An Online Survey on COVID-19 Vaccine Hesitancy among Facebook Users in Mogadishu, Federal Republic of Somalia

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MSc Tropical and Infectious Diseases

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Declaration of Originality

I, Dr. Ikram Abdulahab Mo'allim Mohamed, of Faculty of Health Sciences, Department of Medical Microbiology and Immunology, declare that this dissertation titled: "An Online Survey on COVID-19 Vaccine Hesitancy among Facebook Users in Mogadishu, Federal Republic of Somalia" for the award of Master of Science in Tropical and Infectious Diseases is my original work and has not been submitted elsewhere for consideration. Where other people's work or my previous own work has been used, this has been properly acknowledged and referenced according to the University of Nairobi's requirements. I have not sought or used the services of any professional agencies to produce this work and I have not allowed and shall not allow anyone to copy my work with the intention of passing it off as her/his own work. I understand that any false claim in respect to this proposal shall result in disciplinary action in accordance to the University Plagiarism Policy.

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List of Abbreviations and Acronyms

Acronym	Meaning
COVAX	COVID-19 Vaccines Global Access
COVID-19	COVID-19: 2019 Coronavirus Disease
ERB	Ethical Review Board
IP address	Internet protocol address
KAVI-ICR	KAVI Institute of Clinical Research
MBs	Megabytes
PBC	Perceived Behavioral Control
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
WHO	World Health Organization

Operational Definitions

Term	Definition
Confounder	A factor independently related to both the risk factor and the outcome but is not on their causal pathway (1).
Conspiracy	Agreement by more than two people for an evil purpose (2)
Determinant	A determining factor (2)
Logistic regression	A statistical model used for predictive analysis of the probability of a binary or multinomial dependent variable (3).
Non-*halal*	Not fit to use according to Islamic law (2)
Survey Monkey	An online survey software for creating and sending surveys (4)
Vaccine Hesitancy	Reluctance to be vaccinated (2)

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Abstract

Introduction: During the height of the COVID-19 pandemic, Somalia faced challenges with mass vaccination such as limited vaccine supplies and vaccine hesitancy. Identifying reasons for vaccine hesitancy will inform the development of evidence-based interventions to address the challenge.

Objectives: The objective of this study was to assess the level of COVID-19 vaccine hesitancy among Facebook users in Mogadishu, Somalia; and to identify the reasons for vaccine hesitancy.

Methods: A cross-sectional study design using an online survey was applied. Data was collected from internet-connected adult Mogadishu residents. Recruitment of participants was done online through social media. Data on the demographics of the participants, willingness to be vaccinated, and views on determinants of vaccine hesitancy was collected using a structured questionnaire. Nine preselected determinants were considered; they included low confidence in the vaccine, side effects, efficacy, mistrust of government, perception of vaccine information as inconsistent and contradictory, perception of health status as not susceptible to severe disease, a belief that the COVID-19 and its vaccine are created to benefit pharmaceutical businessmen, and a belief that COVID-19 vaccines are made with non-*halal* compounds. Data was analyzed to obtain proportions of participants with vaccine hesitancy and other characteristics. Bivariable logistic regression analysis and multivariable logistic regression analysis assess any association between vaccine uptake and hesitancy with the independent variables.

Results

A total of 1325 respondents met the inclusion criteria. They were mainly university students without income and residing in Hodan and Wadajir districts in Mogadishu. Nineteen percent had been vaccinated against COVID-19. The percentage of the participants with vaccine hesitancy was 65% overall and 71% among those aged 18-26 years. Factors that emerged as significantly

associated with vaccine hesitancy were age, occupation, and income. The odds of vaccine hesitancy of participants aged less than 26 years, working in healthcare, and earning less than the mean income ($278) were 4.4, 2.9, and 3.4 times the odds of vaccine hesitancy among participants aged more than 25 years, not working in healthcare, and earning more than $278, respectively. More than 70% indicated that their confidence in the COVID-19 vaccine was low because the vaccine has side effects and is not effective. Similarly, more than 70% indicated that they did not trust the government to administer a safe vaccine, their risk of getting COVID-19 would remain the same even after getting vaccinated, the information about COVID-19 vaccines is inconsistent and contradictory, and their health status can cope with SARS-CoV-2 infection without risk for severe disease.

Conclusion

Majority of internet-using Mogadishu residents are vaccine-hesitant. Multiple factors contribute to the COVID-19 vaccine hesitancy. All the nine determinants of vaccine hesitancy included in the model are important. Interventions to increase vaccine acceptance in Mogadishu should target the factors and determinants highlighted in this survey. Future surveys should use larger sample sizes for precision of predictions and apply systematic sampling to enhance representativeness and generalizability of findings.

Chapter 1: Introduction

Globally, over 762 million cases and 6.8 million deaths of COVID-19 had been confirmed as of April 2023 (5). The first case of COVID-19 in Somalia was reported on 16th March 2020 (6). As of November 2021, Somalia had reported 22,837 cases and 1,313 deaths to the World Health Organization (WHO) (7). The confirmed cases and deaths had only increased to 27334 and 1361 respectively by April 2023 (8). Benadir state, where Mogadishu is located, had the highest proportion of the cases, about 30% of the total cases in the country (9). The cases and deaths could be under-reported because Somalia's registration system is underdeveloped and the healthcare system is weak (10). Estimation of daily burial rates based on geospatial data of cemeteries revealed that burial rates had increased 1.5-2.2-fold during the pandemic compared to pre-pandemic times (10). Therefore, COVID-19 is a substantial problem in Somalia just as it is in the rest of the world.

It is generally believed that the best promising way of ending the COVID-19 pandemic is by using an effective preventive vaccine. There are currently several COVID-19 vaccines that are efficacious and have been approved by several countries and the World Health Organization (WHO). These include vaccines such as ChAdOx1-S [recombinant] vaccine, Pfizer-BioNtech, Mrna-1273, Janssen, Sinovac-CoronaVac, Sinopharm, Sputnik V, and Novavax (11), to mention a few.

As of January 2022, about 10 billion vaccine doses had been administered globally (5). In Africa, slightly above 130 million doses had been administered as of 22nd September 2021 (12). The approach of focusing on mass vaccination against COVID-19 to curb the pandemic is taking center stage in Somalia as is the global trend. By 15th November 2021, Somalia had administered 964, 433 vaccine doses (1).

As key informants in a study by Besson et al. (10) indicated, Somali residents are not effectively adhering to COVID-19 prevention measures commissioned by the government. The challenges the key informants listed include an overburdened public health system, a capacity gap for handling COVID-19 among healthcare professionals, and the inaccessibility of materials such as face masks and antiseptics needed for the prevention of COVID-19 (10). Such challenges may also derail the administration and uptake of COVID-19 vaccines.

Even when vaccines are available, uptake may remain low when they are not mandated. Trends in the uptake of childhood vaccines have shown that mandating vaccines improves uptake (13). As long as the uptake of vaccines is voluntary, having governments avail the vaccines does not guarantee uptake (14). COVID-19 vaccine uptake rates in Africa range from 15% to 89% (15). Somalia launched a COVID-19 vaccination drive on 16th March 2021 by targeting 300, 000 people in priority groups in phase 1 (16). However, by 16th June 2021, only about half of the target population size had received the vaccine. Despite the three-month gap between the start of the vaccination drive and the assessment of uptake, only 15% of recipients of the first dose had received the second dose by 16th June 2021 (16).

The COVID-19 Vaccine Global Access (COVAX) Facility has been supplying Somalia with COVID-19 vaccines (16). By June 2021, it had supplied 43% (300000/400000) of the COVID-19 vaccines available in Somalia. Since most developed countries have vaccinated the majority of their residents, some are supporting developing countries such as Somalia to vaccinate their populations through strategies like donation of vaccine doses. For example, China donated 200, 000 Sinopharm vaccines to Somalia. The United Arab Emirates also donated 200, 000 doses of the Sputnik vaccine to Somalia (16). The support has to some extent contributed to addressing the challenges of limited vaccine supply (16).

1.1 Problem statement

Vaccine hesitancy may slow or delay the uptake of the COVID-19 vaccines. While COVID-19 vaccine acceptance rate is more than 50% in most developed countries (17), it is low in developing countries perhaps due to factors such as misinformation, mistrust of the healthcare system, and cultural and religious beliefs (1, 2). For example, only 28% of Democratic Republic of Congo healthcare workers indicated a willingness to be vaccinated against COVID-19 in 2020 (18). In Somalia, an online survey that explored the acceptance of COVID-19 vaccines among Mogadishu University students between December 2020 and January 2021 found that the acceptance rate is 76.8% (n = 3488) (19). By April 2023, only 6.5 million (43%) of the Somalia population had been vaccinated against COVID-19, which is lower than the vaccine acceptance (8). University students are not representative of the general population, hence the need to study vaccine hesitancy and factors associated with it in the general population.

1.2 Rationale/ Study Justification

Vaccine hesitancy is one of the main challenges limiting the uptake of COVID-19 vaccines in Mogadishu. It is alleged that news of side effects associated with the Oxford/AstraZeneca vaccine, which was among the vaccines supplied by COVAX, contributed to the vaccine hesitancy (16). People may also mistrust COVID-19 vaccines for reasons such as containing non-*halal* compounds or being administered by the government that they disdain (20). There is a need to identify population-specific reasons for vaccine hesitancy to inform the development of evidence-based interventions to improve vaccine uptake.

A cross-sectional study (13) conducted between October and December 2020 that assessed vaccine acceptance in the Benadir region of Somalia commonly known as Mogadishu municipality found that 63% of the 500 participants were vaccine hesitant. However, this study was only confined

among individuals at high risk for severe COVID-19. A cross-sectional study conducted among Arab-speaking healthcare workers globally including those in Somalia found a vaccine hesitancy rate of about 30% (21). African countries that were included in the study had the highest rates of vaccine hesitancy ranging from 30-60% (21). On the other hand, a survey (19) conducted between December 2020 and January 2021 in Mogadishu found a high rate of vaccine acceptability with 77% of the 4543 respondents aged between 17 and 30 years indicating a willingness to receive the COVID-19 vaccine once accessible.

Despite the indication of low vaccine hesitancy by Ahmed et al. (19), the uptake of vaccines was considerably low when the vaccines were available (16). Perhaps respondents in the survey did not fall in the risk groups that were prioritized in the initial phases of the vaccination drive given that they were all youths; 65% were students in Mogadishu University since the electronic survey link was mainly distributed through Mogadishu University's media platforms (19). Another survey is required to explore vaccine hesitancy in a wider population group given that university students do not represent the general population. A higher vaccine hesitancy rate in the non-student respondents compared to the students (mean adherence score: 2.69 *versus* 2.82 respectively, $p = 0.002$) is a sign that vaccine acceptance may be lower in the general Mogadishu population than the study estimated (19). Characterizing vaccine hesitancy is vital to facilitate the design of effective interventions for optimal uptake of the vaccines.

The urban-based fixed health center vaccination sites model being used in Somalia implies that people in cities like Mogadishu have higher access to vaccines than people in rural areas. It is more likely to encounter people that are unvaccinated due to hesitancy and not due to inaccessibility in Mogadishu where vaccine access is high than in remote areas (16). Mogadishu is also more likely

than other areas in Somalia to have diverse population groups whose responses provide a broader scope of the reasons for vaccine hesitancy.

Mobile penetration in Somalia is at 51% (22). Mogadishu has a fiber metro ring but connection to the rest of the country is via microwave connections (22). Most likely, Mogadishu has the highest internet penetration in Somalia (23), hence the online survey will reach a more representative population in Mogadishu. Most of the internet users in Somalia are on Facebook (23); 14.3% of Somalia's entire population were Facebook users as of November 2021 (23). Thus, choosing Facebook as the platform for inviting participants to the online survey was strategic.

1.3 Study Questions

1. What proportion of the Facebook users in Mogadishu, Somalia is COVID-19 vaccine-hesitant?
2. What are the reasons for COVID-19 vaccine hesitancy among Facebook users in Mogadishu, Somalia?

1.4 Objectives

1.40 Broad Objective:

To characterize the COVID-19 vaccine hesitancy by residents of Mogadishu in the Federal Republic of Somalia.

1.41 Specific Objectives

1. To assess COVID-19 vaccine hesitancy among Facebook users in Mogadishu, Somalia.
2. To identify the reasons for vaccine hesitancy among Facebook users in Mogadishu, Somalia.

