The moderating effects of demographic factors on the relationship between COVID-19 television messages and vaccine adoption behavior among youths in Kiambu County, Kenya

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ABSTRACT

Media content on health pandemics significantly shapes audience responses across different demographic groups. During the COVID-19 pandemic, television messages emphasized severity, susceptibility, and efficacy beliefs, aiming to simplify complex health information and provide coping mechanisms. These messages defined COVID-19, explained its causes, and recommended preventive measures to ease anxiety and reduce infections. Anchored in the Health Belief Model, this study examined the moderating effects of demographic factors on the relationship between COVID-19 television messages and vaccine adoption behavior among youths in Kiambu County, Kenya. A mixed-methods approach was applied, combining qualitative and quantitative data within a cross-sectional research design. The demographic variables analyzed were gender, age, education, and religion. Out of 384 youths sampled, 346 participated in the survey. The coefficient results indicated that education, gender, and age significantly moderated the relationship between COVID-19 television messages and vaccine adoption behavior among youths, while religion did not have a statistically significant moderating effect. Specifically, education ($p = 0.010$), gender ($p = 0.007$), and age ($p = 0.004$) were significant moderators, whereas religion was not significant ($p = 0.350$). In addition, the hierarchical regression revealed that perceived response efficacy made a significant contribution to the prediction of vaccine adoption behavior ($\Delta F = 3.48$, $p = 0.016$, $\Delta R^2 = 0.024$), while self-efficacy also contributed significantly to the model ($\Delta F = 3.53$, $p = 0.008$, $\Delta R^2 = 0.010$). The overall hierarchical model demonstrated that the inclusion of demographic variables accounted for an additional 5% of the variance in vaccine adoption behavior ($\Delta F = 3.18$, $p = 0.008$), indicating that demographic characteristics enhanced the explanatory power of the model beyond the effects of television messages alone. The findings underscore the importance of demographic factors in shaping how youths interpret health messages and adopt preventive behaviors. The study recommends that health communication practitioners and policymakers tailor pandemic-related messages to specific demographic groups. Integrating demographic considerations into message design can enhance the effectiveness of media platforms in promoting vaccine uptake and fostering positive health behavior change among diverse youth populations.

Keywords: Adoption Behavior, Covid-19, Demographic Factors, Moderating Effects, Pandemic, Vaccine

I. INTRODUCTION

Media coverage of health pandemics impact how audiences feel about them. Aspects of mediated news items on health pandemics activate certain feelings and thoughts in the audiences' mind leading to stigmatization (Ophir, 2018). Prior studies suggest that individuals use media coverage as form of heuristics crosscut to make sense of complicated issues; this is the case with health pandemics. This is because people do not have direct experience in coping up with them (Sommerlad & David, 2020). Media air pandemic events: number of casualties, number of cases, causes and possible consequences which changes as the issue evolve (Queiroz et al., 2020).

The television defines health crisis, identify the causes, and suggest the remedies put in place which results in different effects. The media messages on health crisis sway public opinion especially on causal and control of the health problems which may result into different patterns of behavior (Hussain, 2020; Gollust et al., 2019). The television plays an essential role in the fight against Covid-19 by coverage of stories aimed at promoting knowledge levels and control.

According to Ranjit et al. (2021), messages aired on television on health matters have significant and direct influence on public attitude which in turn influences the vaccine adoption and preventive behavior. Therefore, the researcher sought to find out the effects of Covid-19 television messages on vaccine adoption behavior of among youths in Kiambu County.

According to Osur et al. (2022), Covid-19 has become a global public health concern due to mutation of the virus, deaths and new cases reported daily. With the key mitigation being mass vaccination, there has been hesitation in acceptance of vaccines among communities. Further, in a cross- sectional research conducted by Osur et al. (2022) on the determinants of covid-19 vaccine behavior intentions among youth in Kenya found out that indecision remains high among youth where only 42% were ready for vaccination, 52% waiting to see the effects of the vaccines to the already vaccinated and 6% unwilling.

