

# Covid-19 Vaccine Hesitancy and Associated Factors Among Adults in Urban and Rural Communities in Rivers State

Doris Gilbert<sup>1</sup>, Emmanuel Clement<sup>1</sup> and Uchechukwu Ifeanyichukwu Apugo<sup>2\*</sup>

<sup>1</sup>School of Public Health, University of Port Harcourt, Nigeria

<sup>2</sup>Department of Human Physiology, University of Port Harcourt, Nigeria

**\*Corresponding author:** Uchechukwu Ifeanyichukwu Apugo, Department of Human Physiology, University of Port Harcourt, Nigeria

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## ABSTRACT

Vaccines have been one of the most successful public health interventions of all time, as they have been successfully deployed in the control of vaccine-preventable diseases (VPDs). However, they have been seriously challenged by the concept of vaccine hesitancy. Hence this study investigated the level of vaccine hesitancy among the adult population in urban and rural areas of Rivers state. This community-based comparative cross-sectional study recruited 422 adults using a multi-stage sampling technique. Their data was collected with the aid of a semi-structured, self-administered questionnaire adapted from the WHO SAGE (Strategic Advisory Group of Experts on Immunization) vaccination hesitancy survey. The resulting data was analysed using SPSS version 25. The result revealed that the majority of the respondents were females (69.9%), aged between 30 - 39 years (42.9%), single (49.8%), completed secondary school (41.5%), employed (45.5%), Christians (91.7%), had either received the COVID-19 vaccine or had a member of their household who did (78.4%) and got side effects from the vaccine (99.7%). There were 13.7% hesitant towards the uptake of COVID-19 vaccine which was significantly higher among urban respondents in comparison with their rural counterparts, while lack of trust for the vaccine, the safety of the vaccine, fear of adverse effects, having received the vaccine or anybody in the household and having any side effects from COVID-19 vaccine were identified as factors associated with vaccine hesitancy. Hence, more intensified efforts should be made towards sharing verified information regarding the COVID-19 vaccines, their importance, and the negative implications of refusing through every available media.

**Abbreviations:** VPDs: Vaccine-Preventable Diseases; PHEIC: Public Health Emergency of International Concern; WHO: World Health Organisation; ACT: Access to COVID-19 Tools; AU: African Union; NPHCDA: National Primary Health Care Development Agency; VH: Vaccine Hesitancy

## Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified in Wuhan Jinyintan Hospital in December 2019 as pneumonia of unknown aetiology (WHO [1]). The virus is highly contagious and can be transmitted from person to person through respiratory droplets produced by infected persons while sneezing and coughing or via inhalation of aerosols from an infected individual (WHO [2]). The resulting disease, Corona Virus Disease-19 (COVID-19) was declared a Public Health Emergency of International Concern (PHEIC) on 30 January 2020 and subsequently updated to

pandemic status on March 11, 2020, by the World Health Organisation (WHO), due to its very high case-fatality rate (Akande & Akande, et al. [3,4]). The severity of the spread of the disease and its associated morbidity and mortality led to the global campaign for prevention, early detection, and medical treatment of COVID-19 (Dror, et al. [5]). This was also accompanied by significant calls for the development of a vaccine capable of resolving the COVID-19 pandemic (Schoch-Spana, et al. [6]). Following this call, a new record was set for the earliest time a vaccine has been developed, as several pharmaceutical companies developed different vaccines which were evaluated in a number of clinical trials across a wide range of populations at unprecedented

speeds (Kochhar & Salmon, et al. [7,8]). They include the Oxford-AstraZeneca vaccine (ChAdOx1 nCoV-19), Ad26.COV2 vaccine by Johnson and Johnson as well as the two mRNA-based (BNT162b and mRNA-1273) vaccines by Pfizer-BioNTech and Moderna respectively (Fisher, et al. [9,10]).

The demand for the vaccines was unparalleled and to ensure that developing and low-and middle-income countries can also have access to these vaccines, COVAX, the vaccine pillar of the Access to COVID-19 Tools (ACT) Accelerator, co-lead by Gavi, World Health Organization (WHO) and Coalition for Epidemic Preparedness and Innovations (CEPI) was set up (WHO [11]). According to Nigeria Health Watch (NHW), Nigeria took delivery of 3.92 million doses of the ChAdOx1 nCoV-19 vaccine on the 2<sup>nd</sup> March 2021, through the COVAX facility (NHW [12]), while the National Primary Health Care Development Agency (NPHCDA) reported that as at 7<sup>th</sup> January 2022, Nigeria has received three more brands of COVID-19 vaccines from the COVAX Facility and the African Union (AU): BioNTech vaccine, mRNA-1273 and Ad26.COV2 vaccines (NPHCDA, 2022). However, despite the availability and supply of the vaccine, the demand and willingness of the populace towards receiving the vaccine also play some vital roles (NHW [12]). This concept which is termed vaccine hesitancy (VH), has been defined by WHO as a delay in acceptance or refusal of vaccines despite the availability of vaccine services (WHO, 2013).

