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The Role of Health Education in Covid 19 Vaccine Hesitancy Among Outpatients in Kericho County, Kenya. An Institution Based Cross Sectional Survey

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ABSTRACT

Vaccine hesitancy is a global health issue. It is known to undermine the efforts of relief agencies and humanitarian institutions to control the spread of Covid 19 pandemic and attain herd immunity, hence leading to prolonged public health, social, and economic consequences. The aim of the study was to assess Covid-19 vaccination hesitancy rate among individuals residing in Kericho County, and the role of mass education in vaccine hesitancy. Health facility based cross sectional study was carried out among participants who had access to mass health education on Covid 19 disease. The 5Cs psychological antecedents of vaccination model was used to construct variables based on the five dimensions of confidence, convenience, complacency, risk calculations and collective responsibilities. Simple random sampling and proportionate probability to size were used to select 1200 participants. Structured questionnaires were used during the study period. Data was analyzed using statistical package for social sciences (SPSS) version 26. Binary regression model was used to establish the nature of association between the study variables. The study found that those having confidence in the safety of the vaccine had lower likelihood of accepting it (AoR = 0.56, 95% CI: 0.37 – 0.86, p = 0.008), while a higher likelihood of accepting Covid 19 vaccine was observed among those who were well informed about it (AoR = 2.78, 95% CI: 1.78-4.31, p < 0.001) and those who thought that getting the vaccine was important (AoR = 7.78, 95% CI: 2.74 – 22.12, P < 0.001). Therefore, health education can potentially improve the confidence about Covid 19 vaccine but not complacency about the vaccine.

Keywords: Covid 19, Vaccines Hesitancy

1. INTRODUCTION

Vaccine hesitancy is one of the top ten threats to global health (Nuwarda et al., 2022). It is known to undermine the efforts of agencies and stakeholders to control the spread of Covid 19 pandemic, and efforts to attain herd immunity, hence leading to prolonged public health, social, and economic consequences across the world (Lane et al., 2018). Vaccine hesitancy for Covid 19 varied from one nation to another, ranging from 10% to 80% (Rahbeni et al., 2024). The variation was attributed to differences in socio-economic, political, and cultural factors. Cooper & Wiysonge (2023) found that the vaccine acceptance rate in the Asian region was lower (68%) compared to China, where it was over 90%. The variation was attributed to differences in health education and public perceptions on Covid 19 vaccination, complacency to the Covid 19 vaccines, lack of confidence in Covid 19 vaccination, and inconvenience. However, there were significant variations in the rates of vaccine acceptance between these nations, with low- and middle-income countries reporting lower rates of vaccine acceptance compared to developed nations (Anino & Sanga, 2024, Anino et al., 2023). For instance, in China, a high vaccine acceptance of 91.3% was reported (Begum et al., 2024). Interestingly, though South Korea and Vietnam are middle income countries but reported high vaccine acceptance rates of 89.3% and 87.4%, respectively (Hwang et al., 2023; Tran et al., 2023). These were attributed to significant successful public health education campaigns and strong healthcare infrastructure, which were vital to enhancing public trust in government and health agencies in respective countries.

High Covid 19 vaccine hesitancy has been reported by low- and middle-income countries. In African countries, vaccine hesitancy remains a major public health obstacle that has hindered immunization and vaccination coverage, particularly against Covid 19 (Anino & Sanga, 2024; Anino et al., 2023; Mbulayi et al., 2023; Wassie et al., 2024)). They reported that 15 to 60% of the African population expressed hesitancy towards Covid 19 vaccines which was attributed to concerns about vaccine safety, mistrust in governments and healthcare systems, and misinformation. However, a higher hesitancy of 78.8% to Covid 19 vaccines was reported in South Africa (Mishi et al., 2023). They attributed such hesitancy to vaccine side effects and mistrust in the healthcare authorities. Additionally, low vaccine coverage was attributed to vaccine nationalism, and diplomacy which threatened the distribution of vaccines to low- and middle-income countries.