Chapter 2: Literature Review

Vaccine hesitancy is the reluctance to receive the recommended, safe and available vaccines by the targeted people (24). A scoping review (15) to identify reasons for vaccine hesitancy in Africa picked concerns over the safety and side effects of vaccines as the major reasons. Various reasons are associated with vaccine hesitancy in Somalia. An online survey (19) conducted in December 2020 and January 2021 identified reasons for vaccine hesitancy among about 25% of respondents, who indicated they would not receive the vaccine (19). A household survey targeting severe COVID-19 high-risk groups in Mogadishu conducted in 2021 also requested about 41% of their respondents who were vaccine-hesitant, to pick whether their refusal was due to concerns over effectiveness or side effects (14). The reasons for vaccine hesitancy that emerged from the studies are discussed in the following subsections.

2.1 Fear of side effects as a reason for vaccine hesitancy

The reasons provided in the research by Ahmed et al. (19) include claims that the vaccine is ineffective, has side effects, and is not necessary because 'COVID-19 was over in the country'. Fear of side effects was the commonest reason, with 40% of the 1055 respondents that were vaccine-hesitant citing it as the reason (19). Similarly, 52% of vaccine-hesitant respondents in the household cross-sectional study by Ahmed et al. (14) reported side effects as their main reason for refusing the vaccine.

Adverse reactions were the most important vaccine characteristic associated with vaccine refusal in a global cross-sectional study (16), with 41% of the 1933 vaccine-hesitant individuals in the study citing it. In another study that was conducted in Jordan and Kuwait (25), 23% mentioned infertility as the adverse reaction they were fearing in COVID-19 vaccines. Therefore, fear of possible adverse reactions may be a major issue of concern in certain populations.

2.2 Doubting the effectiveness of vaccines as a reason for vaccine hesitancy

Doubts regarding the effectiveness of vaccines also influence vaccine hesitancy. Vaccine ineffectiveness was cited by 19% of participants (14). In the previous related online survey (19), 27% of the respondents indicated vaccine ineffectiveness as their reason for refusing it. About 64% of the participants who did not accept the vaccine considered it ineffective and unsafe (14). In another global study (16), the proportion of the about 1933 vaccine-hesitant individuals that indicated vaccine effectiveness as their reason for concern is 35%. Since vaccine ineffectiveness featured among several respondents as an issue of concern, it could be a determinant of vaccine hesitancy.

2.3 Conspiracy beliefs as a reason for vaccine hesitancy

Conspiracy beliefs could be determinants of reasons for COVID-19 vaccine hesitancy in Mogadishu (26). They are common in Arab-speaking countries, including Somalia (25). Sallam et al. (25) investigated the association between conspiracy beliefs and COVID-19 conspiracy beliefs in Arab-speaking countries including Somalia. They found that about 40% of the 2031 respondents perceived the COVID-19 vaccines as a commercial product whose market was created by developing and releasing the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) to infect and cause disease in the general public. People with conspiracy beliefs are unlikely to accept the vaccine (26). The low vaccine acceptance among participants with this belief indicates that conspiracy beliefs are significant predictors of vaccine hesitancy (25).

2.4 Confidence in individual immunity

Preference for natural immunity is a substantial determinant of vaccine hesitancy (27). About 19% of the vaccine-hesitant respondents in the study by Ahmed et al. (19) expressed that they did not need vaccines because their immunity was strong enough to protect them from COVID-19. Although health education campaigns can reduce the perception that natural immunity is adequate

to prevent COVID-19 (27), the vaccine hesitancy due to confidence in natural immunity before the health education reaches a significant population can significantly derail the uptake of COVID-19 vaccines. Historically, the confidence in natural immunity makes people become only willing to vaccinate when frightening outbreaks occur in their surroundings (28). Apparent death and debility from a particular disease scared people to react by accepting vaccination immediately.

2.5 Belief that COVID-19 vaccines are made from non-*halal* compounds

Vaccine mistrust due to various reasons is a major determinant of vaccine hesitancy. Cultural factors such as a belief that substances that are religiously forbidden make the concerned populations vaccine hesitant (27). Muslims complained that non-*halal* substances may have been used in the development of vaccines. In the study among high-risk groups (19), there were fears that the COVID-19 vaccine was being developed using substances from pigs, hence they are non-*halal*. Some people consider that the religious, moral, and social implications of taking a vaccine that is not consistent with their standing may have very catastrophic effects that far outweigh the risks from the disease (28). Since Mogadishu is mainly occupied by Muslims and Islam perceives non-*halal* foods as spiritually defiling, Mogadishu residents who believe that the COVID-19 vaccines are made from non-*halal* compounds are unlikely to accept the vaccine.

2.6 Perception of vaccine information as inconsistent and contradictory

Inadequate time to test the vaccine and distrust of healthcare policies are other commonly cited reasons for COVID-19 vaccine refusal (15). Widespread community resistance to vaccines due to disagreement with the provided information such as safety assurance can be traced back to the 1905 Supreme Court ruling in the US on *Jacobson v. Massachusetts* whereby states were granted the authority to pass compulsory vaccination laws (28). The distrust commonly occurs if the communities to be vaccinated feel underrepresented in the authorities dispensing the vaccine (28).

Since Somalia residents may not be highly trusting their government, vaccine hesitancy due to disbelief on the information the government is providing regarding the vaccines is likely.

2.7 Theoretical framework

This study was based on the theory of reasoned action (TRA) and the theory of planned behavior (TPB). According to the TRA, intention antecedes behavior (29). Attitudes and norms are the basis for the formation of an intention. Attitude towards vaccines is determined by beliefs and appraisals regarding negative and positive outcomes after the vaccination (30). Norm towards a vaccine is mainly dependent on what an individual identifies as acceptable by others in their circles. The perceived level of acceptance of a vaccine among people that one identifies with also determines their vaccine acceptance (29). For example, if a person believes that members of their religion largely reject the COVID-19 vaccine because of the presence of religiously-condemned substances, they are also likely to resist the vaccine.

Notably, individuals do not always have volitional control over some of their behaviors. The perceived behavioral control (PBC), which is an aspect of TPB, considers that. Self-efficacy, which is determined by factors such as level of education and access to information, interacts with perceived control to drive the PBC (29). PBC directly influences intention alongside norms and attitude to shape behavior. It also directly impacts behavior (30). Therefore, vaccine hesitancy can be influenced by PBC directly or through its effects on intention.

Vaccine acceptance varies by population characteristics. Diverse sociocultural factors such as level of education, religious beliefs, and access to information make different populations have diverse levels of vaccine hesitancy due to their effect on attitudes and norms (29). Different population groups refuse vaccines for specific reasons. Interventions to address vaccine hesitancy in a particular population ought to be tailor-made to address the specific drivers of the hesitance (30).

For example, if fear of side effects emerges as a major concern in a population that has low levels of education, an awareness intervention to share information regarding the safety of the COVID-19 vaccines in a simple language can be implemented. It can change the attitudes and increase the self-efficacies of the target population for better decision-making regarding taking the vaccine.

Online surveys have been used to study vaccine hesitancy by previous researchers. Fernandes et al. (24) conducted an online survey in Portugal to predict determinants of COVID-19 vaccine hesitancy. They recruited participants using online social networks such as Facebook as done in the current study (24). An anonymous online survey (31) to explore determinants of vaccine hesitancy among parents of adolescents in Italy distributed the link to their online survey through a Facebook page and a website of the local health agency (31). Bertoncello et al. (32) used an online survey to study vaccine hesitancy regarding childhood vaccines in Italy. Recruitment of participants was voluntary and anonymous as in the proposed study (32). However, the online recruitment made it impossible to ensure representativeness of the sample. For example, sample characterization including gender, age and levels of education were skewed since the online nature of the survey denies the researcher control over selection of participants (32). Nevertheless, the method is generally reliable since it is not possible to control online recruitment (24). Thus, it was appropriate to use an online survey in this study.

Several online surveys used logistic regression to analyze determinants of vaccine hesitancy. The logistic regression used for statistical analysis in this study was also used in a similar study to assess the determinants of COVID-19 vaccine hesitancy (31). Similarly, Bertoncello et al. (32) applied a logistic regression model to identify the determinants of vaccine hesitancy. Another research (33) also used logistic regression to assess determinants of vaccine hesitancy in China. Logistic regression was the statistical approach in a study about determinants of vaccine hesitancy

in Quebec, Canada (34). Since the various studies reliably used logistic regression to identify determinants of vaccine hesitancy, it was appropriate for this study that is almost similar to the reviewed studies.

2.8 Conceptual framework

The 3Cs model of vaccine hesitancy by the WHO Strategic Group of Experts (SAGE) working group will be the basis of the conceptual framework for the current study. It comprises confidence, complacency, and convenience as categories of determinants of vaccine hesitancy (27). Vaccine hesitancy emerges when the target population has little confidence with the vaccine due to various concerns including safety, efficacy, and mistrust of the authority in charge of the vaccination, among others. Complacency occurs when the target population perceives their health status as not susceptible to the vaccine-preventable disease and believes that the vaccine is mainly meant to benefit businessmen since it is not necessary to prevent the disease (27). Under convenience, the target population perceives the vaccine as uncomfortable due to a belief that it is contravening their religious beliefs such as containing non-*halal* compounds for Muslims. Inconsistency and contradictions in the shared information about the vaccine can also cause discomfort about the vaccine, thus the public can consider it unnecessarily inconveniencing.

Chapter 3: Methodology

3.0 Study Design:

This was a descriptive cross-sectional online survey.

3.1 Study Area Description:

The study was conducted in Mogadishu, Somalia. The online survey targeted Facebook-using residents of Mogadishu, which is the city where most city dwellers in Somalia live. Somalia has a population of about 15.8 million people, with 46.1% of them living in urban areas (35). About 3.8 million Somalis live in the five cities in the country; 70% of these (2.7 million) live in Mogadishu (35). Approximately 58% of Somalia inhabitants have mobile cellular subscriptions (36). Mobile penetration in urban areas such as Mogadishu is as high as 80% (37). Facebook penetration rate in Somalia is about 12.8% (38). Although literature review could not identify a study showing internet penetration in Mogadishu, most of the Facebook users in Somalia may be residing in Mogadishu. Mogadishu, unlike other cities in Somalia, has a fiber metro ring that is crucial for high internet connectivity (22).

3.2 Study population

The target population was the general population residing in Mogadishu, Somalia, whose size is about 2.7 million people. The accessible population comprised Mogadishu residents with internet access. Participation in the study was dependent on access to the online questionnaire and willingness to complete the survey. The survey was provided in three languages namely English, Arabic, and Somali to ensure even Mogadishu residents who do not understand English had a chance to participate in the study.

3.3 Population characteristics

2.30 Inclusion/ exclusion criteria

Any adult who self-identified as a resident of Mogadishu by responding to the survey questions was included in the study. Since the survey was online, only the Mogadishu residents with internet access were included in the study. Both the recruitment Facebook post and the first page of the questionnaire specified that only adult Mogadishu residents were to participate.

3.4 Sample Size Determination

G*Power 3.1.9.7 (Heinrich Heine University Düsseldorf, Germany) was used to estimate the sample size. The type I error for the test was set at 0.05 while the desired power was 0.8. The distribution of the factors was binomial. Since the probability of vaccine hesitancy in people with the determinants of vaccine hesitancy was not known, a conservative guess of 0.55 was made. For the people without the determinants of vaccine hesitancy, the probability of vaccine hesitancy was assumed to be 0.45. The assumptions were based on the fact that the maximum margin of error exists at a probability of 50%. The estimated sample size was 778 (figure 1).

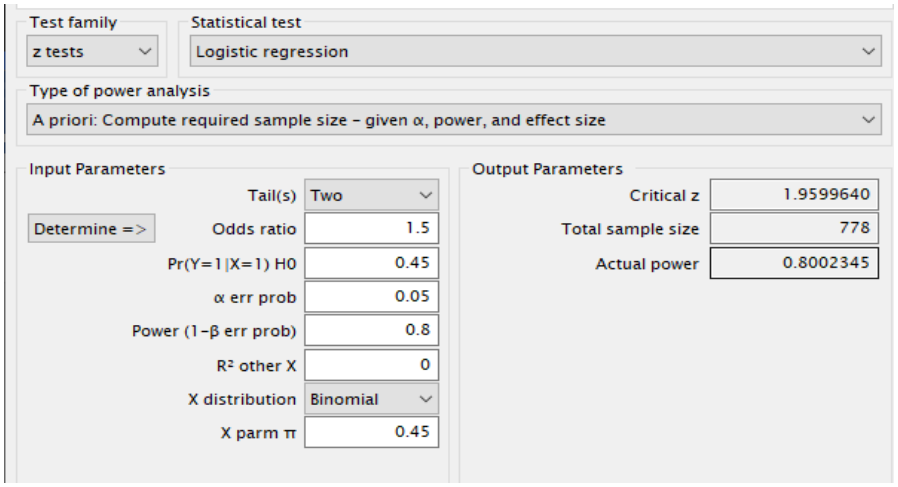

Figure 1: A demonstration of sample size calculation using the G-power software

The odds ratio of 1.5 was obtained using the estimated probabilities of vaccine hesitancy in people with and without the vaccine hesitancy. The Pr (Y=1 | X=1) H0 was indicated as 0.45 because the probability of vaccine hesitancy in people with the determinants is 0.45. The expected squared multiple correlation coefficient (R^2) was estimated to be zero since there are no other covariates besides the predictors. X parm π is 0.45 since the proportion of vaccine hesitant individuals who have the determinant is 0.45.

