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COVID-19 VACCINE UPTAKE AMONG STUDENTS AT TAKORADI TECHNICAL UNIVERSITY, GHANA: PREVALENCE AND PREDICTORS

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ABSTRACT

Coronavirus Disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, has significantly impacted global health and economies. Vaccine development and acceptance have been critical in mitigating its effects. This notwithstanding, anecdotal evidence suggests that young adults in many sub-Saharan African countries, including Ghana, have not taken the vaccine. However, there are limited documented facts to authenticate this assertion and the correlations between COVID-19 and vaccine uptake have not been well-interrogated.

As such, this study aims to examine the prevalence and determinants of COVID-19 vaccine uptake among students at Takoradi Technical University, Ghana. The study used a cross-sectional online survey to analyse demographic, socio-cultural, behavioural and belief factors influencing vaccine uptake. A sample of 375 students was randomly selected for the study, SPSS version 21 was used to analyse the data using univariate, bivariate and binary logistics regression.

The results showed low acceptance of the COVID-19 vaccine among TTU students. The study also showed that the correlates of the COVID-19 vaccine uptake among students are multifaceted. Of particular importance is the influence of students from urban areas. Most students from all tribes, except the Gas and those who did not wear nose masks regularly, did not accept the COVID-19 vaccine.

This study's major contribution to the literature is identifying students from urban centers and particular tribes/races as people who did accept the COVID-19 vaccine. Findings suggest targeted interventions for improving vaccine coverage among urban young adults, emphasizing socio-cultural inclusivity.

KEYWORDS: *COVID-19, Vaccine Uptake, Predictor, Prevalence, Ghana*

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), an infectious disease caused by SARS-CoV-2 initially appeared in Wuhan, China, in December 2019. The outbreak, originating from zoonotic transmissions at a Wuhan wet market, rapidly spread to other parts of China and globally, according to WHO (Jeremy et al., 2021). The epidemic was declared a Public Health Emergency of International Concern in January 2020 and the first person to die was confirmed in Washington State (Moore, 2021).

COVID-19 has affected nearly all countries globally, with 776,696,160 confirmed cases and 7,072,509 deaths as of October 20, 2024 (WHO, 2024). The USA is the most severely affected nation, with 103 million confirmed cases and 1.2 million deaths since October 20, 2024 (WHO, 2024). In Africa, 9,583,895 confirmed cases and 175,531 deaths according to the WHO dashboard as of October 20, 2024 (WHO, 2024). According to the WHO, COVID-19 deaths in Africa are expected to drop by 94% in 2022 when compared to 2021, the pandemic's deadliest year. The COVID-19 mortality rate varies by country in Africa, high-income countries and South Africa have twice the rate of lower-income and lower-middle-income countries (WHO, 2022).

The first COVID-19 cases in Ghana were confirmed in March 12, 2020, after two travellers returned from Norway and Turkey (WHO, 2022). Travellers from countries with 200 or more cases were banned, but not Ghanaian citizens or residents. The President banned public gatherings to reduce the spread of COVID-19. According to the WHO dashboard, as of October 20, 2024, Ghana has recorded 172,210 confirmed cases and 1,462 deaths (WHO, 2024). Strict precautions were implemented globally to prevent the pandemic.

In March 2020, travel limitations and social distancing measures were implemented, along with guidelines for good handwashing practices, social distancing and wearing of nose marks. However since these steps were only expected to halt the virus's spread, scientists realised that a vaccine was necessary to end the pandemic. The Modern mRNA vaccine started the first COVID-19 human vaccine trials on March 17, 2020 (Moore, 2021). Acceptability by people in general is a significant barrier to the implementation of these vaccines, which could make it more difficult to attain acquired immunity in a significant percentage of the population (Paterson et al., 2016). A study by Okai & Abekah-Nkrumah, (2022) in Ghana, suggests that only 62.7% of the respondents indicated that they would accept the COVID-19 vaccine if provided.

