Understanding Covid-19 Vaccine Hesitancy among Low-Income Earners in Oshodi/Isolo Local Government Area, Lagos State, Nigeria

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Abstract

COVID-19 vaccines are vital for curbing the health impacts of SARS-CoV-2 infection, yet many low-income earners in Nigeria are hesitant to get vaccinated despite accessibility. Community organizations play a key role in providing essential vaccine information and addressing hesitancy factors to promote acceptance. To understand low-income earners' knowledge, attitudes, and barriers towards COVID-19 vaccines, a descriptive cross-sectional study was conducted. Structured questionnaires with closed-ended questions were used for uniform data collection. Analysis involved Chi-square tests and logistic regression. 651 respondents participated, with the majority from Ejigbo (36.1%), Isolo (33.9%), and Oshodi (30.0%). Most were aged 26-35 (30.0%) or 36-45 (26.6%), and nearly equal gender representation was observed. Respondents' overall perception of COVID-19 vaccines was positive, with Ejigbo showing slightly higher positivity. Trust in scientists likely influenced this perception. Despite a willingness to take the vaccine, distrust in government programs and religious beliefs may hinder vaccination efforts. Targeted education initiatives are crucial, especially in communities where religious beliefs strongly influence decisions. Rebuilding trust with citizens is essential for higher vaccination rates. Addressing geographical, cultural, and socio-economic factors is vital for widespread vaccine acceptance and achieving community immunity against COVID-19.

Keywords: COVID-19 Vaccines, Community Perspectives, Low-income Earners, Vaccine Hesitancy.

Introduction

As the world enters the third year of the global COVID-19 pandemic, the devastating toll on both public health and economies is evident, with 450 million cases and 6 million deaths reported as of March 2022 [1-2]. This crisis has plunged millions into poverty due to a global recession. With the ongoing emergence of new variants and limited treatment options, widespread vaccination is widely recognized as the most effective strategy to curb the virus and aid in economic recovery [3-4]. Despite progress, as of early March 2022, only over 60% of the global population had received at least one dose of a COVID-19 vaccine. However, significant disparities exist in vaccination rates between countries, with only 14% of individuals in low-income countries having received a single dose by March 22, 2022, compared to 79% in high-income countries and 81% in upper-middle-income countries [5]. While initially, the focus was primarily on supply-side challenges, with vaccine production now outpacing demand, understanding vaccine hesitancy and addressing concerns has become increasingly crucial. Despite global efforts, Nigeria lagged in achieving the goal of fully vaccinating 10% of its population by September 30, 2021, with only 1.7% fully vaccinated and 1.3% partially vaccinated by November 25th, 2021 [6-7].

The World Health Assembly's global aim of fully vaccinating 10% of each country's population by September 30, 2021, met success in over 90% of high-income countries, but Nigeria struggled to catch up [8]. With only minimal progress in increasing vaccination rates, the situation is crucially relevant for public health scholars and practitioners. Despite the recognized importance of COVID-19 vaccination, scholars are turning to understanding the public's willingness, perceptions, and attitudes toward the vaccine [9].

Vaccines are the most important public health measure and most effective strategy to protect the population from COVID-19, since SARS-CoV-2 is a highly contagious virus and affects populations globally. The competition for COVID-19 vaccine invention and development against the spread and catastrophic effects of the disease is ongoing [10, 11], and new, more effective vaccines are likely to be developed as we move through the pandemic. With the distribution of vaccines underway, it is very important to examine community acceptance of COVID-19 vaccinations [12].

While specialists advocate for the necessity of the COVID-19 vaccine to effectively curb the pandemic [13], public health scholars have shifted their focus to determining the willingness of individuals in their respective countries to accept the COVID-19 vaccination. Furthermore, the aim is to identify the determining factors across the general population [14-19]. Previous instances of vaccine administration have frequently indicated a low acceptance rate [20]. As far back as 2009, concerns regarding attitudes and perceptions about vaccine acceptance were considered a notable health promotion challenge [21, 22]. Previous research on COVID-19 vaccine acceptance has highlighted factors including perceptions of disease threat [23], concerns about vaccine safety, misconceptions about health [24, 25], and recommendations from healthcare professionals [26-28].

