Covid-19 vaccine prevalence and its associated factors among rural households in The Gambia: a community-based cross-sectional study

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Abstract

Background: The Covid-19 pandemic has affected the globe in all spheres of human life: physical health, mental health, economic burden, and social lives. Population-based vaccination is considered one of the core global response strategies for the containment of Covid-19 across regions, including third world countries. The study aimed to determine the prevalence and factors associated with Covid-19 vaccination uptake among rural dwellers in the North Bank Region (NBR) of The Gambia.

Methods: A community-based cross-sectional study design was used in the NBR from 1st to 10th October 2021. The study was carried out among 504 rural households across districts in the NBR through a multistage sampling procedure. Structured interviews were used to generate data for this study. Chi-square/Fisher exact tests, as well as logistic regression analysis, were used to examine the associations, with statistical significance set at a p-value <0.05 and the computed adjusted odds ratio (aOR) set at a 95% confidence interval (CI).

Results: Covid-19 vaccination prevalence was 44%, out of which 87% received Johnson while 13% received AstraZeneca vaccines. In terms of associated factors, males [aOR: 2.728, 95% CI (1.638 - 4.542)] and those at the senior secondary educational level [aOR: 4.525, 95% CI (1.272 - 16.098)] were more likely to utilize Covid-19 vaccines. However, other factors such as being Wollof by ethnicity [aOR: 0.334, 95% CI (0.132 - 0.845)], those who earned D1,000 – D4,999 [aOR: 0.125, 95% CI (0.029 - 0.541)], D5,000 – D9,999 [aOR: 0.096, 95% CI (0.021 - 0.440)], those who tested for Covid-19 vaccines [aOR: 0.227, 95% CI (0.121 - 0.428)], and those who travelled outside the country [aOR: 0.576, 95% CI (0.367 - 0.904)] were less likely to utilize Covid-19 vaccines after controlling for confounders.

Conclusion: The study revealed a low prevalence of Covid-19 vaccine uptake in the region, with associated factors including gender, ethnicity, and educational level. There is a need for social and political commitment in the drive to increase vaccine uptake across the country. Target-specific messaging for the population should be developed in local languages across media outlets in The Gambia.

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Introduction

The severe acute respiratory syndrome coronavirus - 2 (SARS-CoV-2) causing coronavirus infection (Covid-19) had its first case reported from Wuhan, China, on December 31, 2019 [1]. Subsequently, Covid-19 was declared by the World Health Organization (WHO) as a global Public Health Emergency on the 11th day of March 2020, and the pandemic has continued to be a health issue of global concern since then due to its virulent status [2]. The Covid-19 pandemics have affected the globe in all spheres of human life: physical and mental health, economic burden, and social lives [3]. Globally, more than 221 million confirmed cases of Covid-19 were reported; nearly 5 million people died, and more than 5 billion doses of Covid-19 vaccines were administered as of the 8th day of September 2021. Compared to other WHO regions, the African region has the least number of confirmed cases, about 6 million cases [4].

The Gambia registered its first case of Covid-19 on March 16, 2020. Since then, the country has registered nearly 10

thousand confirmed cases, more than 300 deaths, and nearly 200 thousand doses of Covid-19 vaccines have been administered, according to the Outbreak Situational Report [4][5]. Besides the preventive measures of Covid-19 by the WHO, different countries, including The Gambia, have developed and adopted measures to curb the spread of Covid-19 infection and mitigate its health effects, including social distancing, temporary lockdowns, banning social events and gatherings, closing schools and business places, religious congregations, wearing a face mask, hand washing with detergent, and robust disease surveillance and testing [6][7][8]. In addition to the public health preventive measures of Covid-19, vaccination is undoubtedly among the outstanding health interventions in reducing the spread and effects caused by Covid-19, preserving lives, alleviating pain and suffering, and easing restrictions on various socio-economic activities [9][10]. The outcomes of Covid-19 vaccination have made countries and partners in vaccination set achievable goals in scaling up the approval, manufacturing, providing, and vaccinating more people to ensure herd immunity against the coronavirus. Conversely, there are some challenges to vaccination success, ranging from the production rate to the demand for vaccines, myths, and misinformation [11].

