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DISRUPTIVE TECHNOLOGY AND THE INDIRECT IMPACT ON THE UPTAKE OF COVID-19 VACCINATION THROUGH SELF-EXEMPTING DISCRIMINANT ATTITUDES AND MISINTERPRETATIONS IN KENYA AND THE USA

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ABSTRACT

The study examines the indirect impact of disruptive technology on the uptake of COVID-19 vaccination through self-exempting discriminant attitudes and misinterpretations in Kenya and the USA. COVID-19 vaccine refusal is identified as a major obstacle to achieving health for all, with hesitant individuals spreading misinformation through social media platforms (disruptive technology) thus contributing to low vaccination uptake. The history of disruptive technology, vaccination, and the global COVID-19 pandemic are discussed as context for understanding the current challenges faced in promoting vaccination uptake using disruptive technology. Findings indicated no significant direct effects of disruptive technology on vaccination uptake, with key influencers being attitudes and misinterpretations. Recommendations include focusing on demystifying vaccine effectiveness and tailoring interventions to improve public knowledge and attitudes towards vaccination.

1.0 INTRODUCTION

The use of vaccination has proven to be effective in reducing the mortality and morbidity rates for preventable diseases among populations, especially childhood diseases. In this regard, immunizations have been endorsed by the World Health Organization (WHO) as one of the most inventive medical discoveries in human history (Dodd et al. 2020). Vaccines against coronavirus disease (COVID-19) were developed by international organizations and governments to control the spread and viral infection from coronavirus disease hence contributing to the reductions in morbidity and mortality related to this pandemic. The UK and the US were among the first countries to vaccinate their populations, followed swiftly by other countries like the United Arab Emirates (UAE) and Israel among others. By mid-2021, most countries adopted vaccination against coronavirus disease as a measure to control the virus in populations among other measures, and promoted this intervention among its citizens (Pogue, 2020).

Nonetheless, COVID-19 vaccine refusal is now considered to be among the major obstacles to achieving health for all, among other threats like antimicrobial resistance, the influenza pandemic, and climate change (Lazarus et al., 2021). Vaccine hesitancy is defined as the refusal to be vaccinated or delay to accept to be vaccinated when vaccination services are available (Lazarus et al., 2021). This concept of vaccine hesitancy tends to be context-specific and complex since it varies by place and time. Those who are COVID-19 vaccine hesitant can spread misinformation about COVID-19 vaccination risks on disruptive technologies with the

aim of anti-vaccination campaigns. Contents with misinformation can contribute towards low uptake of COVID-19 vaccination (Depoux et al., 2020). When the public access anti-vaccine and misinterpretations of vaccines on disruptive technologies, their attitude toward getting vaccinated becomes negative. Moreover, when a person visits websites with anti-vaccination information even for only ten minutes, they are likely to develop decreased vaccination acceptance (Moran, Lucas, Everhart, Morgan, & Prickett, 2016). The present study examined disruptive technology and its indirect impact on the uptake of COVID-19 vaccination through self-exempting discriminant attitudes and misinterpretations in Kenya and the USA.

2.0 BACKGROUND

Vaccination history began in prehistoric times when the Chinese used powdered material to prevent smallpox infections in the populations and rubbed a fluid obtained from a patient suffering from smallpox on a healthy person's skin. Similarly, Turkish children were vaccinated by the Ottomans in the late 1600s (Al-Regaiey et al., 2021). Immunity against smallpox was demonstrated evidently by Edward Jenner, an English physician, about a century later. For instance, in the 1900s the greatest achievements in the public health agenda were the introduction of vaccines and how immunization substantially reduced the number of cases, deaths, hospitalizations, and cost of healthcare with regards to communicable diseases that are vaccine-preventable (Al-Regaiey et al., 2021).

2.1 COVID-19 Pandemic and Vaccination Drive

In late 2019, coronavirus disease was reported in China as an epidemic, particularly in Wuhan, and by the first quarter of 2020, it was declared by WHO to be a pandemic since it not only was an epidemic in China but had now penetrated the global populations by infecting more people across many countries (Guan et al., 2020). In essence, the cases of coronavirus disease in the same period were over 140 million, and mortality-related cases due to the coronavirus disease were over 3 million worldwide. In mid-2021, the global coronavirus disease cases stood at over 200 million with more than 4.3 million deaths. The USA coronavirus disease cases were over 36 million with over 600,000 deaths in mid-2021 (Worldometer, 2021). In Kenya, the coronavirus disease in the same period was over 211,000 with over 4,000 deaths (see table below).

Table 1. Total reported cases of coronavirus disease and coronavirus disease-related deaths by region or country in mid-2021 since December 2019.

Region/Country	Total cases of coronavirus disease (000's)	Total coronavirus disease related deaths (000's)
World	203,687	4,312
Europe	52,502	1,143
North America	43,670	950
Asia	64,345	936
South America	35,972	1,102
Oceania	117	1
Africa	7,078	177
USA	36,543	633
Kenya	211	4

Source: (Worldometer, 2021).

Vaccines against COVID-19 came as a relief to many countries to fight the spread of the pandemic among populations. In the USA, for instance, efforts have been made to maintain and achieve high vaccine coverage levels among the citizen population through coordination and implementation of various interventions including community-based, health system and public policy measures (Al-Regaiey et al., 2021). In addition, the vaccination drive in Kenya and other African countries has been promoted through collaboration with international partners, and between private hospitals and public health hospitals with multiple agencies involved.

Despite the efforts by governments aimed at vaccination drive among the populations, people seem not to readily accept the coronavirus disease vaccine as recommended by health professionals and healthcare providers (Dryhurst et al., 2020). Consequently, the voluntary uptake of the COVID-19 vaccines has been a concern. In both developed economies and developing economies, there have been reports of COVID-19 vaccine hesitancy being attributed to multiple factors including non-medical factors like philosophy, culture, ignorance or poor immunization knowledge, misinterpretations, discriminant attitudes, sociodemographic factors, and even religion (Hudson & Montelpare, 2021).