Noticeably, the determinants of this hesitancy were attributed to the nature of information on Covid-19 pandemic and vaccine, conflicting messages from social media platforms, religious factors, recipients level of education, perceived risks of contraction of the pandemic, efficacy beliefs, and trust issues on MoHK. Significantly, the study found out that low uptake of vaccines was higher among females, those with post-secondary education and protestants (Osur et al., 2022).

Further, the influence of gender on health has become key during covid-19 pandemic. As such, the data has led to proper understanding of testing, cases, hospitalizations, and deaths. According to Peckham et al. (2020), males have three times odds of intensive care units' admissions and 40 % higher odds of dying from the pandemic compared to females. Additionally, gender constructs affect the outcomes due to differences in exposures to the disease (Walter & McGregor, 2020; Wolfe et al., 2021).

Contrary, further studies found higher vaccine acceptance among men than women Malik et al. (2020); Wouters et al. (2021), suggesting targeting messages on women to address the rejection and hesitancy. As such, it is pertinent to design messages persuasive enough to women. The messages tailored should address the more hesitant population in relationship to their age, gender, and education.

Further, in a study on understanding factors to Covid-19 vaccine adoption in Gujarat, India by Tolia et al. (2022), different factors influence adoption of an innovation. Through forty- four interviews that were conducted via semi- structured interviews conducted through convenience sampling on different demographics found religion to have influence on vaccines adoption.

Noticeably, religion has different norms in culture, politics, and economic concerns. Several participants stated that religion have long-term influence on their decision towards vaccine uptake. In addition, 26 participants stated that religious leaders' influences vaccination process. As such religious leaders are powerful in influencing people's decision irrespective of people's lifestyles and education background (Tolia et al., 2022).

Further studies by Orangi et al. (2021) on assessing the level and determinants of Covid-19 vaccine in Kenya, found some demographics have influence however level of education has no statistical significance on vaccine hesitancy but individual's Covid-19 risks perceptions and impacts determines the level of hesitancy.

Additionally, concerns on effects and effectiveness of the vaccine as portrayed by the media have an upper hand on vaccine uptake in the society. Orangi et al., (2021), suggests that the messaging should be focused on if at all positive acceptance is expected. This calls for holistic, transparent, and dynamic messaging by the media and from public health campaigns.

Contrary, in other similar studies by Ophir (2018), on the vaccine acceptance and hesitancy in low and middle-income countries found that higher level of education was linked to less probability of Covid-19 vaccine hesitancy. The study reported that, less- educated had higher acceptance in Burkina Faso, Rwanda, Sierra Leone, and Uganda. However, contrary pattern was observed in India, Pakistan since the acceptance was high among educated respondents. As such education is significant predicator of acceptance of Covid-19 vaccines (Ophir, 2018).

Agreeing with the HBM, Sulat et al. (2018), modifying variables can influence health behavior change amongst different communities. As such individual characteristics such as psychosocial (personality, peer pressure etc), structural variable (knowledge on disease and prior contact with the disease) and demographics (gender, religion, level of education, age among others) can affect perceptions of health-related behavior.

These modifying variables influence health related behavior by affecting perceived susceptibility, perceived severity, perceived efficacy beliefs, perceived benefits, cues, and barriers (Sulat et al., 2018). Therefore, this study seeks to find out where the modifying variables, for this case, religion, gender, and education of youth in Kiambu county influence their Covid-19 vaccines adopting behavior.

1.1 Research Hypotheses

factors have no moderating effects on the relationship between Covid-19 television messages and the vaccine adoption behaviour among youths in Kiambu County.

II. METHODOLOGY

A mixed-methods approach was adopted. Qualitative data were drawn from transcriptions of COVID-19 news content on YouTube, focusing on Citizen TV, KTN, and NTV after vaccines became available to all Kenyans. For the quantitative phase, a cross-sectional research design was applied to assess the influence of television messages on vaccine adoption among youths in Kiambu County, capturing both acceptance and rejection behaviors alongside their media exposures.

