the announcement was made by the Government on procuring the COVID-19 vaccine (Agyekum et al., 2021b).

According to a World Health Organization, the Coronavirus disease outbreak has been preceded by a massive "infodemic." "We're not just fighting an epidemic; we're fighting an infodemic," the Director-General of the World Health Organization (WHO) said about COVID-19 prior to it becoming a pandemic in February 2020 (World Health Organization, 2020). The COVID-19 vaccine's hesitancy poses a major threat not just to those who decline to be immunized or who hesitate in receiving the vaccine, but also to the larger population.

Acceptance of the COVID- 19 vaccine will result in communities being able to obtain herd immunity against the virus thus resulting in a drastic decrease in suffering and death (Wiysonge et al., 2021).

1.3 Conceptual Framework

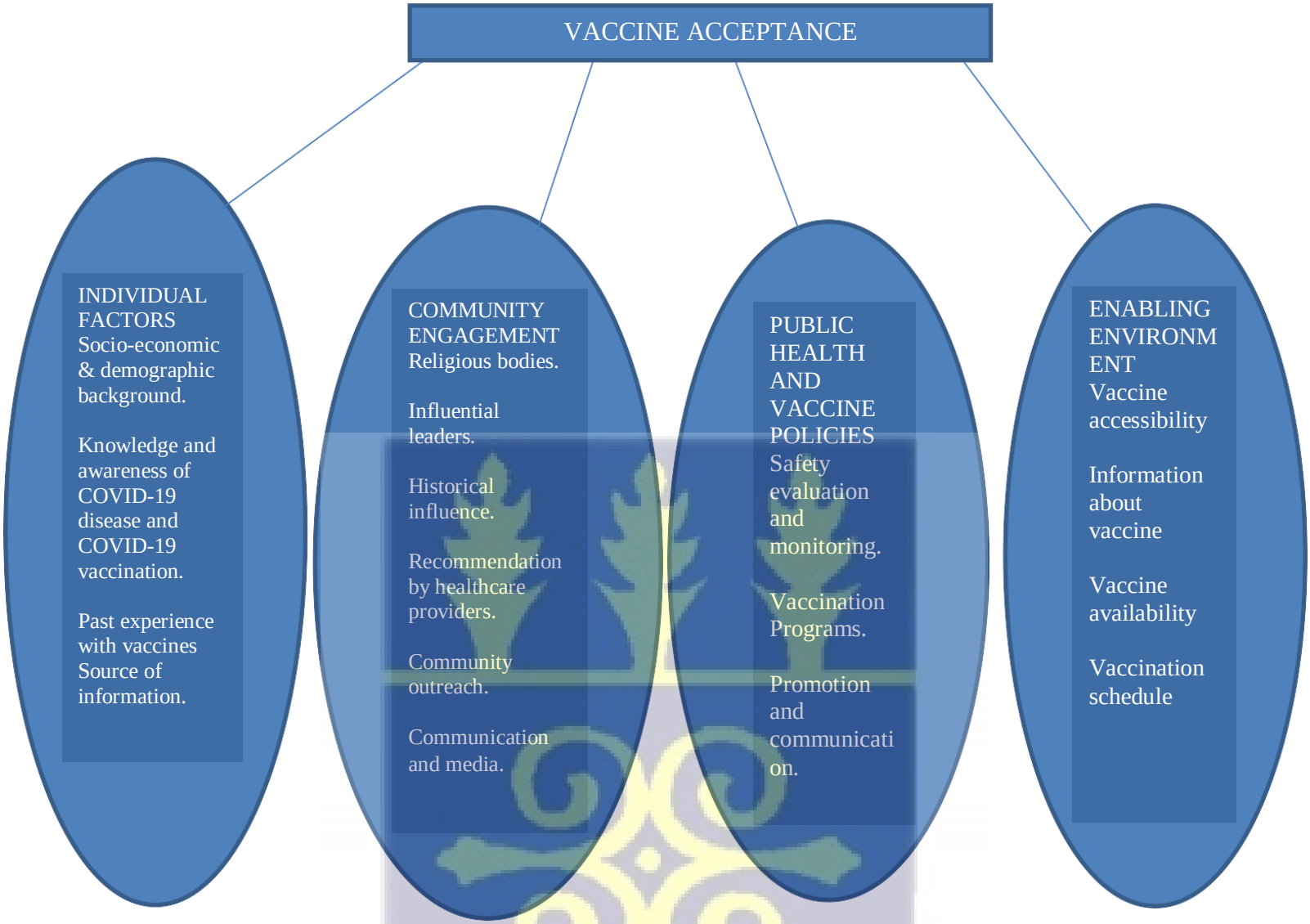


Figure 2: Conceptual Framework. Adapted from SAGE Vaccine Hesitancy model (Dube et al, 2014)

Vaccine acceptance is influenced by a variety of interrelated factors, as shown in the conceptual framework above. The knowledge and information about vaccinations, which is influenced by the basis of information for the COVID-19 vaccine, is one of these connected factors. Incorrect information about the COVID-19 vaccine will lead to low vaccine uptake and acceptability which will result in a substantial rise in mortality as herd immunity is not achieved.

The utilization of religious entities and significant individuals, as well as recommendations from health care experts, promotes community uptake and acceptance of the COVID-19 vaccine. This is because practically everyone belongs to a religious group and looks to influential leaders for guidance and assistance. When these organizations and individuals are educated on the need to accept the COVID-19 vaccine, they will be able to pass on the information they have learned to their subordinates and communities, as well as positively persuade them to adopt the vaccine.

There must also be processes in place to monitor and evaluate the vaccine's safety. Experts should be accessible to advice on the vaccine's ongoing safety, and weekly updates on the vaccine's safety will improve people's confidence in the vaccination, leading to more indigenous people taking and accepting the COVID-19 vaccine

An enabling environment which includes vaccine accessibility and availability an information about the vaccine can improve the coverage of the COVID-19 vaccine. Individuals who are informed of the vaccination date, time, and location, as well as the ease with which they can receive the vaccine, will adhere to it attentively. The COVID-19 Vaccine's acceptance will also be boosted by its easy accessibility, which eliminates the need for individuals to drive vast distances and wait hours to be vaccinated.

1.4 Justification

This study is especially important because there is limited information on the factors that affect COVID-19 vaccination acceptance in Ghanaian communities. Importantly, media access differs amongst urban, peri-urban, and rural residents. As a result, three communities representing the urban and peri-urban communities were studied: Adenta, Frafraha, and Abokobi. Because of the potential negative consequences of COVID-19 vaccine hesitancy for both individuals and communities, it is essential to comprehend and identify potential factors and predictors that result to vaccine acceptance, as well as common barriers so that the appropriate actions and public education can be conducted by the government, community leaders, lawmakers, researchers, and health workers in order to improve COVID-19 vaccine coverage and as well as likely poor acceptance of COVID-19 vaccine.

1.5 Objectives

1.5.1 General Objective

To determine factors associated with COVID-19 vaccine acceptance among residents in the Adenta, Frafraha and Abokobi communities.

1.5.2 Specific objectives

1) Determine the level of awareness and knowledge of community residents on COVID-19 disease and COVID-19 vaccines.
2) Determine factors influencing vaccine acceptance or hesitancy among community members

1.6 Research questions

1. How are the members in the three communities abreast with the knowledge and awareness of the COVID-19 vaccine?

2. What factors impact COVID-9 vaccine acceptance?

CHAPTER TWO

LITERATURE REVIEW

2.1 Brief history about vaccines

Vaccines are the most economical drugs currently available, as well as one of the most substantial medical breakthroughs in the history of worldwide infectious disease, as they play a vital role in the major prevention of infectious diseases with a large percentage of efficacy, giving rise in the yearly rescuing of at least 2 to 3 million lives worldwide (Domínguez-Andrés et al., 2020; Durán-Méndez et al., 2021). Edward Jenner, the pioneer of immunology and virology, created a 'live attenuated' smallpox vaccine in the 1800s, which led to the birth of modern vaccination (Plotkin, 2014). No more vaccines were created after Jenner's breakthrough due to a lack of competence in immunology and microbiology. However, Louis Pasteur, the pioneer of microbiology, discovered in 1878 that passing one microbe through numerous in vitro cultures led the microorganisms to reduce, paving the way for the development of subsequent vaccines. As a result, Pasteur was able to generate anti-anthrax and anti-rabic vaccines in 1881 and 1885 respectively (D'Amelio et al., 2016). The 19th century was a breakthrough point in medicine, with Louis Pasteur's "Germ Theory," Robert Koch's finding of the germ tubercle bacillus for tuberculosis, and George Miller Sternberg's isolation of the pneumococcus organism. Diphtheria toxin was identified by Emile Roux, and a serological therapy was discovered by Emil Von Behring and Paul Ehrlih (Hajj Hussein et al., 2015). In the ensuing decade, several new vaccines were produced by attenuating the germs that caused the diseases, either by Pasteur's approach or through physical and chemical techniques. As knowledge of microbiology and immunology advanced during the twentieth century, techniques for virus cell culture were developed. This made rapid progress in the eradication of illnesses like polio, varicella influenza, and others possible (Hsu, 2013) . Presently,

85 human vaccines and vaccine combinations are available (Chung et al., 2021)

2.2 Individual Factors

The acceptance of vaccines has been found to be influenced by several socioeconomic and demographic factors(Latkin et al., 2021). According to a recent study in the Congo, the occupation and gender of health practitioners may have an impact on their acceptance of the COVID-19 vaccine. Also, men were more likely than women to accept the vaccination, which may be because men see the disease as having a higher danger than women do(Kabamba Nzaji et al., 2020) .A study conducted by Lazarus et al indicated that higher educational level , income, and old age were also associated with a higher likelihood of vaccine acceptance (Lazarus et al., 2021). A study conducted by Pugliese-Garcia et al showed that some participants in Lusaka, Zambia were hesistant to vaccination programs and this was due to past personal and community's experiences with vaccines (Pugliese-Garcia et al., 2018) . Another study also conducted proved that Vaccination acceptance depends on individuals' knowledge, information and awareness of when, where and who should be vaccinated(Kumar et al., 2016).