However, In Nigeria, limited research exists on the public's willingness to receive the COVID-19 vaccine, despite context-specific factors influencing vaccine rejection [29-31]. Addressing this gap, this study focuses on the knowledge and attitudes of Low-Income Earners towards the uptake of COVID-19 vaccines in the Oshodi/Isolo Local Government Area, Lagos State, Nigeria. Low-income earners represent a demographic group that often faces unique challenges in accessing healthcare services and information, making it imperative to understand their perspectives on COVID-19 vaccination. Understanding these factors is crucial for developing effective interventions, strategies, or programs to enhance vaccine acceptance.

The Oshodi/Isolo Local Government Area, situated in Lagos State, Nigeria, is characterized by its diverse population, including a significant number of low-income earners. Lagos State has been one of the regions most severely impacted by the COVID-19 pandemic in Nigeria, underscoring the urgency of understanding the dynamics of vaccine acceptance within this local community.

This study explores Nigerians' knowledge and attitude of the COVID-19 vaccine, aiming to guide interventions by healthcare professionals and authorities. By rejecting the null hypothesis, it highlights the influence of socio-demographic factors on awareness and attitudes, offering insights into vaccine acceptance. Focusing on low-income earners in Oshodi/Isolo, the research seeks to inform tailored strategies to boost vaccination rates. Understanding their attitude is crucial for achieving community immunity and controlling the spread of COVID-19 in Lagos State and beyond. The report provides methodology, findings, and recommendations to address gaps in vaccine acceptance research and promote public health efforts.

Materials and Methods

Ethical Consideration

Participants provided written online consent. [32] By not requesting names and making sure that all entries were made into a single Excel file that was only accessible to the data analyst, confidentiality and data protection were put in place.

Study Area, Design, and Population

The study was conducted in Oshodi/Isolo Local Government in Lagos State, Nigeria, the Local Government which is subdivided into three Local Council Development Areas (LCDAs). The LCDAs are Oshodi, Isolo, and Ejigbo, which have high numbers of low-income earners with an adult population of 621,509. A descriptive cross-sectional study design was used involving adults (≥18 years of age) resident in the three LCDAs. The inclusion criteria are where Participants should fall within the low-income category, typically defined by specific income thresholds or socioeconomic indicators. This criterion ensures that the study focuses on the target population of interest. Those that did not give consent were excluded from the study. The study was conducted within three weeks from January 2023 to February 2023 [32].

Sample Size and Sampling Technique

For the quantitative part of the research, the sample size of 635 was determined using the formulae to estimate proportions as described by Fisher's formula for descriptive studies at standard normal deviation corresponding to a 95% confidence interval. A multistage sampling technique was used in selecting the respondents. The total number of low-income earners from the selected study area (comprising health workers, artisans, etc.) out of which the desired sample size was selected.

Study Instrument and Data Collection

Qualitative interview guides (unstructured questionnaires) were designed using the literature review results and comprising open-ended questions with the study participants.

These guides were put on an online JotForm Application for ease of collection of responses (JotForm App was used to collect the responses online for the in-depth interview. JotForm enables one to create online forms, collect responses directly in emails and create fillable PDF forms.). The forms were distributed to identify low-income earners.

The structured questionnaires were designed. According to the sample size determination, a total of 635 questionnaires were used for the quantitative study. These were shared among the 3 LCDAs.

An approved standardized questionnaire was used to elicit information from randomly selected respondents. The questionnaire was used to quantify the demographic characteristics, awareness and knowledge, attitudes, and practices of low-income earners of the COVID-19 vaccine. This survey involved the use of smartphones that had CSEntry downloaded and installed on them. The software called CSpro (Census and Survey Processing System) for Laptop/desktop and an App CSEntry (Phone App) was developed by the United States Census Bureau and ICF international. The CSPro was downloaded as a user-friendly and easy-to-use software for data entry, editing, manipulation, tabulation dissemination, and thematic and Global Positioning System (GPS) mapping [33].

Statistical Analysis

The survey data obtained from field activities and stored in the cloud server were cleaned and edited and then read into SPSS version 25.0 for analysis. Chi-squared tests and descriptive analysis were employed for the evaluation of the association between demographic characteristics and awareness/knowledge, attitude, and perception of low-income earners towards COVID-19 vaccine intake. The study involved the use of univariate statistics to describe the study sample and vaccine collection

sources that were collected. Also, a binary logistic regression analysis was used to model relationships between respondents' demographic, and socio-economic variables and vaccine collection information. Cross tabulations were used to test the hypothesis related to the variables used at a 0.05 significance level.