In Kenya, recent data suggests high levels of vaccine hesitancy (Anino & Sanga, 2024; Orangi et al., 2024). Therefore, though the advent of Covid-19 vaccine was a critical tool in the global fight against the Covid 19 pandemic, achieving widespread vaccination coverage was contingent upon other factors. Health education plays a significant role in addressing vaccine hesitancy and enhancing vaccination uptake. According to Bezbaruah et al. (2024), the health education campaigns should be regular, should disseminate

information correctly, focus on addressing misconceptions, and strengthen trust within the community. Freeman et al. (2023) reported that personalized health education programs that emphasized vaccine safety, benefits, and efficacy, improved vaccine acceptance and uptake by 15%. This outlined the effectiveness of such programs among the vaccine-hesitant population. Another study found that educational campaigns that focused on community engagement and transparent communication led to a significant decrease in vaccine hesitancy (Marić & Gama-Araujo, 2024). These studies highlight the significant role of health education in strengthening public trust, addressing vaccine safety and efficacy, and dispelling common myths and misconceptions about Covid 19 vaccination. Therefore, this study assessed Covid-19 vaccination among Kericho County residents in Kenya, examining the potential influence of education on vaccine hesitancy.

2. METHODOLOGY

2.1. Study area and design

The study was carried out in two hospitals within Kericho County using institution based cross sectional study design. They included Kapkatet Sub County hospital in Bureti Sub County and Kericho Referral Hospital in Ainamoi Sub County.

2.2. Sampling design and procedure

The two institutions were purposively chosen based on the high number of patients seeking their services. In each institution, the participants were selected using simple random sampling. The sampling frame was obtained from the health records department of the participating institutions. The inclusion criteria included any patient seeking outpatient services who had resided in Kericho County for the last three years and had received mass health education on Covid 19 disease and vaccination. However, persons seeking outpatient services who were critically ill were not included in the current study. Probability proportionate to size was used to select the participants across the two health facilities. A total of 1200 participants were selected.

2.3. Study variables and data collection

The study variables were conceptualized using the 5Cs antecedents' model for vaccination (Betsch, et al., 2018). The variables were clustered in one of the five dimensions of the 5Cs model. They included confidence, convenience, complacencies, risk calculation, and collective responsibility. For confidence dimension, the following three variables were studied; trust government recommendations regarding Covid 19 vaccination, trust in the efficacy and trust in effectiveness of the vaccines. For complacency five variables were studied and they included seeking information about the vaccine, thinking that vaccination is important, understand Covid 19 transmission and prevention measures, and being informed about Covid 19 vaccine. For convenience, collective responsibility and risk calculation on Covid 19, two variables were included in each case in the respective order; ease of access of vaccine and faced challenges in accessing the vaccine; feel a responsibility to protect others and follow the recommended Covid 19 practices; and concerned about potential risk of Covid 19 vaccine, and concerned with the risk of contracting Covid 19 disease. Additionally, socio-demographic characteristics, age, education and occupation were assessed in the study.

Data was collected from October to December 2023. The questionnaires were pretested and validated before data collection. Validation was carried out by a team of expert from the department of Public Health at the University of Kabianga. Reliability was ensured by a Crobach alpha test score of r = 0.08.

2.4. Data analysis

Data was analyzed using statistical package for social sciences (SPSS). Multivariate analysis using binary regression analysis was carried out to establish the nature of the association between vaccine hesitancy and the 5Cs constructs. The regression analysis scores were presented as adjusted odds ratio (AoR). The confidence interval was 95% CI and the *p* value was set at 0.05.

2.5. Ethical consideration

Ethical approval was granted by the ethical scientific review committee of the University of Kabianga. Both verbal and written informed consent were sought from all the study participants. The investigators also assured the study participants of their anonymity and privacy of their data by ensuring that unique codes were used to identify the participants and the collected data stored in a lockable cabinet accessible only to the investigators.

3. RESULTS

3.1. Response rate

We sampled 1200 participants. However, some participants did not complete the study due to various reasons, including not consenting to participate in the study, and withdrawing from the study in the course of the interview. Therefore, the participants who completed the study were 1172 giving a response rate of 97.7%.

3.2. Covid 19 vaccine hesitancy

A total of 872 (74.4) of the participants interviewed had not received vaccination as shown in Figure 1.