2.3 Public Health and Vaccine policy

To properly inform the population, communication is a valuable resource for public health. Although reliable vaccine surveillance is well established in developed countries, only a small portion of the public and medical professionals are aware of it. False data and information about the safety and effectiveness of vaccines have caused serious issues for public health professionals, decision-makers, and patients, and these issues have paved the way for vaccine licensing and their inclusion in universal programs(Kumar et al., 2016). According to a study conducted in Africa to investigate the level of COVID-19 vaccine acceptance among African healthcare professionals, there is typically low acceptance of the COVID-19 vaccination among African healthcare

professionals. The COVID-19 infections, short duration of the clinical trials, safety, efficacy, and effectiveness of the vaccine, as well as the lack of communication were the main motivators and justifications(Ackah et al., 2022).

2.4 Community Engagement

Cues to action are a strong predictor of intention to receive vaccinations. It has been demonstrated that recommendations from the government and healthcare professionals significantly predict desire to accept vaccines. Recent studies have shown that recommendations from healthcare providers and the government were strong predictors of intention to receive the COVID-19 vaccine as well as having a substantial influence on intention to accept COVID-19 immunizations (Reiter et al., 2020; Wong et al., 2021). Religious leaders' attitudes towards vaccination vary from full acceptance to clear refusal. A study to ascertain the role of religious leaders in promoting vaccination acceptance among a minority group in Dutch community revealed that orthodox Protestant religious leaders' views on vaccination are firmly rooted in religious doctrine, and their authority is derived from how they interpret and apply this doctrine. As a result, it is unlikely that these leaders' positions will change quickly. Information exchange has accelerated due to globalization. The impact of pro- and anti-vaccine news from industrialized nations on global views regarding vaccination may have a substantial effect (Goldstein et al., 2015). Lackluster or ineffective immunization campaign messaging can cause vaccine reluctance and outright refusal in high income nations with well-resourced vaccination programs. Lack of communication resources in low- and middle-income countries makes it difficult to combat false information about vaccinations and win community support for immunization campaigns. (MacDonald, 2015).

2.5 Role of Vaccination in Public Health

Vaccines have had a significant influence on the public's health. Two major diseases, smallpox and rinderpest, have been eradicated. In the twentieth century, smallpox claimed approximately 375 million lives, but no one has perished from the condition since 1978, when an efficient eradication operation was finished (Greenwood, 2014; Nabel, 2013) Although it is difficult to predict how long this will take, efficient vaccinations against key infections such as HIV, TB, and malaria are expected to be developed, and these infections will cease to be a major public health problem, even if they cannot be completely eradicated (Greenwood, 2014). In addition, therapeutic vaccinations for the treatment of chronic illnesses or cancer have been created in recent years, albeit they are still in clinical studies (Melero et al., 2014).

Vaccination has had a key role in lowering human mortality, particularly among children, as well as a substantial increase in life expectancy over the last two centuries (Sainz, 2020.). Vaccines, according to the World Health Organization (WHO), are more likely than any other medical intervention to offer widespread benefits to society (Melero et al., 2014). In summary, vaccination is by far the most economical strategy to save lives, maintain exceptional health, and maintain a higher quality of life (Nabel, 2013).

2.6 Vaccine Hesitancy

Vaccine acceptance and request are multifaceted and context-specific, shifting across time, geography, and the society's perceived behavioral nature (Larson et al., 2014). Vaccine hesitancy, defined by the World Health Organization as the delay in accepting or outright refusal of vaccines, is a developing concern in health (Marti et al., 2017).). As a developing trend in global health, vaccine-preventable diseases have been diminished where high immunization uptake has been

achieved (Machingaidze et al., 2013). Vaccine reluctance during the Measles outbreak made unvaccinated children more at risk in large, metropolitan areas (Patel et al., 2019). According to the Global Polio Eradication Initiative, Pakistan is the only nation with constant impediments to polio vaccination and eradication. Religious activism and, in some cases, global political objectives are behind the obstacles (Masood, 2019). In Africa, vaccine reluctance is based on a variety of factors, including perceived vaccine risk, vaccine safety and effectiveness, overall immunization strategy, prior immunization experiences, religious convictions, accessibility to immunization, and sociocultural constraints(Habersaat et al., 2020; Koirala et al., 2020).Vaccination coverage in Sub-Saharan Africa has consistently lagged behind that of other regions, with substantial differences across nations within Africa. Uptake rates in Africa must be enhanced to stop and control vaccine-preventable illnesses (Cobos Muñoz et al., 2015). There have been widespread stories and experiences throughout Africa that have hampered the successful execution of immunization programs. In Ghana, community members misunderstood a major deworming effort, resulting in its refusal. Residents of the northern Nigerian community likewise declined to get vaccinated against polio owing to erroneous religious beliefs (Febir et al., 2013). Due to the refusal of vaccination programs in these circumstances, many people were subjected to communicable diseases, which led to disease development among the sick. These findings imply that vaccine hesitancy is a concern to individuals, personal, and global health because it slows herd immunity for diseases (Fine et al., 2012). Poor vaccine acceptance and uptake is important examining, particularly in the COVID-19 environment, because of our continent's underdeveloped health system and history with communicable diseases.

2.7 Development of COVID-19 Vaccines

Given COVID-19's rapid spread and asymptomatic nature, a potent vaccine with widespread immunization coverage is certainly required to return life to normal (Li et al., 2020). The genetic code of SARS-COV-2, the coronavirus that causes COVID-19, was discovered on January 11, 2020, igniting a spike in global R&D attempt to develop a vaccine (Huang et al., 2021). COVID-19 vaccines have advanced at an unprecedented rate in vaccination history (Ndwandwe & Wiysonge, 2021). Amongst the most scientific and technological achievements is the COVID-19 vaccine, which was ready in late 2020. The vaccinations against SARS-CoV-2 can be classified into seven classes to aid in the management of SARS-CoV-2 variants (Dai & Gao, 2021).

Vaccinations dependent on nucleic acids fall into the first category (RNA or DNA). The second group includes knocked-out virus vaccines, which use inactivated or weakened viruses. The third form of vaccine is virus vector vaccines. The fourth group includes recombinant protein subunit vaccines. The fifth class is made up of protein components from coronaviruses. The sixth category includes DNA vaccines. Vaccines that have been attenuated and repurposed make up the final group (Abdulla et al., 2021). Among the vaccines that have been approved and extensively used are Sputnik V, Pfizer-BioNTech BNT162b2, Moderna mRNA-1273, and AstraZeneca-Oxford AZD122 (Vuong et al., 2022). As of December 31, 2021, more than nine billion COVID-19 vaccination doses had been administered globally (around 116 doses per 100 people) (Mathieu et al., 2021).

2.8 Success of Vaccination

Vaccination is one of the most cost-effective and productive public health initiatives. Vaccination is a prophylactic strategy against vaccine-preventable diseases, with strong evidence showing that smallpox was eradicated after a global immunization effort carried out by The World Health

Organization (WHO). Conditions such as tetanus, diphtheria, and polio have also decreased dramatically because of vaccination delivery. Persons who are responsive to vaccines will reap the best outcomes from vaccination. The Expanded Program on Immunization (EPI) was established by the World Health Organization in 1974 with the goal of producing safe and effective immunizations available to all children worldwide. Several projects have been instrumental in increasing EPI coverage, including Universal Childhood Immunization, the Global Alliance for Vaccines and Immunization (GAVI), the Millennium Development Goals, and recent times, the Global Vaccine Action Plan (GVAP), which has set a goal of using national vaccination initiatives to attain 90% national vaccination coverage by 2020.

2.9. COVID-19 Vaccine Acceptance and Uptake

In the Democratic Republic of Congo, a study was done to determine the level of willingness for COVID-19 immunization. In all, 2310 people (55.9%) said they were willing to be vaccinated. The study concluded that inhabitants of the DRC's existing readiness to get COVID-19 vaccine is insufficient to significantly reduce community spread. The poor immunization motivation among healthcare personnel is a major source of worry. To boost COVID-19 vaccination uptake, a large-scale public awareness campaign will be required (Ditekemena et al.., 2021).

Research conducted in France to assess COVID-19 vaccine apprehension in a representative workforce, most people chose not to be vaccinated. According to the survey, 560 out of 1942 working-age adults, or 28.8%, chose not to be vaccinated in all eight tasks. COVID-19 vaccine uptake was shown to be greatest at both extremities of the working-age continuum, among the youngest adults at greatest risk of SARS-CoV-2 infection and the oldest persons at greatest risk of a severe of COVID-19 infection, according to the study (Schwarzinger et al., 2021).

Another study done to assess the willingness of the COVID- 19 vaccine uptake of Kaifeng residents in China showed that (89.06) individuals out of 3000 individuals were willing to accept the COVID-19 vaccine (Lu, 2021).

A study was done to determine and assess the acceptance of a coronavirus disease 2019 (COVID-19) vaccination among Kuwait's general adult population. Overall, 53.1 percent (1,257/2,368) of trial participants indicated a willingness to get COVID-19 vaccination. Although vaccination looks to be an important preventive approach for halting the COVID-19 pandemic, public health efforts must address issues related to low vaccine acceptance as soon as possible. (Alqudeimat et al., 2021).

Vaccine hesitancy to a COVID-19 vaccine was 84.6 percent in a recent study by Dinga et al to analyze Vaccine Hesitancy to a COVID-19 Vaccine in Cameroonian Adults and Its Global Implication (Dinga et al., 2021).

Because health care personnel are a credible source of health information, their approval of the COVID-19 vaccine can affect the uptake of COVID-19 immunizations among the public at large. In Ghana, a study was conducted to investigate the acceptability of COVID-19 vaccinations among Ghanaian health care personnel. 234 health-care workers were polled for information. According to the findings, 39.3 percent of health-care employees agreed to get the COVID-19 vaccine (Agyekum et al., 2021b).

2.10 Barriers to COVID-19 Vaccination

The most significant predictors detected using the suggested Matrix of Determination of Vaccine Hesitancy, according to the WHO, are media and communication setting, pharmaceutical industry opinion, vaccine efficacy and/or source, and value (Dinga et al., 2021). Confusion about the COVID-19 vaccine, as well as anti-vaccine campaigns instructing Africans to reject COVID- 19

vaccines on social networks; negative connotations of the pharmaceutical industry; and, given the disparity between developing and developed countries, context-specific guidelines to enhance vaccine uptake levels in Africa must be established. Different factors contribute to the reported poor vaccination coverage in developing nations, such as in Africa (Dinga et al., 2021). Competing health demands, poverty, poor vaccination awareness, religion, culture, weak healthcare systems and lack of funding, political will, and competition for limited resources are all critical problems in Sub-Saharan Africa (Howard et al., 2012). Stakeholder engagement, effective communication, and health professional development have all been suggested as initiatives that help improve vaccine uptake in Sub-Saharan Africa (Tedrow et al., 2012). By boosting herd immunity, an increase in vaccination uptake would lower the risk of morbidity and mortality caused by vaccine-preventable diseases and their consequences among individuals and society improving herd immunity. Increased human capital could lead to increased vaccine coverage, which is a cost-effective technique for improving these developing countries' long- term growth prospects (Jung et al., 2015). While most factors that contribute to vaccine hesitancy vary between developed and developing countries, some African countries, such as South Africa, are starting to see a rise in factors that are more frequently cited in developed countries, thanks to advances in communication that have resulted to anti-vaccine movements vaccines; and cost to individuals (Burnett et al., 2012). The safety, effectiveness, dangers, and advantages associated with the COVID-19 vaccination program are severely influenced by people's knowledge, attitude, behaviors, and concerns about the vaccine's safety, efficacy, risks, and advantages (Kourlaba et al., 2021).