In striving to provide the Covid-19 vaccine to people, The Gambia received its first consignment of AstraZeneca COVAX in March 2021, which includes 36 thousand doses of the vaccine[5]. The vaccine was earmarked to be given to high-risk groups, including healthcare workers, people with underlying medical conditions, the elderly over 65 years, teachers, and immigration and security officers. The President of the country officially launched the Covid-19 vaccination as part of an advocacy strategy to get more people vaccinated. Moreover, in July 2021, the health ministry announced that a limited stock of the Sinopharm Covid-19 vaccine was available in the country and identified a vaccination site at the Sukuta Health Centre [12]. As the country continues to receive more Covid-19 vaccines, the Government of the United States of America also donated 150,000 doses of the Johnson and Johnson vaccine in July 2021 through the COVAX partnership [4]. Evidence revealed that less than half of the global population had received at least a single dose of Covid-19 vaccines; more than 721 million doses of vaccine were administered, with nearly 32 million doses administered daily; and nearly 2 percent of people in low-income countries have received at least one dose of Covid-19 [13]. Furthermore, The Gambia has administered a total of more than 350 thousand doses of Covid-19 vaccines, more than 150 people are fully vaccinated, and less than 7 percent of the population is fully vaccinated [13]. The WHO has listed vaccine hesitancy and resistance among the top ten health risks for 2019 [14]. This effect of hesitancy has created myths and misinformation that affect the uptake of Covid-19 vaccination among some people.

To avert the effects of vaccine hesitancy among Gambians, the Expanded Programme of Immunization (EPI) in The Gambia has conducted numerous training sessions for health workers as vaccinators, and community sensitizations were conducted to allay the fears and infodemics. The EPI unit provided training for vaccinators on WHO guidelines ranging from Covid-19 vaccinations, storage, handling, delivery, and waste management of Covid-19 vaccines, Adverse Events Following Immunization monitoring, vaccine recording and monitoring, and the communication and organization of vaccination sessions. This study, being the first of its kind in the country and known for high immunization coverage among children less than five years old, will help the Ministry of Health and partners strategise the way forward in improving Covid-19 vaccination and any other mass vaccination campaigns in the country. The study aimed to determine the prevalence and factors associated with Covid-19 vaccination uptake among rural dwellers in the North Bank Region of

the Gambia.

Methodology

Study setting and Design

The study utilized a community-based cross-sectional study design in the North Bank Region from the 1st to the 10th of October 2021. North Bank East is among the seven Regional Health Directorates in The Gambia, and the directorate is located in Farafenni town in the NBR. The region stretches from Kerewan to Ngayen Sangal and has four districts: Upper Badibou, Lower Badibou, Central Badibou, and Sanjal District. The region is endowed with a general hospital called Farafennin General Hospital and a major health centre located in Kerewan village, six minor health centres, eight community clinics, and a host of primary health care key villages. The expanded programme of immunization's population target for the region is projected at 132,740 inhabitants, of which children less than five years old account for 20,840, and women of childbearing age account for 33,678 [15].

Population

The study was carried out among rural households in the North Bank East Region in each selected district. The participants in the study were people aged 18 years and above living in the region.

Inclusion and exclusion criteria

Participants included in this study were rural household members aged at least 18 years old, physically and mentally healthy, and currently residing in the region. Non-residents and seriously ill persons were excluded from the study.

Sample size determination

A Cochran formula was used to determine the study's sample size with a marginal error of 0.05%, a confidence interval of 95%, a probability value of 0.5, and a prevalence precision of 50%. The total sample size calculated was n=385, with a 10% non-response rate adding up to a sample of 424 participants. In order to improve the power of the study, a total sample of 504 respondents was included in the study.

$$n_0 = \frac{z^2(p)(q)}{e^2}$$

Sampling procedure

A multistage sampling procedure was used to select study respondents. Firstly, four villages were selected from each district using a simple random sampling method. Secondly, 15 households from each village were included in the study

through a systematic sampling procedure using the taxpayers' list from the village heads. Thirdly, at the household level, two respondents were selected through a simple random sampling method for the interview. In a household with more than two eligible respondents, a simple random sampling method was used to select a respondent.