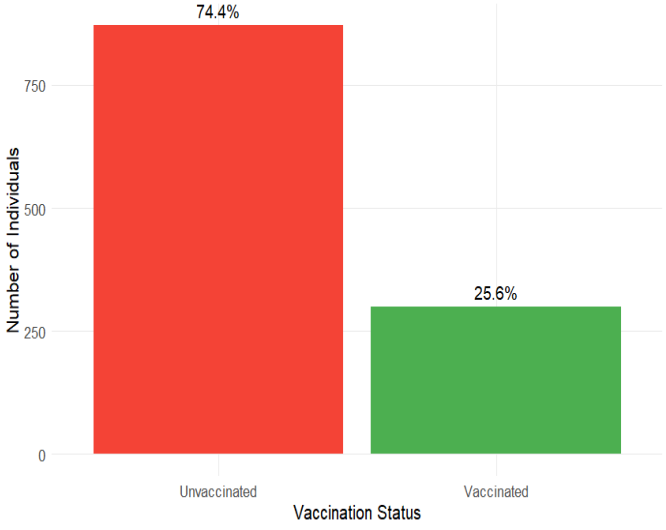

Figure 1. Covid 19 vaccination status among respondents

3.3. Individual characteristics

Level of education and age were the individual characteristics that were significantly associated with hesitancy to Covid 19 vaccine as shown in Table 1. Lower education level with AoR = 0.46, 95% CI = 0.32 – 0.66, *P* = < 0.001 for secondary education and AoR = 0.04, 95% CI = 0.01 – 0.12, *P* = < 0.001 for primary education or not having attained any level of education (AoR = 0.11, 95% CI = 0.03 – 0.34, *P* = < 0.001) were associated with reduced likelihood of accepting the vaccine. Similarly, being older than 35 years was also linked with reduced willingness to get Covid 19 vaccine (AoR = 0.34, 95% CI = 0.22 – 0.53, *P* = < 0.001).

Table 1. Description and logistic regression analysis of individual characteristics and Covid 19 vaccine hesitancy, n = 1172

Variable	**Description *N* (% of total)**	**AoR**	**95% CI**	***P***
Education				
None	100 (8.5)	0.11	0.03 – 0.34	< 0.001
Primary	172 (14.7)	0.04	0.01 – 0.12	< 0.001
Secondary	344 (29.4)	0.46	0.32 – 0.66	< 0.001
Tertiary	556 (47.4)	1		
Occupation				
House wife	124 (10.6)	1.30	0.60 – 2.87	0.508
Student	368 (31.4)	1.52	0.75 – 3.08	0.242
Formal/self - employed	440 (37.5)	1.71	0.88 – 3.31	0.113
Farmer	240 (20.5)	1		
Age				
18 to 35	964 (82.3)	1		
36 and above	208 (17.7)	0.34	0.22 - 0.53	< 0.001

Model adjusted for all the variables in the table, 1 denote reference category

Confidence in the safety of Covid 19 vaccine was the only confidence related factor that was significantly linked to vaccine hesitancy as presented in Table 2. Those who were confident in the safety of Covid 19 vaccine had lower odds of accepting it with AoR = 0.56 (95% CI = 0.37 – 0.86, *P* = 0.008).

Table 2. Description and logistic regression analysis of confidence related knowledge and Covid 19 vaccine hesitancy, n = 1172

Variable	Description *N* (% of total)	AoR	95% CI	*P*
Trust government recommendations regarding Covid 19 vaccination				
No	212 (18.1)	1		
Yes	960 (81.9)	1.02	0.62 – 1.67	0.94
Confidence in the safety of vaccine				
No	360 (30.7)	1		
Yes	812 (69.3)	0.56	0.37 – 0.86	0.008
Confidence in the efficacy of vaccine				
No	392 (33.4)	1		
Yes	780 (66.6)	0.86	0.58 – 1.25	0.421

Model adjusted for education, occupation and age, 1 denote reference category

Table 3 shows the odds of complacency related knowledge on Covid 19 vaccine hesitancy. Seeking information about Covid 19 vaccine and understanding Covid 19 transmission and prevention measures were not statistically associated with hesitancy. However, having thoughts that vaccination is important, and being informed about Covid 19 vaccine were significantly associated with hesitancy. Those who perceived that Covid 19 vaccination was important were more likely to accept the vaccine (AoR = 7.78, 95% CI = 2.74 – 22.12, *P* = < 0.001). Similarly, those who were informed about the vaccine had a greater willingness to get vaccinated (AoR = 2.78, 95% CI = 1.79 – 4.32, *P* = 0.001).