Results

The structured questionnaires designed were programmed into an online JotForm Application for ease of collection of responses (the JotForm App was used to collect the responses online for the in-depth interview). A total of 651 respondents consented and responded to the online questionnaire [32].

Demographic Profiles of the Study Participants

Table 1 & 2 provides information on the social-demographic characteristics of the study respondents. The largest number of respondents were from Ejigbo (36.1%), followed by Isolo (33.9%), and Oshodi (30.0%). Most respondents were in the age range of 26-35 years (30.0%), followed by 36-45 years (26.6%) and 18-25 years (18.1%). Just about half of the respondents were males (49.5%), while female respondents accounted for 50.5% of the total sample. Most respondents were Christians (64.1%), followed by Muslims (31.2%), while traditional religion and no religion had only 2.2% and 2.6% of respondents, respectively. The majority of the respondents are businessmen and women (41.6%) followed by Traders 17.2%, and Technician/Artisan accounted for 13.5%. About 76% of respondents earn less than 50,000 while 21% of respondents earn between N50,000 and N99,000 and less than 4% of the respondents earn above 100,000. Finally, about half of the respondents (50.2%) had completed only secondary education, while 27.6% had attained tertiary education. The number of respondents with no formal education was very low (8.8%), and only a small percentage had completed primary education (13.4%).

Table 1. Social-demographic Parameters of the Study Respondents

Gender		
Variables	**Frequency**	**Valid Percent**
Male	57	8.8
Female	87	13.4
Secondary Only	327	50.2
Tertiary Education	180	27.6
Total	651	100
Age		
Variables	**Frequency**	**Valid Percent**
18 - 25 years	118	18.1
26 - 35 years	201	30.9
36 – 45 years	173	26.6
46 - 55 years	96	14.7
56 and above	63	9.7
Total	651	100

Religion		
Variables	**Frequency**	**Valid Percent**
Christianity	417	64.1
Islam	203	31.2
Traditional religion	14	2.2
No religion	17	2.6
Total	651	100
Marital Status		
Variables	**Frequency**	**Valid Percent**
Single	220	33.8
Married	368	56.5
Divorced/Widowed	63	9.7
Total	651	100

Table 2: Social-demographic Parameters of the Study Respondents

Location		
Variables	**Frequency**	**Valid Percent**
Ejigbo	235	36.1
Isolo	221	33.9
Oshodi	195	30.0
Total	651	100
Educational Attainment		
Variables	**Frequency**	**Valid Percent**
Male	322	49.5
Female	329	50.5
Total	651	100
Occupation		
Variables	**Frequency**	**Valid Percent**
Health Worker	11	1.7
Teacher	16	2.5
Technical/Artisan/Handwork	88	13.5
Engineer	31	4.8
Businessman/Woman	271	41.6
Unemployed	27	4.1
Student	53	8.1
Retiree	10	1.5
Trader	112	17.2
Transporter	17	2.6
Security Work	11	1.7
Others	4	0.6
Total	651	100
Monthly Income		
Variables	**Frequency**	**Valid Percent**

<N50,000	491	75.4
N50,000 – N99,000	137	21.0
N100,000 and above	23	3.5

Knowledge of Respondents on Covid-19 Vaccine

Respondent's knowledge of illness and COVID-19 was evaluated using five questions, including "Do you have any medical issue in the last 12 months?", "If yes to Q9, what was the issue?", "Have you travelled out of Nigeria in the last 12 months?", " Do you have a chronic condition(s)?" and "If Yes to Q12, kindly state the kind of chronic condition(s)" Positive answers (Yes) were scored one mark, and No was scored a zero. Respondents who scored 2 of 3 marks were considered knowledgeable, while those who scored less were considered non-knowledgeable.