However, four years into the roll-out of the vaccination campaign in Ghana there was anecdotal evidence that suggests that the prevalence of COVID-19 vaccine uptake was very low. Hence this study seeks to assess the prevalence of COVID-19 vaccine uptake and the factors which influenced the uptake among university students.

METHODS

Methods Survey Design and Study Population

The study was conducted in the Takoradi Technical University main campus community. The student population of the university is the main population for the study and eligibility to receive the COVID-19 vaccine. The study was developed as an anonymous cross-sectional online study to help solicit information on whether they have received the vaccine. The survey was in English, hosted via Google Forms and was open from 1st July 2024 to 1st August 2024. The survey was circulated among all students of Takoradi Technical University WhatsApp platforms. Questionnaires were used to obtain data on variables such as demographic, social-cultural, behavioural and belief factors as independent variables with the prevalence of COVID-19 vaccination as the dependent variable.

Sample Size and Sample Technique

Using epi info software version 7.2.4.0, the sample size of 375 from a population of 16, 055 students on the Main campus with 50% expected frequency, 5% acceptable margin of error, 1.0 design effect, 95% confidence level and a cluster of 1 was estimated.

Variable Definition

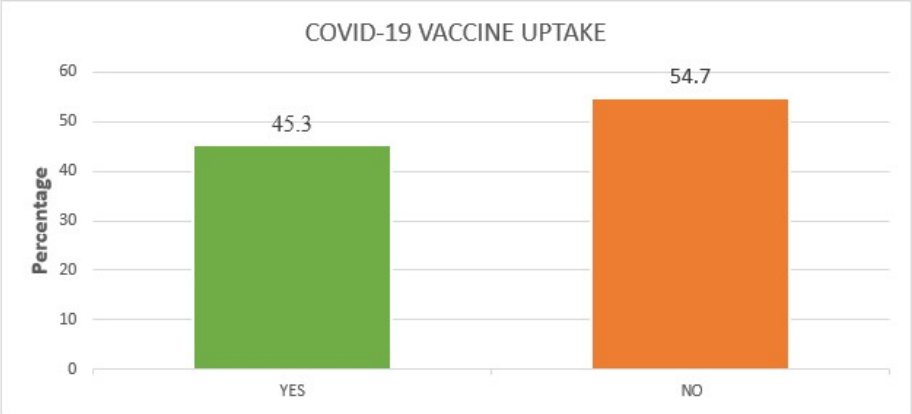
COVID-19 vaccine uptake: This is coded as 1 if a respondent has taken the COVID-19 vaccine or 0 if otherwise. The study contained several independent variables. The demographic factors comprised age, gender, household wealth, place of residence and region of residence. The social-cultural factors were ethnicity, religious affiliation and political party affiliation. The variables under behavioural factors were wearing of nose mask regularly, avoiding crowded places and belief factors were perceived vaccine severity, perceived vaccine benefits, perceived vaccine barriers, perceived vaccine susceptibility and cues to action.

Statistical Analysis

The data collected was cleaned, checked for errors and analyzed using SPSS Version 21. The statistical analysis was done in two phases. The first described the data of the participants of the COVID-19 survey, including the various factors considered in the study. In the second phase, a discussion was done comparing and contrasting with previous works using the results from the binary logistic regression conducted to explore the relationship between the independent variables and dependent variables influencing the respondents' COVID-19 vaccine uptake.

RESULTS

The figure shows that approximately 55% of respondents had not taken the COVID-19 vaccine, while 45% had received it.



Source: SPSS Output Of The Data Collected From The Field, 2024.