Study variables

The ***dependent variable*** of the study was the uptake of the Covid-19 vaccination. This was classified as received the Covid-19 vaccine, coded as “Yes,” and did not receive the Covid-19 vaccine, coded as “No”. The study's ***independent variables*** were socio-demographic factors such as age, gender, religion, marital status, and educational level attained. Covid-19 positivity status ranges from contact with an infected person, travelling to a high-risk zone, a relative infected with Covid-19, information about Covid-19 vaccination, vaccination, and vaccine hesitancy.

Data collection

Structured interviews were used to collect data from study participants through face-to-face interviews. The questionnaire was developed into an open data kit (ODK), and data collectors from the School of Public Health, Gambia College, were trained to use the tool. The students used their mobile phones to collect data and synchronize with a server to clean the data before analysis. Due to Covid-19 prevention protocols, students have been trained and supervised to adhere to preventive measures such as wearing face masks, physical distancing, and avoiding overcrowding.

Data analysis

The study data were analyzed using IBM SPSS version 26, and the general information of participants was presented in frequencies and percentages. Covid-19 vaccination prevalence was calculated using the vaccinated and eligible populations in the study. Bivariate analyses such as the Pearson chi-square/Fisher exact test were conducted for categorical independent variables. Variables with a p-value ≤0.15 were introduced into a logistic regression model to examine the association between study variables, with statistical significance set at a p-value <0.05 and the computed adjusted odds ratio (aOR) set at a 95% Confidence Interval (CI).

Ethical Considerations

Ethical clearance was sought from the Gambia College Research and Consultancy unit for the approval of the study. Before the study, consultations were held with regional authorities such as the Regional Governor, District Chiefs, Local Government Authorities, and the Regional Health Directorate of the North Bank East Region. Both written and verbal consent was sought from study participants during data collection.

Results

Socio-demographic characteristics

The study constituted 504 participants with a 98.5% response rate. The total number of female respondents accounted for 61%, and 57% were below 34 years of age, with a mean age of 34 and a standard deviation of 14. Mandinka accounted for 49% of the ethnicity, 98% were Muslims, and 59% were married. About 32% had no formal education, and only 3% attained a university education. One-third of the respondents were farmers, less than 5% were non-Gambians, and nearly 84% earned less than $100 in a month. Conversely, nearly 70% used social media, and 11% were currently smoking at the time of the study. About 17% claimed to have been tested for Covid-19, up to 44% had traveled outside the country, and only 8% had had contact with Covid-19 patients. Other variables found to be significant at a p-value <0.05 were gender, ethnicity, educational level, monthly income, cigarette smoking, having been tested for Covid-19, and having traveled outside the country.

Table 1. Socio-demographic characteristics of participants in North Bank Region (NBR)

Variables		n (%)	Received Covid-19 vaccine		p-value
			No 282 (56%)	Yes 222 (44%)	
Age of respondents					0.256
	18 - 33	288(57.1)	183(36.3)	105(20.8)	
	34 - 49	125(24.8)	60(11.9)	65(12.9)	
	50 - 65	73(14.5)	33(6.5)	40(7.9)	
	66+	18(3.6)	6(1.2)	18(3.6)	
Gender					**<0.001***
	Male	197(39.1)	121(24.0)	76(15.1)	
	Female	307(60.9)	161(31.9)	146(29.0)	
Ethnicity					**0.002***
	Mandinka	248(49.2)	153(30.4)	95(18.8)	
	Fula	107(21.2)	52(10.3)	55(10.9)	
	Wolof	94(18.7)	42(8.3)	52(10.3)	
	Serahuli	9(1.8)	7(1.4)	2(0.4)	
	Manjago	5(1.0)	3(0.6)	2(0.4)	
	Serer	41(8.1)	25(5.0)	16(3.2)	
Religion					0.673
	Muslim	493(97.8)	275(54.6)	218(43.3)	
	Christian	11(2.2)	7(1.4)	4(0.8)	
Marital status					0.089
	Single	158(31.3)	104(20.6)	54(10.7)	
	Married	299(59.3)	150(29.8)	149(29.6)	
	Divorced	14(2.8)	11(2.2)	3(0.6)	
	Widow	33(6.5)	17(3.4)	16(3.2)	
Educational level					**0.009***

