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RESEARCH ARTICLE

MJM BIOLABS

Impact of Knowledge, Attitudes, And Perceptions Regarding the Covid-19 Vaccine Among Students at A Tertiary Institution in Kenya

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ABSTRACT

COVID-19 vaccination was authorised as a preventive measure due to its proven effectiveness in reducing infection incidences, severity and mortality rates. mRNA-based vaccines, such as the Pfizer-BioNTech and Moderna vaccines, work by utilizing a small piece of the virus's genetic material called messenger RNA (mRNA). Viral vector-based vaccines, such as the Oxford-AstraZeneca and Johnson & Johnson vaccines, use a harmless virus to deliver a modified version of the SARS-CoV-2 virus's genetic material into cells. As of June 2021, COVID-19 vaccines approved to be safe and effective by the WHO included: *AstraZeneca* (oxford vaccine), *Johnson and Johnson, Pfizer* (BioNTech), *Moderna, Sinopharm, and Sinovac*. Both mRNA-based and viral vector-based vaccines have shown high efficacy in preventing COVID-19 and reducing the severity of the disease. We assessed how knowledge, attitudes, and perceptions of COVID-19 vaccines influenced uptake by students at a tertiary institution in Kenya. This was a descriptive cross-sectional study conducted in Kabarak University-Main Campus. The sampling procedure employed was convenience sampling method. The data was collected via a self-administered questionnaire on 385 students and analysed using SPSS. Vaccination was not entirely successful (at threshold) in Kenya due to insufficient public education (benefits or side effects); inadequate health care professionals; myths & misconceptions (including risk of infertility), opinions & beliefs (clinical trials short time to detect long term side effects like malignancies); resistance (fear for death or infection, fear of expired vaccines administration); mistrust on government (forced, threats by leaders, charade to donations, benefits government, research on Kenyans) & mistrust on the sources of vaccines (China, Russia), reluctance, procrastination, negligence & ignorance (not embraced, negative attitude to westernization, pandemic is over!); infection even after being vaccinated and the dosage forms available injection, fear for syringes, oral preferred. The study results revealed that 15.1% strongly agreed that a vaccine is important to end the COVID-19 pandemic; 33.5% agreed that a vaccine is important to end the COVID-19 pandemic; 33.2% were undecided that a vaccine is important to end the COVID-19 pandemic. The study findings showed that 53.0% had been vaccinated as compared to 47.0% who had not been vaccinated. That is medical students (pharmacy and medicine) had higher rates of vaccine uptake compared to Engineering students.

Keywords: *Knowledge, Attitudes, Perceptions, Vaccine, COVID-19*

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INTRODUCTION

Coronaviruses are enveloped positive-sense, single-stranded RNA (ssRNA) viruses of the *Coronaviridae* family (V'kovski et al., 2021). These viruses are commonly implicated in causing common cold, Middle East Respiratory Syndrome, Severe Acute Respiratory Syndrome, and Coronavirus diseases. Severe Acute Respiratory Syndrome Coronavirus -2 (SARS-CoV-2) is the causative agent in the recent COVID-19 pandemic. Its outbreak began at Hubei province, China and was declared a pandemic by the World Health Organization on 11th March 2020. Its variants include alpha, beta, gamma, and delta strains (Mason, 2020). Further, upcoming variants such as lambda and mu have been observed through mutations by substitution of amino acids. These variants have an incubation period of 14 days with common symptoms including: fever, cough, and fatigue. Other symptoms are difficulty breathing, loss of sense of smell and taste, runny nose, sore throat, headache, chills, muscle aches, chest pain, nausea, vomiting, diarrhoea, conjunctivitis, and rash. Here in Kenya, first case was reported on 12th March 2020.

COVID-19 outbreaks pose challenges to global health. Noteworthy, there have been preceding challenges of SARS (2002 and 2003) and MERS (2012 to the present) outbreaks (Mason, 2020). The key feature of COVID-19 is the domination of nosocomial transmission and pathogenesis driven by viral replication in the lower respiratory tract together with the host immune response (de Wit et al., 2016)the case fatality rate of MERS is much higher than that of SARS.Comorbidities have an important role in SARS and MERS. Several risk factors are associated with progression to acute respiratory distress syndrome (ARDS. Viral infection occurs by spike proteins binding specifically to the host cellular entry receptors such as human aminopeptidase N, angiotensin-converting enzyme 2 (ACE2-common cold virus, SARS-CoV, SARS-CoV2), and the dipeptidyl peptidase 4 (DPP4-MERS-CoV). Coronavirus virion has structural proteins such as envelope, nucleocapsid, spike, membrane, and haemagglutinin esterase. These particles bind to attachment factors and the host receptors through S interaction, with the aid of the host factors such as serine proteases on the cell surface aids viral uptake and fusion on the cellular membrane. Followed by, uncoating to release the genomic RNA that undergoes translation to form polyproteins. Viral replication and transcription creates sub-genomic mRNAs that translocate into the Endoplasmic Reticulum. Virions then form that exit to the host tissues through exocytosis (V'kovski et al., 2021).