Figure 1

From Table 1, the majority of respondents (68%) were aged between 20–24 years, with smaller proportions being drawn below 20 (13%), between 25–29 (13%) and 30–34 (6%) year groups. This suggests the sample predominantly consisted of students aged 20–24 years. Gender distribution indicated that 74.7% of the respondents were male, while 27.9% were female. Additionally, 59% of respondents come from urban areas, whereas 41% live in rural areas. Regarding regional background, 73.6% of respondents were from the southern parts of Ghana and 26.4% from the northern parts. Socioeconomic analysis revealed that 73.3% of respondents came from middle-class households, 17.9% from wealthy households and 8.8% from poor households.

Similarly, the majority (66.1%) of respondents were Akan, followed by Ga (17.1%), Ewe (10.7%) and Mole Dagbani (6.1%). Christians formed the largest religious group (83.5%), followed by Muslims (13.9%) and adherents of African Traditional Religion (2.7%). Political affiliation analysis revealed that 40.8% of respondents were aligned with the NPP party, 24.8% with the NDC, 30.1% with other parties and 4.3% reported no political affiliation. The majority of the

respondents (81.9%) wore masks regularly in crowded areas, while 18.1% did not. Additionally, 75% avoided crowded places, whereas 25% could not. As shown in Table 1, 56.8% of respondents believed they were susceptible to COVID-19, while 43.2% did not. Approximately half (49.9%) of respondents believed their associates were at risk if they contracted COVID-19, while 50.1% disagreed. A significant proportion (71.7%) expressed concerns about potential sickness after taking the vaccine, while 28.3% did not share this belief. Only 47.5% believed the vaccine restored normalcy, while 52.5% thought it would protect from the virus. Perceived barriers included potential side effects (56.3%), pain (27.7%) and cultural/religious restrictions (16%). Motivation to take the vaccine was predominantly self-driven (38.7%), while others were influenced by close associates (30.1%), politicians (19.7%) or celebrities (11.5%).

Table 1: Univariate Analysis Characteristics of Respondents

Characteristics	Frequencies	Percentages (%)
Demographic Factors		
Age		
Below 20 years	49	13
20 – 24 years	49	13
25 – 29 years	255	68
30 – 34 years	22	6
Gender		
Male	280	75
Female	95	25
Household Wealth		
Poor	33	9
Average	275	73
Rich	67	18
Place of Residence		
Urban	221	59
Rural	154	41
Region of Residence		
Northern Part of Ghana	226	74
Southern Part of Ghana	99	26
Social-cultural Factors		
Ethnicity		
Ga	64	17
Ewe	40	11
Mole Dagbani	23	6
Akan	248	66
Religious Affiliation		
Christianity	313	84
Islam	52	14
Africa Traditional Religion	10	3
Political Party affiliation		
NPP	153	41
NDC	93	25
Other parties	113	30
No party	16	4
Behavioural Factors		
Wore a nose mask regularly during covid-19 pandemic		
Yes	307	81
No	68	19
Avoided crowded places during covid-19 pandemic		
Yes	281	75
No	94	25

Table 1: Contd.,

Belief Factors		
Were you susceptible to COVID-19?		
Yes	213	56.8
No	162	43.2
If I get COVID-19 my associates are susceptible to COVID-19		
Yes	187	50
No	188	50
Perceived benefits of COVID-19 vaccine		
The vaccine helped things to go back to normal	178	47.5
The vaccine protects against COVID-19	197	52.5
Perceived severity of COVID-19 vaccine		
There are side effects associated with the vaccine	211	56.3
The vaccine was painful	104	27.7
My culture/religion prevented me from vaccines	60	16
Cues to action to COVID-19 vaccine		
Politicians motivate one to take the vaccine	74	19.7
Close associates' motivation to take the vaccine	113	30.1
Celebrities motivated one to take the vaccine	43	11.5
My motivation to take the vaccine was personal	145	38.7

Table 2: Estimated Odds Ratios (OR) and Confidence 95% Confidence Intervals (CI) From Logistic Regression Of COVID-19 Vaccine Uptake