The percentage of respondents who had medical issues in the last 12 months varies across the three locations. The highest proportion of respondents who had medical issues in the last 12 months was from Oshodi (19.7%, n = 128), followed by Ejigbo (13.1%, n = 85), and Isolo (10.3%, n = 67). The chi-square value of 59.58 and p-value less than 0.001 indicate a statistically significant association between the location and the number of respondents that had medicals in the last 12 months. The data suggest that respondents in the surveyed local government in Nigeria had medical issues in the last 12 months, with a significant difference in medical issues (Figure 1).
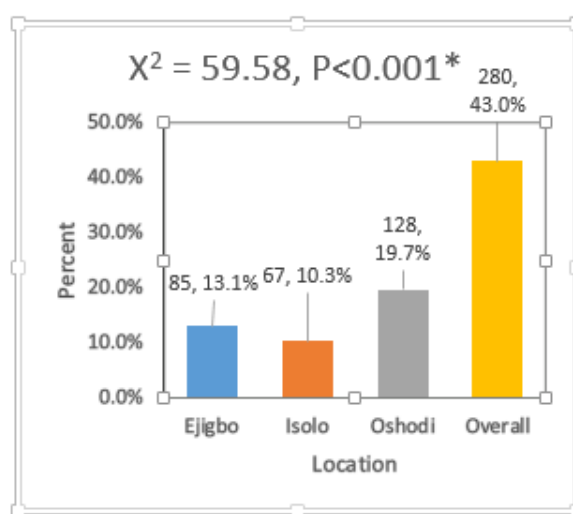

Fig. 1. Number of Medical Issues Recorded in the Last 12 Months.

Figure 2 presents the breakdown of reasons prompting respondents to undergo COVID-19 testing. Out of the 651 surveyed participants, merely 115 had undergone testing for COVID-19. Interestingly, a majority of those who went for the test (55.7%) did so primarily to ascertain their COVID-19 status, indicating a proactive approach towards health monitoring. Approximately 17% of respondents opted for testing when they took ill, indicating a reactive response to illness. Additionally, around 14% underwent testing in preparation for travel, highlighting the significance of testing as a prerequisite for mobility during the pandemic. Notably, a relatively small proportion, only 4.3%, sought testing because a family member had tested positive for COVID-19, suggesting a degree of awareness and concern for potential exposure within familial circles. These findings underscore the diverse motivations driving individuals to seek COVID-19 testing, reflecting a combination of personal health concerns,

adherence to travel regulations, and responses to familial circumstances.
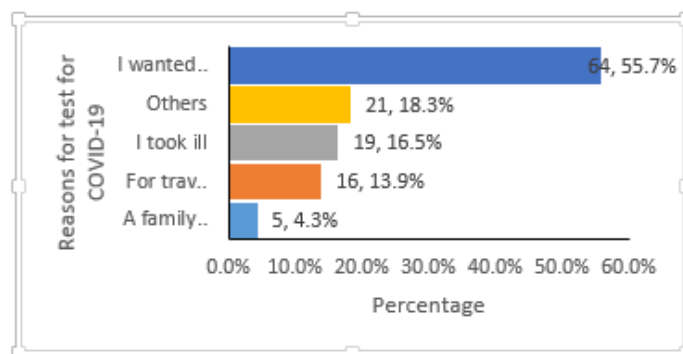
Figure 2. Reasons for going for COVID-19.

Respondents' Attitude to Covid-19 Vaccine

Respondents' attitude towards COVID-19 vaccine uptake was determined with seven questions:" Have you ever tested for COVID-19 ", " Have you been diagnosed with COVID-19 before?", "Have you ever heard of any Vaccine for COVID-19?", "Do you think the COVID-19 vaccine is safe?", "Do you think enough awareness has been created about COVID-19 vaccine in Nigeria", "Do you think there is (are) effective vaccine available for preventing COVID-19 disease" and " Will you be willing to get COVID-19 vaccine?" Positive answers (Yes) were scored one mark, and "No" was scored a zero. Respondents who scored 4 or higher marks were considered to have a positive attitude, while those who scored less were considered to have a negative attitude.

Table 3 presents a statistical analysis of respondents' attitudes to COVID-19 vaccines, specifically assessing factors such as location, age, gender, religion, marital status, education level and income about having either positive or negative attitudes. In total, 651 participants were involved, with about half of the population having a positive attitude towards COVID-19 vaccines (48.2%).

Participants residing in Oshodi showed 3.00 times higher odds of having a positive attitude towards COVID-19 vaccines than those living in Ejigbo [COR = 3.00; CI = (1.54 - 3.44); p = <0.001]. This relationship remained statistically significant upon controlling for other factors [AOR = 1.92; CI = (1.22 – 3.01); p < 0 .005]. Crude odds ratios for Isolo (1.66) revealed that respondents from this location had better attitudes than those in Ejigbo. The adjusted odds ratios (AOR) for Isolo (1.42) further revealed that location is a major determinant of respondents' attitudes towards COVID-19 vaccines.