COVID-19 has three clinical stages: stage I (asymptomatic state day 1-2) is the initial stage of infection (incubation) during which diagnosis by Polymerase Chain Reaction PCR is possible (Mason, 2020). In stage II, there is evidence of innate immune response in the upper where the virus has propagated down the respiratory tract. Nasal swabs, sputum yield and the markers of immune response (cytokines) helps in diagnosis (Mason, 2020) at this stage. In, stage III, symptoms of hypoxia, and ground glass pulmonary infiltrates are evident and disease may progress to Acute Respiratory Distress Syndrome [ARDS] (Mason, 2020). At stage III the virus primarily infects the alveolar type II cells of the lungs (Mossel et al., 2008). This brings in a pathological result of diffuse alveolar damage with fibrin rich hyaline membranes and few multinucleated giant cells (Xu et al., 2020)2019, an outbreak of a novel coronavirus disease (COVID-19; previously\nknown as 2019-nCoV which on wound healing, leads to more fibrosis and tissue scarring (Mason, 2020). COVID-19 has a higher risk of death in people with underlying comorbidities such as Chronic Kidney Disease, malignancy, diabetes, hypertension/other cardiovascular diseases, and lung diseases (Wu & McGoogan, 2020).

Coronavirus disease can be prevented by keeping a social distance of a metre apart, wearing a well-fitting mask, self-isolating, regular handwashing with soap or an alcohol-based sanitizer, practicing respiratory etiquette (sneezing or coughing with the elbow covering the mouth), being in a well-ventilated, open spaces and vaccination. Equitable access to safe and effective vaccines is the game-changing tool to ending the pandemic but it is not the COVID-19 vaccines that will stop the pandemic. As of 3rd June 2021, WHO evaluated the vaccines for safety and efficacy which includes: AstraZeneca/ Oxford Vaccine, Johnson and Johnson(Janssen), Moderna, Pfizer/BioNTech, Sinopharm, and Sinovac. The vaccines reduce the risk of severe illness.

There are several types of COVID-19 vaccines that have been developed and authorized for use. *AstraZeneca, sputnik, and Johnson and Johnson* are DNA adenovirus that prompts an immune response to the viral protein encoded in DNA (Xu et al., 2020)2019, an outbreak of a novel coronavirus disease (COVID-19; previously\nknown as 2019-nCoV. *Sinovac (coronovax)* is an inactivated/

weakened virus that does not cause the disease but sufficient to generate an immune response (Mascellino et al., 2021). mRNA vaccines such as *Pfizer/BioNTech* and *Moderna* act by stimulating the immune system to produce antibodies against the" spike proteins" made in the cell with the instruction of the vaccine (Mason, 2020). The "spike proteins" are displayed on the cell surface of the SARS-CoV-2 virus where the antibodies bind specifically and break the virus. The mRNA strand does not enter the cell nucleus, therefore does not affect the host cell nucleus and has the advantage of the potential, to target many diseases, and is non-infectious (Centres of Disease Prevention and Control, 2021). Like other vaccines, COVID-19 vaccines can cause mild-moderate and short-lasting side effects such as low-grade fever, pain at the injection site, headache, fatigue, chills, muscle pain, and diarrhoea. Also, a severe and rare adverse effect is anaphylaxis or allergic reactions. Both mRNA-based and viral vector-based vaccines have shown high efficacy in preventing COVID-19 and reducing the severity of the disease. We assessed how knowledge, attitudes, and perceptions of COVID-19 vaccines influenced uptake by students at a tertiary institution in Kenya.

METHODOLOGY

Study Design

This was a descriptive cross-sectional study done according to Wang and Cheng (2020). In a descriptive cross-sectional study, researchers aim to gather information about a population at a specific point in time to describe the prevalence of certain characteristics or behaviours. The researchers selected a target population based on specific criteria and defined the variables of interest that were measured.