2.2 Disruptive Technology and COVID-19 Vaccination Uptake

The 21st century world has been revolutionized by the advancement in disruptive technologies given that people have become connected making the world a small global village where information is disseminated widely and quickly over long distances. Disruptive technology enables internet users to share ideas and interact with their social networks hence users can access a large audience globally within seconds of being online (Puri, Coomes, Haghbayan, & Gunaratne, 2020). Users easily search and access information online, including on social media and other disruptive technologies. Although the dissemination of information is a major benefit of disruptive technologies, this important role can also turn out to be a problem, especially when it is about COVID-19 vaccine misinformation. Some people have refused to get COVID-19 vaccinations because of confusion, distrust, and holding on to the misinterpretations and negative feedback they received on disruptive technologies about vaccinations (Imhoff & Lamberty, 2020).

Several authors posit disruptive technology as an innovation that significantly alters the way that consumers, industries, or businesses operate, interact, share, and exchange information, products, and services (Allen, 2018; Christensen et al., 2015; Gans, 2016). The very same authors explain how technological innovations disrupt the systems or habits it replace because it has noticeably superior attributes. Below are just a few examples of disruptive technologies:

- Social Media vs. Traditional News Media Outlets
- Online news sites vs. Traditional News Media outlets
- Blogs vs. Traditional News Media Outlets
- E-commerce vs. Brick-and-Mortar business models
- Streaming platforms for Videos, Movies, and Music
- Ride-sharing apps

- GPS systems
- Blockchain
- Artificial intelligence, etc…

2.3 Social Media Platforms, Misinformation, and COVID-19 Vaccination Uptake

Social media platforms are disruptive technologies that facilitate interactive, digital multimedia marketing channels that enable their registered users to design, develop, share content, engage, or interact with other users. Some of the most popular social media platforms include Facebook, YouTube, Instagram, Twitter, TikTok, and LinkedIn. These platforms enable users to share text, images, videos, and other forms of content, and they play a significant role in disrupting, distorting and often is viewed as a substitute for traditional broadcast and print media channels for communication, entertainment, and information dissemination (Tomasis, 2023).

During the COVID-19 pandemic, misinformation on social media significantly disrupted public health messaging about vaccination requirements. Some key factors in how misinformation was used are as follows:

1. Spreading False Information: Misinformation about the safety, efficacy, and necessity of COVID-19 vaccines spread rapidly on social media. This included false claims about vaccine ingredients, side effects, and conspiracy theories (Loomba et al., 2021).
2. Exploiting Information Gaps: Misinformation often filled gaps where there was uncertainty or lack of information. People sought to understand the pandemic and vaccines, and misinformation provided seemingly plausible but incorrect explanations (Pennycook et al., 2020).
3. Amplifying Distrust: Misinformation fuelled existing distrust in government agencies and health professionals, particularly in communities with historical reasons for skepticism. This further hindered vaccination efforts (Jamison et al., 2020).
4. Viral Nature of Misinformation: The dynamic and fast-moving nature of social media allowed misinformation to spread quickly and widely, often outpacing efforts to disseminate accurate information (Cinelli et al., 2020).

Overall, combating misinformation required coordinated efforts from public health officials, social media companies, and trusted community leaders to provide clear, accurate, and culturally sensitive information (How misinformation, medical…, 2021). People's attitudes towards COVID-19 vaccination have been changing over time as they increasingly access more information about COVID-19 vaccines through disruptive technologies like social media during the pandemic (Imhoff & Lamberty, 2020). In the past, healthcare workers were the main source of health-related information. Nonetheless, this is no longer the case today since individuals own smartphones, tablets, iPads, and other computer devices that allow them to access any information on health issues, including information about the risks of getting COVID-19 vaccines.

3.0 RESEARCH QUESTIONS

The study aimed to examine how disruptive technology/innovation affects the uptake of COVID-19 vaccination directly or indirectly through its impact on self-exempting discriminant

attitudes and misinterpretations in Kenya and the USA. To achieve this aim, the following specific questions were developed:

1. What is the effect of disruptive technologies on COVID-19 vaccination uptake?
2. Does disruptive technologies affect the uptake of COVID-19 vaccination mainly through its impact on discriminant attitudes and misinterpretations?
3. Does prior immunization knowledge moderate the relationship between disruptive technologies and COVID-19 vaccination uptake?

4.0 RESEARCH METHODS

The next sections concern the methods considered and adopted to adequately address the research questions and hypotheses.

4.1 Study Design, Data Collection, and Sample

A Cross-sectional study design was conducted at a given point in time during the COVID-19 pandemic for two (2) weeks in 2021 when COVID-19 vaccines were widely accessible and available in both Kenya and the USA. The target population was adults over 18 years in Kenya and the USA, hence a total of 400 questionnaires were distributed to the target population. Questionnaires filled by 186 respondents were found to be appropriate for analysis after removing incomplete and inconsistently answered questionnaires. The final study sample size for the analysis was a total of 186 respondents (92 from Kenya and 94 from the USA).

4.2 Survey Questionnaire

The questionnaire had various questions focusing on the variables examined by the study (see Appendix 1). These variables included independent variables (disruptive technology usage), mediator variables (misinterpretations and discriminant attitudes), moderator variables (prior immunization knowledge), dependent variables (COVID-19 vaccine uptake), and control variables (job status, country of origin, age group, sex, income of household, marital status, and education level). Questions were simple and easy to understand and required less than ten (10) minutes to complete given that they were multi-choice questions.

4.3 Data Analysis

Data obtained from the completed responses were coded and entered into PASW statistics and Amos 22 software for analysis. The analysis included both descriptive and inferential analysis. Exploratory Factor Analysis (EFA) was conducted to test the structure of the dimensions and examine the factorability of the items. Internal consistency was tested through scale reliability analysis while model fit indices were tested through confirmatory analysis. The relationship between independent variables, mediator variables (misinterpretations and discriminant attitudes), moderator variable (prior immunization knowledge), dependent variables, and control variables were tested through structural equation modelling (SEM). The hypotheses tested included the following:

Table 2. The study hypotheses

Null Hypotheses	Statement
Hypothesis 1	Disruptive technology does not significantly impact COVID-19 vaccination uptake
Hypothesis 2	Disruptive technology does not significantly impact discriminant attitudes
Hypothesis 3	There is no significant indirect impact of disruptive technology on the uptake of COVID-19 vaccination through a discriminant attitude
Hypothesis 4	Disruptive technology does not significantly impact misinterpretations
Hypothesis 5	There is no significant indirect impact of disruptive technology on the uptake of COVID-19 vaccination through misinterpretations
Hypothesis 6	Prior immunization knowledge does not moderate the relationship between disruptive technology and COVID-19 vaccination uptake

The paths for the regression tests are depicted in the structural model for the study. The structural model for the study illustrating the relationships between the independent variables, mediator variables (misinterpretations and discriminant attitudes), moderator variable (prior immunization knowledge), dependent variables, and control variables is shown in Figure 3 below.