3.5 Selection of study participants

Purposive sampling was used to select the participants. The specific type of purposive sampling that was used is homogenous sampling. The researcher targeted populations whose online profiles indicated that they could meet the inclusion and exclusion criteria.

Online recruitment through Facebook posts was used to recruit participants for the survey. Adults whose place of residence were Mogadishu in Somalia were targeted. The post in appendix IV asking people to complete the questionnaire accessible through an included link was published on Facebook. Posts for the recruitment of participants were shared in Facebook groups such as Somali English Channel (52,000 members), Fursado Shaqo (Job Opportunities, 36,000 members), Barbaarta Reer Muqdisho (Mogadishu Youth, 27,000 members), and Baraarug Library (Lamb Library, 21,000 members) to further reach potential participants with the characteristics of interest.

Additionally, snowball recruitment may have occurred since Mogadishu residents who got the invitation to participate in the study were encouraged to share the link with fellow Mogadishu residents as specified in the recruiting Facebook post. Besides, administrators of the Facebook groups were engaged to facilitate the distribution of the online questionnaire to members of their groups to enhance representativeness of the sample for the target population. Recruitment of

participants was on a rolling basis as people volunteered to respond to the online survey during the study period.

3.6 Recruitment and consenting procedures

Once adults (18 years old and above) clicked on the link provided, they were redirected to a questionnaire in Survey Monkey. The first page of the questionnaire was the informed consent form outlining the topic, objectives, methodology, benefits, and risks of the research in layman's English language. There was a statement at the bottom of the form informing the participant that they should only proceed to complete the rest of the questionnaire if they were 18 years and above, residing in Mogadishu, and volunteered to participate in the study described in the consent form. A tab for persons who chose not to proceed with the questionnaire to click was provided; the questionnaire closed once that tab was clicked.

3.7 Variables

3.70 Dependent Variable

COVID-19 vaccine uptake and hesitancy, which were yes/no responses in the questionnaire, were the dependent variables.

Vaccine uptake was identified as having received at least a single dose of the COVID-19 vaccine. A research participant was considered vaccine-hesitant if they indicated that they had not received the vaccine and did not intend to get vaccinated even when the vaccine would be available. On the other hand, expression of willingness to get vaccinated once the COVID-19 vaccine would be available was the basis for classifying a research participant as vaccine-accepting.

3.71 Independent Variables

Sociodemographic characteristics and preselected determinants of vaccine hesitancy were the independent variables. Age (categorized), education, occupation, and income (categorized) were

the sociodemographic characteristics considered as independent variables. Reasons for the decision to be vaccine-hesitant as expressed in the responses to survey questions were considered as the preselected determinants of vaccine hesitancy. The determinants listed on the questionnaire included low confidence in the vaccine because of its side effects or ineffectiveness; mistrust of government; perception of vaccine information as inconsistent and contradictory; perception of health status as not susceptible to severe disease; a belief that the COVID-19 and its vaccine were created to benefit pharmaceutical businessmen; and a belief that COVID-19 vaccines were made with non-*halal* compounds. Yes/ no response to the question on whether the determinant is the reason for a participant's vaccine hesitancy was obtained for each of the determinants. Other reasons for vaccine hesitancy were collected in the first question about determinants of vaccine hesitancy, which was an open-ended question requesting participants to list reasons for their decision to avoid or delay the COVID-19 vaccination.

3.72 Confounders

Adjusted odds ratios were calculated using multivariate binary logistic regression analysis to ensure that the effect of other factors was considered when determining whether an independent variable was a predictor of COVID-19 vaccine uptake or hesitancy.

3.8 Data collection procedures

A questionnaire with both open and closed-ended questions regarding the demographics of the participants, whether they would be vaccinated when a vaccine would be available to them, and their positions regarding preselected determinants of vaccine hesitancy was used. The preselection of the determinants was based on previous literature and discussions in the public domain regarding COVID-19 vaccines.

The Online Survey Monkey questionnaire that was used in this study is attached as appendix III. Each of the Arabic and Somali translations of the questionnaire were done by two independent translators who were native speakers of the languages. One translator was knowledgeable of the concepts the questionnaire was measuring while the other translator was naïve to them. Their independent translations were reviewed to detect discrepancies that were resolved through discussion. The English, Arabic, and Somali versions of the questionnaire were pilot-tested on a sample of 30 Facebook users in Somalia (39). The respondents who completed the questionnaire were asked open-ended questions on their thoughts regarding the meaning of each of the questionnaire items and their corresponding responses to ensure translated items retained the meaning of the original items (39).

The questions were about sociodemographic details, COVID-19 vaccination status, willingness to get vaccinated, and reasons for not getting vaccinated. For age, residence, and occupation questions, the participants wrote the responses. For the level of education and vaccination status, the participants selected a response from the provided categories. Responses to questions on willingness to get vaccinated and reasons for refusing the vaccine were in yes/no format for the preselected determinants of vaccine hesitancy, where the participant selected either of the two options. The first question about reasons for avoiding or delaying COVID-19 vaccination was open-ended; respondents listed the reasons.

3.9 Materials

A Facebook post (appendix IV) was composed to invite Mogadishu residents to participate in the study. A questionnaire (appendix III) to enter into the Survey Monkey for data collection was developed. IBM SPSS Software version25® (IBM, New York, USA) was used for data analysis.

The resources that were used to acquire the materials are shown in the budget estimates in appendix I.

3.10 Quality assurance procedures

In order to reach the target population and minimize responses from other populations, the Facebook promotional post to invite Mogadishu residents to participate in the study was specific that only adults aged 18 years and above and living in Mogadishu can complete the survey to avoid instances of minors completing the questionnaires. The requirements were also repeated on the first page of the survey in case some people clicked on the link without meeting the inclusion criteria. The first question of the questionnaire requested for age of the participant while the second question asks for the district of residence; data from respondents who ignored the requirement in the Facebook post and the first page of the questionnaire prohibiting minors and people not residing in Mogadishu from participating was discarded if the age stated was less than 18 years and district of residence was not in Mogadishu.

3.11 Ethical considerations

The magnitude of interaction with the participants on Facebook is an ethical issue of concern. Facebook was only a platform for the potential participants to be invited to access the link to the survey, hence there were no interactions with the researcher, making the project low-risk. The proposal for this study was approved by the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee, approval number P411/05/2022. The research department in the National Institute of Health-Somalia permitted this study reference number MOH&HS/DGO/1226/September/2022.

Autonomy to choose whether to participate was another issue of concern. Informed consent was obtained from all study participants. The potential participants read the consent information form

and clicked a button to indicate whether they would like to fill the questionnaire or not. For those who did not wish to proceed, the questionnaire closed once they clicked the 'No' button. A statement clarifying that the survey should have been exclusively completed by the participant who consented was included in the consent form to ensure that the participants understood that they could not be assisted to complete the survey after consenting.

Anonymity was also a relevant ethical concern since internet protocol (IP) addresses of the devices the participants used to complete the survey risked being traced. Limiting access to the data to only the researchers ensured that the data was in safe hands. Secondly, the risk of decoding the identities of the participants by establishing links between demographic variables, which would compromise anonymity of the participants, was reduced by collecting only minimal demographic data.

Privacy was optimal since no personal identifiers such as mobile phone numbers and email addresses were collected. There was a privacy notice assuring the participants that their identities would not be noticeable when they complete the survey. No identifiable data was entered into the questionnaires. For participants who opened the survey but found it inappropriate to respond to the survey questions after reading the consent form and the privacy notice, they applied the skip logic function in Survey Monkey to exit. The ethical concern of confidentiality was addressed by assuring that the data would only be used for this study's purposes. Confidentiality was enhanced by password-protecting the hard disk and Google Drive where the data was stored, with only the researcher having access to it.

3.12 Data management

Data was collected for three months (October-December, 2022). Data from the questionnaires was downloaded from SurveyMonkey into an excel codebook for storage and analysis. The codebook comprised a "data recorded" sheet, and a "coded data" sheet. Since age is a continuous variable,

its level of measurement was scale. Residence, level of education, occupation, vaccination status, willingness to get vaccinated, and reasons for not getting vaccinated had a nominal level of measurement because they are nominal data. Data extracted from Survey Monkey was in the “recorded data" sheet. Nominal data was coded, and the resultant numerical data recorded in the “coded data” sheet. The data to be analyzed was imported into IBM SPSS Statistics from the coded datasheet of the excel codebook. The recorded data was cleaned by activating case-wise listing of residuals when doing the initial binomial logistic regression to identify outliers. No outliers were identified.

The data was stored in a password-protected computer and a backup was maintained in a password-protected Google Drive account accessible by the researchers only. The responses in the Survey Monkey, which were also in a password-protected account, are being retained for six months before deleting.

3.13 Statistical analysis

IBM SPSS Software version 25 was used in data analysis. For descriptive analysis, mean and standard deviation were calculated for the continuous variable, age. Percentages were calculated for all the other variables. Proportions of participants with each of the attributes in the categorical data were obtained and expressed in percentages.

Bivariate analyses were done to assess the association between the determinants and vaccine uptake and hesitancy. Bivariable logistic regression analysis and multivariable logistic regression analysis was used to estimate the probability of vaccine uptake and hesitancy due to each of the independent variables. The level of significance for the analyses was set at $p < 0.05$.

Results of performing logistic regression were presented to assess the ability of the independent variables to predict vaccine uptake and hesitancy. The factors that predicted vaccine hesitancy

were identified from the binary logistic regression analysis. The relative importance of the predictor variables was indicated by the proportions of participants that considered them as factors contributing to their vaccine hesitancy.

3.14 Study results dissemination plan

The study results will be presented to the scientists in journal clubs. A scientific article will be written and published in a peer-reviewed journal to communicate the findings to other scientists. A policy brief will be written to share the findings with policymakers in the Ministry of Health in Somalia. A science article will be written and distributed to the major media houses in Somalia to reach other stakeholders in Somalia with the information.

3.15 Study timeline

The study was conducted following the schedule presented in appendix II.

Chapter 4: Results

A total of 1,795 internet users responded to the survey between November and December 2022, out of whom 98% (n = 1,754) agreed to participate in the study. Only 76% (n = 1,325) of respondents met the inclusion criteria of being aged above 18 years and residing in Mogadishu. The sociodemographic characteristics of the participants are presented in table 1.

Table 1: A summary of the sociodemographic characteristics of the participants.

Characteristic	Sub-category	n (%)
Age	18 - 26 years	1,075 (81)
	27 - 35 years	223 (17)
	36 years and above	27 (2)
District	Hodan	318 (24)
	Wadajir	177 (13)
	Yaqshid	127 (10)
	Dharkenley	126 (10)
	Others	577 (44)
District's economic status [a]	High	679 (51)
	Middle	220 (17)
	Low	384 (29)
Level of education	Post-secondary	1,171 (88)
	Secondary	98 (7)
	Primary	31 (2)
	Not indicated	25 (2)
Occupation	Student	697 (53)
	Health Worker	271 (21)
	Other occupation	224 (17)
	Self-employed	23 (2)
	Unemployed	55 (4)
	Not indicated	55 (4)
Income (US Dollars)	0	652 (50)
	1-300	254 (19)
	301-1000	225 (17)
	Above 1000	57 (4)
	Not indicated	136 (10)

[a]*The classification of the districts into high, middle, and low income was based on the researcher's subjective assessment*

The median age of the participants was 21 years, with a range of 18-78 years. The few adults aged more than 50 years that participated in the survey were residing in Daynile (n = 2), Hodan (n = 3),

and Howlwada (n = 4). The distribution of ages by district of residence shows that most of the older respondents were residing in Howlwada and Hodan (figure 2). Hodan was also the single district with the highest number of respondents since 24% (n = 318) were residing there (table 1).