Study Population

The target population for this study was students enrolled in the tertiary institution in Kenya. This included undergraduate and postgraduate students pursuing various fields of study. The sample population was a subset of the target population, selected to participate in the study. The sample was representative of the broader student population to ensure the findings can be generalized.

Sampling Technique and Size

The sampling technique employed was convenience. Researchers requested the subjects available and who would meet the inclusion criteria to participate. It was also gender inclusive and enabled drawing inferences about the entire Kabarak University student population adequately. The sample size was based on the Fischer's formula (Zimmer et al., 2023) to generate an adequate sample size for the study.

Where:

n = desired sample size from the total population

z = standard error of the mean which corresponds to 95% confidence level (1.96)

p = expected proportion/prevalence estimate 50%=0.5 (no such study has been done before in Kabarak on COVID-19 vaccines)

q = (1-p)

d = margin of error at 5% (0.05)-absolute error/precision limit

$n = 384.16$

$n = 385$

Data Collection Tools

Data for this study was collected using structured questionnaires or surveys administered to the selected students. The questionnaires included items related to knowledge about the COVID-19 vaccine, attitudes towards vaccination, and perceptions regarding the vaccine's safety and efficacy. The questionnaires were distributed electronically or in-person, depending on the logistics and preferences of the researchers and participants. Researcher developed a structured questionnaire consisting of items related to knowledge, attitudes, and perceptions regarding the COVID-19 vaccine. The questionnaire included both closed-ended questions (e.g., multiple-choice, Likert scale) and open-ended questions to gather qualitative information. To ensure the questionnaire's content validity, researcher conducted a thorough review of existing literature and consulted subject matter experts in the field of vaccine acceptance or public health. Experts provided feedback on the relevance, clarity, and appropriateness of the questionnaire items. Data were collected through a self-administered anonymous questionnaire that had both open-ended and close-ended questions. The questionnaire had questions to gather information on student's knowledge, attitudes, and perceptions towards the COVID vaccine. The questionnaire was distributed through an online google form to the study participants.

Data collection Procedures

Permission was sought from the university, KUREC and NACOSTI, participants were then recruited. The study involved a self-administered online questionnaire that composed of 35 questions divided into four sections containing demographic information, knowledge, attitudes, and perceptions towards COVID-19 Vaccines. The study sought to establish the demographic information of the respondents including their age, date of birth, gender, religion, and marital status, whether they had children, where they stay in Kabarak, and their courses at the university and whether they have been vaccinated. To establish their knowledge, attitudes and perceptions towards COVID-19 vaccination, 25 items were asked. To establish knowledge which is the practical understanding of a subject (COVID-19 Vaccines) six questions were asked.

Data Analysis

Data were analysed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) version 25.0 for cleaning, management and analysis of data. Descriptive statistics, such as frequencies, percentages, means, and standard deviations, were calculated to summarize the data and provide an overview of the students' knowledge, attitudes, and perceptions regarding the COVID-19 vaccine. These statistics helped describe the central tendencies, variability, and distribution of the data. Depending on the research objectives, various inferential statistics were used to explore relationships and test hypotheses. Chi-square test was used to examine associations between categorical variables, such as the relationship between attitudes towards the COVID-19 vaccine and demographic factors like gender or academic field of study. The confidence interval was used in the study is not mentioned in the information provided. A confidence interval of 95% was chosen, indicating that there was a 95% probability that the true population parameter lies within the calculated interval. The study's findings were presented in the form of tables, graphs, and pie charts. Tables can be used to present detailed numerical information, such as frequencies or mean scores, while graphs and pie charts can visually represent the distribution of data or highlight key findings.