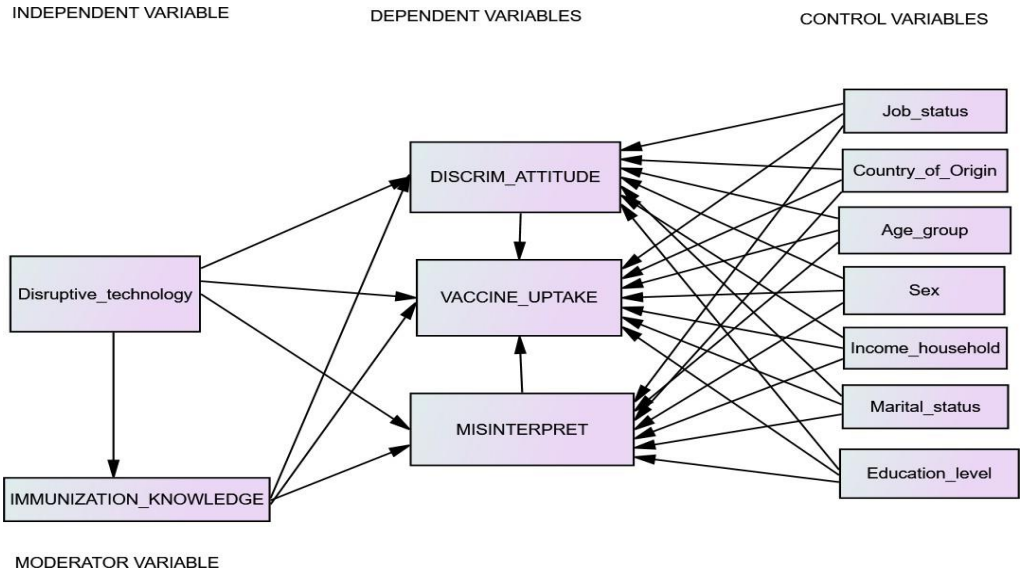


Figure 3. Structural model for the study

4.4 Exploratory Factor Analysis (EFA)

An Exploratory Factor Analysis (EFA) was conducted to test the structure of the dimensions and examine the factorability of the items. Kaiser-Meyer-Olkin was .897 suggesting a good sampling adequacy since it was above the .60 threshold. Bartlett's test of sphericity, $\chi 2$ (190) = 3055.54, $p < .001$, which is significant. The Initial Eigenvalues were above 1. to generate the extracted factors while the cut-off point for Maximum Likelihood was .30. In addition, not less than 4 items were used for each dimension factor, for example, discriminant attitude (4 items), vaccine uptake behavior (4 items), misinterpretations of COVID-19 vaccine (7), and prior immunization knowledge (5 items). In total, there were four main dimensions and 20 items,

resulting in 71.14% of the total variance explained. Table 3 below shows the communality estimates and the pattern matrix coefficients.

Table 3. EFA commonalities and loadings for the measurement constructs and dimensions for the Total sample (N = 186).

		Pattern Matrix coefficients				
Individual items	Label	1	2	3	4	ἐ
COVID-19 vaccine is not for immunosuppressed individuals	Discriminant1			.786		.693
COVID-19 vaccine reduces breast milk in lactating women	Discriminant2			.924		.755
COVID-19 vaccine offers little protection against the disease	Discriminant3			.682		.476
COVID-19 vaccines are a placebo	Discriminant4			.840		.793
Planning to or has received COVID-19 vaccine	Vaccine_Upt1				.798	.575
Recommends family members to get COVID-19 vaccine	Vaccine_Upt2				.868	.759
Would receive a new COVID-19 vaccine for new variants	Vaccine_Upt3				.868	.771
Advocates for all community members to be vaccinated	Vaccine_Upt4				.685	.587
Vaccination against COVID-19 can lead to infertility	Misinterpret1	.813				.688
Vaccines for COVID-19 were developed for profit making	Misinterpret2	.792				.651
Ingredients in COVID-19 vaccine are recycled aborted foetus	Misinterpret3	.971				.846
COVID-19 vaccine has microchips to monitor humans	Misinterpret4	.962				.875
COVID-19 vaccine can result in fatal blood clots	Misinterpret5	.827				.710
COVID-19 vaccine lead to fatal adverse reactions	Misinterpret6	.796				.660
COVID-19 cannot infect people without underlying conditions	Misinterpret7	.763				.692
Natural immunity is stimulated by vaccines	Immunization_ knowledge1		.876			.752
Vaccines protect populations from getting certain infections	Immunization_ knowledge2		.900			.822
Vaccines must be approved by the government after testing	Immunization_ knowledge3		.882			.739
Vaccines are not 100% effective in preventing disease	Immunization_ knowledge4		.764			.642
Vaccines can reduce the duration of illness and its severity	Immunization_ knowledge5		.852			.741

Notes. N = 186. Extraction Method = Maximum Likelihood. ἐ = communalities estimate. Rotation Method = Promax with Kaiser Normalization. Factor loadings <.3 were suppressed.

The pattern matrix shows that the individual items were loaded on the four-dimension categories with no merging of the items between dimensions. In this regard, no item was eliminated. Pattern coefficients for factor 1 (discriminant attitude) ranged from .68 to .92 while that of factor 2 (vaccination uptake) ranged from .69 to .87. In addition, pattern coefficients for factor 3 (misinterpretations) were between .76 and .92 while that of factor 4 (prior immunization knowledge) was between .76 to .90.