Regarding demographic characteristics, such as age groupings, though some COR identified significant relationships but after adjustment (AOR) none identified significant relationships linking this variable to attitudes towards COVID-19 vaccines. Males exhibited lower positive attitudes than their female counterparts (p = 0.179), and this result had no significance after adjusting by other factors in the AOR. Two of the religious affiliations Christianity [COR = 2.86; CI = (1.04 – 7.88); p< 0.05] and Islam Christianity [COR = 3.81; CI = (1.35 – 10.74); p< 0.05] were both significant differences and also remain significant even after adjusting by other factors, marital status and attitudes towards covid-19 vaccines (P > 0.05). Education level presented remarkable disparities in users' opinions surrounding COVID-19 vaccines. For example, secondary-educated participants displayed a 0.74 times lower likelihood of developing positive attitudes than those without formal instruction [COR = 0.74; CI = (.41 - 1.33); p = 0.315]. However, this association became statistically significant when accounting

for contributing variables [AOR =0.39; CI = (0.18 - 0.87); p = 0.021]. However, regarding respondents' income demographic characteristics, neither the COR nor the AOR identified significant relationships linking this variable to attitudes towards COVID-19 vaccines.

Table 3. Respondents' Attitude towards Uptake of Covid-19 Vaccines

	Negative	Positive	COR (95% CI)	P-value	AOR (95% CI)	P-value
Overall n (%)	337 (51.8)	314 (48.2)	-	-	-	-
State						
Ejigbo	113 (48.1)	122 (51.9)	Ref	-	Ref	-
Isolo	79 (35.7)	142 (64.3)	1.66 [1.14 – 2.42]	.008	1.42 [.92 – 2.24]	.111
Oshodi	56 (28.7)	139 (71.3)	3.00 [1.54 - 3.44]	<.001	1.92 [1.22 – 3.01]	.005
Age category						
18 – 25	57 (48.3)	61 (51.7)	Ref	-	Ref	-
26 – 35	94 (46.8)	107 (53.2)	1.06 [.68 – 1.68]	.790	.79 [.47 – 1.34]	.384
36 – 45	51 (29.5)	122 (70.5)	2.24 [1.37 – 3.64]	.001	1.24 [.63 – 2.42]	.539
46 – 55	27 (28.1)	69 (71.9)	2.39 [1.35 – 4.24]	.003	1.27 [.59 – 2.74]	.538
56 & above	19 (30.2)	44 (69.8)	2.16 [1.13 – 4.14]	.020	1.12 [.49 – 2.56]	.792
Gender						
Male	131 (40.7)	191 (59.3)	Ref	-	Ref	-
Female	171 (35.6)	212 (64.4)	1.24 [.91 – 1.71]	.179	1.11 [.77 – 1.61]	.571
Religion						
Christianity	163 (39.1)	254 (60.9)	2.86 [1.04 – 7.88]	.042	4.54 [1.44 – 14.29]	.010
Islam	66 (32.5)	137 (67.5)	3.81 [1.35–10.74]	.012	4.17 [1.30 - 13.40]	.017
Traditional/Others	8 (57.1)	6 (42.9)	1.38 [.32 – 5.88]	.667	1.96 [.40 – 9.66]	.408
No Religion	11 (64.7)	6 (35.3)	Ref	-	Ref	-
Marital status						
Single	109 (49.5)	111 (50.5)	Ref	-	Ref	-
Married	120 (32.6)	248 (67.4)	2.03 [1.44 – 2.86]	<.001	1.56 [.94 – 2.61]	.087
Divorced/Widowed	19 (30.2)	44 (69.8)	2.74 [1.25 – 4.14]	.007	1.63 [.75 – 3.56]	.219
Education						
No formal	20 (35.1)	37 (64.9)	Ref	-	Ref	-
Primary	35 (40.2)	52 (59.8)	.80 [.40 – 1.61]	.535	.45 [.20 – 1.04]	.063
Secondary	138 (42.2)	189 (57.8)	.74 [.41 – 1.33]	.315	.39 [.18 - .87]	.021
Tertiary	55 (30.6)	125 (69.4)	1.23 [.66 – 2.31]	.522	.68 [.29 – 1.58]	.369
Ethnicity						
Hausa	22 (61.1)	14 (38.9)	Ref	-	Ref	-
Igbo	100 (47.8)	109 (52.2)	.48 [.19 – 1.23]	.126	.1.76 [.65 – 4.78]	.265
Yoruba	106 (29.1)	258 (70.9)	.82 [.40 – 1.68]	.585	3.83 [1.52 – 9.63]	.004
Non-Nigerian	5 (71.4)	2 (28.6)	1.83 [.90 – 3.7]	.095	.71 [.10 – 4.88]	.725
Others	15 (42.9)	20 (57.1)	.30 [.051 – 1.76]	.183	2.23 [.72 – 7.44]	.156