Ethical considerations

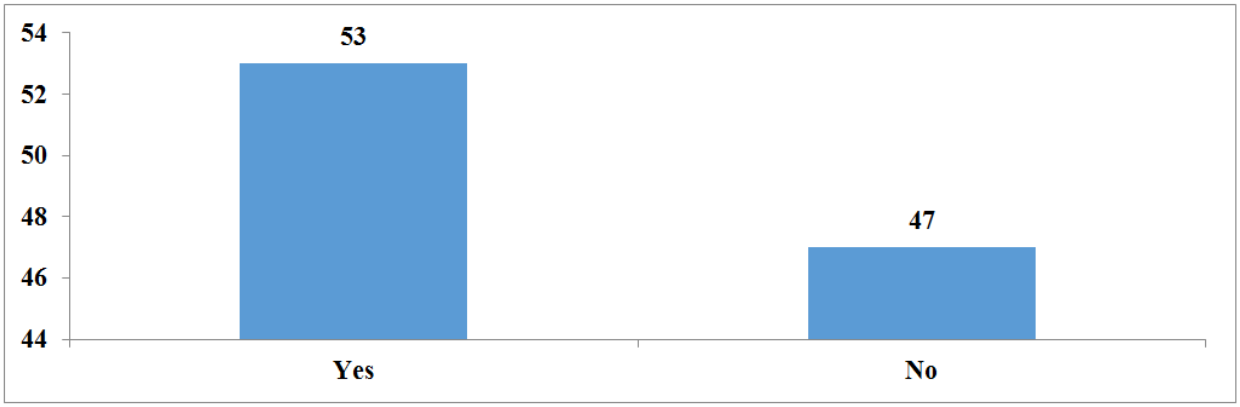
Researcher obtained informed consent from participants, ensuring that they have a clear understanding of the study's purpose, procedures, potential risks, benefits, and their rights. Participants had the right to voluntarily participate or withdraw from the study without facing any negative consequences. Researcher ensured the privacy and confidentiality of participants' data. This included protecting participants' identities and ensuring that their responses or personal information cannot be linked back to them individually without their consent. Data was stored securely and only accessible to authorized personnel. Researcher adhered to data protection regulations and guidelines. Personal data was collected and handled in a way that minimizes risks of unauthorized access, use, or disclosure. Data was anonymized or de-identified whenever possible to protect participant privacy. Researcher took steps to minimize any potential harm or discomfort to participants. This included avoiding invasive or harmful procedures, ensuring that participants' mental and physical well-being is safeguarded, and providing appropriate support or referral services if needed.

RESULTS

Rate of vaccine uptake

The subjects of vaccination status were as presented in Figure 1. The study findings showed that 53.0% had been vaccinated as compared to 47.0% who had not been vaccinated. This implies that a higher proportion of individuals in the study had undergone vaccination compared to those who had not.

Figure 1:
Subjects Vaccination Status



Knowledge Towards COVID-19 Vaccines

The study results revealed that 15.1% strongly agreed that a vaccine is important to end the COVID-19 pandemic; 33.5% agreed that a vaccine is important to end the COVID-19 pandemic; 33.2% were undecided that a vaccine is important to end the COVID-19 pandemic; 10.4% disagreed that a vaccine is important to end the COVID-19 pandemic whereas 7.8% strongly disagreed that a vaccine is important to end the COVID-19 pandemic. This implies that 48.6% agreed that a vaccine is important to end the COVID-19 pandemic as compared to 19.2% who disagreed that a vaccine is important to end the COVID-19 pandemic.

The study findings further revealed that 39.0% of the respondents strongly agreed that vaccines are important for the prevention of severe diseases; 47.0% agreed that vaccines are important for the prevention of severe diseases; 7.8% were undecided that vaccines are important for the prevention of severe diseases; 2.9% disagreed that vaccines are important for the prevention of severe diseases while 3.4% strongly disagreed that vaccines are important for the prevention of severe diseases. This can be interpreted to mean that majority of the respondents (86.0%) agreed that vaccines are important for the prevention of severe diseases as compared to 6.3% who disagreed that vaccines are important for the prevention of severe diseases.

Table 1:
Subject's Knowledge towards COVID-19 Vaccines

Statement	SA	A	N	D	SD	Total
A vaccine is important to end the COVID-19 pandemic	15.1	33.5	33.2	10.4	7.8	100.0
Vaccines are important for the prevention of severe diseases	39.0	47.0	7.8	2.9	3.4	100.0