A study of vaccine hesitancy: Beliefs and Barriers Associated with COVID-19 Vaccination was undertaken among Egyptian medical students. COVID-19 vaccination hesitancy was seen in 46 percent of the participants. Inadequate data about the vaccine's detrimental effects (potential 74.2

percent and unknown 56.3 percent), insufficient information about the vaccine itself (72.8 percent), financial cost hindrance if the vaccine is not free (68.0 percent), and insufficient trust in the vaccination source were the most widely reported impediments to COVID-19 vaccination (55.1 percent) (Saied & Kabbash, 2021.).

Another study looked at the public's perceptions of COVID-19 vaccination and the barriers to vaccination in Saudi Arabia. According to the findings, 44.7 percent of the 3,101 participants are willing to receive COVID-19 vaccine if it is accessible, whereas 55.3 percent are hesitant. Questions about side effects were shown to be the most significant obstacle to vaccine acceptance in the study (Magadmi, 2020.).

Mistrust and refusal to vaccinate for COVID-19 were found in a study to assess the effect of COVID-19 on migrants assessed to primary care, with concerns expressed about the degree of misguided COVID-19 vaccination information circulating in their communities via social media and the perceived low depiction of their communities in vaccine trials. COVID-19 is a "hoax" or "Western sickness," according to one qualitative research of refugees and asylum seekers. It also has a microchip to control the population, according to another (Knights et al., 2021). Knowledge, hurdles, and facilitators among the general public about the COVID-19 vaccine and immunization campaign. Concerns regarding vaccine availability ((35.55%), unanticipated foreseeable adverse effects (35.62%), vaccine faultiness (19.32 %), quick development (55.72%), and pharmaceutical gains have all been identified as hurdles to the COVID-19 vaccine (Table 5). (22.02 %). Various concerns, such as vaccine availability ($p < 0.001$and vaccine quality ($p < 0.001$), were found to be substantially related to age. The vaccine's side effects were substantially related with socioeconomic background ($p < 0.05$). The more the fear about the immunization, the lower the socioeconomic standing (Kumari et al., 2021).

2.11 Strategies for Preventing COVID-19 Vaccine Hesitancy

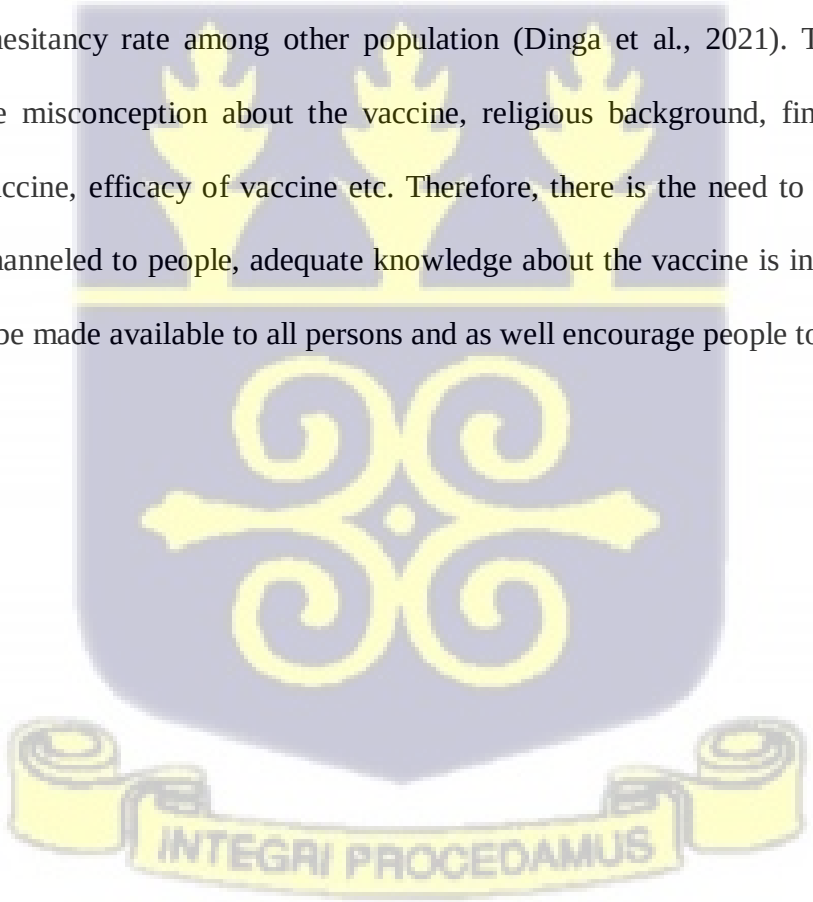
COVID-19 has caused several morbidities and deaths around the world, owing in large part to the lack of a COVID -19 vaccine. In several countries, the COVID-19 vaccination is now being carried out and is available. To combat COVID-19 vaccine reluctance, policies and processes must be put in place, particularly in Africa, where vaccine hesitancy has been documented preceding the implementation of novel vaccinations. It is advised that the public be included as much as possible in the structure and delivery of the COVID-19 vaccine. Individuals who were apprehensive and postponed their decision to get the COVID 19 vaccine may be further convinced by positive encouragement from authorized immunization communication (Afolabi & Ilesanmi, 2021; Freeman, 2021). To increase community acceptability of the COVID-19 vaccination, recognition of community response through feedback mechanisms in prior health initiatives should be increased. Furthermore, there should be increased multi-sectoral cooperation to boost COVID-19 vaccine acceptability by giving additional means required to address

COVID-19 vaccine reluctance. The health system would be bolstered if the COVID-19 vaccine was included in the usual vaccination schedule (Afolabi & Ilesanmi, 2021). A large fraction of significantly reluctant persons may be anti-vaxxers in nations with early hesitation about

COVID-19 immunization, sluggish expansion of vaccine coverage, and distrust in official information sources, and boosting official vaccination communication may be detrimental. If the overall objective is to make herd immunity through mass vaccination, more social science contribution is required in these rural contexts (Lazarus et al., 2021; Schwarzinger et al., 2021; Ward, 2021).

2.12 Summary

Vaccination has shown to be one of the most cost-effective public health strategies, lowering morbidity and mortality from vaccine-preventable diseases dramatically over time. Despite attempts over the years to increase vaccination coverage, some people are still hesitant to be vaccinated. Despite the availability of vaccination facilities, this results in a lag in acceptance, hesitation, or opposition of immunization (Soares et al., 2021). Vaccine hesitancy usually occur because of people's negative perceptions or barriers that may impede the coverage of vaccines. In relation to the COVID-19 vaccine, though some studies have proven to have found greater acceptance rate (Lu, 2021) of the COVID-19 vaccine among population, other studies also found relatively high hesitancy rate among other population (Dinga et al., 2021). This attributes to barriers such the misconception about the vaccine, religious background, financial cost, low knowledge of vaccine, efficacy of vaccine etc. Therefore, there is the need to ensure that right information is channeled to people, adequate knowledge about the vaccine is instilled in people, vaccines should be made available to all persons and as well encourage people to get vaccinated



CHAPTER THREE

3.0 METHODS

3.1 Introduction

This chapter is devoted to the methods used in the study. It gives information about the research design, study area, population size, methods of data collection and data analysis.

3.2 Study Design

The study was a cross sectional study with a quantitative approach. Data was collected from individuals aged 18 and above from the selected communities.

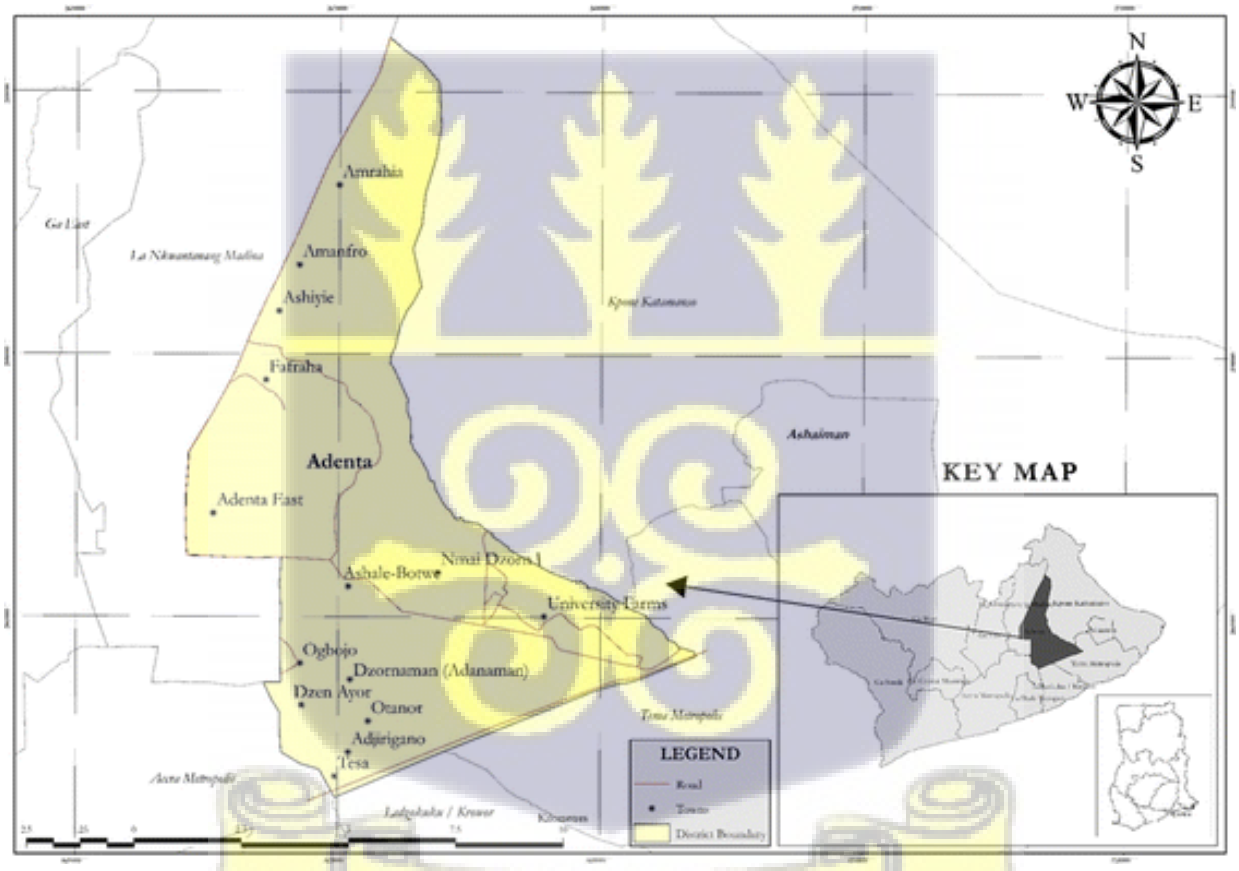


Figure 2: Map of the Adentan Municipality. Source: Ghana-Statistical-Service-2014a-b .)