Characteristics	Exp (β)	[95% CI]		P-Value
		Lower	Upper	
Age of Students				
Below 20 years (**RC**)	1.000	1.000	1.000	0.938
20 – 24 years	0.795	0.365	1.731	0.563
25 – 29 years	0.771	0.287	2.068	0.605
30 – 34 years	0.949	0.253	3.557	0.938
Gender				
Male (**RC**)	1.000	1.000	1.000	1.000
Female	1.697	0.933	3.088	0.083
Place of Residence				
Urban (**RC**)	1.000	1.000	1.000	1.000
Rural	0.594	0.366	0.963	0.034
Household Wealth				
Poor (**RC**)	1.000	1.000	1.000	0.064
Average	2.263	0.958	5.342	0.063
Rich	1.330	0.499	3.547	0.569
Region of Residence				
Northern Part Ghana (**RC**)	1.000	1.000	1.000	1.000
Southern Part Ghana	1.395	0.807	2.411	0.234
Ethnicity				
Ga (**RC**)	1.000	1.000	1.000	0.044
Ewe	2.778	1.048	7.364	0.040
Mole Dagbani	3.106	1.003	9.617	0.049
Akan	2.600	1.311	5.158	0.006
Religious Affiliation				
Christianity (**RC**)	1.000	1.000	1.000	0.353
Muslim	0.656	0.330	1.304	0.229
Africa Traditional Religion	0.490	0.100	2.412	0.381
Political Party affiliation				
NPP (**RC**)	1.000	1.000	1.000	1.000
NDC	0.697	0.385	1.263	0.385
Other political parties	1.161	0.656	2.055	0.234
No Political affiliation	0.626	0.192	2.043	0.609

Table 2: Contd.,

Did you Wear Your Nose Mask Regularly				
Yes (**RC**)	1.000	1.000	1.000	1.000
No	2.278	1.177	4.409	0.015
Were you able to Avoid Crowded Places				
Yes (**RC**)	1.000	1.000	1.000	1.000
No	0.475	0.270	0.837	0.010
Susceptibility of my associate contracting COVID-19 if I get it				
Yes (**RC**)	1.000	1.000	1.000	1.000
No	1.133	0.665	1.932	0.646
Perceived benefits of the COVID-19 vaccine				
The vaccine helped things to go back to normal**(RC)**	1.000	1.000	1.000	1.000
The vaccine protects against COVID-19	0.517	0.273	0.980	0.043
Perceived severity of COVID-19 vaccine				
There are side effects associated with the vaccine(**RC**)	1.000	1.000	1.000	0.379
The vaccine was painful	1.812	0.624	5.267	0.275
My culture/religion prevented me from vaccines	1.066	0.276	4.115	0.926
Cues to action to COVID-19 vaccine				
Politicians can motivate one to take the vaccine(**RC**)	1.000	1.000	1.000	0.725
Close associates can motivate one to take the vaccine	1.276	0.536	3.035	0.582
Celebrities can motivate take the vaccine	1.359	0.366	5.044	0.647
Motivation to take the vaccine is personnel	0.894	0.304	2.626	0.838