4.5 Scale Reliability

The discriminant attitude subscale was composed of 4 items (α =.89), and the vaccine uptake subscale was composed of 4 items (α =.88). the misinterpretation subscale had 7 items (α =.95) and prior immunization knowledge was composed of 5 items (α = .93) (refer to table).

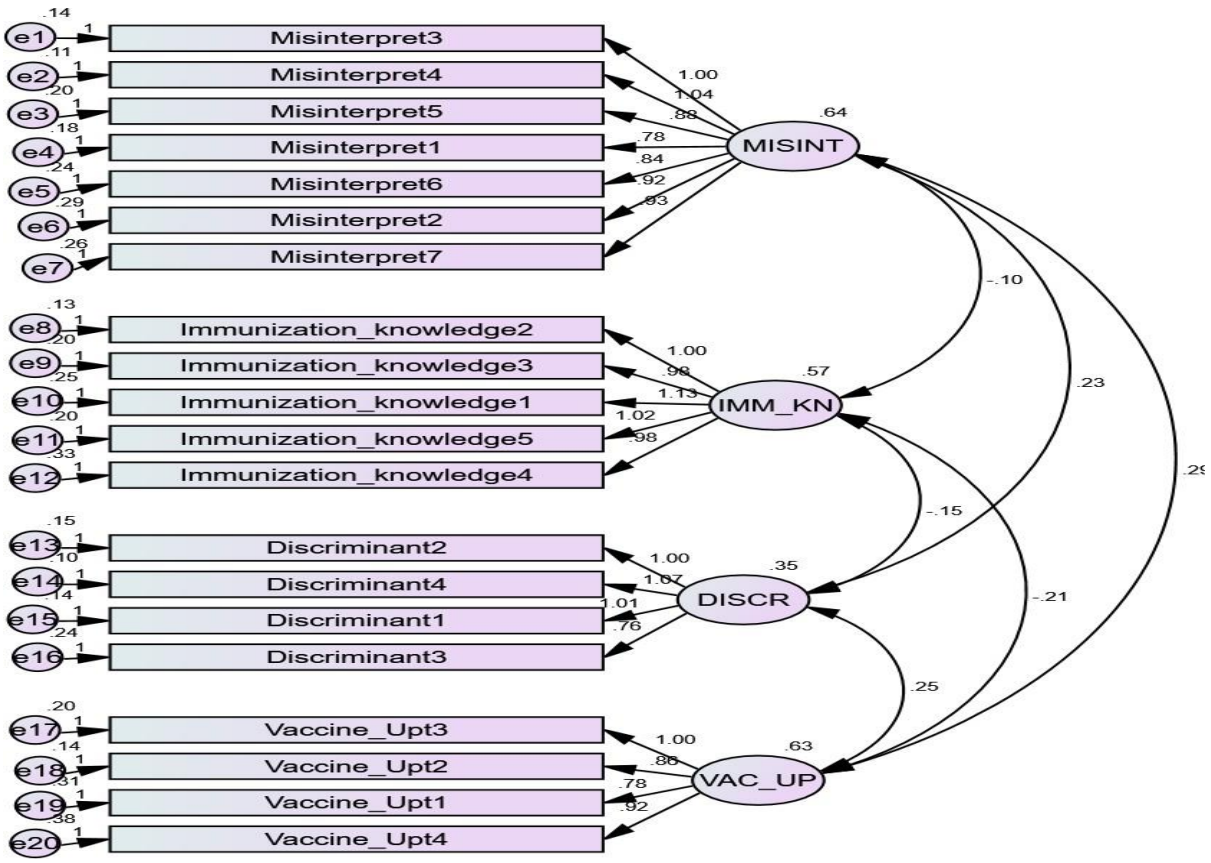
Table 4. Scale reliability for the Total sample (N = 186).

Dimension	Cronbach'sAlpha	N of Items
Discriminant attitude	.889	4
Vaccine uptake	.884	4
Misinterpretations	.948	7
Prior immunization knowledge	.930	5

Results from the scale reliability generally indicate that internal consistency can be rated as excellent ($0.9 \leq \alpha$) and good ($0.8 \leq \alpha < 0.9$) for the dimensions.

4.6 Confirmatory Factor Analysis (CFA)

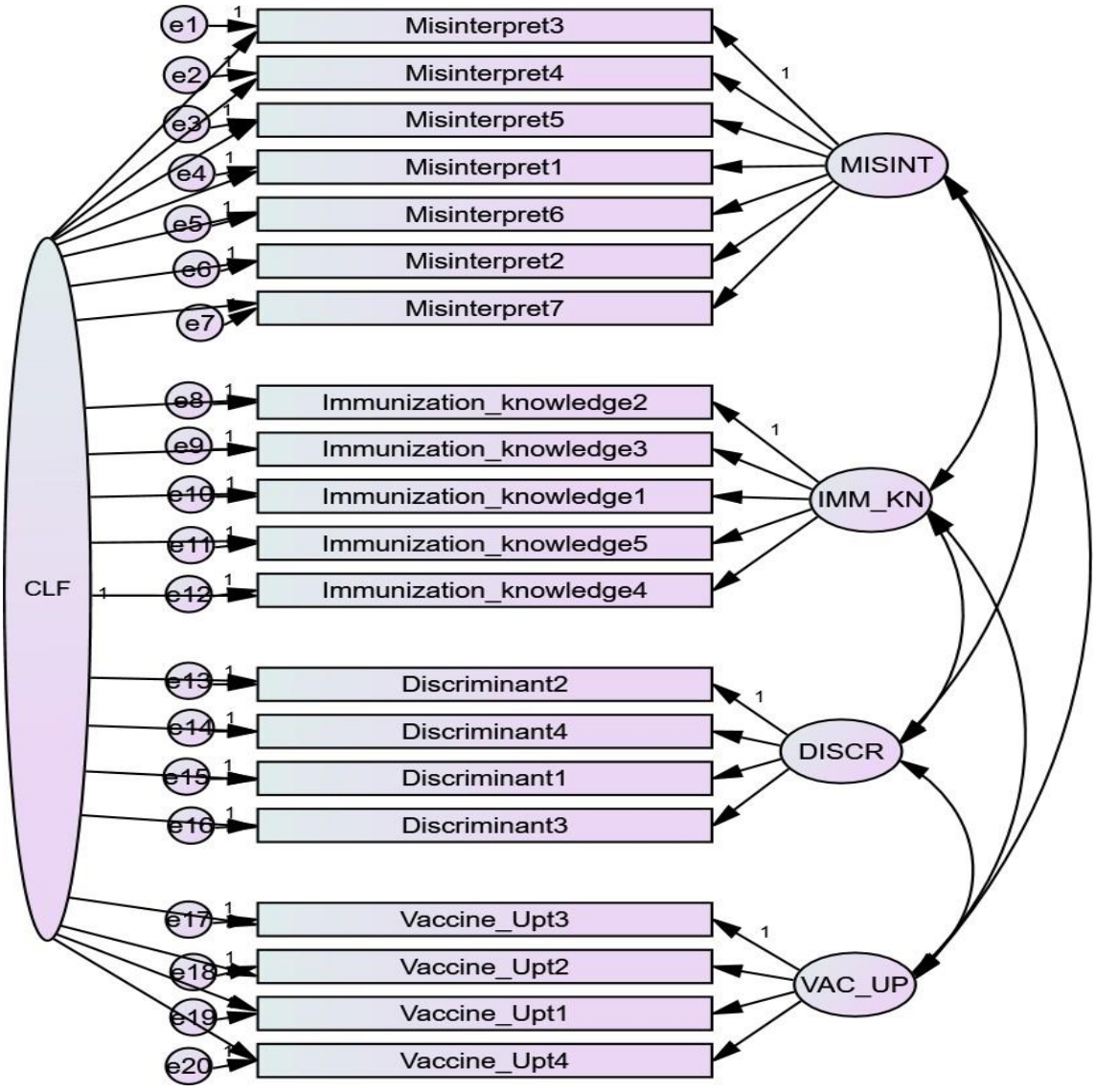
A Confirmatory factor analysis (CFA) was conducted, and model fit indices were examined. AGFI and GFI were .812 and .853 respectively which implies a good fit. It was also found that TLI and CFI were .944 and .951 respectively while RMSEA was .069 which is less than 0.08 cut-off point. These indices reveal that the model fits well given the satisfactory values hence the properties expected were achieved (Figure 1).