It is among the 10 major global public health threats which pose a major barrier to achieving coverage and community or herd immunity (NHW [12]). This is necessary to enable indirect protection for the overall community and reduce the transmission of COVID-19 (Dube, et al. [13,14]). It is a significant problem in Nigeria as the report put forward by the NPHCDA showed that as of 30<sup>th</sup> January 2022, which is 11 months after the rollout of the COVID-19 vaccine in the country, only 2.59% and 4.48% full and first dose vaccination was achieved respectively (NPHCDA, 2022). Rivers State which is also the third-ranked in terms of confirmed cases of COVID-19 in Nigeria (16,449) as at 2<sup>nd</sup> February 2022, has only achieved 4.32% (369,819) of the first dose and 1.98% (169,954) of the second dose vaccination (NPHCDA, 2022). Several factors contribute to the hesitancy of the public towards the uptake of vaccines such as the spread of misinformation-which is particularly rampant in the context of the COVID-19 pandemic. Other factors include sociodemographic factors arising from personal interpretation of the vaccines (WHO, 2013), fear of side effects, socio-cultural and religious factors, distrust in the vaccine and the healthcare system, vaccine-related risks, and the perceived effectiveness of the vaccine, personal risk perception, sources of information and accessibility to a healthcare facility (Burke, et al. [15]). Hence, this study was set at determining the level of COVID-19 hesitancy among adults in rural and urban communities in River's state, Nigeria.

## Methods

### Study Setting and Design

This study was designed as a community-based comparative cross-sectional study that was carried out in two LGAs (one urban and one rural) in River's state, from April to July 2022.

### Study Population and Sample Size

The study population was made up of adults of either gender aged 18 years and above. A minimum sample size of 422 participants was derived by applying the double proportion formula which is used for the comparison of two proportions (Onwasigwe [16]), and considering; a 95% confidence interval, 5% margin of error, a power of 80%, as well as 8% and 23% level of the hesitancy of rural and urban residents in Nigeria towards the uptake of COVID-19 Vaccine, respectively (NHW, 2019), a 10% non-response rate and design effect of 2. The participants were selected from their households by applying a multistage sampling method.

### Study Instrument

Data for the study was collected with the aid of a semi-structured, self-administered questionnaire adapted from the WHO SAGE (Strategic Advisory Group of Experts on Immunization) vaccination hesitancy survey sample questions were used to gather the data required for the study (Domek, et al. [17]). It is made up of sections that collected information on the socio-demographic characteristics of the respondents and vaccine hesitancy among the respondents.

### Data Analysis

The data from the study was entered into an Excel Spreadsheet, cleaned, and statistical analysis was done using IBM SPSS version 21. Descriptive statistics were used to derive frequencies and percentages for the sociodemographic characteristics and hesitancy towards the uptake of COVID-19 vaccines, while Chi-square statistics were used to analyse relationships and differences between the variables in the rural and urban areas. The relationship was considered statistically significant at p values less than 0.05 ( $p < 0.05$ ).

### Ethical Consideration

The study was approved by the Research and Ethics Committee of the University of Port Harcourt while official permission was obtained from the community heads and written consent from the household heads who were informed of the voluntary nature of the study.

## Results

### Socio-Demographic Characteristics of the Respondents

The result of the socio-demographic characteristics of the respondents in both the rural and urban communities in Rivers State is presented in (Table 1) above. According to the results, 42.9% of respondents were aged between 30 - 39 years, with 30.3% living in urban areas, and 55.5% in rural areas, while females (69.9%)

were more than males (30.1%), with the majority of the females seen to be residing in the urban areas (76.8%) and 63.0% in the rural. Also, 49.8% were single, with 52.1% and 47.4% in the urban and rural areas respectively, while 41.5% and 45.5% were shown to have attained secondary education and employed respectively, with 19.9% and 38.4% from the urban areas while 63.0% and 52.6% are from the rural areas respectively. Furthermore, a vast majority are

of the Christian faith (91.7%), with 100% and 83.3% from the rural and urban areas respectively. Lastly, 78.4% of the respondents, out of which 77.7% were in urban and 79.1% in rural areas, had either received the COVID-19 vaccine or had a member of their household who did. Of this number, 99.7%, out of which 100.0% were in rural and 99.4% in urban stated that they got side effects from the vaccine.