DISCUSSION

This study illustrated the relationship between factors influencing COVID-19 vaccine uptake among students at Takoradi Technical University. In this study, age of students is not a significant predictor of COVID-19 vaccine uptake. However, students in all categories of age groups (20-24, 25–29 and 30-34 years) were less likely to be unvaccinated compared to students below the age of 20 years. This outcome is contrary to studies documented by Sackey et al. (2023) and Guidry et al. (2021) which established that age of students is a significant predictor of COVID-19 vaccine uptake. Similarly, there is no statistically significant association between the gender of students and COVID-19 vaccine uptake. This result affirms earlier findings (Okai & Abekah-Nkrumah (2022); Alshagrawi (2024) which indicate that there is no significant correlation between gender and COVID-19 vaccine uptake. This current study found students who live in rural areas were less likely to be unvaccinated compared to students in urban areas. This outcome is contrary to a study conducted by Oyekale (2022), which established that place of residence is a significant predictor of COVID-19 vaccine uptake. According to these studies, individuals who resided in urban areas were more likely to have received the COVID-19 vaccine. With household wealth, there is no statistically significant association between household wealth and COVID-19 vaccine uptake, the results of the analysis suggest that students from an averagely rich and rich background were more likely to be vaccinated compared to those from a poor background. The study affirms the findings from several kinds of research in recent times Ben-Umeh & Kim (2024); Masterson et al. (2023) which indicate that the average wealthy individuals are less likely to reject the COVID-19 vaccine. Similarly, region of residence is not a significant predictor of COVID-19 vaccine uptake. This outcome is similar to studies conducted by Matas et al. (2023) which established that region of residence is not a significant predictor of COVID-19 vaccine uptake. The results from the analysis suggest a statistically significant association between ethnicity and COVID-19 vaccine uptake. This result affirms the findings of Na et al. (2023) and Nguyen et al. (2022) suggesting that there is a significant correlation between ethnicity (race) and COVID-19 vaccine uptake. In this study, religious affiliation is not a significant predictor of COVID-19 vaccine uptake. However, students belonging to the Islamic and the African traditional religious faith are less likely to reject the COVID-19 vaccine compared

to students belonging to the Christian faith. This outcome is contrary to studies documented by Sampene et al. (2023) which established that religious affiliation is a significant predictor of COVID-19 vaccine uptake.

Moreover, the current study suggests that political party affiliation is not a significant predictor of COVID-19 vaccine uptake. However, the results suggest that comparing students who belonged to the NPP party, students belonging to the NDC and those who did not belong to any political party were less likely to reject the COVID-19 vaccine. This outcome is contrary to studies documented by Alemi & Lee (2023) which established that political party is a significant predictor of COVID-19 vaccine uptake. According to these studies, it was seen that the Republicans are less likely to accept COVID-19 vaccination compared to the Democrats.

The model shows that those who did not wear their nose mask regularly during the pandemic were more likely to reject the COVID-19 vaccine compared to students who wore their nose mask regularly during the pandemic. The reasonable explanation is that they believed that COVID-19 was not real so there was no need to wear their nose mask. Again there is a positive significant association between students who were able to avoid crowded places and COVID-19 vaccine uptake, the study shows that those who could not avoid crowded places were less likely to reject the COVID-19 vaccine compared to students who were able to avoid the crowded places.

The study suggests that students who did not believe if they get COVID-19 their associates were also at risk of getting COVID-19 were more likely to reject COVID-19 vaccine uptake as compared to students who thought their associates were also at risk of getting COVID-19. This result is contrary to studies documented by Nasiratu et al. (2023) which recognised that, perceived COVID-19 susceptibility is a significant predictor of COVID-19 vaccine uptake. It is seen that students who thought they would die if they took the vaccine have about seventy per cent lower likelihood of rejecting the COVID-19 vaccine than students who also thought they would get sick from taking the vaccine. This finding affirms studies documented by Hilverda & Vollmann (2021) and Adewoye et al. (2023) which established that perceived vaccine severity is a significant predictor of COVID-19 vaccine uptake. These studies suggested that perceived severity exposed a higher score of the possibility of receiving the COVID-19 vaccine. The study indicates that students who claim that the vaccine will be protective against COVID-19 are less likely to reject the COVID-19 vaccine as compared to students who believe that the vaccine will help things go back to normal. This finding affirms studies documented by Okai & Abekah-Nkrumah (2022) and Adewoye et al. (2023) which established that perceived vaccine benefit is positively associated with the predictor of COVID-19 vaccine uptake. According to these studies, those who perceived the vaccine to be beneficial have a positive attitude towards COVID-19 vaccine uptake. In the study, the perceived vaccine barrier is not a statistically significant predictor of COVID-19 vaccine uptake. Respondents who believe that the vaccine will be painful and those for cultural/religious reasons cannot take vaccines are more likely not to accept the COVID-19 vaccine compared to students who believe they will get side effects from the vaccine. This outcome is similar to studies documented by Nasiratu et al. (2023) and Kuhfeldt et al. (2024) which established that the perceived vaccine barrier is a predictor of COVID-19 vaccine uptake.