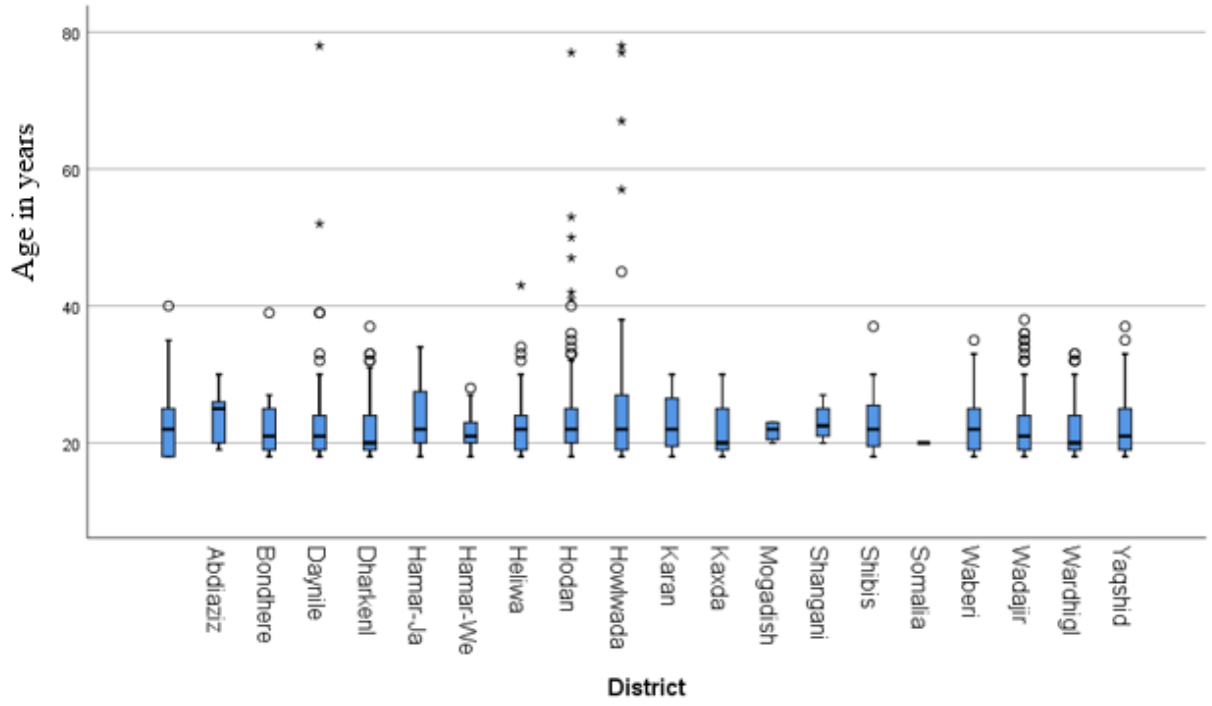

Figure 2: Distribution of ages of participants by the district of residence

4.1 COVID-19 vaccine uptake in Mogadishu

Only 19% of the 1,325 participants reported that they had been vaccinated against COVID-19. The rate of vaccine hesitancy among the participants was 65% (n = 857) (figure 3).

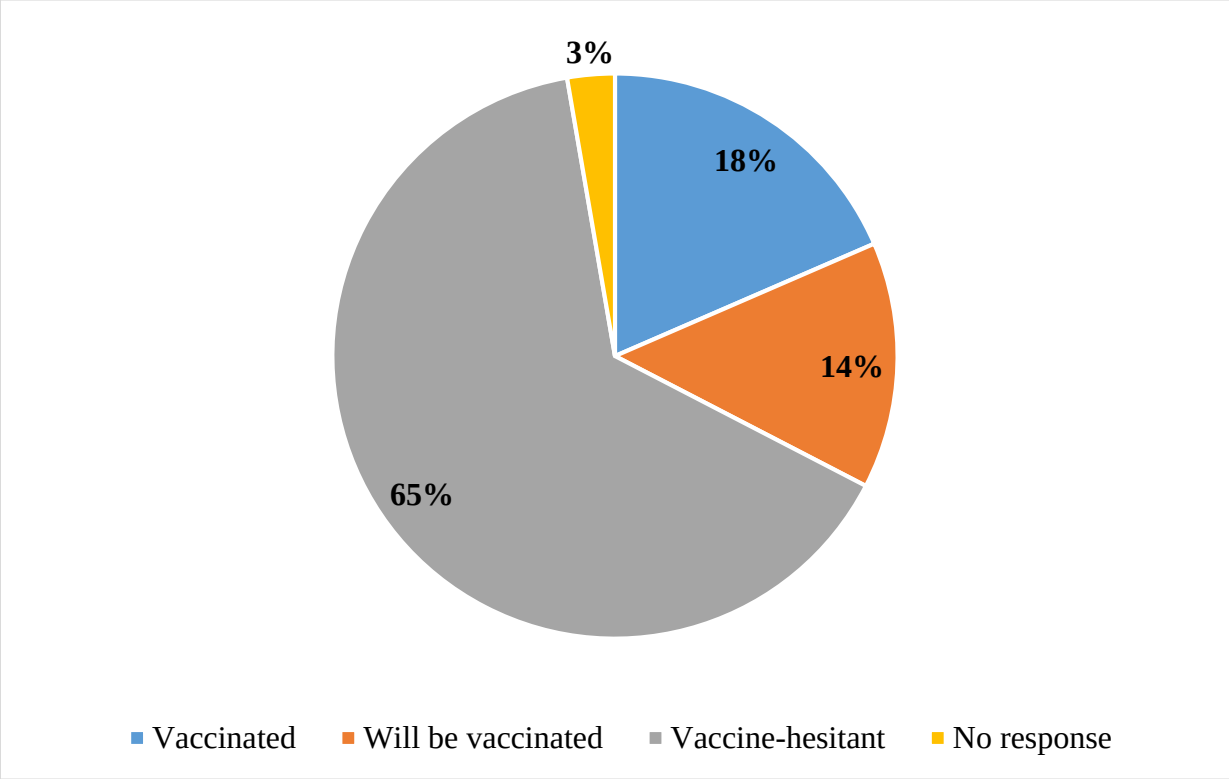

Figure 3: COVID-19 Vaccine uptake among Internet users in Mogadishu

4.2 Level of education and vaccine uptake and hesitancy

Post-secondary education was the commonest academic qualification since 88% of respondents (n = 1171) identified as having post-secondary education. However, it emerged that most of the participants were university students but confused the pursuit of the qualification with its possession. Vaccine uptake did not differ with variations in levels of education (table 2). Similarly, there was no association between level of education and vaccine hesitancy (table 3). Sixty-five percent of the 1,171 participants with post-secondary education expressed vaccine hesitancy. A similar proportion (65%) of primary school leavers (n = 31) were vaccine hesitant. A slightly larger proportion (68%) of secondary school graduates indicated that they had no intention of getting vaccinated against COVID-19.

Table 2: Bivariable regression analysis of sociodemographic characteristics of the participants and their association with vaccine uptake

Characteristic		Vaccine Uptake	Odds Ratio (95% Confidence Interval)	p-value
Age group	18 - 20 years	53/567 (9.3%)	Reference	
	21-25 years	70/ 445 (15.7%)	1.81 (1.24 - 2.65)	**0.002**
	26 years and above	122/287 (42.5%)	7.17 (4.07-10.35)	**<0.001**
Above 25 years	No	123/1012 (12.2%)	Reference	
	Yes	122/287 (42.5%)	5.34 (3.96 - 7.22)	**<0.001**
Level of education	Primary	5/30 (16.7%)	Reference	
	Secondary	16/91 (17.6%)	1.07 (0.36 – 3.21)	0.909
	Post-secondary	217/ 1153 (18.8%)	1.16 (0.44 – 3.06)	0.766
Basic education	Basic education	21/121 (17.4%)	Reference	
	Tertiary	217/1153 (18.8%)	1.1 (0.67 – 1.81)	0.694
Occupation	Student	56/685 (8.2%)	Reference	
	Health worker	92/269 (34.2%)	5.84 (4.03 – 8.47)	**<0.001**
	Others	97/345 (28.1%)	4.39 (3.06 – 6.30)	**<0.001**
Health worker	Yes	92/269 (34.2%)	2.78 (2.20 – 4.04)	**<0.001**
	No	153/1030 (14.9%)	Reference	
Student	Yes	56/685 (8.2%)	0.20 (0.15 – 0.28)	**<0.001**
	No	189/614 (30.8%)	Reference	
Income category	Below $278	132/973 (13.6%)	Reference	
	Above $278	113/326 (34.7%)	3.38 (2.52 – 4.53)	**<0.001**
Note: Bold p-values are statistically significant at 95% confidence interval				

4.3 Age and vaccine uptake and hesitancy

Participants aged 26 years and above had 7.2 times the odds of vaccine uptake than participants aged 18-20 years (table 2), which was a statistically significant ($p < 0.01$). Vaccine uptake was higher among participants aged 25 years and above (42.5%) compared to those aged less than 25 years (12.2%) ($p = 0.001$).

Vaccine hesitancy was significantly associated with age below 26 years compared to age between 18 and 20 years (OR = 4.4, $p <0.001$). About 74% of participants aged less than 26 years were vaccine hesitant while only 40% of those aged more than 25 years were vaccine hesitant (table 3).

Table 3: Bivariable regression analysis of sociodemographic characteristics of participants and their association with vaccine hesitancy

Characteristic	Categories	Hesitancy	Odds Ratio (95% Confidence Interval)	p-value
Age group	18 - 20 years	460/562 (81.9%)	6.86 (4.99 – 9.45)	**<0.001**
	21-25 years	284/442 (64.3%)	2.74 (2.01 – 3.72)	**<0.001**
	26 years and above	113/285 (39.6%)	Reference	
Above 25 years	No	744/1004 (74.1%)	4.356 (3.31 – 5.74)	**<0.001**
	Yes	113/285 (39.6%)	Reference	
Level of education	Primary	20/29 (69.0%)	1.14 (0.51 – 2.53)	0.749
	Secondary	67/89 (75.3%)	1.56 (0.95 – 2.57)	
	Post-secondary	759/1148 (66.1%)	Reference	
Basic education	Basic education	87/118 (73.7%)	1.44 (0.94 – 2.21)	0.096
	Tertiary	759/1148 (66.1%)	Reference	
Occupation	Student	561/682 (82.3%)	4.56 (3.41 – 6.09)	**<0.001**
	Health worker	125/268 (46.6%)	0.86 (0.62 – 1.18)	0.352
	Others	171/339 (50.4%)	Reference	
Health worker	No	732/1021 (71.7%)	2.90 (2.20 – 3.82)	**<0.001**
	Yes	125/268 (46.6%)	Reference	
Student	Yes	561/682 (82.3%)	4.87 (3.78 – 6.27)	
	No	296/607 (48.8%)	Reference	**<0.001**
Income category	Below (<$278)	691/963 (71.8%)	2.45 (1.89 – 3.17)	**<0.001**
	Above average (>$278)	166/326 (50.9%)	Reference	

Note: Bold p-values are statistically significant at 95% confidence interval

4.4 Occupation and vaccine uptake and hesitancy

Health workers and other workers had higher odds of vaccine uptake compared to students (OR = 5.8 and 4.4, respectively), which were statistically significant ($p < 0.001$). Slightly more than a third of the health workers who participated in the survey had received the vaccine (table 2). The odds of vaccine hesitancy among students were 4.6 times the odds of vaccine hesitancy among non-healthcare workers. More than 80% of students who responded to the survey were vaccine hesitant (table 3).

4.5 Income and vaccine uptake and hesitancy

Above average (>$278) income earners had 3.4 times the odds of vaccine uptake among below-average (<278) income earners, which was a statistically significant association ($p < 0.001$). Thirty-five percent of the above-average income earners had received the vaccine compared to 14% of the below-average income earners (table 2).

Seventy-two percent of the participants who earned below $278 were vaccine hesitant. Vaccine hesitancy was similarly high among above average income earners since 51% of them were vaccine hesitant (table). Although the association was statistically significant ($p < 0.001$), the odds ratio was only 2.45 (table 3)

4.6 Residence and vaccine hesitancy

There was no statistically significant association between residence status and vaccine hesitancy. Among respondents who indicated as residing in districts that are considered affluent (n = 679), 63% were COVID-19 vaccine-hesitant. On the other hand, 69% of participants whose districts of residence can be considered low class (n = 384) were vaccine hesitant. Out of the 220 respondents whose districts of residence can be categorized as middle class, 65% were vaccine-hesitant.

4.7 Sources of information regarding COVID-19

There was no statistically significant association between sources of information regarding COVID-19 and covid-19 vaccine hesitancy. Out of 1080 participants who responded to the question on sources of information, the proportion that relied on Facebook for information on COVID-19 was 27%. The second and third most common sources of information were the WHO website (22%) and Somali Ministry of Health website (20%) (figure 4).