The study was conducted in three communities: Adenta, Frafraha, and Abokobi. The Adenta and Frafraha settlements are in the Adenta municipality, whereas Abokobi is in the Greater Accra region's Ga East municipality. The Adentan Municipality is located 10 kilometers northeast of Accra and is bordered on the east and north by Ashaiman Municipal Assembly and Kpong Akatamanso District Assembly, and on the west and south by La Nkwantanang Municipal Assembly. The municipality is home to nearly all ethnic groups, and major religions include Christianity, Islam, and traditional religion.

The Adentan municipality has a population of 78,215 people, while the Adenta community has a population of 13,788, with males accounting for 51.1 % and females for 48.9%, as per 2010 population and housing census. According to the 2010 population census, the Frafraha community covers 6,214 people, with males accounting for 50.4 percent and females for 49.6%

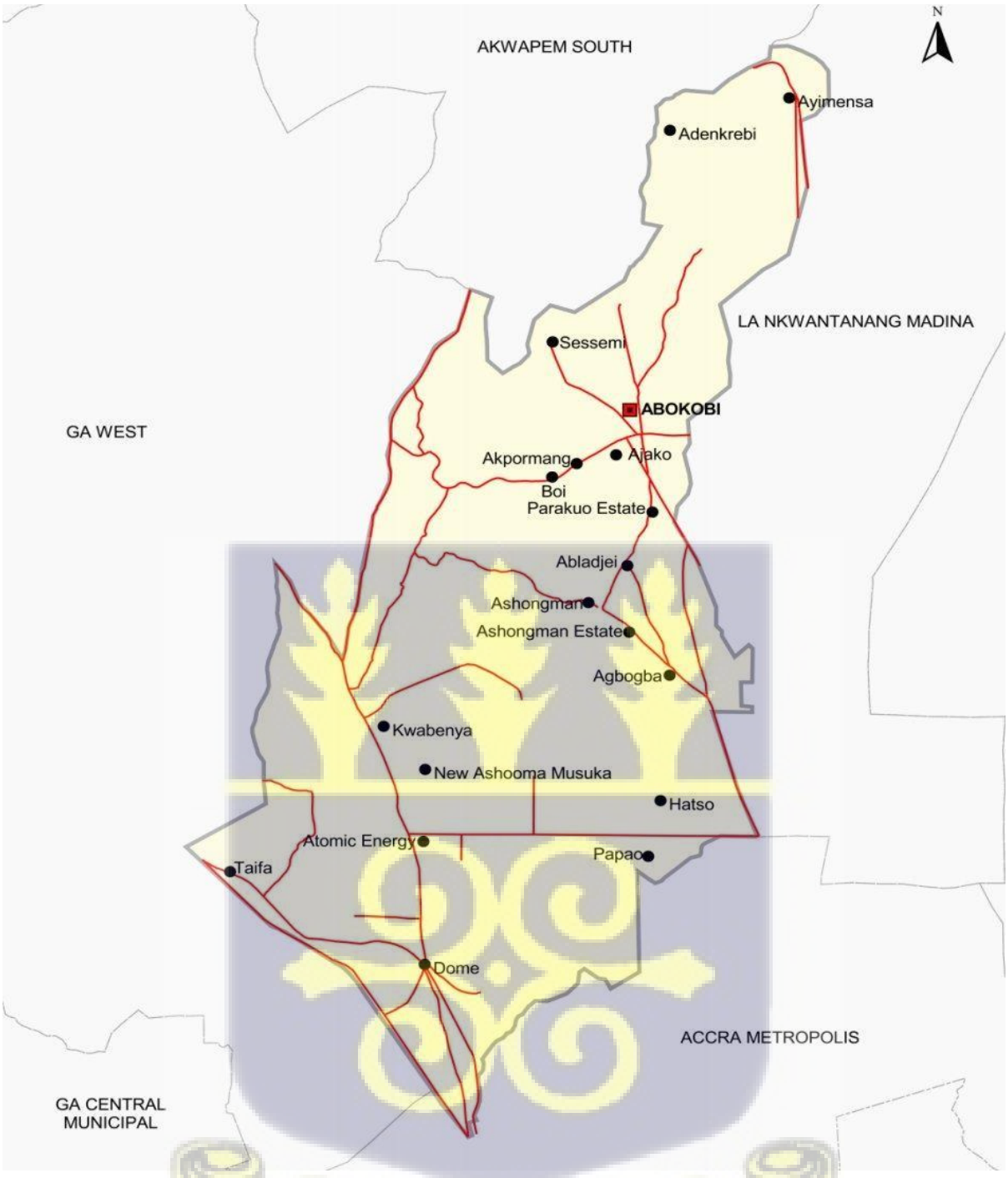


Figure 3: Map showing Ga East Municipal. Source: Ghana-Statistical-Service-2014a-b.)

The Ga East Municipal is also located at the northern part of Greater Accra Region. It shares boundaries with the Ga West Municipal to the west, the La - Nkwantanang Municipal to the east,

Accra Metropolitan to the south and the Akwapim South District to the north. The municipality is made up of a population of 147,742 representing 3.68 percent of the region's population. Almost all the ethnic groups are found in the municipality and the popular religions include the Christianity, Islamic and Traditional religions. Out of the municipal's population, the Abokobi community covers 1,654 with males covering about 48.9 percent of the population and females, 51.1 percent as projected from the 2010 population census.

3.3 Variables

3.3.1 Explanatory (Independent Variables)

The independent variable of this study includes:

Age, Sex, Marital status Religion, Occupation, Educational level, Religion. Ethnicity, Presence of chronic disease, Active on NHIS, Knowledge and awareness on COVID-19.

3.3.2 Outcome (dependent Variable)

The dependent variable includes acceptance of COVID-19 vaccine

3.4 Study Population

Study population comprised of inhabitants in the Adenta, Frafraha and Abokobi communities.

3.5 Sample Size Determination

The total number of households as estimated from the Population and Housing data for Abokobi, Frafraha and Adenta are 414, 1554 and 3447 respectively. The estimated sample. The procedure will be repeated until the total number of respondents for each community or cluster will be attained. Thus obtaining at least 32 respondents from Abokobi community, 121 respondents from Frafraha community and 269 from Adenta community. The sample size for each stratum was

calculated using the proportional method as shown below.

The sample size for this study was calculated using Cochran's (1977) formula:

$$n = \frac{z^2 pq}{d^2}$$ where;

z being the critical value of the normal distribution at the required confidence level of 95% and 1.96 as critical value, p as sample proportion (0.5 was used as a conservative approach), q as the acceptable deviation from the assumed proportion (1-0.50 = 0.50), d as the margin of error around p estimated as 0.05 in this study.

Therefore, $n = \frac{(1.96)^2 \times (0.50) \times (0.50)}{(0.05)^2} = 384.16 \approx 384$

Adding 10% of none response rate to 384 (thus 384 × 0.10 = 38.4 ≈ 38). The sample size for the study was 422 (thus 384+38).

3.5.1 Sample Size for Each Stratum

The sample size for each stratum was calculated using the proportional method $n_h = \frac{N_h}{N} * n$ where;

n_h is the sample size of the stratum, N_h is the actual size of the stratum, N is the entire population of the three strata and n is the study sample size.

Therefore; the sample size for Abokobi community was calculated as $n_h = \frac{1,654}{21656} * 422 = 32$

The sample size for Frafraha community was calculated as $n_h = \frac{6,214}{21656} * 422 = 121$

The sample size for Adenta community was calculated as $ni = \frac{13,788}{2165} * 422 = 269$

3.5.2 Sampling Procedure

In this study, a multi-stage sampling technique was used. The three communities represented three separate strata, with stratum 1 representing Adenta, stratum 2 representing Frafraha and stratum 3 representing Abokobi. A systematic sampling approach was applied inside each stratum.

Dividing the total number of households by the desired sample size, the sampling interval (k) was obtained. As a result, Abokobi's sample interval was calculated as (414 divided by 32) 13, Frafraha's was calculated as 13, and Adenta's was calculated as 13. When there were two or more respondents who were eligible for the study, a random sampling procedure was employed to choose study participants from a household. The first household was chosen at random, followed by the fourteenth home (Sampling interval +1). The technique was repeated until each community's total number of responses was determined. As a result, at least 32 respondents from the Abokobi community, 121 from the Frafraha community, and 269 from the Adenta community were obtained. Yeboah et al. used a similar sampling technique method in their research to assess factors influencing the use of contraceptives among reproductive-age females in the Kwadaso Municipality, in sub-municipalities namely Kwadaso Central, Asuoyeboah, and Agric-Nzema (Yeboah et al., 2022).