**Table 1:** Socio-demographic characteristics of adults in rural and urban communities in Rivers State.

Variables	Urban N = 211 n (%)	Rural N = 211 n (%)	Total N = 422 n (%)
<b>Age category</b>			
15 - 19 years	55 (26.1)	3 (1.4)	58 (13.7)
20 - 29 years	76 (36.0)	48 (22.7)	124 (29.4)
30 - 39 years	64 (30.3)	117 (55.5)	181 (42.9)
40 - 49 years	4 (1.9)	28 (13.3)	32 (7.6)
≥50 years	12(5.7)	15 (7.1)	27 (6.4)
<b>Sex</b>			
Female	162 (76.8)	133 (63.0)	295 (69.9)
Male	49 (23.2)	78 (37.0)	127 (30.1)
<b>Marital status</b>			
Single	110 (52.1)	100 (47.4)	210 (49.8)
Married	95 (45.0)	104 (49.3)	199 (47.2)
Divorced/Separated	6 (2.8)	3 (1.4)	9 (2.1)
Widowed	0 (0.0)	4 (1.9)	4 (0.9)
<b>Educational level</b>			
Primary	35 (16.6)	57 (27.0)	92 (21.8)
Secondary	42 (19.9)	133 (63.0)	175 (41.5)
Tertiary	134 (63.5)	21 (10.0)	155 (36.7)
<b>Occupational status</b>			
Unemployed	30 (14.2)	10 (4.7)	40 (9.5)
Student/Youth Corp	68 (32.2)	43 (20.4)	11 (26.3)
Employee	81 (38.4)	111 (52.6)	192 (45.5)
Self-employed	32 (15.2)	47 (22.3)	79 (18.7)
<b>Religion</b>			
Christianity	175 (83.3)	211 (100.0)	386 (91.7)
Islam	29 (13.8)	0 (0.0)	29 (6.9)
African traditional religion	6 (2.9)	0 (0.0)	6 (1.4)
Have you or anybody in your household received COVID-19 vaccine	164 (77.7)	167 (79.1)	331 (78.4)
Got any side effects from COVID-19 vaccine (N = 331)	163 (99.4)	167 (100.0)	330 (99.7)

**Table 2:** Hesitancy in the uptake of COVID-19 vaccines.

Hesitancy Toward the Uptake of Covid-19 Vaccines	Rural N (%)	Urban N (%)	Total N (%)
Hesitant (score >50%)	18 (8.5)	40 (19.0)	58 (13.7)
Non-hesitant (score ≤50%)	193 (91.5)	171 (81.0)	364 (86.3)
Total	211 (100.0)	211 (100.0)	422 (100.0)

Note: \*Statistically significant (p<0.05), Chi square = 9.674; p-value = 0.002\*

### Hesitancy Towards COVID-19 Vaccination

The analysis of the hesitancy in the uptake of COVID-19 vaccination among the respondents is presented in (Table 2) above. The result revealed that 58 (13.7%) of the respondents out of which 18 (8.5%)

were from the rural and 40 (19.0%) from the urban areas were hesitant towards the uptake of COVID-19 vaccines. This showed that there is a statistically significant ( $\chi^2 = 9.674$ ;  $p$ -value = 0.002) higher level of hesitancy among the urban respondents, in comparison with their rural counterparts.