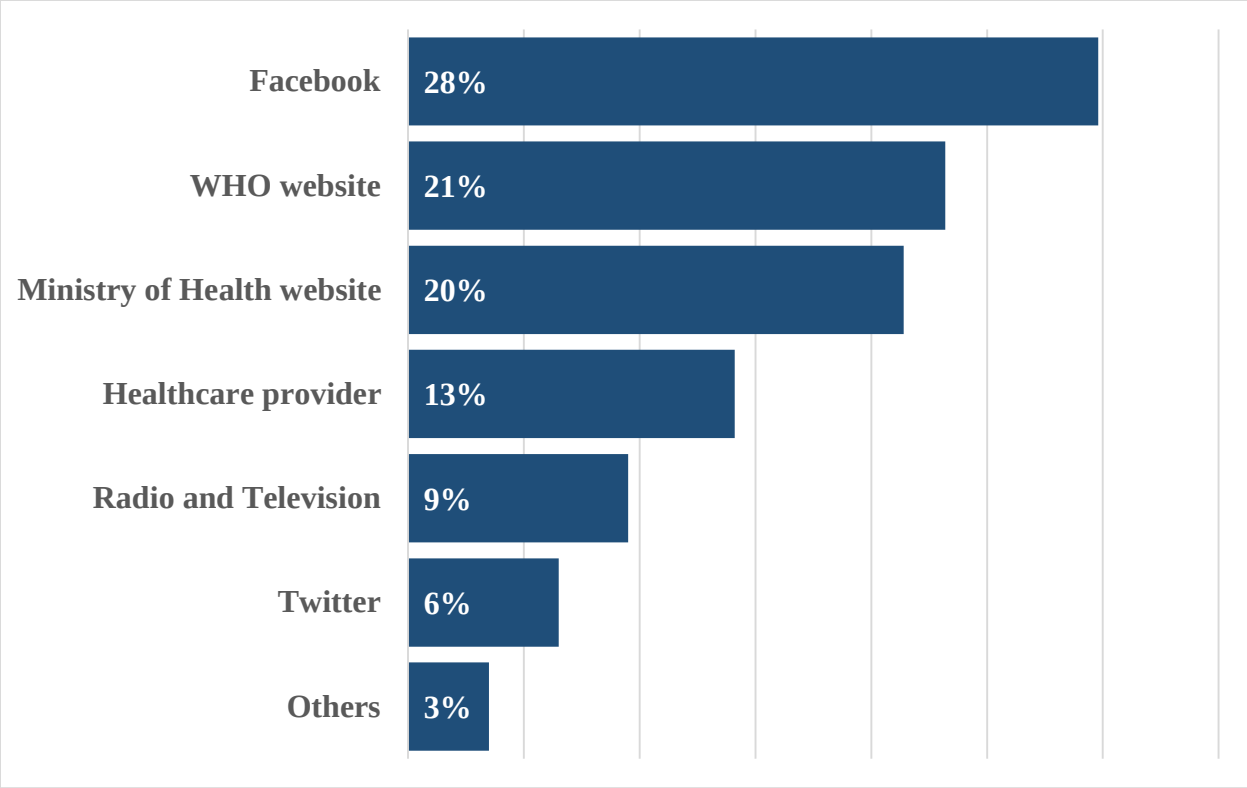

Figure 4: Participants who used various sources of information on COVID-19

4.8 Association between demographic factors and vaccine uptake or hesitancy

Only age and occupation emerged as predictors of COVID-19 vaccine uptake based on the bivariate logistic regression analysis. The ratio between the adjusted odds of vaccine uptake among participants aged more than 25 years and those aged 18-20 years was 3.7, which was a statistically significant association ($p < 0.001$). Similarly, being a worker predicted COVID-19 vaccine uptake (Adjusted OR = 3.6 for healthcare workers and 2.6 for other workers) ($p < 0.001$) (table 4).

Table 4: Predictors of covid-19 vaccine uptake

Parameter	Crude OR		Adjusted OR	
	OR [95% CI]	p-value	OR [95% CI]	p-value
Above 25 years				
18 – 20 years	Reference			
21 – 25 years	1.81 [1.24 - 2.65]	**0.002**	1.39 [0.927-2.07]	0.112
26 years & above	7.17 [4.07-10.35]	**<0.001**	3.73 [2.46-5.66]	**<0.001**
Occupation				
Students	Reference			
Health worker	5.84 [4.03-8.47]	**<0.001**	3.56 [2.35-5.40]	**<0.001**
Others	4.39 [3.06-6.30]	**<0.001**	2.64 [1.76-3.97]	**<0.001**

Note: Bold p-values are statistically significant at 95% confidence interval; OR – odds ratio; CI – confidence interval

Age group, education, occupation, and income were included in the multivariable binary logistic regression analysis for vaccine hesitancy. Only age group and occupation remained after running a backward elimination model. Thus, age and occupation were identified as significant predictors of vaccine hesitancy (table 5). Participants aged between 18 and 20 years had 3.6 times the odds of vaccine hesitancy among participants aged above 25 years assuming that the level of education and type of occupation are held constant. Students had 2.9 times the odds of vaccine hesitancy among workers assuming that the level of education and age are held constant (table 5).

Table 5: Predictors of covid-19 vaccine hesitancy

Parameter	Crude OR		Adjusted OR	
	OR [95% CI]	p-value	OR [95% CI]	p-value
Age group				
18 – 20 years	6.86 [4.99 – 9.45]	<0.001	3.59 [2.50-5.15]	**<0.001**
21 – 25 years	2.74 [2.01 – 3.72]	<0.001	1.77 [1.27-2.46]	**0.001**
26 years & above	Reference			
Occupation				
Students	4.56 (3.41 – 6.09)	**<0.001**	2.88 [2.09-3.97]	**<0.001**
Health worker	0.86 (0.62 – 1.18)	0.352	0.82 [0.59-1.15]	0.243
Others	Reference			

Note: Bold p-values are statistically significant at 95% confidence interval; OR – odds ratio; CI – confidence interval

4.6 Reasons for vaccine hesitancy

The vaccine-hesitant individuals identified various reasons for their refusal to be vaccinated. More than 70% reported that seven out of the nine reasons were behind their refusal to be vaccinated (table 6). For example, out of the 808 participants that responded to the question about side effects, 86% (n = 695) indicated that their confidence in COVID-19 vaccines was low because the vaccines have side effects. Market creation for COVID-19 vaccines and vaccines containing non-*halal* substances were the least cited reasons. Only 44% indicated that they refused to be vaccinated due to a belief that COVID-19 was developed to create a market for COVID-19 vaccines. Similarly, only 36% attributed their refusal to be vaccinated to the vaccine containing non-*halal* substances.

Table 6: Participants who attributed their vaccine hesitancy to the nine preselected reasons

Reason	Respondents	Yes (%)
I feel safer without the COVID-19 vaccination	807	720 (89)
My confidence in the COVID-19 vaccine is low because the vaccine has side effects	808	695 (86)
I do not trust the government to administer a safe vaccine	807	633 (78)
My risk of getting COVID-19 would remain the same even after getting vaccinated	808	625 (77)
The information about COVID-19 vaccines is inconsistent and contradictory	806	603 (75)
My confidence in the COVID-19 vaccine is low because the vaccine is ineffective	803	594 (74)
My health status can cope with SARS-CoV-2 infection without risk for severe disease	803	581 (72)
COVID-19 was created to create a market for vaccines	808	352 (44)
COVID-19 vaccines contain non-*halal* substances	807	293 (36)

Chapter 5: Discussion

The COVID-19 vaccine hesitancy of 65% observed among the internet users, mainly University students in Mogadishu, Somalia is high. Similar previous studies also reported high rate of vaccine hesitancy. A face-to-face cross-sectional study among 400 Mogadishu residents reported a 40.6% vaccine hesitancy (14). Similarly, a 63% hesitancy rate was reported in a cross-sectional study conducted among 500 participants in the Benadir region, where Mogadishu is based (40). A survey in 17 countries including Somalia reported a 48% vaccine hesitancy in Somalia, which was the highest compared to the other countries (41). The rates are considerably higher than that reported in an online survey in Somalia conducted between December 2020 and January 2021, which recorded a vaccine-hesitancy of 23% (19).

The hesitancy rate reported in the current study matches that reported in a study conducted in Kenya, which was a survey involving 1,218 respondents in Wajir county (42). Wajir borders Somalia and the majority of its residents are of Somali ethnicity. The survey reported a vaccine hesitancy rate of 61% (n = 743) among the Wajir residents (42). Similarly, a community-based survey conducted in Jordan, Kuwait, and Saudi Arabia reported a high rate of vaccine hesitancy (71%). Our results are also consistent with the findings of a large-scale survey (36,220 participants) conducted in Arab-speaking countries including Somalia that reported a COVID-19 vaccine hesitancy of 82% (43). Somalia and other developing countries generally have high levels of vaccine hesitancy compared to developed countries like Portugal that reported a vaccine hesitancy of 9.2% (44).

Our study did not observe any differences in vaccine hesitancy between participants with primary, secondary, and post-secondary levels of education. The finding contradicts previous findings by

global studies that few years of education are associated with low uptake of the COVID-19 vaccine (41, 45). A scoping review in Africa also associated higher levels of education with positive attitudes towards COVID-19 vaccination (46). A survey in Portugal reported higher vaccine hesitancy among participants without a university degree (13.9%) compared to participants with a university degree (8.2%) (44). Similarly, the online survey covering Jordan, Kuwait, and Saudi Arabia identified lower education levels as a determinant for vaccine hesitancy (25). Low levels of education are associated with vaccine hesitancy among residents of Arab countries (43).

Age is a predictor of COVID-19 vaccine hesitancy. Vaccine hesitancy was higher among adults aged 18-25 years compared to adults aged more than 25 years. The finding agrees with a survey in Portugal that found older individuals as more vaccine-accepting than younger respondents (44). The finding is different from the conclusion of a global study that younger adults are more vaccine-accepting (45). Notably, the global study did not specify age categories of the adults they considered younger, hence they could be mainly working young adults compared to the current study's participants that mainly consisted of students.

Our research is complementary to a face-to-face survey whose 79% of participants were aged over 50 years (14). Since most of the respondents in the current study were students residing in Hodan and Wadajir and the participants in the study by Ahmed et al. (14) were older adults based in Hodan and Wadajir, the studies are supplementing the information in each other. The students may be living in their parents' homes in Hodan and Wadajir.

Income level is a predictor of vaccine uptake and hesitancy. Vaccine uptake was higher and vaccine hesitancy was lower among participants with above-average income. The high rate of vaccine hesitancy among respondents with zero income in the current study is consistent with the

findings by Ahmed et al. (14) that having less than $50 monthly income in Mogadishu is associated with five times more likelihood of vaccine hesitancy. Our findings contradict with the results of another study (45) that for individuals with income, vaccine acceptance is not substantially associated with income levels. Similarly, Ackah et al. (44) did not find an association between monthly income and vaccine hesitancy.

Occupation is a predictor of vaccine uptake and hesitancy. Low vaccine uptake and high vaccine hesitancy was observed among students. The finding differs from a previous online survey that reported similarity of vaccine acceptance between students and non-students (19). In the current study, healthcare workers and other workers had higher vaccine uptake and lower vaccine hesitancy compared to students. The finding contradicts an observation in the Portugal's survey in which students were more vaccine-accepting compared to workers (44).

The high vaccine hesitancy in this study could be due to relying on inappropriate sources of information. Most of the vaccine-hesitant respondents did not rely on credible sources for information regarding COVID-19. Even though Mogadishu residents are relatively informed about COVID-19 vaccines (40), they may be relying on inappropriate sources of information. Only 20% and 22% relied on the World Health Organization (WHO)'s website and Ministry of Health's website respectively for information about COVID-19 vaccines. About 27% depended on Facebook for the COVID-19 vaccines information.

Access to the correct information about the safety and efficacy of COVID-19 vaccines strongly determines whether a person will be vaccine-hesitant (44). Relying on social media as the main source of information about COVID-19 vaccines is associated with a high likelihood of believing conspiracy theories (25), consequently increasing vaccine hesitancy. Upon accessing credible

information on safety and adverse effects of COVID-19 vaccines, individuals reconsider their stance against COVID-19 (47).

The perception that one is safer without the COVID-19 vaccine was one of the common reasons for COVID-19 vaccine hesitancy. Eighty-nine percent of the vaccine-hesitant participants expressed that they felt safer without the COVID-19 vaccine. Residents of the Benadir region had safety concerns regarding COVID-19 vaccines (40). Concerns over safety are a major hindrance to the uptake of COVID-19 vaccines in Africa (46). Globally, fears that the COVID-19 vaccines might be having live coronavirus hence posing a health risk to the immunocompromised have been reported (47). The safety concerns could be due to the fact that the COVID-19 vaccine was rapidly developed, approved for emergency use, and rolled out for mass vaccination (41).