3.5.3 Inclusion and Exclusion Criteria

Ghanaian citizens living in household that qualify using the sampling interval technique in any of the three community irrespective of gender, cultural background, religious beliefs , 18 years an abovewhose consent was sought were included in the study. On the other hand, Ghanaian citizens who are less than 18 years and pregnant women were excluded. Also, adult Ghanaian who has not lived in any of the three community since March 2020 were excluded

3.6 Data Collection Method

A questionnaire comprising of both open and close-ended questions was used to obtain data from respondents. The questionnaires were designed in the English language, but the questions were explained to respondents in both English and the local dialects (i.e., Ga, Guan, Twi, Krobo etc.) with the aid of field assistants employed for the study. This was to ensure a better understanding of participants who may have challenges with speaking and understanding the English language. The questionnaire was sectioned into A, B, and C, where section A captured socio-demographic characteristics of respondents, Section B captured data on respondents' knowledge on COVID-19 and COVID-19 vaccine and Section C will capture data on Perceived barriers hindering the uptake of COVID-19 vaccine. Three data collectors (Undergraduates) underwent a two-day training lead by the researcher to ensure quality of the field exercise. The training was centered on interpreting the questions from English to local dialects and filling the questionnaire. A duration of about 10-15 minutes was allocated for administering a questionnaire.

3.7 Pre-Testing of Questionnaires

The questionnaires were pre-tested prior to final administration to the candidate participants. Pre-testing was conducted at La Nkwantanang Municipality with respondents of the same

characteristics. However, this sample was not part of the sample for the main study. This stage also offered the interviewer a better understanding of the questionnaire and to test for the validity and reliability of the questionnaire.

3.7.1 Editing Pre-Tested Questionnaires

Identified mistakes and inconsistencies from the conducted pre-testing were fixed and examined before the study began.

3.7.2 Quality Assurance

Sufficient precautions were put in place to protect and ensure data quality and accuracy without bias. The research assistant was trained to ensure the right procedures are followed to obtain genuine data. Monitoring activities were done to ensure data collectors will do the right thing. All COVID-19 protocols (use of sanitizers, face masks, physical distancing, etc.) were duly observed to ensure the safety of respondents and the interviewer.

3.8 Data Processing and Handling

The research assistant cleaned, edited, and double-checked the data from the field before submitting it for entry. Data was entered into an excel spreadsheet. The information entered was kept private and confidential. Hard copies were kept in a lockable filing cabinet. Soft copies were kept on a password-protected USB flash drive. They were only accessible to the principal investigator.

3.9 Data Analysis Method

Data generated was be analyzed using the STATA 16 software. Means, standard deviations and proportions were used to summarize data. The Chi-square test was used to test for association between vaccine acceptance and socio-demographic characteristics. There were 13 questions on knowledge ranked on a 13-point Likert scale. Strongly agree and agree responses were coded one (1) whiles neutral and strongly disagree and disagree responses were coded zero (0). Overall knowledge score of the participants ranged from 0 to 13 with a mean of 10.2, standard deviation (SD) of 3.6 and standard error of 0.037. The knowledge scores were grouped into three levels: low knowledge, moderate knowledge and high knowledge. Low knowledge was defined as those getting a score of 4 and below (30% of the total score), moderate knowledge was those getting a score from 5 to 9 (70% of the total score) and high knowledge was those getting a score of 10 and above (71% and above). Logistics regression model was used for detailed analysis to obtain the crude and adjusted odds ratio. Statistical significance was determined at a confidence interval of 95% and p-value of 0.05

3.10 Ethical Clearance

Ethical clearance was obtained from the Ghana Health Service Ethics Review Committee (GHS-ERC) as a requirement to undertake the study among respondents. GHS-ERC was chosen because it is the most appropriate to obtain ethical clearance to undertake this kind of study. Permission was sought from the Adenta Municipality and Abokobi municipality to conduct the research.

CHAPTER FOUR

4.0 RESULTS

4.1 Background characteristics of study participants

Table 4.1 summarizes the background characteristics of study participants. Of the 431 participants, 7.4% were from Abokobi, 62.4% from Adenta and 30.1% from Frafraha. There was a significant difference in age groups across place of residence. About 36.6% of participants were aged between 26-35 years. In Adenta, ratio of male: female participation was approximately 1:1, i.e. 218 (50.5%) males: X (49.5%) females, whiles more females participated in Abokobi 21 (65.6%) and Frafraha 68 (52.3%) than males. Most of the study participants were never married 260 (60.2%) at the time of the study. Only 132 (30.6%) and 9.3% were divorced/married/separated were married and with regards to level of education, 164 (37.9%) had attained SHS level of education and few 23 (5.3%) had no formal education. Majority 380 (88%) were Christians by religion. Also, most 172 (39.8%) belong to other tribes such as the Ga-Adangbe, Krobo etc. Majority of the study participants 283 (65.5%) were active members of the National Health Insurance Scheme (NHIS) and majority 358 (82.8%) do not have any chronic disease.

Table 1 Background Characteristics of Study Participants

Characteristics	Abokobi N = [32]	Adenta N = [269]	Frafraha N = [130]	Total N = [431]	p-value
		n (%)			
Age group (years)					
18-25	13 (40.6)	96 (35.7)	42 (32.1)	151 (34.9)	
26-35	8 (25.0)	98 (36.4)	52 (39.7)	158 (36.6)	
36-45	2 (6.3)	58 (21.6)	24 (18.3)	84 (19.4)	
46+	9 (28.1)	17 (6.3)	13 (9.9)	39 (9.0)	0.002
Sex					
Male	11 (34.4)	145 (53.9)	62 (47.7)	218 (50.5)	
Female	21 (65.6)	124 (46.1)	68 (52.3)	213 (49.4)	0.083
Marital status					
Never married	22 (68.8)	158 (58.7)	80 (61.1)	260 (60.2)	
Currently married	5 (15.6)	88 (32.7)	39 (29.8)	132 (30.6)	
Divorced/separated/widowed	5 (15.6)	23 (8.5)	12 (9.2)	40 (9.3)	0.306
Alternate occupation					
Unemployed	4 (12.5)	55 (20.5)	27 (20.6)	86 (19.9)	
Artisan	5 (15.6)	34 (12.6)	15 (11.5)	54 (12.5)	
Civil servant	16 (50.0)	140 (52.0)	71 (54.2)	227 (52.5)	
Trader	7 (21.9)	40 (14.9)	18 (13.7)	65 (15.1)	0.858
Educational level					
No formal education	6 (18.8)	10 (3.7)	7 (5.3)	23 (5.3)	
Primary	0 (0.0)	5 (1.9)	8 (6.1)	13 (3.0)	
JHS	9 (28.1)	65 (24.2)	34 (25.9)	108 (25.0)	
SHS	10 (31.3)	102 (37.9)	52 (39.7)	164 (37.9)	
Tertiary	7 (21.9)	87 (32.3)	30 (22.9)	124 (28.7)	0.004
Religion					
Christian	31 (96.)	235 (87.4)	114 (87.0)	380 (88.0)	
Islam	1 (3.1)	31 (11.5)	15 (11.5)	47 (10.9)	
Traditional	0 (0.0)	3 (1.1)	2 (1.5)	5 (1.2)	0.600
Ethnicity					
Akan	9 (28.1)	104 (38.7)	50 (38.2)	163 (37.7)	
Ewe	6 (18.8)	62 (23.1)	29 (22.1)	97 (22.5)	
Other	17 (53.1)	103 (38.3)	52 (39.7)	172 (39.8)	0.613
Have any chronic disease					
Yes	7 (21.9)	38 (14.1)	29 (22.1)	74 (17.1)	
No	25 (78.1)	231 (85.9)	102 (77.9)	358 (82.8)	0.104
Active on NHIS					
No	9 (28.1)	82 (30.5)	58 (44.3)	149 (34.5)	
Yes	23 (71.9)	187 (69.5)	73 (55.7)	283 (65.5)	0.018

4.2 Knowledge and Awareness of COVID-19 Vaccine

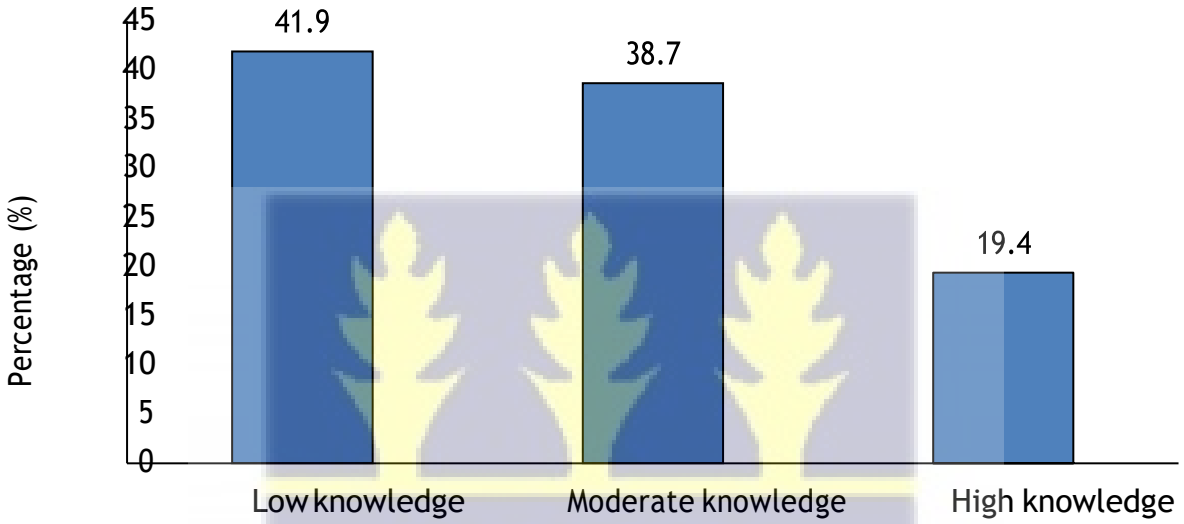
Study participants were also assessed on their knowledge on COVID-19 vaccine on a five (5) point Likert scale. Agree and strongly agree responses were grouped as one whereas disagree and strongly disagree response were grouped as one. Neutral responses were ranked as separate groups. More than half 227 (52.6%) agreed that COVID-19 can be prevented by vaccines and that taking COVID-19 vaccine protects one against infection 243 (56.3%). However, 38.4% were neutral on the statement that, there is no harm in taking COVID-19 vaccine. Only 141 (32.6%) agreed there is harm in taking COVID-19 vaccine. Majority 369 (85.4%) of the study participants agreed that COVID-19 vaccine is available free of cost and also about half 254 (58.8%) agreed COVID-19 vaccine is useful in protecting one against infection. Further, most 260 (60.2%) agreed that benefits of COVID-19 vaccines outweigh the risk involved and the uptake of COVID-19 vaccine is a societal responsibility 278 (63.3%). Less than half 177 (41.0%) agreed that sufficient data exists regarding the efficiency and efficacy of COVID-19 vaccine and the vaccine will help eradicate infection 208 (48.2%). However, majority 284 (65.7%) were neutral on the statement that, after getting vaccinated, there is no need to follow preventive measures. More than half, 252 (58.3%) of participants agreed that there is currently no effective treatment for COVID-19 and that they there are aware many people are taking the COVID-19 vaccine (263 (60.9%)). About half of the study participants agreed that one can be re-infected with COVID-19.