Based on the Media Council of Kenya they are most watched television stations in Kenya with Citizen TV at 27%, Kenya Television Network at 11% and Nation TV at 9%. 58% of Kenyans consume television content in a day where the most watched is news content (MCK, 2021). The news videos were analyzed using content analysis, they were compressed into transcripts using Rask AI and You Tube software. The transcripts allowed the researcher to make suggestions. The following sampling frame for television messages was adopted:

Table 1

Television Messages Sampling Frame

TV station	Percentage of viewership	No. of videos
Citizen TV	27%	17
KTV	11%	7
NTV	9%	6
Total	**7%**	**30**

Further, a pretested questionnaire was administered to 384 Youths in three sub-counties in Kiambu County. Thika, Ruiru and Kiambaa Sub-counties had five and above Covid-19 vaccine centers. Thika had 13 Covid-19 vaccine centers, followed by Ruiru at 8 and Kiambaa at 6 (MoHK, 2021). The following sampling frame for questionnaires was adopted.

Table 2

Sampling Frame for Questionnaires

Location	Youths	Vaccine centers
Thika town Constituency	185	13
Ruiru Constituency	114	8
Kiambaa Constituency	85	6
Total	**384**	**27**

Source: MoHK (2021)

The pilot study was done to identify potential gaps and measure internal consistency of the research questionnaires. To ensure the research instruments gave reliable and valid results, a pilot test was conducted among youths in Nairobi County. The questionnaires were administered to 30 respondents: 10.6% of the samples size without missing value. The reliability of the research instruments was done using Cronbach's Alpha. The minimally acceptable measure of reliability has been 0.70. For reliability test, there were six items that were under scrutiny. From the findings, the research tool was reliable and had an alpha coefficient above 0.7 and no item was removed from the series. Regarding validity, was done using Correlation Pearson's, the p value for validity was 0.001 (If Sig. < 0.05 instruments are valid). The data was cleaned, coded and entered in Statistical Package for Social Sciences software (IBM.SPSS version 21). Both inferential and Descriptive statistics were used to analyze data.

III. FINDINGS

3.1 Demographic Factors

The study determined the social demographics characteristics of youths who participated in the study. The demographics characteristics included age, gender, religion, and education.

Table 3

Demographic Factors

Social demographics of respondents					
Age	**Frequency**	**Percentage**	X^2	**df**	**p-value**
18-24	284	82.1	.003	2	0.008
25-30	46	13.3			
31-35	16	4.6			
Total	**346**	**100.0**			
Gender					
Female	225	65.0	.009	1	0.009
Male	121	35.0			
Total	**346**	**100.0**			
Religion					
Christian	295	85.3	.910	2	0.668
Muslim	40	11.6			
Traditional	11	3.1			
Total	**346**	**100.0**			
Level of education					
Primary & below	3	0.9	.039	3	0.008
Secondary	17	4.9			
Vocational/college	96	27.7			
University	230	66.5			
Total	**346**	**100.0**			

Most of the youths were aged between (82.1 %) 18-24. This was followed by respondents aged between 25 to 30 and 31 to 35 years, 13.3% and 4.6% respectively. Combined the two age groups accounted for 17.9% of all the respondents. This asserted that those aged between 18 to 24 years took or did not take vaccines. From the frequencies, vaccine adoption differed across different ages, 174 youths aged 18 to 24 rejected the vaccines. Further, 23 youths and 5 youths aged 25 to 30 and 31 to 35 years respectively rejected vaccines. The number decreased with age increase.

Additionally, most of the respondents were females (65% were females and 35% were males). 225 females and 121 males participated in the study. This distribution shows most women went for Covid-19 vaccines compared to men. Gender remains marginalized in global vaccines response. Further, the findings reveal that more than 85.3 % of the respondents were Christian, 11.6% were Muslims and 3.1% were traditional. This distribution demonstrated that majority of the youths in Kiambu County were Christians followed by Muslims. Also, those respondents who attained primary school level of education and below were 0.9 %, those who attained secondary level were 4.9%, while 27.7 % had college education and 66.5% who were the majority had attained university education and above.