Note. MISIN = Misinterpretations. IMM_KN = Prior immunization knowledge. DISCR = Discriminant attitude. VAC_UP = Vaccine uptake.

Figure 1. CFA of the dimensions

Common latent factor (CLF) was also used to examine common method bias as shown in Figure 2. It was found that all the regression weights with CLF were equal, otherwise there would have been common method bias.



Note. MISIN = Misinterpretations. IMM_KN = Prior immunization knowledge. DISCR = Discriminant attitude. VAC_UP = Vaccine uptake.

Figure 2. Common latent factor (CLF)

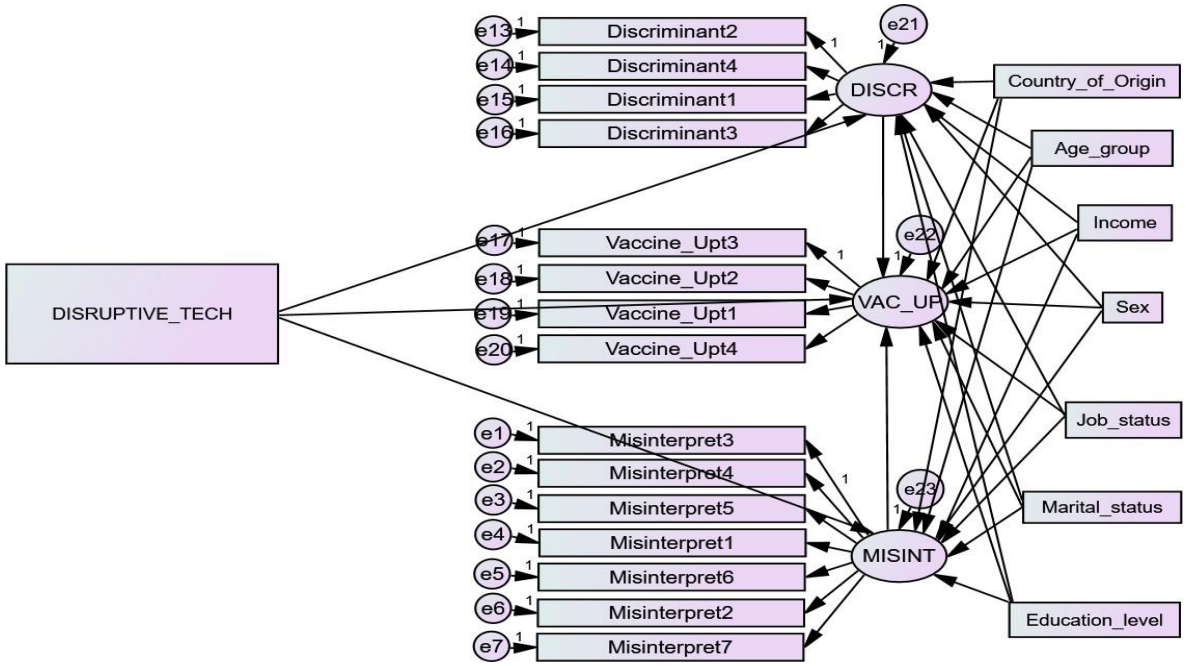
5.0 FINDINGS

5.1 Study Participants

The 186 participants in this study were drawn from both Kenya (49.5%) and the US (50.5%). The majority (38.2%) were young adults in the age group 28 to 37 years. Males (54.8%) were slightly more than females (45.2%) in number. About 43.5% rated their household income as average while only 2.7% as very high. A descriptive analysis of marital status shows that single was the majority at 39.2%. In addition, education level and job status were also examined, and the majority had a university-level education (41.4%) and were employed (32.8%) respectively.

5.2 Direct Effect of Disruptive Technologies on COVID-19 Vaccination Uptake

The impact of disruptive technologies on the uptake of COVID-19 vaccination was analyzed by running a Structural Equation Model (SEM) analysis while controlling for demographic factors to test the relationships and hypotheses among variables in the study. The paths for the regression tests are depicted by arrows in the model in Figure 4 to show hypothesized relationships among variables. Results from the estimated SEM model 1 are presented in Table 5 and the summary of hypotheses tests results in Table 6.