Table 2 KNOWLEDGE ON COVID-19 VACCINE INDEX

	Knowledge and awareness of COVID-19 vaccine	Agree/strongly agree	Neutral	Disagree/Strongly disagree
			n (%)	
1	One can be reinfected with COVID-19	233 (53.9)	113 (26.2)	86 (19.9)
2	COVID-19 can be prevented by vaccine	227 (52.6)	101 (23.4)	104 (24.1)
3	Taking COVID-19 vaccine protects one against COVID-19	243 (56.3)	84 (19.4)	105 (24.3)
4	There is no harm in taking COVID-19 vaccine	141 (32.6)	166 (38.4)	125 (28.9)
5	COVID-19 vaccine is useful in protecting one against COVID-19	254 (58.8)	84 (19.4)	94 (21.8)
6	COVID-19 is available free of cost	369 (85.4)	32 (7.4)	31 (7.2)
7	The benefits of COVID-19 vaccines outweigh the risk involved	260 (60.2)	77 (17.8)	95 (22.0)
8	Uptake of COVID-19 vaccine is a societal responsibility	278 (63.3)	103 (23.8)	51 (11.8)
9	There is sufficient data regarding the efficiency and efficacy of COVID-19 vaccine	177 (41.0)	124 (28.7)	131 (30.3)
10	Many people are taking the COVID-19 vaccine	263 (60.9)	77 (17.8)	92 (21.3)
11	COVID-19 vaccine will help eradicate infection	208 (48.2)	130 (30.1)	94 (21.8)
12	After getting vaccinated, there is no need to follow preventive measures	103 (23.8)	284 (65.7)	45 (10.4)
13	There is currently no effective treatment for COVID-19	252 (58.3)	140 (32.4)	40 9.3)

4.3 Overall knowledge and awareness on COVID-19 vaccine among community members

Overall knowledge was categorized into low, moderate, and high. Generally, 19.4% of community members had high knowledge on COVID-19 vaccine. An estimated 38.7% and 41.9% had moderate and low Knowledge levels on COVID-19 vaccine.



Knowledge level on COVID-19 among community members

Figure 4: Knowledge level on COVID-19 among community members

4.4 Knowledge level on COVID-19 vaccine stratified by place of residence

Overall knowledge on COVID-19 was high among community members in Adenta (24.2%) compared to Frafraha (13.7%) and Abokobi (3.1%). Similarly, community members with moderate knowledge on COVID-19 vaccine were higher in Frafraha (46.6%) than Adenta (35.7%) and Abokobi (31.3%). An estimated 65.6% and 39.7% of study participants had low knowledge in Abokobi and Frafraha. About 40.1% had low knowledge in Adenta.

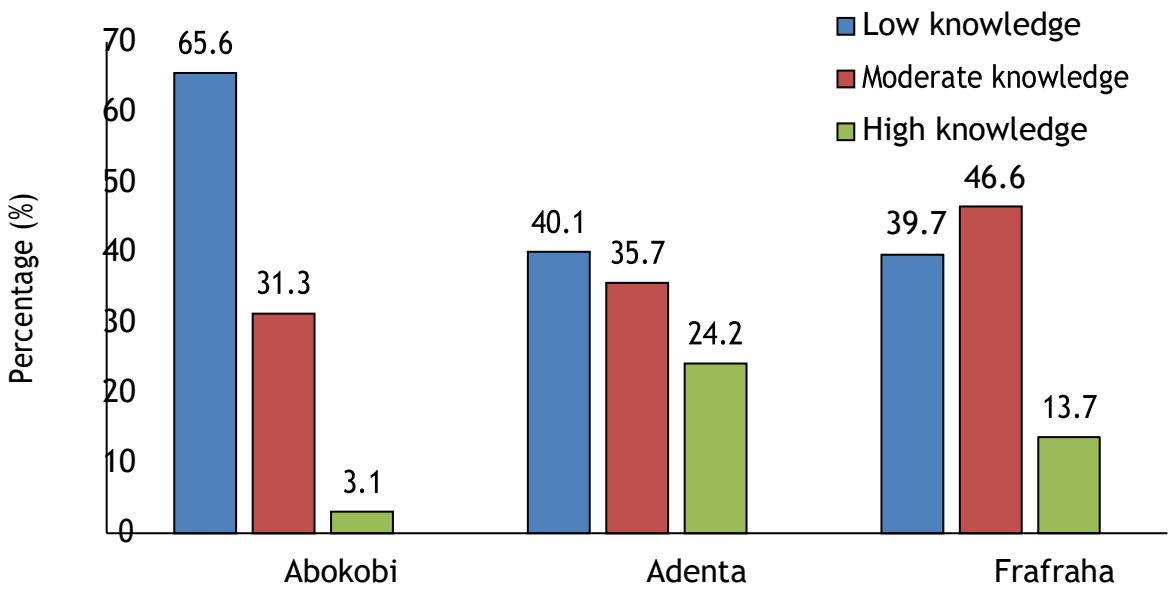


Figure 5: Knowledge level on COVID-19 by place of residence

4.5 Acceptance of COVID-19 vaccine

Community members were also assessed on eminent COVID-19 vaccine acceptance. Participants were asked if they would accept eminent COVID-19 vaccine. An estimated 60.9% agreed to accept COVID-19 vaccine. Only 39.1% did not accept the eminent COVID-19 vaccine.

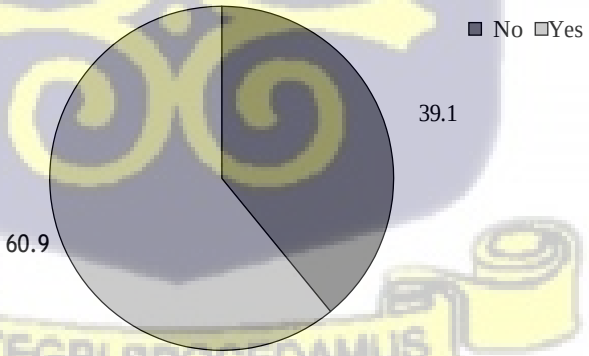


Figure 6: Acceptance of COVID-19 vaccine among community members

4.6 Acceptance of COVID-19 Vaccine by Place of Residence

Prevalence of COVID-19 vaccine acceptance was also assessed by place of residence. Acceptance of COVID-19 vaccine was high (63.4%) in the Adenta community as compared to Frafraha (29%) and Abokobi (6.5%).

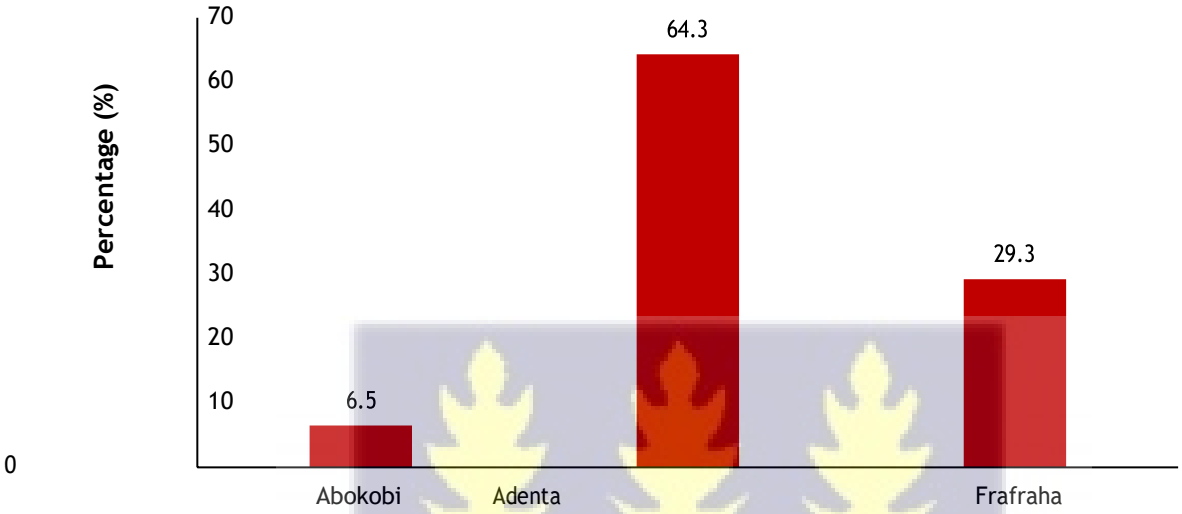


Figure 7: Acceptance of COVID-19 vaccine among community members by place of residence

4.7 Association between Socio-Demographic Characteristics and acceptance of COVID-19 Vaccine

The Chi-square test was used to determine association between socio-demographic characteristics and the acceptance of COVID-19 vaccine. There was a significant association between marital status and acceptance of COVID-19 vaccine ($\chi 2=12.140$: $p=0.002$). There was also a significant association between religion ($\chi 2=6.971$: $p=0.031$), ethnicity ($\chi 2=10.533$: $p=0.005$) and acceptance of COVID-19 vaccine. Further, being an active NHIS member ($\chi 2=26.266$: $p<0.001$) and willing to pay for COVID-19 vaccine ($\chi 2=20.222$: $p<0.001$) were associated with the acceptance of COVID-19 vaccine. Finally, being aware of the uptake of COVID-19 vaccine by role models in

the community was also associated with the acceptance among community members ($\chi 2=7.201$: $p=0.007$) (Table 4.3). However, age, gender, level of education, having chronic disease were not associated with acceptance of COVID-19 vaccine.