Subject's Knowledge towards Covid-19 Vaccines

The study results revealed that 69.1% agreed that vaccines can protect against COVID-19 as compared to 30.9% who disagreed; 55.8% agreed that certain antibiotics can prevent and/or treat COVID-19 as compared to 44.2% who disagreed; 89.4% agreed that on average it takes 5–6 days from when someone is infected with COVID-19 for symptoms to show, however it can take up to 14 days as compared to 10.6% who disagreed; 95.6% agreed that The preventive measures can help prevent infection with COVID-19 (Vaccination, mask, hand hygiene with soap/sanitizer, social distancing, self-isolation) as compared to 4.4% who disagreed; 17.4% agreed that once one contracts COVID-19, the virus can never be eliminated from their body as compared to 82.6% who disagreed; 91.2% agreed that Symptoms of COVID-19 can include sore throat, fever, runny nose, diarrhoea, conjunctivitis (eye infection), loss of sense of taste/smell, difficulty breathing as compared to 8.8% who disagreed; 90.4% agreed that most people who contract COVID-19 will recover from it as compared to 9.6% who disagreed; 43.4% agreed that they are less likely to receive the vaccine because it has to be administered in two separate doses as compared to 56.6% who disagreed; 36.9% agreed that the side effects of most vaccines are greater than the benefits as compared to 63.1% who disagreed and that that 81.3% agreed that Other people around me being vaccinated against COVID-19 will be helpful in controlling the pandemic as compared to 18.7% who disagreed (see Table 2).

Table 2:
Importance of the Vaccines

Statement	True	False
Vaccines can protect against COVID-19	69.1	30.9
Certain antibiotics can prevent and/or treat COVID-19	55.8	44.2
On average it takes 5–6 days from when someone is infected with COVID-19 for symptoms to show, however it can take up to 14 days	89.4	10.6
The preventive measures can help prevent infection with COVID-19 (Vaccination, mask, hand hygiene with soap/sanitizer, social distancing, self-isolation)	95.6	4.4
Once you contract COVID-19, the virus can never be eliminated from your body	17.4	82.6
Symptoms of COVID-19 can include sore throat, fever, runny nose, diarrhoea, conjunctivitis (eye infection), loss of sense of taste/smell, difficulty breathing	91.2	8.8
Most people who contract COVID-19 will recover from it	90.4	9.6
I am less likely to receive the vaccine because it has to be administered in two separate doses	43.4	56.6
The side effects of most vaccines are greater than the benefits	36.9	63.1
Other people around me being vaccinated against COVID-19 will be helpful in controlling the pandemic	81.3	18.7

Importance of the Vaccines

The study results showed that 63.6% disagreed that following vaccination against COVID-19, the vaccinated person need no longer wear a mask or face covering in public as compared to 10.4% who agreed that following vaccination against COVID-19, the vaccinated person need no longer wear a mask or face covering in public. A further 80.5% disagreed that following vaccination against COVID-19, the vaccinated person need no longer wash their hands/ sanitize frequently as compared to 3.6% who agreed that following vaccination against COVID-19, the vaccinated person need no longer wash their hands/ sanitize frequently; 76.8% disagreed that following vaccination against COVID-19, the vaccinated person need no longer adhere to social distancing measures in public as compared to 5.7% who agreed that following vaccination against COVID-19, the vaccinated person need no longer adhere to social distancing measures in public. The study results showed that 76.8% disagreed that following vaccination against COVID-19, the vaccinated person need no longer avoid contact or crowded places as compared to 7.3% who agreed that following vaccination against COVID-19, the vaccinated person need no longer avoid contact or crowded places (see Table 3).

Table 3:
Following Vaccination Against COVID-19 the Vaccinated Person

	Disagree	Neutral/unsure	Agree
Need no longer wear a mask or face covering in public	63.6	26.0	10.4
Need no longer wash their hands/ sanitize frequently	80.5	15.8	3.6
Need no longer adhere to social distancing measures in public	76.8	17.4	5.7
Need no longer avoid contact or crowded places	76.8	15.8	7.3

The study results showed that 73.0% said news organizations: Print, TV, online, or mobile; 43.9% said social media platforms: Twitter WhatsApp or Facebook; 26.5% said friends or family or acquaintances; 20.5% said scientific and research studies; 27.0% said CDC (Centre for Disease Control and Prevention), WHO (World Health Organization); 27.8% said medical professionals; 11.9% said public/political figures while 17.9% said communications from professional organizations.

Table 4:

Primary Source of Information Regarding COVID-19

Primary source of information regarding COVID-19	Frequency	Percentage
News organizations: Print, TV, online, or mobile	281	73.0
Social media platforms: twitter, WhatsApp or Facebook	169	43.9
Friends or family or acquaintances	102	26.5
Scientific and research studies	79	20.5
Centre for Disease Control and Prevention; World Health Organization	104	27.0
Medical professionals	107	27.8
Public/political figures	46	11.9
Communications from professional organizations	69	17.9

The study results showed that 19.0% of the respondents opined that they were much more likely to vaccinate themselves; 29.4% opined that they were more likely to vaccinate themselves; 30.6% were of the opinion that vaccinations had not changed; 12.7% opined that they were less likely to vaccinate themselves while 8.3% were of the view that they were much less likely to vaccinate themselves.