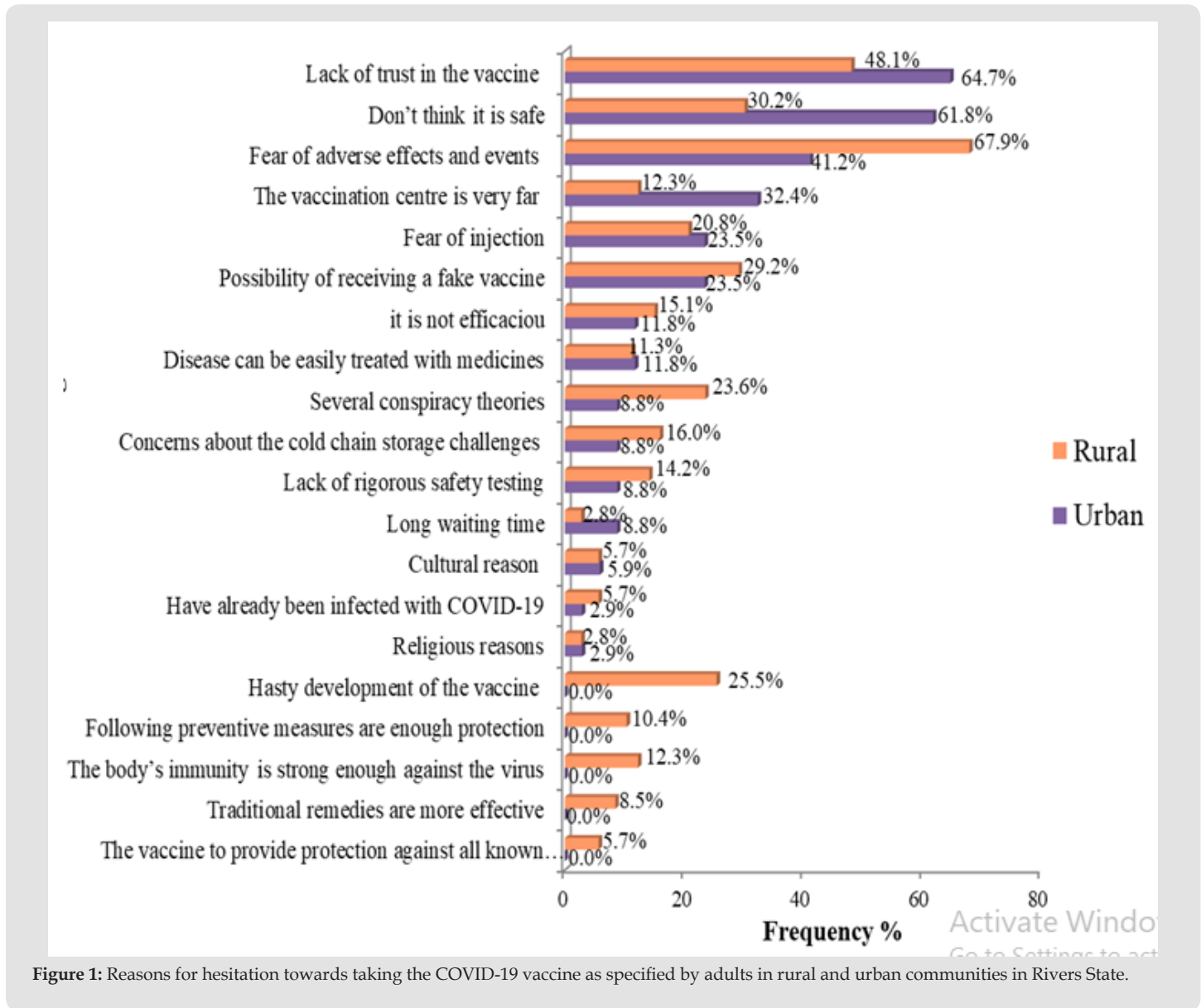


Figure 1: Reasons for hesitancy towards taking the COVID-19 vaccine as specified by adults in rural and urban communities in Rivers State.

### Factors Associated with Hesitancy Towards COVID-19 Vaccination

Investigation into the possible factors responsible for hesitancy toward COVID-19 vaccine uptake as presented in (Figure 1), revealed that lack of trust for the vaccine (64.7%), the safety of the vaccine (61.8%), and fear of adverse effects and events (41.2%) were the major concerns raised by the urban respondents, while the major reason cited by the rural respondents was fear of adverse effect and

events (67.9%), followed by lack of trust for the vaccine (48.1%) and safety of the vaccine (30.2%). The study also reported the relationship between the socio-demographic characteristics of the respondents and their hesitancy toward COVID-19 vaccine uptake as presented in (Table 3). According to the result, having received the vaccine or anybody in the household and having any side effects from the COVID-19 vaccine were seen to have a statistically significant ( $p < 0.005$ ) effect on the hesitancy of the respondents in the rural communities towards the uptake of the vaccine.