Regarding whether there was any statistical relationship between social demographic factors and vaccine adoption behaviour among youths in Kiambu County, Chi-square test with p value set at P=0.05 was done. The test returned statistically significant results for age (X^2 =.003, df= 2, P= 0.008), gender (X^2=0.009, df=1, P= 0.009), education (X^2=0.039 df=3, p=0.008), and statistical insignificant results for religion (X^2= 0.910, df=2, p=0.668).

3.2 Covid-19 Television Messages

To derive television messages on Covid-19 the researcher analysed different YouTube video clips using qualitative content analysis. For inclusion and exclusion of Covid-19 news videos, extensive filtering and search on YouTube was done using phrases touching on perceived severity, perceived susceptibility, a4nd perceived efficacy beliefs. Covid-19 television messages had different elements as tabulated below.

Table 4

Covid-19 Television Messages

Message Elements	**Citizen TV**	**KTN**	**NTV**
Perceived severity	17	7	6
Perceived susceptibility	16	7	6
Perceived self-efficacy	1	0	1
Perceived response efficacy	16	6	5

As tabulated above, out of 17 videos analyzed from Citizen TV, 17 videos had perceived severity elements, 16 perceived susceptibility elements, 1 perceived self-efficacy elements and 16 perceived response efficacy elements. Further, out of 7 from Kenya Television Network (KTN) 7 had perceived severity elements, 7 had perceived

susceptibility and 6 had response efficacy elements. Also, out of 6 from Nation TV (NTV) 6 had perceived severity elements, 6 had perceived susceptibility elements and 5 had perceived response efficacy elements.

3.3 Vaccine Adoption Behavior

The study sought to find out on whether the youths had received Covid-19 vaccines. The finding on vaccine adoption rate were as illustrated in figure below

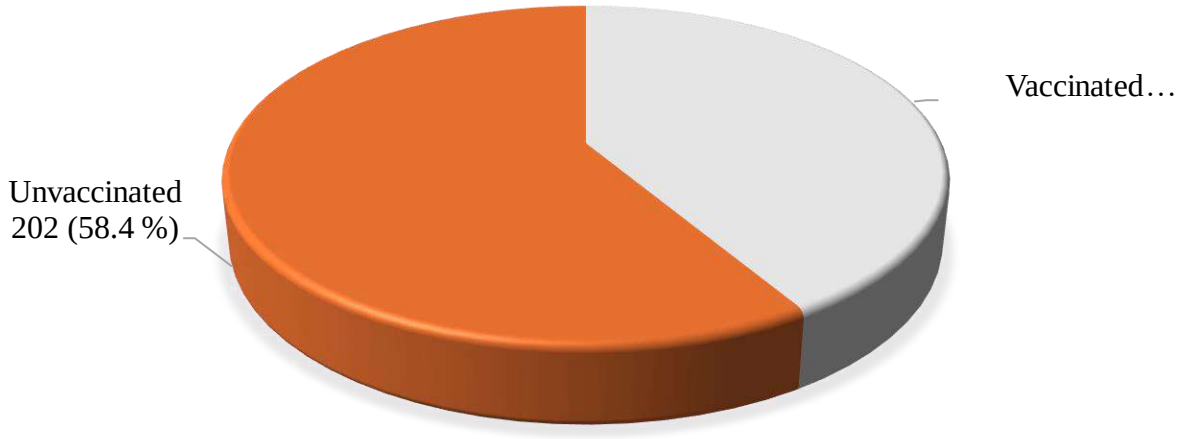

Figure 1
Vaccine Adoption Behavior

Based on the figure above the study found out that majority of youths in Kiambu County had not been vaccinated. 202 (58.4 %) out of 346 youths had not received vaccines and 144 (41.6%) youth had been vaccinated with different vaccines. Media is a key tool in fight against pandemic. This is because how the media designs and disseminates news influences mitigation measures. Increasing vaccines hesitancy was noted globally (Tolia et al., 2020).