Table 5:

Experience with the COVID-19 Global Pandemic and Opinion on Vaccinations

Opinion	Frequency	Percentage
I am much more likely to vaccinate myself	73	19.0
I am more likely to vaccinate myself	113	29.4
My opinion on vaccinations has not changed	118	30.6
I am less likely to vaccinate myself	49	12.7
I am much less likely to vaccinate myself	32	8.3
Total	385	100.0

The study results on the statements which most closely resembles the respondents' reason for choosing not to vaccinate themselves indicated that 29.5% did not believe the vaccine is safe; 28.4% did not believe the vaccine is effective; 12.7% did not trust the source that encouraged them to get the vaccine; 6.2% did not believe in any vaccines, and their reason is not any different for a new COVID-19 vaccine; 8.4% noted that a source that they trust encouraged them not to get the vaccine while 20.0% said that they were indifferent to receiving the vaccine, but will probably end up not receiving it.

Table 6:

Reason for Choosing to not Vaccinate

Opinion	Frequency	Percentage
I do not believe the vaccine is safe	81	29.5
I do not believe the vaccine is effective	78	28.4
I do not trust the source that encouraged me to get the vaccine	35	12.7
I do not believe in any vaccines, and my reason is not any different for a new COVID-19 vaccine	17	6.2
A source that I trust encouraged me to NOT get the vaccine	23	8.4
I am indifferent to receiving the vaccine, but will probably end up not receiving it	55	20.0
Total	385	100.0

Risk level the respondents were to get covid-19

The study sought to find out based on the respondents' health, age and risk factors, what do they believe to be their risk level were they to get covid-19. The study results were as presented. The study results showed that 52.5% were of the view that they would likely be asymptomatic or have mild disease; 30.4% said that they could be ill without requiring hospitalization, 12.2% said that they could be hospitalized, 2.3% said that they could be severely ill requiring oxygenation while 2.6% said that they could die.

Figure 2:
Risk Level the Respondents Were to Get Covid-19

The study results showed that 20.8% said that they had no disease or they did not know anyone who had Covid-19; 15.3% said mild illness; 22.1% noted moderate or severe illness but not requiring hospitalization, 24.4% said death, 14.0% said hospitalization while 3.4% mentioned intensive care.

Table 7:
Most Severe Outcome of COVID-19 Among Someone Known

The most severe outcome of COVID-19	Frequency	Percentage
No disease or I don't know anyone who had Covid-19	80	20.8
Mild illness	59	15.3
Moderate or severe illness but not requiring hospitalization	85	22.1
Death	94	24.4
Hospitalization	54	14
Intensive care	13	3.4
Total	385	100.0

The study results showed that 50.1% said the Covid-19 is serious, life threatening infection, 31.7% said moderate infection similar to flu, 10.9% said not very serious, most people had no trouble and 7.3% said Covid-19 is deadly.

Table 8:
Seriousness of Covid-19

Seriousness of Covid-19	Frequency	Percentage
Serious, life threatening infection	193	50.1
Moderate infection similar to flu	122	31.7
Not very serious, most people had no trouble	42	10.9
Deadly	28	7.3
Total	385	100.0

Perceptions towards COVID-19 Vaccines

The study established how much they agreed with the statement that they worry about the rushed pace of testing for a new COVID-19 vaccine will fail to detect potential side effects or dangers. The study results revealed that 57.9% of the respondents agreed that the rushed pace of testing for a new COVID-19 vaccine will fail to detect potential side effects or dangers as compared to 13.8% who disagreed that the rushed pace of testing for a new COVID-19 vaccine will fail to detect potential side effects or dangers.