Income						
<50,000	195 (39.7)	296 (60.3)	Ref	-	Ref	-
50,000 – 99,000	48 (35.0)	89 (65.0)	1.22 [.82 – 1.81]	.321	1.21 [.72 – 1.75]	.620
100,000 and above	5 (21.7)	18 (78.3)	2.37 [.87 – 6.49]	.093	2.05 [.67 – 6.29]	.210

*Significant at p<0.05

Discussion

The ongoing COVID-19 pandemic has inflicted significant devastation worldwide, highlighting the critical importance of effective vaccination strategies to mitigate its impact. Despite global efforts, Nigeria has encountered obstacles in achieving sufficient vaccination coverage. This section examines the study's findings, drawing comparisons with existing research and offering recommendations to address the ongoing crisis and enhance vaccination rates. By analyzing the data and identifying areas for improvement, policymakers and healthcare professionals can formulate targeted interventions to bolster vaccination efforts and protect the population from the ravages of COVID-19.

Respondents' Knowledge of Covid-19 Vaccines Uptake

In this study, awareness/knowledge is significantly associated with age, gender, religion, marital status, education, ethnicity, and income. This study's findings show that the highest proportion of Respondents with good knowledge about COVID-19 vaccine uptake was from Oshodi (40.1%), followed by Ejigbo (34.1%), and Isolo has the lowest proportion (25.8%). This study also found that the percentage of Respondents with good knowledge of COVID-19 vaccine uptake in the local government was slightly below average (48.2%).

This shows that five out of ten Respondents in this study have good knowledge about COVID-19 vaccine uptake. This shows that about five out of ten respondents in this study have good knowledge about COVID-19 vaccine uptake

This finding aligns with similar studies conducted in Bangladesh, which also showed no significant disparities between genders in terms of knowledge regarding COVID-19 [34, 35].

The analysis of respondents' attitudes towards COVID-19 vaccines yielded insightful findings, shedding light on various factors influencing vaccine acceptance. Firstly, the study observed that nearly half of the participants exhibited a positive attitude towards COVID-19 vaccines, indicating a moderate level of acceptance within the population.

Respondents' Attitudes Of Covid-19 Vaccines Uptake

Location emerged as a significant determinant of attitudes towards COVID-19 vaccines, with respondents from Oshodi displaying notably higher odds of having a positive attitude compared to those from Ejigbo. This finding underscores the geographical variability in vaccine acceptance and suggests the need for targeted interventions tailored to specific communities.

Among demographic characteristics, religion notably influenced attitudes towards COVID-19 vaccines, with both Christianity and Islam showing significant associations with positive attitudes. This highlights the role of religious beliefs and cultural norms in shaping vaccine acceptance and emphasizes the importance of engaging religious leaders in vaccine advocacy efforts.

Education level also played a crucial role, with participants with secondary education exhibiting lower likelihoods of positive attitudes compared to those without formal education. However, this association became

significant after adjusting for other factors, suggesting that education may indirectly influence vaccine acceptance through other contributing variables. Similarly, one study found that individuals with a university or post-graduate education were more likely to receive the COVID-19 vaccine than those with a high school education [36].

Interestingly, no significant associations were found between income levels and attitudes towards COVID-19 vaccines, indicating that financial status may not be a significant predictor of vaccine acceptance among low-income earners in this context.

Overall, these findings underscore the multifaceted nature of vaccine acceptance, influenced by geographical, cultural, and socio-economic factors. Targeted interventions addressing these diverse influences are essential for promoting widespread vaccine acceptance and achieving community immunity against COVID-19.