Table 3. Description and logistic regression of complacency related knowledge and Covid 19 vaccine hesitancy, n = 1172

Variable	**Description *N* (% of total)**	**AoR**	**95% CI**	***P***
Seek information about vaccine				
Rarely	684 (58.4)	1.28	0.73 – 2.26	0.389
Daily	68 (5.8)	1.52	0.98 – 2.35	0.062
Weekly	128 (10.9)	1.27	0.89 – 1.81	0.194
Monthly	292 (24.9)	1		
Think that vaccination is important				
No	156 (13.3)	1		
Yes	1016 (86.7)	7.78	2.74 – 22.12	< 0.001
Understand Covid 19 transmission and prevention measures				
No	140 (11.9)	1		
Yes	1032 (88.1)	1.59	0.93 – 3.35	0.995
Informed about Covid 19 vaccine				
No	408 (34.8)	1		
Yes	764 (65.2)	2.78	1.79 – 4.32	< 0.001

Model adjusted for education, occupation and age, 1 denote reference category

This study found that several factors increased the likelihood of people accepting Covid 19 vaccine as shown in Table 4. These included factors related to convenience of access, a feeling of collective responsibility, and a careful consideration of potential risks. Specifically, ease of access of vaccine, facing challenges in accessing vaccine and a feeling of responsibility to protect others had AoR = 2.55 (95% CI = 1.87 – 3.47, *P* = <0.001), AoR = 1.58 (95% CI = 1.16 – 2.14, *P* = 0.004) and AoR = 2.06 (95% CI = 1.22 – 3.50, *P* = 0.007) respectively. Compliance with Covid 19 practices, concern about potential risks of the vaccine and concern about contracting the disease all had *P* = 0.001 or lower with AoR = 2.02 (95% CI = 1.33 – 3.04), AoR = 2.34 (95% CI = 1.70 – 3.20) and AoR = 2.24 (95% CI = 1.63 – 3.09) respectively.

Table 4. Description and logistic regression of knowledge on convenience and constraint, collective responsibility and risk calculation on Covid 19 vaccine hesitancy, n = 1172

Variable	Description *N* (% of total)	AoR	95% CI	*P*
Ease of access of Vaccine				
Not easily accessible	740 (63.1)	1		
Easily accessible	432 (36.9)	2.55	1.87 – 3.47	< 0.001
Faced challenges in accessing vaccine				
No	612 (52.2)	1		
Yes	560 (47.8)	1.58	1.16 – 2.14	0.004
Feel a responsibility to protect others				
No	229 (19.5)	1		
Yes	943 (80.5)	2.06	1.22 -3.50	0.007
Follow the recommended Covid 19 practices				
No	305 (26.0)	1		
Yes	867 (74.0)	2.02	1.33 – 3.04	0.001
Concerned about potential risk of Covid 19 vaccine				
No	696 (59.4)	1		
Yes	476 (40.6)	2.34	1.70 – 3.20	< 0.001
Concerned about contracting Covid 19				
No	664 (56.7)	1		
Yes	508 (43.3)	2.24	1.63 – 3.09	< 0.001

Model adjusted for education, occupation and age, 1 denote reference category

4. DISCUSSION

We found lower levels of education and older age to be associated with increased likelihood of vaccine hesitancy. This aligned with previous studies which observed similar trends where hesitancy was higher among individuals with lower education levels, particularly among the primary and non-educated groups (Baghani et al., 2023; Usman et al., 2022, Anino et al., 2023). However, our findings disagreed with the reports by Dolu et al. (2023) and Reno et al. (2021) who reported lower hesitancy rates among the older adults and among the well-educated populations. The majority of the participants in our study were younger adults. An earlier report showed lower baseline trust in scientific institutions among this demographic group which is comparable to the demographic groups in our study (Groeniger et al., 2021). Additionally, we found higher hesitancy levels than those reported in previous studies in Kenya and within the current study area. For instance, Osur et al. (2022) reported hesitancy of 19% among the community health volunteers conducted in four counties in Kenya. We postulate that the reason for such variation has to be on the approach used to measure hesitancy. These studies used participants verbal report on vaccination status to measure hesitancy, while in our study an extra step was taken to establish proof of vaccination and thereby eliminating recall bias and any other unforeseen bias. Additionally, in the previous studies, partially vaccinated individuals were not considered hesitant contributing to lower hesitancy rates they reported (Borga et al., 2022).