	No Formal	161(31.9)	83(16.5)	78(15.5)	
	Primary	61(12.1)	34(6.7)	27(5.4)	
	Junior	87(17.3)	52(10.3)	35(6.9)	
	Vocational	38(7.5)	22(4.4)	16(3.2)	
	Senior	103(20.4)	72(14.3)	31(6.2)	
	College	38(7.5)	12(2.4)	26(5.2)	
	University	16(3.2)	7(1.4)	9(1.8)	
Occupation					0.667
	Farmer	179(35.5)	87(17.3)	92(18.3)	
	House wife	77(15.3)	44(8.7)	33(6.5)	
	Business	80(15.9)	47(9.3)	33(6.5)	
	Civil Servant	46(9.1)	24(4.8)	22(4.4)	
	Student	104(20.6)	71(14.1)	33(6.5)	
	Retiree	18(3.6)	9(1.8)	9(1.8)	
Nationality					0.629
	Gambian	478(94.8)	265(52.6)	213(42.3)	
	Non- Gambian	26(5.2)	17(3.4)	9(4.1)	
Monthly income					**0.002***
	Less than D999	92(18.3)	65(12.9)	27(5.4)	
	D1000 - D4999	329(65.3)	176(34.9)	153(30.4)	
	D5000 - D9999	66(13.1)	28(5.6)	38(7.5)	
	D10000+	17(3.4)	13(2.6)	4(0.8)	
Social media use					0.223
	Yes	349(69.2)	189(37.5)	160(31.7)	
	No	155(30.8)	93(18.5)	62(12.3)	
Cigarette Smoking					**0.048***
	Never Smoke	417(82.7)	233(46.2)	184(36.5)	
	Current Smoker	56(11.1)	37(7.3)	19(3.8)	
	Former Smoker	31(6.2)	12(2.4)	19(3.8)	
Tested for Covid-19					**<0.001***
	Yes	84(16.7)	26(5.2)	58(11.5)	
	No	420(83.3)	256(50.8)	164(32.5)	
Traveled outside the country					**0.016***
	Yes	219(43.5)	105(20.8)	114(22.6)	
	No	285(56.5)	177(35.1)	108(21.4)	
Contact with Covid-19 patient					0.065
	Yes	39(7.7)	16(3.2)	23(4.6)	
	No	465(92.3)	266(52.8)	199(39.5)	

** = Statistical significance p <0.05*

Covid-19 vaccine uptake/prevalence

As shown in Figure 1, Covid-19 vaccination prevalence was 44%. Out of these, 87% received Johnson's, while 13% received AstraZeneca vaccines, as shown in Figure 2.