Conclusion

The research reveals that while most participants are aware of the availability of COVID-19 vaccines, there exists a gap in their understanding of these vaccines within the local community. About half of the respondents possess a satisfactory level of knowledge regarding COVID-19 vaccine uptake, and they generally exhibit a positive attitude towards vaccination. Furthermore, the study investigates the factors contributing to vaccine hesitancy, highlighting the significant influence of religious beliefs on individuals' vaccination decisions. These findings emphasize the importance of tailored educational campaigns to dispel misconceptions and address concerns, especially in communities where religious convictions heavily shape health-related choices.

Competing Interests

The authors declare that they have no conflicts of interest regarding the publication of this research.

References

[1] Dong E., Du H., Gardner L., 2022. An interactive web-based dashboard to track COVID-19 in real-time. Lancet Infect Dis 2020;20:533-4. doi:10.1016/S1473-3099(20)30120-1

[2] World Bank. Global Economic Prospects. Washington, DC: World Bank, doi:10.1596/978-1-4648-1758-8

[3] International Monetary Fund, 2021, Fault Lines Widen in the Global Recovery. World Economic Outlook Update.

[4] Hoogeveen J. G., Lopez-Acevedo G., eds., 2021, Distributional Impacts of COVID-19 in the Middle East and North Africa Region. MENA Development Report. Washington, DC: World Bank,. doi:10.1596/978-1-4648-1776-2

[5] Ritchie H., Mathieu E., Rodés-Guirao L., et al., 2020, Coronavirus pandemic (COVID-19). Available:https://ourworldindata.org/coronavirus [Accessed 08 Mar 2022].

[6] World Population Review. Nigeria Population 2022 (Live). Accessed 7th January 2022

[7] NPHCDA. Welcome Message from the ED/CEO. Accessed 7th January 2022.

[8] Our World in Data. Coronavirus Pandemic (COVID-19). Accessed 7th January 2022.

[9] Wang J., Jing R., Lai X., Zhang H., Lyu Y., Knoll M. D. et al., 2020, Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in

China. Vaccines (Basel). 2020;8(3): 482.

[10] Chan EY-Y, Cheng CK-Y, Tam GC-H, Huang Z, Lee P.Y., 2015, Willingness of future a/H7N9 influenza vaccine uptake: a cross-sectional study of Hong Kong community. Vaccine. 2015;33(38):4737–40. https://doi.org/10.1016/j.vaccine.2015.07.046.

[11] Wibawa T., 2021, COVID-19 vaccine research and development: ethical issues. Trop Med Int Heal. 2021;26(1):14–9. https://doi.org/10.1111/tmi.13503.

[12] Reiter P. L., Pennell M. L., Katz M. L., 2020, Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? Vaccine. 2020;38(42):6500–7. https://doi.org/10.1016/j.vaccine.2020.08.043.

[13] Wang J, Jing R, Lai X, Zhang H, Lyu Y, Knoll MD et al. Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in China. Vaccines (Basel). 2020;8(3): 482. PubMed| Google Scholar

[14] Graffigna G., Palamenghi L., Boccia S., Barello S., 2020, Relationship between Citizens´ Health Engagement and Intention to Take the COVID-19 Vaccine in Italy: A Mediation Analysis. Vaccines (Basel). 2020;8(4): 576. PubMed| Google Scholar

[15] Pogue K., Jensen J. L., Stancil C. K., Ferguson D. G., Hughes S. J., Mello E. J., et al.. 2020, Influences on Attitudes Regarding Potential COVID-19 Vaccination in the United States. Vaccines (Basel). 2020;8(4): 582. PubMed| Google Scholar

[16] Head K. J., Kasting M. L., Sturm L. A., Hartsock J. A., Zimet G. D., 2020, A National Survey Assessing SARSCoV-2 Vaccination Intentions: Implications for Future Public Health Communication Efforts. Science Communication. 2020;42(5): 698-723. Google Scholar

[17] Sherman S. M., Smith L. E., Sim J., Amlôt R., Cutts M., Dasch H. et al., 2021, COVID-19 vaccination intention in the UK: results from the COVID-19 vaccination acceptability study (CoVAccS), a nationally representative cross-sectional survey. Hum Vaccin Immunother. 2021;17(6): 1612-1621. PubMed| Google Scholar