A belief that the COVID-19 vaccine's side effects are substantial enough to avoid the vaccine was another common reason for vaccine hesitancy. The proportion of vaccine-hesitant respondents that attributed their decision to forego the vaccine to side effects was 86%. Fear of side effects was the main reason for vaccine hesitancy in a face-to-face cross-sectional study in Mogadishu in which 52.4% of 400 participants indicated that they were afraid of side effects (14). Forty percent of the respondents identified side effects as their reason for vaccine hesitancy in another online survey in Somalia (19). In a survey among healthcare workers in Somalia, 50.6% of the 653 residents that had not been vaccinated cited fear of side effects as the main reason for not getting vaccinated (48).

Side effects emerged as the main concern among vaccine-hesitant residents of Arab-speaking countries (43). Almost a quarter of respondents in a survey in Jordan, Kuwait and Saudi Arabia believed that infertility is a side effect of COVID-19 vaccines (25). A scoping review in Africa

identified side effects as a key driver of vaccine hesitancy against COVID-19 vaccines (46). Side effects were an issue of concern characterized in a global systematic review regarding COVID-19 vaccine hesitancy (47). Thus, the fear of side effects of COVID-19 vaccines is an important issue in vaccine uptake.

Contempt against the government as the custodian of the vaccination exercise is another common reason for vaccine hesitancy. Vaccine acceptance is high where the public strongly trusts a country's institutions (41). Seventy-eight percent of the vaccine-hesitant participants indicated that they did not trust the government to administer a safe vaccine. Arab-speaking countries are characterized by high levels of distrust regarding COVID-19 vaccines compared to other countries (43). The observation agrees with a finding that consideration of the measures by the government as inadequate and lack of confidence in the health response to the pandemic are determinants of COVID-19 vaccine hesitancy (44). Mistrusting the government is a major cause of COVID-19 vaccine hesitancy since governments were custodians of the vaccination processes (47).

Most (77%) of the vaccine-hesitant individuals did not find the COVID-19 vaccine valuable to their health. They indicated that the COVID-19 vaccine would not reduce their risk of getting the disease. Soares et al. (44) also reported that individuals who did not perceive their risk for COVID-19 as high as having higher odds of refusing the vaccine. A sentiment that COVID-19 ended has also been previously cited as a common reason for vaccine hesitancy (19).

Poor communication of information on COVID-19 vaccines risks increasing vaccine hesitancy. Three-quarters of the vaccine-hesitant respondents indicated that they restrained from the COVID-19 vaccine due to the inconsistencies and contradictions of information about it. According to Ackah et al. (46), contradictions in information shared by the media and misinformation

contributed to COVID-19 vaccine hesitancy in Africa. The misinformation creates room for conspiracy theories. In the current survey, 44% of the vaccine-hesitant individuals attributed their decision to a perception that COVID-19 was developed to create a market for COVID-19 vaccines. People who believe in conspiracy theories are more likely to be vaccine-hesitant (47).

Ineffectiveness of the COVID-19 vaccine was selected as the reason behind vaccine refusal by 74% of the vaccine hesitant respondents. The face-to-face cross-sectional study in Mogadishu reported that 19% of their participants indicated ineffectiveness as the reason they were COVID-19 vaccine-hesitant (14). About 27% of the 1,055 vaccine-hesitant respondents in an online survey in Somalia by Ahmed et al. (19) attributed their reluctance to be vaccinated to the ineffectiveness of the vaccines. About 64% of Benadir region residents do not believe that COVID-19 vaccines are effective (40). A study among healthcare workers in Somalia reported that 16% of the 653 that had not been vaccinated questioned the vaccines' efficacy (48).

Confidence that one's immunity is strong enough to withstand SARS-CoV-2 infection without getting severe COVID-19 is another reason for COVID-19 vaccine hesitancy. Seventy-two percent of participants in this study expressed that they trusted their immunity to fight COVID-19. About 17% of 653 healthcare workers who had not received the COVID-19 vaccine in a previous survey in Somalia indicated that they had already gotten COVID-19 and recovered, hence they believed that they had developed immunity against it (48). A similar pattern was reported in the survey in Portugal whereby individuals who perceived their health status as good or very good had high odds of refusing the COVID-19 vaccine (44). A global systematic review identified a belief that one's immunity can sufficiently handle infections or rarely contracts infectious diseases is associated with a perception that COVID-19 vaccination is unnecessary (47).

A concern that COVID-19 vaccines were made from non-*halal* substances was the least identified reason for vaccine hesitancy since only 36% of our respondents selected it. Somalia residents among other Islamic countries had fears that COVID-19 vaccines were made using substances from pigs (19), which are non-*halal*. Muslims are often concerned upon hearing assertions that a vaccine is made with substances from pigs (47).

5.1 Limitations

Obtaining a sample representative of the general population in Mogadishu was a challenge due to the online nature of the survey and the fact that most Mogadishu residents are not connected to the internet. The Facebook posts enhanced access to diverse populations, hence increasing the chances of getting responses from various population groups.

Since the current survey was online, participation was anonymous. The researchers did not have full control over the recruitment process. Thus, a risk of people not targeted by the survey ignoring the requirements in the recruitment post and the instructions in the first page of the survey to proceed to fill the questionnaire exists. During data analysis, responses to the first two questions were used to discard data from minors and people who did not reside in Mogadishu.

6.0 Conclusion and recommendations

This cross-sectional online survey reports the COVID-19 vaccine uptake in Mogadishu, Somalia. Most of the participants were university students with no income. More than two-thirds of the participants were vaccine-hesitant. Some of the factors identified as associated with vaccine hesitancy include young age, being a student, having no or low income, and lacking access to credible information. The main reason in the occurrence of vaccine hesitancy in Mogadishu was the fear of side effects. Other reasons for vaccine hesitancy were safety concerns, low trust in government, a perception that the vaccine is not valuable, contradicting information about the vaccine, ineffectiveness of the vaccine, trusting own immunity, and believing that the vaccines are made using non-*halal* substances.

Future surveys should use sample sizes huge enough to obtain precise results upon logistic regression even when large number of determinants are included in the regression model. Face-to-face surveys using systematic sampling should be applied in future to ensure that the sample selected is representative of all Mogadishu residents. A qualitative study is recommended to investigate the identified factors and reasons behind vaccine hesitancy in detail.

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Appendix I: Budget Estimate

Item	Unit	Quantity	Cost per Item ($)	Total ($)
Facebook promotion	Days	90	5	450
Survey Monkey subscription	Month	3	300	300
SPSS 26 Subscription	Year	1	100	100
Statistician fees	US Dollars	1	500	500
Miscellaneous	18%			150
Total costs				**1500**

Appendix II: Timeline

	2021		2022						2023
ACTIVITY by Months in Numbers	**9 10**	**11 12**	**1 2**	**3 4**	**5 6**	**7 8**	**9 10**	**11 12**	**1 9**
Concept note writing and defense									
Proposal writing and defense									
Ethics Review Board (ERB) approval									
Recruitment and data collection									
Data analysis, and thesis writing and defense									

Appendix III: Questionnaire

1. My age is: _____(years)
2. I live in: _____ City/Town in _____District
3. My level of education is: (tick one)
   Primary ___

   Secondary___

   Post-secondary___
4. I work as a: _____and my monthly wage is_____
5. I have been vaccinated against COVID-19: (tick one)
   Yes ___

   No___

If your answer is "No," please proceed to question 6. If your answer is "Yes," you are done!!

6. I will be vaccinated when the COVID-19 vaccine will be available to me:
   Yes ___

   No ___

If your answer to question 6 is Yes, you are done, Hurray!

If your answer to question 6 is NO, please proceed to question 7, 8, 9 and 10.

7. I will not be vaccinated against COVID-19 for the following reasons:

8. I will not be vaccinated because:
   a. My confidence in the COVID-19 vaccine is low because the vaccine has side effects
      Yes ___
      No ___

   b. My confidence in the COVID-19 vaccine is low because the vaccine is ineffective

   c. I do not trust the government to administer a safe vaccine
      Yes ___
      No ___
   d. The information about COVID-19 vaccines is inconsistent and contradictory
      Yes ___
      No ___

e. My health status can cope with SARS-CoV-2 infection without risk for severe disease

Yes ___

No ___

f. I feel safer without the COVID-19 vaccination.

Yes ___

No ___

g. My risk of getting COVID-19 would remain the same even after getting vaccinated.

Yes ___

No ___

h. COVID-19 was created to create a market for vaccines.

Yes ___

No ___

i. COVID-19 vaccines contain non-*halal* substances.

Yes ___

No ___

9. My main source of information on COVID-19 vaccines is:
    a. Facebook
    b. Twitter
    c. Ministry of Health website
    d. World Health Organization website
    e. Radio and television
    f. Healthcare provider
    g. Friend
    h. Other (specify)_____

Appendix IV: Facebook Post

Welcome to be part of the Mogadishu COVID-19 Vaccination survey. Click the following link if you are 18 years and above and you reside in Mogadishu to be directed to the details of the survey. You will read and understand before agreeing to respond to the survey questions. Let your views contribute to understanding the acceptance of COVID-19 vaccines in Mogadishu. It only takes less than 5 minutes to complete the survey.

Appendix V: Informed Consent Form

Title of Study: An Online Survey on COVID-19 Vaccine Hesitancy among Facebook Users in Mogadishu, Federal Republic of Somalia

Principal investigator: Dr. Ikram Abdulwahab Mo'allim Mohamed, University of Nairobi

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research: i) Your decision to participate is entirely voluntary ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. _____

WHAT IS THIS STUDY ABOUT?

The researchers listed above are interviewing individuals who live in Mogadishu and are 18 years and above. The purpose of the interview is to find out whether they accept COVID-19 vaccines and if not the reasons behind their refusal. Participants in this research study will be asked questions about their intention to get vaccinated against COVID-19 and reasons for rejecting or postponing COVID-19 vaccination. There will be approximately 786 participants in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen: you will click yes to be automatically directed to the survey questions. Filling the questionnaire will last approximately five minutes. The questionnaire will cover topics such as low confidence in the COVID-19 vaccine because of its side effects or ineffectiveness; mistrust of government; perception of COVID-19 vaccine information as inconsistent and contradictory; perception of health status as not susceptible to severe COVID-19 disease; a belief that the COVID-19 and its vaccine are created to benefit pharmaceutical businessmen; and a belief that COVID-19 vaccines are made with non-*halal* compounds.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you. Also, answering questions in the questionnaire may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to opt out of the survey by clicking the tab labeled "NO" at the bottom of this page. Furthermore, Survey Monkey, the platform used to administer this survey, ensures anonymity of your responses by hiding your identity and even the IP aadress of your mobile phone or computer.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

The information you provide will help us better understand vaccine hesitancy in Mogadishu. This information is a contribution to science and the clarification of information about COVID-19 vaccines.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

Being in this study will only cost you about 10 minutes and less than 100MBs of data.

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

This study is for a student project and is not funded, hence you will not be refunded the cost of the 100MBs you will use to fill the questionnaire.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page. For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke. The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

Appendix VI: ONLINE STATEMENT OF CONSENT

Participant's statement

I have read this consent form. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study. I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study. I commit to complete the questionnaire following this consent form without delegating or seeking assistance from anybody.

I agree to participate in this study: Yes No

Participant signature / Thumb stamp _____ Date _____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent. Researcher's Name: _____ Date: _____

Signature _____

Role in the study: ____Principal investigator_____ For more information contact _____ at _____ from _____ to _____.

Lifaaqa V: Foomka Oggolaanshaha la ogaalgeliyay:

Ciwaanka Daraasaadda: Sahan cilmibaariseed dhanka Internetka ah oo lagu ogaanayo ka-labalabaynta Tallaalka COVID-19 ee dadka isticmaala Facebook ee Muqdisho, Jamhuuriyadda Federaalka Soomaaliya.

Cilmi-baaraha hoggaaminaya Daraasaddu waa: Dr. Ikram Abdulwahab Mo'allim Mohamed, Jaamacadda Nairobi.