Table 3 Association between socio-demographic characteristics and COVID-19 vaccine acceptance

Characteristics	No n = [169] n (%)	Yes n = [263]	$\chi 2$	p-value
Age group (years)				
18-25	67 (39.6)	84 (31.9)		
26-35	58 (34.3)	100 (38.0)		
36-45	32 (18.9)	52 (19.8)		
46+	12 (7.1)	27 (10.3)	3.31	0.346
Sex				
Male	84 (50.0)	129 (49.1)		
Female	84 (50.0)	129 (49.1)	0.037	0.847
Marital status				
Never married	119 (70.4)	141 (53.6)		
Currently married	38 (22.5)	94 (35.7)		
Divorced/separated/widowed	12 (70.4)	141 (53.6)	12.140	0.002
Alternate occupation				
Unemployed	24 (14.2)	41 (15.6)		
Artisan	45 (26.6)	41 (15.6)		
Civil servant	17 (10.1)	37 (14.1)		
Trader	83 (49.1)	144 (54.7)	8.374	0.039
Educational level				
No formal education	11 (6.5)	12 (4.6)		
Primary	3 (1.8)	10 (3.8)		
JHS	39 (23.1)	69 (26.2)		
SHS	71 (42.0)	93 (35.4)		
Tertiary	45 (26.6)	79 (30.0)	4.162	0.384
Religion				
Christian	141 (83.4)	239 (90.9)		
Islam	24 (14.2)	23 (8.8)		
Traditional	4 (4.4)	1 (0.4)	6.971	0.031
Ethnicity				
Akan	49 (29.0)	114 (43.5)		
Ewe	48 (28.4)	49 (18.6)		
Other	72 (42.6)	100 (38.0)	10.533	0.005
Have any chronic disease				
Yes	28 (19.2)	46 (19.4)		
No	118 (80.8)	191 (80.6)	0.030	0.956
Active on NHIS				
No	83 (49.1)	66 (25.1)		

Yes	86 (50.9)	197 (74.9)	26.266	<0.001
Awareness of COVID-19 vaccine uptake by role models				
No	93 (55.0)	110 (41.8)		
Yes	76 (45.0)	153 (58.2)	7.201	0.007
Willing to pay for COVID-19 vaccine				
No	152 (89.9)	189 (71.9)		
Yes	17 (10.1)	74 (28.1)	20.222	<0.001
Knowledge on COVID-19 vaccine				
Low	117 (69.3)	64 (24.3)		
Moderate	42 (24.8)	125 (47.5)		
High	10 (5.9)	74 (28.1)	89.307	<0.001

4.8 Binary Logistic Regression of Factors Associated with the acceptance of COVID-19 Vaccine

Table 4.4 summarizes results of univariate and multivariate logistic regression models. In the univariate model, marital status, ethnicity, active member of NHIS, awareness of uptake of COVID-19 by role models and willing to pay for COVID-19 vaccine predicted the acceptance of COVID-19 among community members. Community members who were currently married were 2.08 times more likely to accept COVID-19 vaccine compared to those who were never married [OR=2.08 (95% CI: 1.33-3.27); p<0.001]. Also, those belonging to the Ewe and other tribe were 56% and 41% less likely to accept COVID-19 vaccine compared to those belonging to the Akan religion [OR=0.44 (95% CI: 0.26-0.74); p=0.002] and [OR=0.59 (95% CI: 0.38-0.93); p=0.025] respectively. However, community members who are active on NHIS were 2.88 times more likely to accept the COVID-19 vaccine compared to those not on NHIS [OR=2.88 (95% CI: 1.91-4.34); p<0.001]. Communities aware of the uptake of COVID-19 vaccine by role models were 1.7 times more likely to accept the vaccine as compared to those who were unaware of uptake of COVID-19 vaccine by role models [OR=1.70 (95% CI: 1.15-2.51); p=0.007]. Further, those willing to pay for COVID- 19 vaccine were 3.5 times more likely to accept the COVID-19 vaccine as compared to those who were not willing to pay for COVID-19 vaccine [OR=3.50 (95% CI: 1.98-6.18);

p<0.001]. In the multivariate model, variables that were significant in the univariate were considered. Results have shown that, belonging to the Ewe tribe, having an active NHIS, willing to pay for COVID- 19 vaccine and having adequate knowledge on COVID-19 vaccine were significantly associated with the acceptance of the vaccine. Participants belonging to the Ewe tribe were 59% less likely to accept the COVID-19 vaccine compared to those belonging to the Akan tribe [AOR=0.41 (95% CI: 0.22-0.76); p=0.005]. Further, participants with active NHIS were 1.67 times more likely to accept the COVID-19 vaccine compared to those without active NHIS [AOR=1.67 (95% CI: 1.03- 2.67); p=0.034]. Those willing to pay for COVID-19 vaccine were also 2.66 times more likely to accept the vaccine compared to those not willing to pay for vaccine [AOR=1.67 (95% CI: 1.40- 5.05); p=0.003]. In addition, participants with moderate and high levels of knowledge and awareness on COVID- 19 vaccine were 4.85 and 9.46 times more likely to accept the COVID-19 vaccine compared to those with low knowledge and awareness [AOR=4.85 (95% CI: 2.95-7.99); p<0.001] and [AOR=9.46 (95% CI: 4.37-20.51); p<0.001] respectively.

Table 4 Factors influencing the acceptance of COVID-19 vaccine

Characteristics	COR	95% CI	p-Value	AOR	95% CI	p-Value
Age group (years)						
18-25						
26-35	1.37	[0.87-2.16]	0.171			
36-45	1.29	[0.75-2.23]	0.351			
46+	1.79	[0.85-3.80]	0.127			
Sex						
Male						
Female	0.96	[0.65-1.41]	0.847			
Marital status						
Never married						
Currently married	2.08	[1.33-3.27]	0.001	0.98	[0.39-2.42]	0.969
Divorced/separated/widowed	1.96	[0.95-4.04]	0.065	0.60	[0.35-1.01]	0.057
Alternate occupation						
Formal employment	2.39	[1.17-4.85]	0.017			
Informal employment	1.90	[1.15-3.14]	0.012			
No alternate employment	1.87	[0.97-3.62]	0.061			
Educational level						
No formal education						
Primary	3.05	[0.66-14.07]	0.152			
JHS	1.62	[0.65-4.01]	0.296			
SHS	1.20	[0.50-2.87]	0.682			
Tertiary	1.61	[0.65-3.94]	0.298			
Religion						
Christian						
Islam	0.56	[0.31-1.03]	0.066			
Traditional	0.14	[0.01-1.33]	0.088			
Ethnicity						
Akan						
Ewe	0.44	[0.26-0.74]	0.002	0.41	[0.22-0.76]	0.005
Other	0.59	[0.38-0.93]	0.025	0.67	[0.39-1.13]	0.137
Have any chronic disease						
Yes						
No	0.98	[0.58-1.66]	0.956			
Active on NHIS						
No						
Yes	2.88	[1.91-4.34]	<0.001	1.67	[1.03-2.67]	0.034
Residence						
Abokobi						
Adenta	1.49	[0.71-3.11]	0.288			
Fafraha	1.28	[0.57-2.73]	0.562			
Awareness of uptake of COVID-19 by role models						
No						
Yes	1.70	[1.15-2.51]	0.007	1.11	[0.69-1.76]	0.653
Willing to pay for COVID-19 vaccine						

No						
Yes	3.50	[1.98-6.18]	<0.001	2.66	[1.40-5.05]	0.003
Knowledge on COVID-19 vaccine						
Low						
Moderate	5.44	[3.42-8.65]	<0.001	4.85	[2.95-7.99]	<0.001
High	13.52	[6.53-27.99]	<0.001	9.46	[4.37-20.51]	<0.001

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

Millions of individuals were afflicted by the COVID-19 outbreak around the world. COVID-19 does not appear to have a definite treatment available. Vaccination, on the other hand, has been gaining traction for months. (Bar-Zeev & Inglesby, 2020). The proper use of a face mask, social distancing, and the use of alcohol-based hand sanitizers, among other prevention treatments, are still suggested. Since the release of COVID-19 vaccinations under the emergency use act, such as the Pfizer and Moderna RNA vaccines, AstraZeneca and Johnson & Johnson vaccines, and others, the disease's negative effects, such as death and extended hospitalizations, have dropped dramatically. In the aftermath of the pandemic, several issues have surfaced, including economic setbacks, negative health and well-being impacts (Hogan et al., 2020), (Hogan et al., 2020) as well as vaccination reluctance.

Vaccines are typically effective interventions that can reduce the global burden of disease, and diseases, such as smallpox, have been eradicated thanks to long-term immunization programs. Sadly, low vaccination acceptance is becoming an extremely serious concern for public health efforts. Even though COVID-19 vaccinations are accessible in Ghana and that millions of doses have been administered, there is little data on popular acceptance. As a result, the willingness of community members to accept the COVID-19 vaccine was tested in this study.

According to the findings, about 6 out of 10 people agree d to accept the COVID-19 vaccine. This is higher than the 37.4 percent reported in Jordan, but like the 64.5 percent reported in Malaysia for the COVID-19 vaccination. (Mohamed et al., 2021) and Bangladesh with an estimated 61.2% level of acceptance (Mahmud et al., 2021). This study's acceptance percentage is greater than a

prior study in Ghana, where 54.1% of research participants were willing to accept the COVID-19 vaccination (Lamptey et al., 2021). Other studies (Fisher et al., 2020; Neumann-Böhme et al., 2020) reported low levels of COVID-19 vaccine acceptance in Russia (54.9 %), Poland (56.3 %), the United States (56.9%), and France (58.9%). Even though more than half of the participants were eager to accept the COVID-19 vaccine, roughly a quarter were insistent. To achieve herd immunity, this offers a significant public health problem. Failure to accept the vaccine could be attributed to concerns about its safety and efficacy, as well as a lack of general information about COVID-19. This fear is in conformity with the results of Pogue and colleagues, who found that most participants were concerned about the COVID-19 vaccine's negative effects (Pogue et al., 2020). Low use was linked to lack of trust in the government's ability to control the transmission of COVID-19 and skepticism about the vaccine's efficacy

Furthermore, the idea that better understanding of COVID-19 vaccine could impact COVID-19 vaccine acceptance has not been well investigated. Misinformation and misconceptions about the COVID-19 vaccine have circulated and been reposted on various social media channels, adding to the load. Some people have speculated that using mRNA genetic material in vaccinations could affect human DNA. Additionally, the quick development of COVID-19 vaccines is said to have created safety concerns. As a result, determining the public's knowledge level on COVID-19 is critical. Knowledge and awareness of COVID-19 vaccine was found to be low in this study. Only around a quarter of the participants knew a lot about COVID-19 vaccines. However, this is substantially lower than what was documented in Bangladesh, where almost 40% of research participants had a good level of understanding about the COVID-19 vaccine (Mahmud et al., 2021). In a study performed in Northern part of Ghana, it was discovered that roughly 85.5%of pregnant women had adequate knowledge of COVID-19 vaccine (Kumbeni et al.,

2021). It is vital to project public acceptability of the COVID-19 vaccine and discover determinants of vaccine acceptance to ensure equal deployment of the vaccines. People who were married agree to accept COVID-19 vaccine than those who were unmarried in this study. This is in line with the findings of a Bangladesh study, which found that individuals who were married were nearly two times more likely to be vaccinated than those who were not (Mahmud et al., 2021). In addition, according to a study performed in Saudi Arabia, marital status is a key factor influencing acceptance the COVID-19 vaccines (Al-Mohaithef & Padhi, 2020). It is possible that this finding is related to the fact that married couples tend to be health- conscious because of each other's encouragement. Additionally, those who are married may see it as an ethical and family duty to protect their families from illness, therefore accepting the vaccine may be a choice for them.