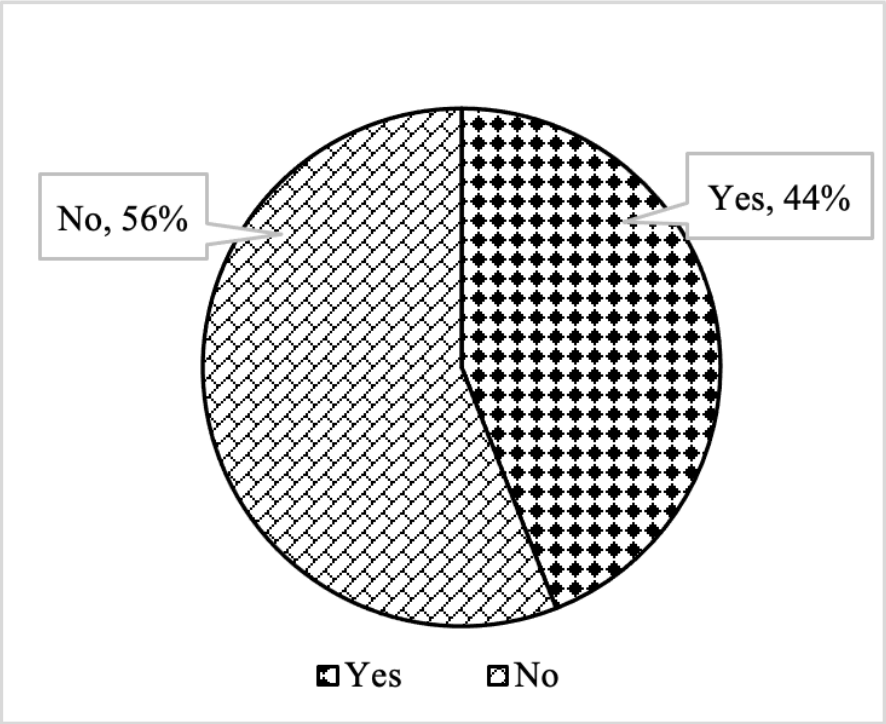

Figure 1. Uptake of Covid-19 vaccine

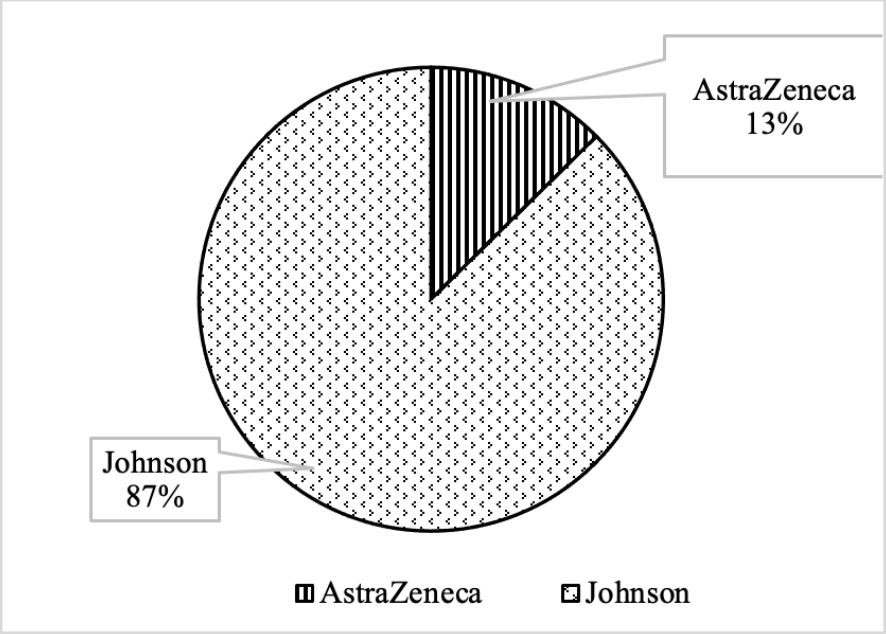

Figure 2. Covid-19 vaccine types

Factors contributing to Covid-19 vaccine uptake

The study revealed that males were 2.728 times [a OR: 2.728, 95% CI(1.638 - 4.542)] more likely to receive Covid-19 vaccines compared to females after controlling for confounders. In terms of ethnicity, Wolof's were 66.6% [a OR: 0.334, 95% CI(0.132 - 0.845)] less likely to receive Covid-19 vaccines compared to Serers. Respondents with senior secondary educational levels were 4.525 times [a OR: 4.525, 95% CI(1.272 - 16.098)] more likely to utilize Covid-19 vaccines compared to those with a university level of education. Respondents who earned D1,000 – D4,999 and D5,000 – D9,999 were 87.5% [a OR: 0.125, 95% CI(0.029 - 0.541)] and 90.4% [a OR: 0.096, 95% CI(0.021 - 0.440)] less likely to utilize Covid-19 vaccines compared to those who earned more than D10,000. The likelihood of Covid-19 vaccine uptake for those who tested for Covid-19 vaccines decreased by 77.3% [a OR: 0.227, 95% CI(0.121 - 0.428)] and 45.4% [a OR: 0.576, 95% CI(0.367 - 0.904)] for those who travelled outside the country after controlling for confounders.