Our study confirms that confidence in the safety of Covid 19 vaccine is an important factor that influence hesitancy. However, unlike in a previous study where it was associated with reduced hesitancy, in our study it was linked with low acceptance of vaccine (Soares et al., 2021). This challenges a traditional understanding where safety concerns are considered the primary drivers of hesitancy. This is because our findings could be an indication that individuals who trust in the safety of the vaccines might prioritize other factors in their decision-making process (Lünich & Kieslich, 2024). Additionally, a study by Arvanitis et al. who reported similar results to our study noted that underlying health conditions and history of adverse reactions to medication were key factors contributing to hesitancy among individuals with trust on vaccine safety (Arvanitis et al., 2021). Our findings therefore confirm that addressing safety concerns remains crucial, but health education efforts need to adapt to the new understanding.

Our findings that individuals who demonstrated a good understanding of both Covid 19 transmission prevention measures and Covid 19 vaccines were more likely to be receptive to vaccination aligned with the previous research by (Soares et al., 2021; Borga et al., 2022). However, our findings diverged from reports by Williams et al which the focus was on promoting the vaccine itself, particularly in the development of intervention to increase the uptake of COVID-19 vaccination among those at high risk (Williams et al., 2020). However, equipping individuals with knowledge about transmission and preventive measures could create a foundation for vaccine acceptance by empowering populations to understand the risks associated with disease and its causative agents and the role vaccine plays in its mitigation. Additionally, when wholistic health education messaging is adopted and the vaccine science, safety profiles

and the potential side effects of the vaccines well explained complacency is generally reduced (Anino & Sanga, 2024). This is possible because when common concerns and myths about the vaccines are addressed, people develop trust in the vaccine and any other prevention strategy which often encourage informed decision.

We found a consistent pattern between our study and those reported in literature with regards to ease of access to the vaccine and hesitancy (Hwang et al., 2023; Tran et al., 2023). Generally, living closer to vaccination centers and living in areas with better transportation infrastructure have been associated with prompt vaccination (Musa et al., 2021). Contrary to our findings, studies by De- Figueiredo et al. and Ekezieet et al. did not find a significant association between facing challenges in accessing the vaccine and vaccination uptake (De Figueiredo et al., 2020; Ekezie et al., 2022). However, we found a significant relationship between these factors. Different studies have used the term challenges differently; thus, the divergence might be attributed to variations in the definition of "challenges" across studies or differences in healthcare systems and vaccine distribution strategies.

Our results aligned with prior research indicating that individuals who perceive a responsibility to protect others are more likely to get vaccinated. This finding is consistent with studies by Korn et al. and Pfattheicher et al, both of which emphasized the role of altruism in vaccination decision-making (Korn et al., 2020; Pfattheicher et al., 2022). Similar to our findings, Belingheri et al. (2021) and Al-Qerem & Jarab (2021) documented a positive association between adherence to recommended COVID-19 practices and vaccination acceptance. However, our study observed a slightly higher odds ratio. This variation could stem from differences in levels of trust in health authorities.

The association between concerns about vaccine risk and vaccination behavior has been documented in several studies. Our results agreed with the findings by Đorđević et al. (2021) and Caserotti et al. (2021) who showed the impact of safety concerns on vaccine hesitancy. Additionally, consistent with previous literature, our study found that individuals concerned about contracting COVID-19 were more likely to get vaccinated and thereby emphasizing the idea that perceived susceptibility is a motivator for vaccination.

5. CONCLUSION

The study has identified factors that are associated with vaccine hesitancy, noting that lower education levels and older age increase hesitancy. Younger adults showed higher hesitancy due to lower trust in scientific institutions. Additionally, confidence in vaccine safety was linked to lower acceptance, suggesting a possibility of other factors in influencing decision-making. On the other hand, understanding COVID-19 prevention and vaccine information was shown to increase vaccines acceptance. Access to vaccination centers and altruistic behavior also positively impacted uptake, while safety concerns and perceived susceptibility to COVID-19 were significant motivators for vaccination.

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