When looking into vaccine acceptability, it is crucial to consider the religion and tribe of the vaccine recipient. The readiness to receive the COVID-19 vaccine was likewise influenced by ethnicity in the current investigation. Community members from the Ewe tribe, as well as other tribes like the Krobo, were less inclined to embrace the COVID-19 vaccine. Individual beliefs and the depth of tribes could be the cause of this discovery. Adherence to tribal ideas is often held in high regard in most African cultures. In fact, these beliefs have a greater influence on health-seeking behavior. Furthermore, even though the vaccine is free, community members on active NHIS were more inclined to accept the COVID-19 vaccine than those who were not. The advent of the National Health Insurance Scheme (NHIS) in Ghana has offered free treatments and care for many years. The possibility of individuals wanting to accept under the NHIS will be great if they have this awareness, assurance, and reliability. Furthermore, those who were willing to pay

for the COVID-19 vaccines were more likely to accept it than those who were not. This finding is consistent with research conducted in Jordan and Bangladesh, which found that vaccine acceptance was predicted by willingness to pay for the vaccine. According to the findings of this study, vaccination acceptability is also determined by proper knowledge of the COVID-19 vaccine. Community members who knew a lot about the COVID-19 vaccine were more likely to accept it. In health emergencies, prevention, containment, and community engagement is critical. In outbreak scenarios, the role of community engagement is not new. It is seen as critical in reacting to any disease outbreak, because perceived severity among the at-risk population frequently varies from that of professionals. In response to the COVID-19 outbreak, a variety of community engagement measures have been developed. People, for example, have a fundamental right to be informed about and comprehend the health hazards they face, as well as get practical advice on how to protect themselves. Having access to scientific knowledge from a reliable source is also essential. Public education was a major community engagement in Ghana. The influence of some notable community members' awareness of the COVID-19 vaccine uptake was investigated in this study. Participants who were aware of some notable people in the community receiving the COVID-19 vaccine were more likely to accept the vaccine. The study has a few drawbacks. First and foremost, because the study was cross-sectional and therefore causality could not be established. To understand how COVID-19 vaccination uptake changes over time, subsequent research should take longitudinal studies into consideration. Additionally, the study examined vaccination acceptance rather than vaccination uptake for the COVID-9 vaccine. Subsequent research should further examine the acceptance and uptake of the COVID-19 vaccination. Despite these drawbacks, the study identifies the factors affecting COVID-19 vaccine acceptance in Adenta, Frafraha, and Abokobi.

CHAPTER SIX

6.0 Conclusion

About 6 in 10 community members were willing to accept COVID-19 vaccine. Acceptance sss of COVID- 19 was profound in the Adenta community compared to Abokobi and Frafraha. However, there is inadequate knowledge on COVID-19 vaccine. Willing to pay for COVID-19 vaccine, having a valid NHIS and having moderate and high knowledge on COVID-19 vaccine predicted acceptance. However, participants belonging to the Ewe tribe were less likely to accept the COVID-19 vaccine.

6.1 Recommendation

1. Generally, it was observed from the study that low knowledge on COVID-19 among community members in the three communities had a higher percentage. Public education should be conducted by the relevant stake holders in the three communities to improve vaccine information awareness and knowledge.
2. The study also showed that ethnicity affects the acceptance of the COVID-19 vaccine. Further research on the effect of ethnicity on the acceptance of COVID-19 vaccine should be considered in future.
3. Health practitioners, media personnel, government officials, community representatives, political groups, and the local assembly must all take the COVID-19 vaccine publicly. Communities aware of the acceptance of the vaccine by role models were more likely to accept the vaccine as compared to those who were unaware of acceptance. They must also that work together to deliver integrated, evidence-based training, communication

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APPENDIX

Appendix A: Participant Information Sheet.

Title of study: Factors affecting COVID-19 vaccine acceptance among residents in Adenta, Frafraha and Abokobi.

Introduction
I am a master's student of the School of Public Health, University of Ghana, Legon. I am conducting a study on The Factors affecting COVID-19 vaccine acceptance and uptake among residents in Adenta, Frafraha and Abokobi.

Background and Purpose of the study
The aim of the study is to determine the factors that affect COVID- 19 vaccine acceptance among residents in Adenta, Frafraha and Abokobi.

Risk and benefits
The study will educate participants on COVID-19 and the importance of the COVID-19 vaccine. The results of the study would help The Municipality Health Directorates and other saccepholders on formulating policies to improve on the COVID- 19 vaccination activities.
Also, it will help the nation to implement programs to educate the public on the importance and advantages of COVID- 19 vaccine acceptance and uptake. There are no risks involved in the study.

Costs/or payments to subjects for participation in the research
There will be no costs for participating in the research. Also, you will not be paid to participate in the research project.

Anonymity and confidentiality
I would like to assure you that whatever information you will provide will be handled with strict confidentiality and will be used purely for research process. Your responses will not be shared with anybody who is not part of the study team. Data analysis will be done at aggregate level to ensure anonymity.

Freedom to participate/ Voluntary withdrawal
Participants' opinions are important, so we want you to be very honest and truthful in answering our questions.
Your participation is completely voluntary and you may refuse to participate in answering the questionnaire at any time.

Who to Contact
In cases of any questions regarding the research, you can contact:

1. GHS/ Ethical Review Committee administrator, Hannah Frimpong (mobile: 0507041223)
2. School of Public health, University of Ghana, Legon. Or
3. Williet Adade Mobile number: 0540908625 Email: willietaroo@gmail.com.

Appendix B: Consent Form

Study Title: Factors affecting COVID-19 vaccine acceptance among residents in Adenta, Frafraha and Abokobi.

Participants' Statement

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (……name of language). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research. Name of Participant……..

Participants' Signature ……...OR Thumb Print……

Date:……

Interpreters' Statement

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (…name of language…) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter…….. OR Thumb Print …….....

Date:……
Contact Details:……..

Statement of Witness

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (….name of language) I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:……

Signature…….. OR Thumb Print …….....

Date:……

Investigator Statement and Signature

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name……

Signature …….

Date…….

Appendix C: Questionnaire

My name is .....from the School of Public Health, University of Ghana. We are asking for your help in carrying out an important study on factors affecting COVID-19 vaccine acceptance.

This study will give you information about you're the COVID-19 virus and the importance of the COVID-19 vaccine uptake and acceptance. Your participation is very important to the success of the study. All information that you give us will be treated with care and will not be released to anyone but researchers conducting the study. Confidential information will be stored in locked files accessible only to study staff.

We would administer a questionnaire. Do feel free to skip any question in the form. Please do you have any questions about the study?

Thank you for agreeing to participate in this important research project. A: General Information

Participants code: ……..……

Name of participant:…….

Contact information:……..

Name of interviewer:……

Date of interview: ……

Place of interview: …….

Section A

1. Gender:
   ◯Female ◯Male
2. Age:
   ◯18–25 years ◯26–35 years ◯36–45 years ◯above 46 years3. Profession: ……
4. Where do you live?
   ◯Frafraha ◯Adenta ◯Abokobi
5. Educational level
   ◯None ◯Primary ◯Junior High ◯Secondary ◯Tertiary
6. Tribe
   ◯Akan ◯Ewe ◯ Fante ◯Ga ◯Ga-Adangbe ◯Others (Specify)……
7. Marital Status
   ◯Currently married◯ never married ◯Divorced/Separated/Widowed
   .8. Number of children……
9. Do you have any chronic disease?
   ◯ Yes ◯ No
10. Do you have a valid National Health Insurance Card?
    ◯ Yes ◯ No
11. How will you rate your overall health?
    ◯Very good ◯ Good ◯ Fair ◯ Poor◯ Very poor

Section B

12. COVID-19 testing/Infection status
    ◯Not tested/Does not know test results ◯Tested Positive ◯ Tested negative
13. Perceived severity of COVID-19 if infected

◯Very severe ◯somewhat severe ◯Not particularly severe◯ Not severe at all ◯ I don't know

14. Where did you hear about COVID-19?
◯Social Media ◯Government radio TV ◯Newspapers ◯Internet ◯My surrounding ◯Others: ….
15. Can you be re-infected after recovering from COVID-19 infection?
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree
16. COVID-19 can be prevented by vaccine?
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree
17. There is currently an effective vaccine against COVID-19?
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree Section C
18. Have you acceptn the COVID-19 vaccine?
◯ Yes ◯ No
18. If no, are you willing to accept the COVID-19 vaccine?
◯ Yes ◯ No ◯ I don't know ◯ others (Please Specify) ……
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree
19. If no, why would you refuse COVID-19 vaccination?
◯I don't think COVID-19 exists ◯I think the vaccine is not effective ◯I think the vaccine is designed to harm us ◯ I am scared of side-effects of the vaccine ◯Others(Please Specify)……
14. Taking the COVID-19 vaccine protects you against COVID-19 infection
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree
15. Taking the COVID-19 vaccine protects others against COVID-19 infection
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
16. I will recommend my family and friends to get vaccinated against COVID-19
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree◯ Strongly Agree
17. I think there is no harm in taking COVID-19 vaccine
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
18. COVID-19 is available free of charge
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
20. My health care provider has recommended me to accept the vaccine
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
21. I feel the benefits outweighs the risk involve
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree 22 I believe that taking the COVID-19 vaccine is a societal responsibility
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
23. There is sufficient data regarding the vaccine's safety and efficacy released by the government
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
24. Many people are taking the vaccine
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
25. Taking the COVID-19 vaccine will help eradicate COVID-19
◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree
26. My role models/ politicians/ leaders have acceptn the COVID-19 vaccine

◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree

27. After taking the COVID-19 vaccine, I don't need to follow preventive measures such as wearing of nose mask, frequent hand washing, social distancing, and sanitization

◯Strongly disagree ◯ Disagree ◯ Neutral ◯Agree ◯ Strongly Agree