Table 9:
Testing and Detection of Potential Side Effects or Dangers

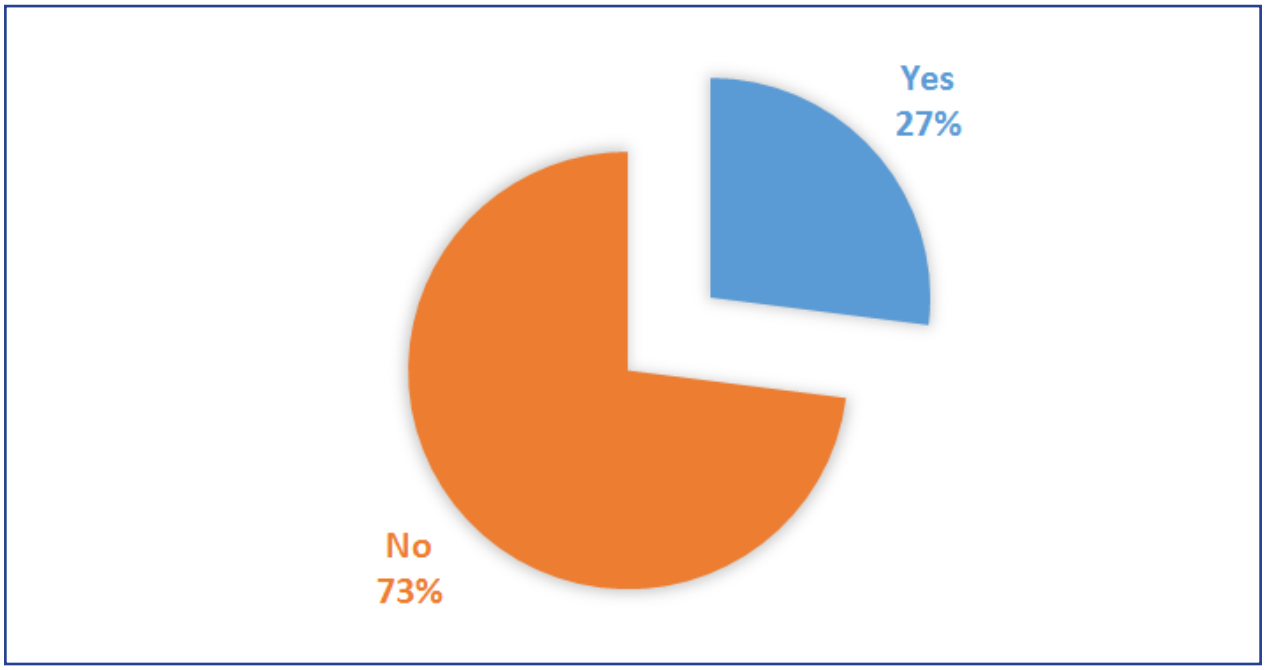
Statement	SA	A	N	D	SD	Total
The rushed pace of testing for a new COVID-19 vaccine will fail to detect potential side effects or dangers.	20.0	37.9	28.3	9.1	4.7	100.0

Receive repeated vaccinations

The study sought to establish if the COVID-19 vaccine would need to be administered yearly; the respondents would receive repeated vaccinations. The study results were as shown in figure 3. The study findings revealed that 27.0% agreed that if the COVID-19 vaccine would need to be administered yearly; the respondents would receive repeated vaccinations as compared to 73.0% who disagreed that if the COVID-19 vaccine would need to be administered yearly; the respondents would receive repeated vaccinations.

Figure 3:
Receive Repeated Vaccinations

The study results on whether the COVID-19 Vaccination is successful in Kenya revealed that 13% said that the COVID-19 Vaccination is successful in Kenya; 40% said that theCOVID-19 Vaccination is unsuccessful in Kenya; 27% said that the COVID-19 Vaccination is somewhat successful in Kenya while 20% were not sure that the COVID-19 Vaccination is successful in Kenya. Most Kenyans do not know much about the vaccines and its benefits and effect are not clearly stated. People fear what they do not understand. Some Kenyans got vaccinated just because it was a job requirement. The view of the vaccination process by the people isn't entirely positive thus not so many people agree with vaccination. Also, the percentage that has been



vaccinated is not entirely big enough. Most people still have a stereotype that it is not acceptable and have a negative attitude towards westernization. Majority of Kenyans have not been vaccinated and very many doses are getting expired because of low turn up. Somehow it is since quite a good number went for the vaccine while there are still those who are against it and hold strongly to their belief that the vaccine only worsens one's condition once you have taken it.