Table 2. Factors associated with Covid-19 vaccine uptake in NBR

Variables		Adjusted Odd Ratio 95% C.I.
Age of respondents		
	18 - 33	1.530 (0.427 - 5.484)
	34 - 49	0.849 (0.240 - 3.007)
	50 - 65	1.095 (0.306 - 3.924)
	66+ (Ref)	1
Gender		
	Male	2.728 (1.638 - 4.542)*
	Female (Ref)	
Ethnicity		
	Mandinka	0.996 (0.427 - 2.326)
	Fula	0.498 (0.201 - 1.236)
	Wollof	0.334 (0.132 - 0.845)*
	Sarahuli	4.722 (0.514 - 43.402)
	Manjago	3.887 (0.107 - 141.135)
	Serer (Ref)	1
Religion		
	Muslim	1.524 (0.216 - 10.770)
	Christian (Ref)	1
Marital status		
	Single	0.881 (0.301 - 2.581)
	Married	0.717 (0.291 - 1.762)
	Divorced	4.814 (0.830 - 27.933)
	Widow (Ref)	1
Educational level		
	No Formal	3.306 (0.889 - 12.297)
	Primary	3.746 (0.964 - 14.562)

	Junior	2.863 (0.785 - 10.439)
	Vocational	2.601 (0.636 - 10.646)
	Senior	4.525 (1.272 - 16.098)*
	College	0.762 (0.187 - 3.112)
	University (Ref)	1
Occupation		
	Farmer	1.215 (0.343 - 4.306)
	House wife	1.781 (0.466 - 6.810)
	Business	1.243 (0.328 - 4.708)
	Civil Servant	2.218 (0.542 - 9.080)
	Student	1.504 (0.388 - 5.828)
	Retiree (Ref)	1
Monthly income		
	< D999	0.267 (0.056 - 1.284)
	D1000 - D4999	0.125 (0.029 - 0.541)*
	D5000 - D9999	0.096 (0.021 - 0.440)*
	D10000+ (Ref)	1
Tested for Covid-19		
	Yes	0.227 (0.121 - 0.428)*
	No (Ref)	1
Traveled outside the country		
	Yes	0.576 (0.367 - 0.904)*
	No (Ref)	1
Contact with Covid-19 patient		
	Yes	0.414 (0.162 - 1.057)
	No (Ref)	1

** = Statistical significance p <0.05*

Discussion

The approval and acceptance of the Covid-19 vaccine have been a relief across the globe, with optimism to control this pandemic [16]. However, the coronavirus vaccination has been deemed safe and reliable, but the vaccination issue has sparked controversies and caused vaccine hesitancy and even denial in some instances [17]. This study found that the prevalence of Covid-19 vaccination among respondents was 44% lower than the targets for herd immunity. Compared to other studies, the prevalence was higher than in a study in Iraq, India, and Jordan, and lower than that of Kuwait and Southern Ethiopia [18][19][20][21]. The socio-demographic status dynamics could closely influence the variation in vaccination prevalence across various studies [22][23][24]. The current study revealed a higher prevalence of vaccination

(20.8%) among the younger generation (18 – 33 years) and the lowest (3.6%) among those 66 years old and above. Thus, the vaccination prevalence decreases with an increase in age. These findings were similar to a study done in Kuwait, where vaccine acceptability was highest within the 21 – 24 age group and lowest among the 50 – 64 age group [20].

The vaccination prevalence was higher in females (29%) than in males. In this study, gender has been predicted as a factor in the uptake of the Covid-19 vaccine. The prevalence among females may be attributed to the long-standing phenomenon that health-related matters in The Gambia were seen as women's preoccupation. This finding is invariable with a study in Ethiopia where males were more willing to take the vaccination than females [21]. More than half of those who received the Covid-19 vaccination were married, and approximately a quarter of these recipients were single. Consequently, married respondents were 72% more likely to take the Covid-19 vaccination, and single respondents were 88% more likely to receive vaccination against the widow.