This finding collaborates with Osur et al. (2020), that regardless of availability of Covid-19 messages and free vaccines the uptake of the same remained low among youths. 65.0% of youths correlated their rejection of vaccines to information, drug effectiveness and safety 42.0% and 45.0% respectively (Osur et al., 2022). Further, Ranjit et al. (2021), notes that there was hesitancy of Covid-19 vaccine adoption across different demographics.

4.4 Moderating Effects of Demographic Factors

The study sought to determine the moderating effects of demographic factors on the relationship between television messages on Covid-19 and the vaccine adoption behavior among youths in Kiambu County.

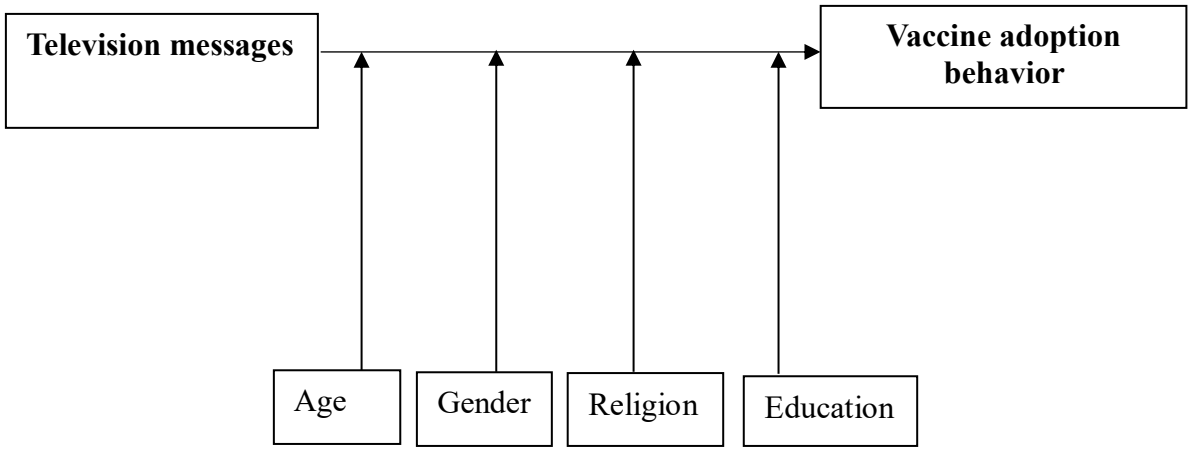

Figure 2
Moderating Variables Model

To evaluate, the moderating effects the respondents participated in questionnaires and a moderation analysis was done. Moderation analysis is a linear regression analysis explaining the impacts of independent variable on dependent variable under the influence of a moderating variable. To achieve this regression analysis was done. Further, the moderated effects of independent variables against the dependent variable were expressed in general form given below:

$Y=\beta_0 + \beta_1X_1*Z + \beta_2X_2*Z + \beta_3X_3*Z + \beta_4X_4*Z + e$

Y stands for dependent variable

X stands for Independent Variable

β_0 = is the constant (Y- intercept) which is the value of dependent variable when all the independent variables are zero

β_1= are regression constants or the rate of change induced by X_1*Z, X_2*Z, X_3*Z and X4*Z

Y = Vaccine adoption behavior

X_1= Perceived susceptibility

X_2= Perceived Severity

X_3 = Perceived response efficacy

X_4 = Perceived Self-efficacy

Z= Moderating variables

e=error

Z= Moderating variables

$Z= \alpha_0 + \alpha_1M_1 + \alpha_2M_2 + \alpha_3M_3 + \alpha_4M_4$

M_1 = Religion

M_2= Education

M_3= Gender

M_4= Age

3.4.1 Moderating Effects Analysis

Table 3

Statistical Findings

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.520	.382		3.976	.000
	Messages	-.004	.003	-.075	-1.409	.160
	Religion	.055	.058	.051	.937	.350
	Education	.112	.043	.141	2.579	.010
	Gender	.149	.055	.143	2.693	.007
	Age	-.154	.053	-.154	-2.906	.004