Table 10:
Schools and Vaccination Rate Cross Tabulation

Schools * Vaccination Cross tabulation					
			Vaccination		Total
			Yes	No	
Schools	Pharmacy	Count	55	21	76
		% within Schools	72.4%	27.6%	100.0%
	Medicine	Count	52	36	88
		% within Schools	59.1%	40.9%	100.0%
	Law	Count	13	11	24
		% within Schools	54.2%	45.8%	100.0%
	Education	Count	23	34	57
		% within Schools	40.4%	59.6%	100.0%
	Music	Count	3	3	6
		% within Schools	50.0%	50.0%	100.0%
	Business	Count	44	51	95
		% within Schools	46.3%	53.7%	100.0%
	Engineering	Count	14	25	39
		% within Schools	35.9%	64.1%	100.0%
Total		Count	204	181	385
% within Schools			53.0%	47.0%	100.0%

Schools and Vaccination

Most of the vaccinated students were from school of pharmacy (72.4%) and school of medicine (59.1%) whereas school of Engineering had the least number of students vaccinated (35.9%).

Table 11:
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.735[a]	6	.001
Likelihood Ratio	23.278	6	.001
Linear-by-Linear Association	17.617	1	.000
N of Valid Cases	385		

[a]. 2 cells (14.3%) have expected count less than 5. The minimum expected count is 2.82.

DISCUSSION

The findings suggest that there are multiple factors contributing to the unsuccessful vaccination efforts in Kenya. These factors range from insufficient public education and inadequate healthcare professionals to myths, misconceptions, resistance, mistrust in the government and vaccine sources, reluctance, and ignorance (Mason, 2020). It is evident that a comprehensive approach is needed to address these challenges and improve the vaccination rate in the country.

One significant factor identified is the lack of public education about the benefits and potential side effects of vaccines. This highlights the importance of effective communication and education campaigns to provide accurate and reliable information to the public. It is crucial to address common misconceptions and concerns, such as the belief that vaccines can cause infertility or that clinical trials are too short to detect long-term side effects like malignancies (Xu et al., 2020)2019, an outbreak of a novel coronavirus disease (COVID-19; previously\nknown as 2019-nCoV. By disseminating clear and evidence-based information through various channels, including news organizations, the public can make informed decisions about vaccination.

Another key finding is the influence of mistrust in the government and vaccine sources. Mistrust can stem from perceived forced vaccinations, threats by leaders, doubts about the government's intentions, and concerns about the sources of vaccines, such as China or Russia. To address this, it is essential to establish transparency, ensure accountability, and build trust in the vaccination process. This can be achieved through open communication, engaging with community leaders and influencers, and providing clear information about the safety and efficacy of the vaccines (Xu et al., 2020)2019, an outbreak of a novel coronavirus disease (COVID-19; previously\nknown as 2019-nCoV.

Moreover, the study reveals that reluctance, procrastination, negligence, and ignorance contribute to low vaccine uptake. Negative attitudes towards Westernization and the belief that the pandemic is over can hinder vaccination efforts. To combat this, tailored messaging and public awareness campaigns should be implemented to address these specific issues and emphasize the ongoing importance of vaccination in preventing the spread of the virus and protecting individuals and communities (Mason, 2020).

The findings also highlight the influence of the students' courses on vaccination rates, with medical students showing higher rates of vaccine uptake compared to engineering students. This suggests that education and knowledge play a significant role in vaccine acceptance. Therefore, incorporating vaccine education into various academic curricula and leveraging the influence of medical professionals can help promote vaccination among different populations.

CONCLUSIONS

The study concluded that that medical students (pharmacy and medicine) had higher rates of vaccine uptake compared to engineering students. This may be attributed to the fact that medical students have a better understanding of vaccines and their importance in healthcare. The main source of information for the students in this context is news organizations, including print, TV, online, or mobile platforms. It is important to ensure that accurate and reliable information is disseminated through these channels to address misconceptions and promote vaccine acceptance. Public education campaigns, involvement of healthcare professionals, and targeted messaging can play a crucial role in improving the vaccination rate in Kenya.

RECOMMENDATIONS

Strengthen Public Education Campaigns: Increase efforts to provide clear and accurate information about the benefits, safety, and effectiveness of vaccines. Utilize multiple communication channels, including news organizations, to reach a wide audience. Address common misconceptions, address concerns about side effects, and emphasize the importance of vaccination in protecting individuals and the community.

Involve Healthcare Professionals: Collaborate with healthcare professionals, including doctors, nurses, and pharmacists, to actively engage in vaccine education and administration. Their expertise and credibility can help address concerns and build trust among the public. Encourage healthcare professionals to proactively discuss vaccines with their patients, answer questions, and address any misconceptions or fears.

DECLARATION

Competing Interests

The authors declare that they have no competing interests.

Authors' Contribution

KH contributed to design, data collection, analysis, interpretation and approval of submitted version.

FM contributed to design, formatting and approval of the submitted version.

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