Waxaan doonayaa inaan halkan idiin kugu soo bandhigo daraasad ay wadaan cilmi-baarayaasha kor ku xusan. Ujeeddada foomkan ogolaanshaha waa in lagu siiyo macluumaadka aad u baahan tahay ee kaa caawinaya inaad go'aansato ka qeybgalka daraasaddan iyo in kale. Waxaad xor u tahay inaad waydiiso su'aalo kasta oo ku saabsan ujeedada cilmibaaristan, waxa dhacaya haddii aad ka qaybgasho daraasadda, khatarta iyo faa'iidooyinka suurtagalka ah ee kaaga imaan kara, xuquuqdaada ka mutadawac ahaan, iyo wax kasta oo kale oo ku saabsan cilmibaaristan ama foomkan ee aan kuu caddayn. Markii aan kaaga jawaabno su'aalahaaga oo dhan si aad ku qanacsantahay, waxaad go'aansan kartaa inaad daraasadda ka qaybqaadato iyo in kale. Hannaankan waxa loo yaqaan 'oggolaanshaha la ogaalgeliyay'. Markaad fahamto oo aad ogolaato inaad daraasadda ka qaybgasho, waxaan kaa codsaneynaa inaad magacaga ku saxiixdo foomkan. Waana inaad fahantaa mabaadi'da guud ee khuseeya dhammaan ka qaybgalayaasha cilmibaarista caafimaadka: i) Go'aankaaga ka qaybqaadashada gabi ahaanba waa ikhtiyaari ii) Waad ka bixi kartaa daraasadda wakhti kasta adigoon lagaa rabin sababta ka bixitaankaaga iii) Diidmada ka qaybqaadashada cilmibaaristu ma saameyn doonto adeegyada aad xaqa u leedahay ee aad ka hesho xaruntan caafimaad ama xarumaha kale. Waxaan ku siin doonaa nuqul ka mid ah foomkan si aad u keydsato.

Ma sii wadi karaa? HAA / MAYA.

Daraasaddan waxaa oggolaaday Isbitaalka Qaranka ee Kenyatta- Guddiga Anshaxa iyo Cilmibaarista ee Jaamacadda Nairobi Protocol No. _____

DARAASADDANI MAXAY KU SAABSANTAHAY?

Cilmi-baarayaasha kor ku xusan ayaa waxay wareysiyo la yeelanayaan shakhsiyaad ku nool magaalada Muqdisho ee da'dooda ay gaartay 18 sano iyo wixii ka sarreeya. Ujeedada waraysigu waa in la ogaado in ay oggolaaden qaadashada tallaallada COVID-19 iyo haddii aysan oggolaan sababaha ka dambeeya diidmadooda. Ka-qaybgalayaasha daraasaddan cilmibaarista ah waxaa la waydiin doonaa su'aalo ku saabsan rabitaankooda ah inay iska tallaalaan COVID-19 iyo sababaha ay u diidanyihiin ama dib u dhiganayaan tallaalka COVID-19. Qiyaastii daraasadda waxaa ka qaybgeli doona ku dhawaad 786 ka qaybgale ah oo lagu soo xushay si aan kala sooc lahayn (random). Waxaan ku waydiisanaynaa ogolaanshahaaga inaad ka qaybgasho daraasaddan.

.

MAXAA DHACAYA HADDII AAD GO'AANSATO INAAD KA QAYBGASHO DARAASADDAN CILMIBAARISEED?

Haddii aad ogolaato inaad ka qaybgasho daraasaddan, waxyaalaha soo socda ayaa dhici doona: waxaad gujin doontaa HAA oo markaas si toos ah laguugu jiheeyo su'aalaha cilmibaarista. Buuxinta xog-ururinta waxay qaadan doontaa ku dhawaad shan daqiiqo. Xog-ururinta ayaa taaban doonta mowduucyo ay ka mid yihiin kalsoonida yarida laga qabo tallaalka COVID-19 sababtoo ah saameyntiisa caafimaad oo xun ama waxtarla'aantiisa; kalsooni darro laga qabo dawladda; Aragtida laga qabo macluumaadka tallaalka COVID-19 inay tahay mid aan is waafaqsanayn oo iska soo horjeeda; Aragtida ku aaddan xaaladaha caafimaad ee aan aad ugu nuglayn cudurka COVID-19; aaminsanaanta in COVID-19 iyo tallaalkiisa ba loo abuuray inay ka faa'iidaystaan ganacsatada dawooyinka; iyo aaminsanaanta in tallaallada COVID-19 lagu sameeyay isku-dhisyo aan xalaal ahayn.

MIYAY JIRAAN WAX KHATARO AH, DHIBAATOOYIN AH, WALWAL KEENI KARA EE LA XIRIIRA DARAASADDAN?

Cilmibaarista caafimaadku waxaa suurtagal ah inay keento khataro nafsi ah, kuwo bulsho, kuwo dareen iyo qaar jireed intaba. Waa in had iyo jeer dadaal la sameeyaa si loo yareeyo khataraha. Halka khatar ee suurtagal ah oo ku jiri kara daraasaddani waa luminta qarsoodiga. Wax kasta oo aad noo sheegto waxaanu ku dhowri doonaa sir ahaan intii suurtogal ah. Waxaan isticmaali doonaa nambar kood (fure) si aan kugu aqoonsanno, xogtaadana waxaan ku keydin doonaa nidaam xogeed kombuyutar sir ah. Si kastaba ha ahaatee, ma jiro nidaam lagu ilaalinayo sirtaada oo si buuxda ammaan u noqon kara, sidaas darteed weli waxaa suurtogal ah in qof uu ogaado inaad ku jirto daraasaddan oo uu ogaan karo macluumaadka adiga kugu saabsan. Sidoo kale, waxaa laga yaabaa in ka jawaabista su'aalaha ku jira xog-ururinta ay kugu noqoto dhib. Haddii ay jiraan su'aalo aadan rabin inaad ka jawaabto, waad ka boodi kartaa. Waxaad xaq u leedahay in aad ka baxdo sahanka cilmibaarista adiga oo gujinaya meesha ku calaamadsan “MAYA” ee ku taal xagga hoose ee boggan. Intaa waxaa dheer, Survey Monkey, oo ah barnaamijka loo adeegsaday in lagu maamulo sahankan, ayaa xaqiijinaya qarsoodi ahaanshaha jawaabahaaga isagoo qarinaya aqoonsigaaga iyo xitaa ciwaanka IP-ga ee taleefankaaga gacanta ama kumbuyuutarka aad isticmaashay.

MIYAY JIRAAN WAX FAA'IIDO AH EE KU JIRA KA QAYBQAADASHADA DARAASADDAN?

Macluumaadka aad na siinayso waxay naga caawin doonaan inaan si wanagsan u fahanno ka-labalabaynta tallaalka ee reer Muqdisho. Macluumaadkani waxay wax-ku-biirinaysaa cilmiga oo caddaynaysaa macluumaadka ku saabsan tallaallada COVID-19.

MAXAA KHARASH AH OO KA QAYBQAADASHADA DARAASADDAN KUGU RAACAYA?

Ka qaybqaadashada daraasaddan waxaa kaaga baxaya kaliya 10 daqiiqo oo wakhtigaaga ah iyo in ka yar 100MBs oo internet ah (data).

MA LAGUU SOO CELIN DOONAA LACAG KASTA OO KAAGA BAXDA DARAASADDAN?

Daraasaddan waxaa loo qabanayaa qalinjabin arday awgeed oo aan la maalgelin, markaa laguuma soo celin doono kharashka 100MB ee aad internetka u isticmaali doonto si aad uga jawaabto su'aalaha.

MAXAA YEELAYSAA HADDII AAD SU'AALO QABTID MUSTAQBALKA?

Haddii aad hayso su'aalo dheeraad ah ama aad qabto walaac ku saabsan ka qaybqaadashada daraasaddan, fadlan soo wac ama u dir farriin qoraal ah shaqaalaha daraasadda ee lambarkoodu ku yaal boggan hoose. Macluumaad dheeraad ah oo ku saabsan xuquuqdaada ka-qaybgale cilmibaaris ahaan waxaad la xiriiri kartaa Xoghayaha/Gudoomiyaha, Isbitaalka Qaranka ee Kenyatta- Guddiga Anshaxa iyo Cilmibaarista ee Jaamacadda Nairobi Taleefanka No. 2726300 Ext. 44102 Emaylka uonknh_erc@uonbi.ac.ke. Kooxda daraasadda ayaa kharashkaaga wicitaannadan kuugu soo celin doona haddii wacitaanka uu yahay isgaarsiin la xiriirta daraasaddan.

MAXAA KALE OO AAD DOORAN KARTAA?

Go'aankaaga ka qaybqaadashada cilmibaaristu waa ikhtiyaari. Xor ayaad u tahay inaad diido ka qaybqaadashada daraasadda oo waad ka bixi kartaa daraasadda wakhti kasta iyada oo aan lagu dulmineyn ama aadan waayin wax faa'iido ah.

LIFAAQA VI: BAYAANKA OGGOLAANSHAHA ONLAYNKA AH

Bayaanka ka qaybgalaha

Waan akhriyay foomkan oggolaanshaha. Su'aalahayga waxaa lagaga jawaabay luqad aan fahmayo. Khatarta iyo faa'iidooyinka waa la ii sharaxay. Waxaan fahamsanahay in ka-qaybgalkayga daraasaddan uu yahay mid ikhtiyaari ah oo aan dooran karo inaan ka noqdo wakhti kasta. Waxaan si xor ah u aqbalay inaan ka qaybqaato daraasaddan cilmibaarista. Waxaan fahamsanahay in dhammaan dadaallada la samayn doono si loo dhowro loona ilaaliyo macluumaadka ku saabsan aqoonsigayga shakhsi ahaaneed.

Saxiixaygaa foomkan oggolaanshaha, kama aan tanaasulin mid ka mid ah xuquuqaha sharciga ah ee aan leeyahay maadaama aan ka qaybqaatay daraasaddan cilmibaarista.

Waxaan oggolahay inaan daraasaddan ka qaybgalo: Haa Maya

Saxiixa ka qaybgalaha / Suul saarka _____ Date _____

Bayaanka cilmi-baaraha

Anigoo ah qofka hoos ku saxiixan, waxan ka-qaybqaataha kor ku xusan si buuxda ugu sharaxay faahfaahinta la xiriirta daraasaddan cilmibaarista oo aan aaminsanahay in ka-qaybqaatuhu uu fahmay oo uu si rabitaankiisa ah oo xor ah u bixiyay ogolaansho. Magaca Cilmi-baaraha: _____ Taariikhda: _____ Saxiixa _____

Doorka daraasadda: ____ cilmi-baaraha hoggaaminaya daraasadda_____ Wixii macluumaad dheeraad ah kala xiriir _____ ee jooga _____ laga billaabo _____ ilaa _____.

LIFAAQA III: WEYDIIMAHA XOG-URURINTA

1. Da'deydu waa: _____(sano jir)
2. Waxaan ku noolahay: _____ ee magaalada/ xaafadda ee Degmada _____ _____
3. Heergeyga Waxbarashadu waa: (dooro hal mid)

   Dugsi Hoose ___

   Dugsi Sare___

   Waxbarasho Dugsi Sare ka-dib___
4. Waxaan ku shaqeeyaa: _____anigoo bishiiba qaata mushaar dhan_____
5. Waxa la iga tallaalay COVID-19: (hal mid dooro)

   Haa ___

   Maya ___

Haddii jawaabtaadu tahay "Maya" fadlan u gudub su'aasha 6aad, Haddiise jawaabtaadu tahay "Haa" waa ay kaa dhantahay!!

6. Waxaa la i tallaali doonaa marka tallaalka COVID-19 la ii helo:

   Haa ___

   Maya ___

Haddii jawaabtaada su'aasha 6 ay tahay Haa, waa ay kaa dhantahay, awguuriyo!

Haddiise jawaabtaada su'aasha 6 ay tahay MAYA, fadlan u gudub su'aalaha 7, 8, 9 iyo 10.

7. Laygama tallaali doono COVID-19 sababaha soo socda awgood:

   _____

   _____

   _____

   _____

   _____

   _____

8. La ima tallaali doono sababtoo ah:
   a. Kalsoonida aan ku qabo tallaalka COVID-19 waa mid hooseysa sababtoo ah tallaalku wuxuu leeyahay waxyeelooyin caafimaad
      Haa ___
      Maya ___
   b. Kalsoonida aan ku qabo tallaalka COVID-19 waa mid hooseysa sababtoo ah tallaalku waa mid aan waxtar lahayn

Haa ___
Maya ___

c. Kuma aamin qabo in dawladdu ay bixiso tallaal badbaado leh (amaan ah)
   Haa ___
   Maya ___
d. Macluumaadka ku saabsan tallaallada COVID-19 waa kuwo aan iswaafaqayn oo iska hor imanaya
   Haa ___
   Maya ___
e. Xaaladdeyga Caafimaad waa la qabsan kartaa caabuqa SARS-CoV-2 iyada oo aanan khatar ugu jirin inaan si xun u jirrado
   Haa ___
   Maya ___
f. Waxaan dareemaa badqab dheeri ah marka aanan qaadan tallaalka COVID-19.
   Haa ___
   Maya ___
g. My risk of getting COVID-19 would remain the same even after getting vaccinated
h. Hubanti la'aanta inaan qaado COVID-19 waxay ahaan doontaa mid la mid ah sidii hore xitaa ka dib marka la i tallaalo.
   Haa ___
   Maya ___
i. COVID-19 waxaa loo sameeyay si loo abuuro suuq tallaal.
   Haa ___
   Maya ___
j. Tallaalka COVID-19 waxa ku jira walxo aan xalaal ahayn.
   Haa ___
   Maya ___

9. Isha ugu weyn ee aan ka helo macluumaadka ku saabsan tallaallada COVID-19 waa:
   a. Facebook-ga
   b. Twitter
   c. Bogga (mareegta) Wasaaradda Caafimaadka
   d. Bogga Hay'adda Caafimaadka Adduunka
   e. Raadiyaha iyo telefishanka
   f. Bixiyaha daryeelka caafimaadka
   g. Saxiib
   h. Mid kale (sheeg) _____

استمارة الموافقة المُبَلَغَةِ مسبقاً: الملحق **V**

عنوان الدراسة: دراسة استقصائية عبر الإنترنت حول التردد في تناول لقاح كوفيد-١٩ بين مستخدمي الفيسبوك في مقديشو، بجمهورية الصومال الفيدرالية.