Based on the findings on table, education, gender and age had moderating effect between Covid-19 television messages and vaccine adoption among youths in Kiambu county. The P value for religion was 0.350, P value for education was 0.010, P value for gender was 0.007 and P value for age was 0.004. These results demonstrate that religion did not have moderating effects. A unit increase of education, gender, and age increased vaccine adoption uptake among youths in Kiambu County with 0.112, 0.149 and 0.154 units respectively.

Further, more analysis on moderating effects was performed using hierarchical multiple regression on all independent variables.

Table 5

Hierarchical Multiple Regression of Message Elements

Variable	β	T	Sr^2	R	R^2	ΔR^2	F	Sig.
Perceived susceptibility	.118	1.921	0.166	.045[a]	.002	.002	.681	.410
Perceived severity	-.030	-.486	0.501	.078[b]	.006	.004	1.026	.360
Perceived response efficacy	-.091	-1.251	2.495	.174[c]	.030	.024	3.481	.016
Perceived self-efficacy	-.129	-1.894	3.345	.201[d]	.041	.010	3.528	.008
Moderating variable	.037	.028	3.754	.213[e]	.045	.005	3.177	.008

Overall, the hierarchical multiple regression model revealed that the first message element (perceived susceptibility) contribution was insignificant F (1, 338) =0.681, P=0.410, R^2 = 0.002 and accounted for 1.66 Sr^2 and 0.002 ΔR^2 . The second message element (perceived severity) contribution was insignificant ΔF (2, 338) =1.026,

p=0.360, ΔR^2=0.04, β=-.030, t= -.486. With addition of severity element in block 2, Sr^2 rose from 0.166 to 0.501 thus accounting for 33.5% variation on Covid-19 vaccine adoption behavior among youths in Kiambu county. Additionally, the ΔR^2 rose from 0.002 to 0.004 accounting for a variation of 0.2%.

The third message element (perceived response efficacy) was added, and its contribution was significant ΔF (3, 338) =3.48, p=0.016, ΔR^2=0.024, β= -.091, t= -1.251. With addition of addition of perceived response efficacy in block 3, Sr^2 rose from 0.501 to 2.495 thus accounting for 1.994 unit increase on Covid-19 vaccine adoption behavior among youths in Kiambu county. Additionally, the ΔR^2 increased from 0.004 to 0.024 accounting for a variation of 2%.

The third message element (perceived self-efficacy) was added, and its contribution was significant ΔF (4, 338) =3.528, p=0.008, ΔR^2=0.010, β= -0.129, t= -1.894. with addition of self-efficacy elements in block 4, Sr^2 rose from 2.495 to 3.34, thus accounting for variation of 85% on Covid-19 vaccine adoption behavior among youths in Kiambu county. Additionally, the ΔR^2 dropped from 0.024 to 0.010 accounting for a variation of 1.4%.

Finally, the study sought to proof the fifth null hypothesis that stated that demographic factors have no moderating effects on the relationship between Covid-19 television messages and the vaccine adoption behavior among youths in Kiambu County. The findings revealed that the contribution was significant the demographic factors contribution was significant ΔF (5, 338) =3.177, p=0.008, ΔR^2=0.005, β= -0.037, t= 0.028. With addition of demographic elements in block 5, Sr^2 rose from 3.345 to 3.745, thus accounting for variation of 40% on Covid-19 vaccine adoption behavior among youths in Kiambu county. Additionally, the ΔR^2 dropped from 0.010 to 0.005 accounting for a variation of 0.05%.

IV. DISCUSSION

The study sought to determine the moderating effects of demographic factors on the relationship between Covid-19 television messages and the vaccine adoption behavior among youths in Kiambu County. The findings were that demographic factors as gender, age and education had moderating effects while religion had no moderating effects. The results are refuting to the null hypothesis:

Ho_1: Demographic factors have no moderating effects on the relationship between Covid-19 television messages and the vaccine adoption behavior among youths in Kiambu County.