Note. MISIN = Misinterpretations. DISCR = Discriminant attitude. VAC_UP = Vaccine uptake.

Figure 3: SEM model 1 without the moderator variable 'prior immunization knowledge'

According to the results, the direct impact of disruptive technology on the uptake of COVID-19 vaccination was not significantly associated with participants' uptake of COVID-19 vaccination in the Total sample (N = 186, β = .062, p = .323), Kenyan sample (n = 92, β = .126, p = .233) and the American sample (n = 94, β = .033, p = .718) while controlling for demographic factors (i.e. sex, income, job status, education level, marital status, age group and

country of origin) (Table 5). Based on these findings, the null hypothesis 1 that disruptive technology does not significantly impact the uptake of COVID-19 vaccination was accepted at a five (5) percent significance level in all three (3) cohorts ($p > 0.05$) (Table 6).

5.3 Indirect Impact of Disruptive Technology on the Uptake of COVID-19 Vaccination through Discriminant Attitude

According to the results, disruptive technology had a positive and significant impact on discriminant attitude in the Total sample ($N = 186$, $\beta = .195$, $p=.009$) and American sample ($n = 94$, $\beta = .265$, $p=.011$) but no significant impact in the Kenyan sample ($n = 92$, $\beta = .107$, $p = .321$) while controlling for demographic factors (i.e. sex, income, job status, education level, marital status, age group and country of origin) (Table 5). The null hypothesis 2 that disruptive technology does not significantly impact discriminant attitudes was rejected at a five (5) percent significance level in both the Total sample ($p<0.05$) and the American sample ($p<0.05$) (Table 6). This implies that the indirect impact of disruptive technology on the uptake of COVID-19 vaccination through discriminant attitude could be examined in these two cohorts.

Further analysis shows that discriminant attitude was positively and significantly associated with participants' uptake of COVID-19 vaccination in the Total sample ($N = 186$, $\beta = .412$, $p < .001$) and the American sample ($n = 94$, $\beta = .572$, $p<.001$) while controlling for demographic factors (i.e. sex, income, job status, education level, marital status, age group and country of origin) (Table 5). Based on these findings, the null hypothesis 3 that there is no significant indirect impact of disruptive technology on uptake of COVID-19 vaccination through discriminant attitude was rejected at a five (5) percent significance level in both cohorts ($p < 0.05$) (Table 6). Indirect Impact of Disruptive Technology on Uptake of COVID-19 Vaccination Through Misinterpretations

According to the results, disruptive technology had a positive and significant impact on misinterpretations in the Total sample ($N = 186$, $\beta = .305$, $p < .001$) and American sample ($n = 94$, $\beta = .452$, $p < .001$) but not significant impact in the Kenyan sample ($n = 92$, $\beta = .161$, $p = .122$) while controlling for demographic factors (i.e. sex, income, job status, education level, marital status, age group and country of origin) (Table 5). The null hypothesis 4 that disruptive technology does not significantly impact misinterpretations was rejected at a five (5) percent significance level in both the Total sample ($p<0.05$) and the American sample ($p<0.05$) (Table 6). Consequently, the indirect impact of disruptive technology on the uptake of COVID-19 vaccination through misinterpretations could be examined in these two cohorts (Total sample and American sample).

Further analysis revealed that misinterpretations were significantly associated with participants' uptake of COVID-19 vaccination in the Total sample ($N = 186$, $\beta = .262$, $p<.001$) and the American sample ($n = 94$, $\beta = .273$, $p=.006$) while controlling for demographic factors (i.e. sex, income, job status, education level, marital status, age group and country of origin (Table 5). Based on these findings, the null hypothesis 5 that there is no significant indirect impact of disruptive technology on the uptake of COVID-19 vaccination through misinterpretations was rejected at five (5) percent significance levels in both cohorts ($p < 0.05$) (Table 6). These findings conform to past studies that COVID-19 vaccine hesitancy among populations is attributed to misleading information obtained from disruptive technologies

(Palamenghi, Barello, Boccia, & Gragna, 2020). It is vital for healthcare providers to continuously promote vaccine usage and its importance among communities.

Table 5. Regression results for SEM model predicting relationships among variables without moderator variable (prior immunization knowledge) for the Total sample, Kenyan sample, and the American sample.