Additionally, the educational level was found to be an associated factor for Covid-19 vaccination among respondents. The majority of those who received the vaccination were respondents who did not receive any formal education. Consequently, respondents who do not have formal education and those who attained senior secondary education were 3 and 4 times more likely to receive the Covid-19 vaccines than those with a university education. These findings were also documented in some other studies [23][25][26]. The acceptance of vaccination may be associated with regulations regarding vaccination status being a requirement in some public offices and schools. The vaccination strategy of the EPI has deployed vaccination teams to institutions and communities to vaccinate people voluntarily.

The study findings also revealed an association between the monthly income of the respondents and the acceptance of Covid-19 vaccination. Respondents whose average monthly incomes were less than D1000 ($20), D5000 ($100), and D10,000 ($200) were 74%, 87%, and 90% less likely to receive the Covid-19 vaccination as against those whose incomes were more than D10,000 ($200). Thus, the vaccination rate reduces with an increase in monthly income among respondents. Ultimately, the confirmation of respondents' Covid-19 status was also a factor associated with vaccination uptake, as those who did the test were 23% more likely to take vaccines. These findings were similar to other studies in Nigeria[24], Malaysia[22], and Thailand[17]. However, travel history was positively associated with vaccination uptake, as travelers were 58% more likely to take the Covid-19 vaccination than non-travelers. Consequently, respondents who had contact with Covid-19 patients were 41% more likely to be vaccinated. The international requirement for Covid-19 vaccination evidence may drive many travelers to accept the vaccine [16].

Strengths and limitations

The large sample size ensured statistical sufficiency with low tendencies for recall bias, since the data was collected when the vaccination process was near completion and respondents had fresh memories of their vaccine utilization, with a high retentivity of vaccination cards. Interviews were conducted face to face with a reduced tendency of avoiding ambiguity. However, the study could not claim a causal relationship across study variables owing to the study design.

Conclusion

The study revealed a low prevalence of Covid-19 vaccine uptake in the region, with associated factors such as gender, ethnicity, educational level, monthly income, cigarette smoking, Covid-19 testing, and a history of travel outside the county. To meet the target for herd immunity to Covid-19 in The Gambia, the health ministry should continue to engage people to accept the utilization of the vaccine. Furthermore, social and political commitment is also required in the drive to increase vaccine uptake across the country. Target-specific messaging for the population should be developed in local languages, with intensified communication strategies across media outlets such as radio and television in The Gambia.

Statements and Declarations

Availability of data and materials

The data used to support the findings of this study is available from the school administration upon reasonable request at sph@gambiacollege.edu.gm.

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Authors' contribution

BK, ET, AB, MB, LC, MSG, & SPSJ conceptualized and designed the study. BK & ET reviewed the literature. BK, ET, MB, LC, MSG, & SPSJ undertook the fieldwork. BK, ET, & AB performed data input, analyzed data, wrote results, discussed findings, and wrote the first draft of the manuscript. All authors critically reviewed the intellectual content of the manuscript. The final manuscript was read and approved by all authors. AB was in charge of submitting the manuscript for publication.

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The Gambia College administration partly funded the study, and the School of Public Health Alumni through donations made during our door-to-door visits to various public and private institutions in The Gambia.

Ethics approval and consent to participate

The Gambia College's Research Committee reviewed the study protocol and granted ethical clearance (Ref. No: PH07013/2021) on June 10, 2021. All procedures were carried out in accordance with the applicable guidelines and regulations. Before the study began, the NBRE Regional Health Directorate of the Ministry of Health and community leaders from the sampled communities provided ethical approval. People were made aware of the nature of the study in their native languages (Mandinka, Fula, and Wolof). Participation in the study was entirely voluntary, and only those who agreed to take part were recruited. Each participant who agreed to participate in the study signed a written informed consent form.

Completing interests

There were no conflicts of interest disclosed.

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