Contrary to Osur et al. (2022): Tolia et al. (2022); Guidry et al. (2022), this study found that there was no moderating effect between religion and vaccine adoption behavior among youths. According to Malik et al. (2020), adoption of covid-19 vaccines differs based on the religious links. Noticeably, religion has different norms in culture, politics, and economic concerns. Religion has long-term influence on their decision towards vaccine uptake. As such religious leaders are powerful in influencing people's decision irrespective of people's lifestyles and education background (Queiroz et al., 2020).

Further, the findings disagree with Orangi et al. (2021) study on assessing the level and determinants of Covid-19 vaccine in Kenya, found some demographics have influence however level of education did impact on vaccine hesitancy but individual's Covid-19 risks perceptions and impacts determines the level of hesitancy.

The findings on age, gender and education agree with studies conducted by Osur et al. (2022) that indecision on vaccine adoption uptake remains high among youths compared to elderly. Borrowing from the same study on vaccine acceptance amongst youths in Kenya by Osur et al. (2022), youths are hesitant to go for vaccines and would wait and see how others reacted to vaccines before accepting them. Further, according to Bhattacharya (2023), youths aged 18 to 24 years have a tenancy of overestimating their life risk due to high immunity level however they are at risk of contracting the pandemic.

Further, Osur et al. (2022), notes that indecisiveness remains high among youth where only 42% were ready for vaccination, 52% waiting to see the effects of the vaccines to the already vaccinated and 6% unwilling.

Further, the influence of gender on health has become key during covid-19 pandemic. According to Peckham et al. (2020), males have three times odds of intensive care units' admissions and 40 % higher odds of dying from the pandemic compared to females (Walter & McGregor, 2020; Wolfe et al., 2021).

Sulat et al. (2018), notes that there has been more covid-19 hospitalization and deaths among men compared to the women. Women hesitancy has been documented; however, this do not translate to actual behaviour. The demographics characteristics influence the relationship between messages and anticipated behaviour thus low vaccine adoption behavior among youths in Kiambu County.

In a similar study on vaccine hesitancy among religious groups, Wouters et al. (2021), notes that individual decision on uptake or non-uptake of vaccines among religious groups is not only attributed to religious affiliation, but this is also because positive trends are observable regardless of barriers to vaccines uptake. Further, Sommerlad and David, (2020), on pro-religion attitudes of vaccination coverage, notes that countries with knowledge on science had higher vaccine adoption regardless of religious beliefs. In addition, vaccine intention can be improved if endorsed by religious leaders and authority.

Further, studies conducted on Evangelicals and Covid-19 vaccine hesitancy in USA by Guidry et al. (2022), notes, evangelical Christians are most hesitant to get Covid-19 vaccines because the vaccines interfered with their beliefs. In addition, they interfered with their divine providence and the manufacturing of vaccine applied aborted stem cells, science conflicts with their beliefs. Therefore, involvements of awareness and increased adoption of control measure during health crisis in multi-religious groups should factor in the changing religious beliefs so as plan and implement effective health control programmes.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study found that age, education and gender had effects on the relationship between Covid-19 television messages and the vaccine adoption behavior among youths in Kiambu County. This implies that the demographic factors influence the vaccine uptake behavior among youths. The demographic factors had effects on engagement and disengagement towards vaccine uptake. The media blended range of information with Covid-19 pandemic. The pandemic's information shared on the television was characterized by messages that had perceived threat and benefits messages which in turn influenced compliance and non-compliance among different demographics as per the control measure put in place by the different actors.

5.2 Recommendations

Health communication practitioners and policymakers should tailor pandemic-related messages to specific demographic groups, ensuring that content is accessible, culturally sensitive, and inclusive. By integrating demographic considerations into message design, television and other media platforms can become more effective tools for influencing positive health behavior change among diverse youth populations.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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