Path			Total sample (N = 186)				Kenyan sample (n = 92)				American sample (n = 94)			
			β	SE	CR	P-value	β	SE	CR	P-value	β	SE	CR	P-value
VAC_UP	<---	DISRUPTIVE_TECH	.062	.046	.987	.323	.126	.065	1.192	.233	.033	.065	.362	.718
VAC_UP	**<---**	**DISCR**	**.412**	**.099**	**5.998**	**.001****	**.281**	**.163**	**2.367**	**.018***	**.572**	**.120**	**6.110**	**.001****
VAC_UP	**<---**	**MISINT**	**.262**	**.071**	**3.783**	**.001****	**.255**	**.097**	**2.285**	**.022***	**.273**	**.102**	**2.756**	**.006****
VAC_UP	<---	Sex	-.067	.100	-1.135	.257	-.049	.146	-.477	.633	-.107	.134	-1.337	.181
VAC_UP	<---	Income	.021	.052	.362	.717	-.029	.075	-.271	.787	.060	.072	.768	.443
VAC_UP	<---	Job_status	-.073	.054	-1.250	.211	.018	.082	.178	.859	-.147	.068	-1.872	.061
VAC_UP	<---	Education_level	-.082	.056	-1.377	.169	-.054	.119	-.519	.604	-.088	.068	-1.089	.276
VAC_UP	<---	Marital_status	-.022	.061	-.363	.716	.044	.106	.420	.675	-.059	.084	-.737	.461
VAC_UP	<---	Age_group	**.256**	**.056**	**4.264**	**.001****	.119	.152	1.138	.255	**.219**	**.153**	**2.746**	**.006**
VAC_UP	<---	Country_of_Origin	**.326**	**.105**	**5.288**	**.001****	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DISCR	<---	DISRUPTIVE_TECH	**.195**	**.038**	**2.604**	**.009***	.107	.048	.992	.321	**.265**	**.057**	**2.556**	**.011***
DISCR	<---	Sex	.094	.088	1.264	.206	-.011	.111	-.102	.919	.124	.134	1.208	.227
DISCR	<---	Income	-.073	.046	-.982	.326	-.137	.056	-1.272	.203	-.004	.074	-.041	.967
DISCR	<---	Job_status	-.002	.047	-.033	.974	.005	.062	.043	.965	.014	.069	.139	.890
DISCR	<---	Education_level	-.044	.048	-.588	.556	-.073	.090	-.675	.499	-.029	.068	-.281	.779
DISCR	<---	Marital_status	.144	.053	1.939	.052	.165	.080	1.524	.128	.101	.084	.986	.324
DISCR	<---	Age_group	.040	.049	.535	.593	.121	.114	1.125	.261	-.074	.154	-.723	.470
DISCR	<---	Country_of_Origin	-.109	.088	-1.463	.143	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MISINT	<---	DISRUPTIVE_TECH	**.305**	**.048**	**4.561**	**.001****	.161	.073	1.545	.122	**.452**	**.061**	**5.060**	**.001****
MISINT	<---	Sex	.072	.111	1.090	.276	-.017	.169	-.168	.867	.145	.143	1.653	.098
MISINT	<---	Income	-.077	.058	-1.168	.243	-.137	.085	-1.309	.191	-.026	.079	-.302	.763
MISINT	<---	Job_status	-.069	.060	-1.046	.296	-.025	.095	-.242	.809	-.111	.074	-1.266	.206
MISINT	<---	Education_level	**.192**	**.061**	**2.891**	**.004***	.062	.137	.599	.549	**.209**	**.072**	**2.388**	**.017***
MISINT	<---	Marital_status	.106	.067	1.595	.111	.060	.121	.572	.567	.170	.089	1.941	.052
MISINT	<---	Age_group	**.170**	**.061**	**2.569**	**.010***	.069	.173	.663	.508	.154	.164	1.760	.078
MISINT	<---	Country_of_Origin	**.216**	**.111**	**3.254**	**.001****	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Note. Bold indicates significant and positive. Regression weights are standardized. **<.001. *<0.05. MISIN = Misinterpretations. IMM_KN = Prior immunization knowledge. DISCR = Discriminant attitude. VAC_UP = Vaccine uptake. SE = Standard Error. CR = Composite Reliability. N/A = Not Applicable 22

Table 6. Summary of hypotheses tests results and the outcomes for the total sample, the Kenyan sample, and the American sample

Null Hypothesis	Statement	Outcome		
		Total sample (N = 186)	Kenyan sample (n = 92)	American sample (n = 94)
Hypothesis 1	Disruptive technology does not significantly impact COVID-19 vaccination uptake	Accepted	Accepted	Accepted
Hypothesis 2	Disruptive technology does not significantly impact discriminant attitudes	Rejected	Accepted	Rejected
Hypothesis 3	There is no significant indirect impact of disruptive technology on uptake of COVID-19 vaccination through discriminant attitude	Rejected	n/a	Rejected
Hypothesis 4	Disruptive technology does not significantly impact misinterpretations	Rejected	Accepted	Rejected
Hypothesis 5	There is no significant indirect impact of disruptive technology on uptake of COVID-19 vaccination through misinterpretations	Rejected	n/a	Rejected
Hypothesis 6	Prior immunization knowledge does not moderate the relationship between disruptive technology and COVID-19 vaccination uptake	Accepted	Accepted	Accepted

5.4 Moderating the Role of Prior Immunization knowledge in the Relationship Between Disruptive Technologies and COVID-19 Vaccination Uptake

SEM model 2 with moderator variable (prior immunization knowledge) added to test its role in the relationship between disruptive technologies and uptake of COVID-19 vaccination is illustrated in Figure 5. The output results from running the SEM model with moderator variable (prior immunization knowledge) while controlling for demographic factors is presented in Appendix 2 in Table A1.