الباحث الرئيسي: الدكتورة. إكرام عبدالوهاب معلم محمد، جامعة نيروبي.

مقدمة:

أود أن أخبركم عن دراسة أجراها الباحثون المذكورون أعلاه. الغرض من نموذج الموافقة هذا هو تزويدكم بالمعلومات التي قد تحتاجونها لمساعدتكم في تحديد ما إذا كنتم ستشاركون في الدراسة أم لا.

لا تتردد في طرح أية أسئلة حول الغرض من البحث، وماذا يحدث إذا شاركت في الدراسة، المخاطر والفوائد المحتملة، وحقوقك كمتطوع، وأي شيء آخر عن البحث أو هذا النموذج غير الواضح.

عندما نجيب على جميع أسئلتك بالطريقة التي ترضيك، فقد تقرر المشاركة في الدراسة أم لا.

تسمى هذه العملية "بالموافقة المُبَلَغَة مسبقاً". وبمجرد أن تفهم وتوافق على المشاركة في الدراسة ، سأطلب منك التوقيع باسمك على هذا النموذج.

يجب أن تفهم المبادئ العامة التي تنطبق على جميع المشاركين في البحث الطبي: (**i** قرارك بالمشاركة بصورة تطوعية تمامًا!!) يمكنك الإنسحاب من الدراسة في أي وقت دون الحاجة بالضرورة إلى إبداء سبب الإنسحاب **iii**) لن يؤثر رفض المشاركة في البحث على الخدمات التي يحق لك الحصول عليها في هذه المنشأة الصحية أو غيرها من المرافق. سنقدم لك نسخة من هذا النموذج لسجلاتك.

هل يمكن أن أواصل؟ نعم/ لا

تمت الموافقة على هذه الدراسة من قبل لجنة بروتوكول الأخلاقيات والبحوث بمستشفى كينياتا الوطني بجامعة نيروبي رقم.

بماذا تتعلق هذه الدراسة؟

يقوم الباحثون المذكورون أعلاه بإجراء مقابلات مع أفراد يعيشون في مقديشو وتبلغ أعمارهم ١٨ عامًا فما فوق. الغرض من المقابلة هو معرفة ما إذا كانوا يقبلون لقاحات كوفيد-١٩ وإذا كانوا لا يقبلون فهل هناك أسباب وراء رفضهم. سيتم طرح أسئلة على المشاركين في هذه الدراسة البحثية حول رغبتهم في أخذ لقاح التطعيم ضد كوفيد-١٩ وأسباب رفضهم أو تأجيلهم تطعيم كوفيد-١٩. سيكون هناك ما يقرب من ٧٨٦ مشاركًا في هذه الدراسة يتم اختيارهم عشوائيًا. ونطلب منك الموافقة بالنظر في المشاركة بهذه الدراسة.

ماذا سيحدث إذا قررت أن تكون في ضمن المشاركين بهذه الدراسة البحثية؟

إذا وافقت على المشاركة في هذه الدراسة، فإن الأشياء التالية ستحدث: سوف تنقر فوق كلمة "نعم" ليتم توجيهك تلقائيًا إلى أسئلة الإستطلاع. يستغرق ملء الاستبيان حوالي خمس دقائق. سيغطي الاستبيان موضوعات مثل الثقة المنخفضة في لقاح كوفيد-١٩ بسبب آثاره الجانبية أو عدم فعاليته؛ عدم الثقة في الحكومة تصور معلومات عن لقاح كوفيد-١٩ على أنها غير متجانسة ومتناقضة؛ تصور أن الحالة الصحية ليست عرضة للإصابة بمرض الخطير ؛ الاعتقاد بأن كوفيد-١٩ ولقاحه تم إنشاؤه لصالح رجال الأعمال الصيدلانيين؛ أو الاعتقاد بأن لقاحات كوفيد-١٩ مصنوعة من معامل غير حلال.

هل توجد أي مخاطر أو مضايقات مصاحبة لهذه الدراسة؟

إن البحث الطبي له القدرة على خلق مخاطر نفسية واجتماعية وعاطفية وجسدية. يجب دائمًا بذل جهد لتقليل المخاطر. أحد المخاطر المحتملة لكونك مشاركًا في الدراسة هو أن تفقد الخصوصية. سنحافظ على سرية كل ما تخبرنا به قدر الإمكان. سنستخدم رقمًا رمزيًا للتعرف عليك في قاعدة بيانات الكمبيوتر وبطريقة محمية بكلمة مرور. على حال، لا يوجد نظام لحماية خصوصيتك بحيث يمكن أن يكون آمنًا تمامًا، لذلك فإنه من الممكن أن يكتشف شخص ما أنك مشارك في هذه الدراسة مما يمكنه من معرفة معلومات عنك. أيضًا، قد تكون الإجابة عن الأسئلة في الاستبيان غير مريحة بالنسبة لك. وإذا كانت هناك أي أسئلة لا تريد الإجابة عنها ، فيمكنك تخطيها. لديك الحق في الاختيار بالإنسحاب من الإستطلاع عن طريق النقر فوق علامة التبويب "لا" في أسفل هذه الصفحة. علاوة على ذلك، قرد المسح، فإن النظام الأساسي المستخدم لإدارة هذا الإستطلاع، يضمن عدم الكشف عن هويتك لردودك عن طريق إخفاء هويتك وحتى العنوان الشخصي الخاص بهاتفك المحمول أو جهاز الكمبيوتر الخاص بك.

هل توجد أية فوائد في مشاركتك بهذه الدراسة؟

ستساعدنا المعلومات التي تقدمها على فهم تردد اللقاح في مقديشو بشكل أفضل. هذه المعلومات هي مساهمة في نشر العلم وتوضيح المعلومات حول لقاحات كوفيد-١٩

كونك جزاء منها فهل ستكلفك هذه الدراسة أي شيء؟

ستكلفك المشاركة في هذه الدراسة بحوالي ١٠ دقائق فقط وأقل من ١٠٠ ميجا بايت من البيانات.

هل ستستعيد أية مبالغ أنفقتها كونك جزءاً من هذه الدراسة؟

هذه الدراسة مخصصة لمشروعٍ طلابي ولن يتم تمويلها، وبالتالي لن يتم إسترداد تكلفة ال١٠٠ ميجا بايت التي ستستخدمها لملء الاستبيان.

ماذا لو كان لديك أسئلة في المستقبل؟

إذا كانت لديك أسئلة أو مخاوف أخرى بشأن المشاركة في هذه الدراسة، فضلاً إتصل أو أرسل رسالة نصية إلى طاقم الدراسة على الرقم الموجود في أسفل هذه الصفحة. لمزيد من المعلومات حول حقوقك كمشارك في البحث، يمكنك الإتصال بالسكرتير/ الرئيس، مستشفى كينياتا الوطني - جامعة نيروبي لجنة الأخلاقيات والبحوث رقم الهاتف 2726300 تحويلة. 44102

بريد إلكتروني **uonknh_erc@uonbi.ac.ke**. سيقوم طاقم الدراسة بسداد الرسوم الخاصة بك نحو هذه الأرقام إذا كانت المكالمة متعلقة بالتواصل الدراسي.

ما هي إختياراتُك الأخرى؟

إن قرارك بالمشاركة في البحث طوعي. ولك مطلق الحرية في رفض المشاركة بالدراسة، ويمكنك الإنسحاب من الدراسة في أي وقت دون ظلم أو خسارة بأية مزايا.

الملحق **VI**: بيان الموافقة عبر الإنترنت

بيان المشارك

لقد قرأت نموذج الموافقة هذا. وأجبتُ عن أسئلتي بلغة أفهمها. تَمَّ شرحُ المخاطر والفوائد لي.

أَفهَمُ أن مشاركتي في هذه الدراسة طوعية وأنني قد أختار الإنسحاب في أي وقت.

أوافق بحرية على المشاركة في هذه الدراسة البحثية. أفهم أنه سيتم بذل كل الجهود للحفاظ على سرية المعلومات المتعلقة بهويتي الشخصية.

بتوقيعي على نموذج الموافقة هذا ، فأنا لم أَتَخَلَ عن أي من الحقوق القانونية التي أمتلكها كمشارك في الدراسة البحثية.

أوافق على المشاركة في هذه الدراسة:

نعم/ لا

توقيع المشارك/ بسمة، ختم

_____ التاريخ _____

أنا، الموقع أدناه، أوضحت تمامًا التفاصيل ذات الصلة بهذه الدراسة البحثية للمشارك المذكور أعلاه وأعتقد أن المشارك قد أعطى موافقته/موافقتها عن طيب خاطر وبحرية.

_____ التاريخ _____

إسم الباحث _____التاريخ

_____التوقيع _____

الدور في الدراسة:

المسؤول _____

المتحري/المحقق_____

للمزيد من المعلومات يُرجَى الإتصال ب_____

من _____

إلى _____

الملحق **III**:

الإستبيان

١. عمري هو:_____من السنين

٢. أنا أعيشُ في: _____ المدينة/ القريه _____ الإقليم

٣. مستوى تعليمي هو: ____(ضع علامة على واحد)

المرحلة الإبتدائية ____

المرحلة الثانوية ____

مرحلة ما بعد الثانوية _____

٤. أنا أعمل ك: _____

مرتبي الشهري هو _____

٥. لقد تم تطعيمي ضد مرض كوفيد -١٩: (ضع علامة على واحد)

نعم _____

لا _____

إذا كانت إجابتك على السؤال ٦ نعم، فقد إنتهيتَ، يا أهلاً وسهلاً!

وإذا كانت إجابتُك "لا" ، يرجى للمتابعة إلى السؤال ٦. وإذا كانت إجابتك "نعم" ، فقد انتهيتَ!!

٦. سوف أتلقى التطعيم عندما يكون لقاح كوفيد-١٩ متاحًا لي:

نعم _____

لا _____

إذا كانت إجابتك على السؤال ٦ نعم، فقد إنتهيتَ، يا أهلاً وسهلاً!

إذا كانت إجابتك على السؤال ٦ هي "لا" ، فيرجى المتابعة إلى الأسئلة ٦ و ٨ و ٩ و ١٠.

٧. لن يتم تطعيمي ضد كوفيد ١٩ للأسباب التالية:

٨. لن يتم تطعيمي للأسباب التالية:

أ. ثقتي في لقاح كوفيد ١٩ منخفضة لأن اللقاح له آثار جانبية

نعم ____

لا ____

ب. ثقتي في لقاح كوفيد-١٩ منخفضة لأن اللقاح غير فعال

ج. لا أثق في أن الحكومة ستقدم لقاحًا آمنًا

نعم ____

لا ____

د. المعلومات حول لقاحات كوفيد-١٩ غير متجانسة ومتناقضة

نعم ____

لا ____

ه. يمكن أن تتكيف حالتي الصحية مع عدوى **SARS-CoV**-2 دون التعرض لخطر الإصابة بمرض خطير

نعم ____

لا ____

و. أشعر بأمان أكبر بدون تطعيم كوفيد-١٩.

نعم ____

لا ____

ز. سيظل خطر إصابتي بـ كوفيد-١٩ كما هو حتى بعد التطعيم.

نعم ____

لا ____

ح. تم إنشاء كوفيد-١٩ لخلق سوقٍ للقاحات.

نعم ____

لا ____

ط. تحتوي لقاحات كوفيد-١٩ على مواد غير حلال.

نعم ____

لا ____

٩. المصدر الرئيسي لمعلوماتي عن لقاحات كوفيد-١٩ هو:

أ. فيسبوك

ب. تويتر

ج. موقع وزارة الصحة

د. موقع منظمة الصحة العالمية

ه. الإذاعة والتلفزيون

و. مُقَدِم الخدمة الطبية

ز. صديق

ح. آخر (حدد) _____