[18] Reiter P. L., Pennell M. L., Katz M. L., 2020, Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? Vaccine. 2020;38(42): 6500-6507. PubMed| Google Scholar

[19] Biasio L. R., Bonaccorsi G., Lorini C., Pecorelli S., 2021 Assessing COVID-19 vaccine literacy: a preliminary online survey. Hum Vaccin Immunother. 2021;17(5): 1304-1312. PubMed| Google Scholar

[20] Eastwood K., Durrheim D. N., Jones A., Butler M., 2010, Acceptance of pandemic (H1N1) 2009 influenza vaccination by the Australian public. Med J Aust. 2010;192(1): 33-36. PubMed| Google Scholar

[21] World Health Organization (WHO)., 2020, Behavioural considerations for acceptance and uptake of COVID-19 vaccines: WHO technical advisory group on behavioural insights and sciences for health, meeting report. Accessed 7th January 2022.

[22] MacDonald N. E., 2015, Vaccine hesitancy: Definition, scope and determinants. Vaccine. 2015;33(34): 4161-4164. PubMed| Google Scholar

[23] Larson H. J., Jarrett C., Eckersberger E., Smith D. M. D., Paterson P., 2014, Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007-2012. Vaccine. 2014;32(19): 2150-2159. PubMed| Google Scholar

[24] Harrison E. A., Wu J. W., 2020, Vaccine confidence in the time of COVID-19. Eur J Epidemiol. 2020;35(4): 325-330. PubMed| Google Scholar

[25] Puri N., Coomes E. A., Haghbayan H., Gunaratne K., 2020, Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. Hum Vaccin Immunother. 2020;16(11): 2586-2593. PubMed| Google Scholar

[26] Moss J. L., Reiter P. L., Rimer B. K., Brewer N. T., Collaborative patient-provider communication and uptake of adolescent vaccines. Soc Sci Med. 2016 Jun;159: 100-7. PubMed| Google Scholar

[27] Gilkey M. B., Calo W. A., Moss J. L., Shah P. D., Marciniak M. W., Brewer N. T., 2016, Provider communication and HPV vaccination: The impact of recommendation quality. Vaccine. 2016;34(9):

1187-1192. PubMed| Google Scholar

[28] Lu P. J., Srivastav A., Amaya A., Dever J. A., Roycroft J., Kurtz M. S. et al., 2018, Association of provider recommendation and offer and influenza vaccination among adults aged ≥18 years - United States. Vaccine. 2018;36(6): 890-898. PubMed| Google Scholar

[29] World Health Organization (WHO)., 2020, Behavioural considerations for acceptance and uptake of COVID-19 vaccines: WHO technical advisory group on behavioural insights and sciences for health, meeting report, 15 October 2020. Accessed 7th January 2022.

[30] MacDonald N. E., 2015, Vaccine hesitancy: Definition, scope and determinants. Vaccine. 2015;33(34): 4161-4164.

[31] Larson H. J., Jarrett C., Eckersberger E., Smith DMD, Paterson P., 2014, Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007-2012. Vaccine. 2014;32(19): 2150-2159.

[32] Bruce N., et al., 2008, Quantitative research methods for health research: a practical interactive guide to epidemiology and statistics. Chichester, U. K.: Wiley.

[33] CSPro (2023) Census and Survey Processing System (CSPro) Online Available https://www.census.gov/data/software/cspro.html (Accessed July 2023)

[34] Islam et al. BMC Public Health (2021) 21:1851 https://doi.org/10.1186/s12889-021-11880-9.

[35] Ferdous M. Z., Islam M. S., Sikder M. T., Mosaddek ASM, Zegarra-Valdivia JA, Gozal D., 2021, Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: an online-based cross-sectional study. PLoS One. 2020;15(10): e0239254.
https://doi.org/10.1371/journal.pone.0239254

[36] Noushad M., Nassani M. Z., Koppolu P., Alsalhani A. B., Samran A., Alqerban A., Abusalim G. S., Barakat A., Alshalhoub M. B., Rastam S., 2021, Predictors of COVID-19 Vaccine Intention among the Saudi Arabian Population: A Cross-Sectional Survey. Vaccines. 2021;9:892. doi: 10.3390/vaccines9080892.