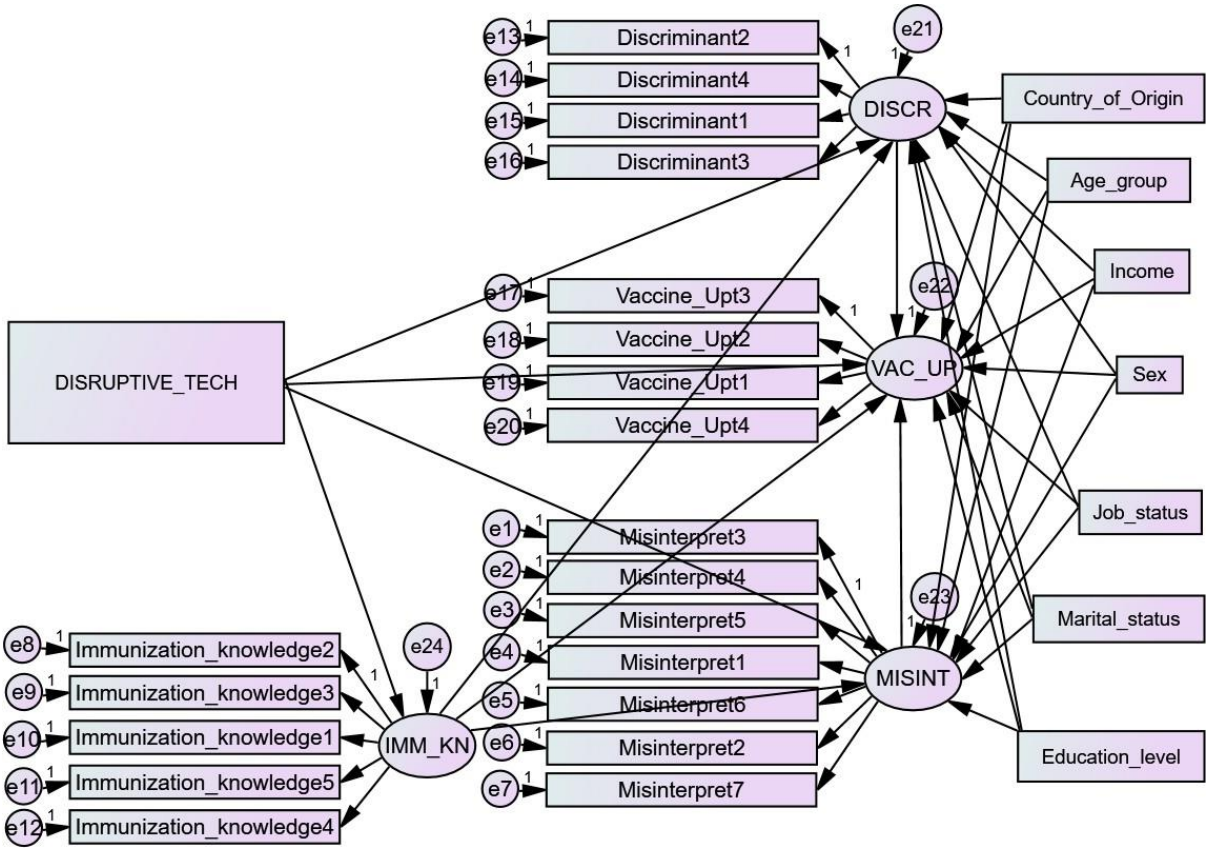


Figure 4. SEM 2 with moderator variable 'prior immunization knowledge' added

Note. MISIN = Misinterpretations. IMM_KN = Prior immunization knowledge. DISCR = Discriminant attitude. VAC_UP = Vaccine uptake.

According to the results in Table 7, prior immunization knowledge had slightly increased the strength of relationship between disruptive technology and vaccination uptake in Total sample (from β = .062 to β = .082), Kenyan sample (from β =.126 to β = .141) and American sample (from β =.033 to β = .037), however, the increase was not statistically significant at five (5) percent level ($p > 0.05$). Therefore, the null hypothesis 6 that prior immunization knowledge does not moderate the relationship between disruptive technology and uptake of COVID-19 vaccination was accepted at a five (5) percent significance level in all three (3) cohorts ($p > 0.05$) (Table 6).

Table 7. Summary of results on the moderating role of prior immunization knowledge on the relationship between disruptive technologies and uptake of COVID-19 vaccination

Relationship	**Cohort**	**Direct without the moderator variable (SEM model 1)**		**Direct with moderator variable (SEM model 2)**		**Indirect effect**
		β	p-value	β	p-value	

VAC_UP	<---	DISRUPTIVE_TECH	Total sample (N = 186)	.062	.323	.082	.205	Not significant No moderator effect
VAC_UP	<---	DISRUPTIVE_TECH	Kenyan sample (n = 92)	.126	.233	.141	.188	Not significant No moderation effect
VAC_UP	<---	DISRUPTIVE_TECH	American sample (n = 94)	.033	.718	.037	.680	Not significant No moderation effect

Note. SEM = structural equation model. Moderator variable is prior immunization knowledge.

Source: Table 5 above and Table A1 in Appendix 2.

6.0 SUMMARY AND STUDY CONCLUSION

The study analyzed the effects of disruptive technology on the uptake of COVID-19 vaccination in both Kenyan and American samples and explored its indirect effects through self- exempting discriminant attitudes and misinterpretations. The moderating role of prior immunization knowledge on the relationship between disruptive technologies and uptake of COVID-19 vaccination was also examined.

Findings revealed that there were no significant direct effects of disruptive technology on the uptake of COVID-19 vaccination found in the Total sample, Kenyan sample, and American sample while controlling for demographic factors such as sex, income, job status, education level, marital status, age group and country of origin.

On the other hand, it was found that disruptive technologies affect the uptake of COVID- 19 vaccination mainly through its impact on discriminant attitudes and misinterpretations.

Implications of these findings are that discriminant attitudes and misinterpretations about COVID-19 vaccinations spread through disruptive technologies were responsible for COVID-19 vaccine hesitancy rather than the disruptive technology itself. This was proved in the study findings given that no direct relationship existed between disruptive technology and vaccination uptake.

The findings in this study are supported by prior studies that reported that vaccine hesitancy can be influenced by confidence in the vaccine, convenience, and complacency. In the USA, such reasons have been reported by past studies to influence vaccine hesitancy (Pogue, 2020). Also, in Pakistan, vaccine hesitancy was found to be caused by religious conflicts, mistrust, and security concerns. In Nigeria, vaccine hesitancy has been associated with beliefs about infertility from taking polio vaccine.

One of the misinterpretations and conspiracy beliefs about coronavirus disease is that it was manufactured in the laboratory as a bioweapon by ‘some governments’. It has also been alleged that the coronavirus disease was caused by cellular networks like 5G. Misinformation on coronavirus disease was retweeted on Twitter despite the source being unverified or low quality since they are not linked to health authorities that are verifiable (Reiter, Pennell, & Katz, 2020).

Some scholars have analyzed millions of posts and comments to explain and document misinformation about coronavirus disease on major online platforms like Gab, YouTube, Twitter, Reddit, Facebook, and Instagram. These scholars have reported that misinformation was amplified on social media about coronavirus disease, which implies that dissemination of misinformation basically depends on how populations are networked or interact online as well as the algorithms of the platform used in spreading misinformation and patterns of interactions among user groups engaged in discussion a given topic or theme (Reiter et al., 2020).

Consequently, it can be recommended from this study that governments in both Kenya and the US should focus on demystifying the effectiveness, safety, and trust in COVID-19 vaccines to deter the apparent self-discriminant attitudes, myths, misinterpretations, and conspiracies about the vaccination existing in their populace. Another recommendation based on findings within this study is that there is a need to enhance tailored policies and interventions to target attitudes towards getting vaccinated against coronavirus or future diseases to explain how to improve attitudes and public knowledge about coronavirus disease vaccines and enhance uptake of the vaccines.

6.1 Implementation and Limitations of the Study

Implementation of the study involved following the positivist paradigm where quantitative data was obtained from the respondents after obtaining informed consent. All authors were actively engaged in the study implementation, preparation of the manuscript, and data acquisition from the study sites.

The limitations associated with the study were assessed and mitigated to ensure they do not affect the implementation of the study including study quality and nature, scope, and timeline. Limitations included selection bias which could affect the generalizing of study findings. Selection bias was mitigated by random sampling.

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