Again, cues to action is not a statistically significant predictor of COVID-19 vaccine uptake. The analysis indicates that there is more likelihood that students will accept the vaccine if celebrities and close associates accept the vaccine. However, students were less likely to reject the vaccine if they were self-motivated. This outcome is contrary to studies documented by Kuhfeldt et al. (2024) and Alatrany et al. (2023) suggest that cues to action is a significant predictor of COVID-19 vaccine uptake.

CONCLUSION

The COVID-19 pandemic has had a profound and far-reaching impact on public health systems, economies and social structures worldwide, including Ghana. The surge in cases and fatalities at the peak of the outbreak highlighted vulnerabilities within national and global health infrastructures. In response, the World Health Organization (WHO) approved several vaccines for emergency use, marking a critical milestone in efforts to combat the pandemic. However, the global rollout of vaccines has been met with varying degrees of acceptance, influenced by socio-cultural, demographic and behavioural factors. In the context of sub-Saharan Africa, including Ghana, unsubstantiated claims about vaccine hesitancy have been prevalent, yet there remains limited empirical evidence to substantiate these narratives or fully explore their correlates.

This study sought to bridge this knowledge gap by examining the prevalence of COVID-19 vaccine uptake among students in Ghana and identifying the factors influencing their vaccination decisions. The findings reveal a low prevalence of vaccine uptake within this population, underscoring the need for targeted interventions. Key determinants of vaccine uptake included socio-cultural norms, behavioural tendencies and demographic characteristics, such as ethnicity and urban-rural residence. Additionally, cultural factors, including communal beliefs and trust in healthcare systems, played a significant role in shaping individuals' willingness to accept COVID-19 vaccination. By elucidating these factors, this study contributes to the growing body of literature on vaccine acceptance and highlights the unique challenges and opportunities within the Ghanaian context. The results emphasize that vaccine uptake is not merely a matter of accessibility but is deeply intertwined with social and cultural dynamics. This underscores the importance of a multi-faceted approach to vaccination campaigns that goes beyond logistical distribution to address the underlying social determinants of health.

Given the findings, health policymakers and public health practitioners in Ghana must implement targeted and context-specific strategies to improve vaccine uptake. Educational campaigns should focus on dispelling misinformation, particularly among urban young adults and tribal differentials who represent key socio-demographic indicators for achieving widespread vaccination coverage. Such campaigns must be culturally sensitive, leveraging trusted community leaders and influencers to foster trust and engagement. Moreover, public health interventions should aim to bridge gaps in knowledge and address vaccine-related fears and misconceptions through transparent communication and evidence-based messaging. Future mass vaccination efforts should prioritize inclusivity, ensuring equitable access to vaccines across diverse ethnic, socio-economic and geographic groups. This is particularly crucial in addressing disparities that may exacerbate existing health inequities. Additionally, integrating behavioural and social sciences into public health strategies can provide valuable insights into the drivers of vaccine hesitancy and acceptance, enabling the design of more effective interventions.

In a nutshell, the low prevalence of COVID-19 vaccine uptake observed among students in Ghana highlights the critical need for tailored and comprehensive public health strategies. By addressing socio-cultural and behavioural barriers to vaccination, policymakers can enhance vaccine acceptance and contribute to the broader goal of achieving herd immunity. This study provides a foundation for future research and interventions to foster a more resilient and health-conscious society in the face of ongoing and future public health challenges. Future research should consider the relationship between orthodox medicine, traditional medicine, faith and physical training to handle outbreaks.

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