**Table 3:** Relationship between sociodemographic characteristics and vaccine hesitancy.

Variables (N = 422)	Urban		Rural	
	Hesitant n (%)	Non-hesitant n (%)	Hesitant n (%)	Non-hesitant n (%)
<b>Age category</b>				
15 -19 years	4 (7.3)	51 (92.7)	0 (0.0)	3 (100.0)
20 -29 years	4 (5.3)	72 (94.7)	7 (14.6)	41 (85.4)
30 -39 years	10 (15.6)	54 (84.4)	27 (23.1)	90 (76.9)
40 -49 years	0 (0.0)	4 (100.0)	6 (21.4)	22 (78.6)
≥50 years	0 (0.0)	12 (100.0)	0 (0.0)	15 (100.0)
	p-value = 0.228		p-value = 0.180	
<b>Sex</b>				
Female	17 (10.5)	145 (89.5)	30 (22.6)	103 (77.4)
Male	1 (2.0)	48 (98.0)	10 (12.8)	68 (87.2)
	p-value = 0.063		p-value = 0.082	
<b>Marital status</b>				
Single	13 (11.8)	97 (88.2)	13 (13.0)	87 (87.0)
Married	5 (5.3)	90 (94.7)	27 (26.0)	77 (74.0)
Divorced/Separated	0 (0.0)	6 (100.0)	0 (0.0)	3 (100.0)
Widowed	-	-	0 (0.0)	4 (100.0)
	p-value = 0.184		p-value = 0.081	
<b>Educational level</b>				
Primary	1 (2.9)	34 (97.1)	9 (15.8)	48 (84.2)
Secondary	6 (14.3)	36 (85.7)	25 (18.8)	108 (81.2)
Tertiary	11 (8.2)	123 (91.8)	6 (18.6)	15 (71.4)
	p-value = 0.212		p-value = 0.463	
<b>Occupational status</b>				
Unemployed	2 (6.7)	28 (93.3)	0 (0.0)	10 (100.0)
Student/Youth Corp	6 (8.8)	62 (91.2)	7 (16.3)	36 (83.7)
Employee	4 (4.9)	77 (95.1)	19 (17.1)	92 (82.9)
Self-employed	6 (18.8)	26 (81.2)	14 (29.8)	33 (70.2)
	p-value = 0.143		p-value = 0.095	
<b>Religion</b>				
Christianity	17 (9.7)	158 (90.3)	40 (19.0)	171 (81.0)
Islam	1 (3.4)	28 (96.6)	-	-
African traditional religion	0 (0.0)	6 (100.0)	-	-
	p-value = 0.698		**	
<b>Have you or anybody in your household received COVID-19 vaccine</b>				
Yes	14 (8.5)	150 (91.5)	10 (6.0)	157 (94.0)
No	4 (8.5)	43 (91.5)	30 (68.2)	14 (31.8)
	p-value = 1.000		p-value = 0.0001*	
<b>Got any side effects from COVID-19 vaccine (N = 331)</b>				
Yes	16 (8.3)	176 (91.7)	13 (7.3)	164 (92.7)
No	2 (10.5)	17 (89.5)	27 (79.4)	7 (20.6)
	p-value = 0.699		p-value = 0.0001*	

Note: \*Statistically significant (p<0.05)

\*\*Statistical test not done due to the presence of zero in the cells



## Discussion

The analysis of the hesitancy in the uptake of COVID-19 vaccination among the respondents revealed that 13.7% of the respondents were hesitant towards taking the vaccine, out of which 19.0% were hesitant in comparison with their rural counterparts 8.5%, thereby showing a statistically significant difference in the hesitancy of the respondents towards the uptake of the vaccine among the urban and rural respondents. The level of hesitancy reported in this study is lower in comparison with the report in the study of (Dinga, et al. [18]) Sinda and Titanji (2021) which reported a rate of 84.6% among Cameroonians, as well as the studies of (Magadmi, et al. [19-21]) reported higher hesitancies of 55.3%, 50.5% and 29.55% respectively. Also, (Breslin, et al. [22,23]) reported that a higher number of the respondents (6.15% and 15.6% respectively) were not willing to take the vaccine, while (Sethi, et al. [10,24,25]) reported that 6.8%, 14.5% and 28% of their respondents refused to take the vaccine. The differences in the level of hesitancy towards the uptake of the COVID-19 vaccine in the different studies could be due to the differences in the population recruited for the studies, their culture and religious predisposition, educational level, knowledge, and perceptions towards the vaccine, as well as the setting and the design of the studies.

Analysis of the reason behind the hesitancy towards the uptake of the vaccine was discovered to include a lack of trust for the vaccine, the safety of the vaccine, and fear of adverse effects. A similar finding was reported in the study of (Mustapha, et al. [26] where public distrust of the government was the major reason behind vaccine hesitancy and the study by (Wiemken, et al. [27]) also reported that concerns about vaccine effectiveness, its safety, and side effects were the major reasons behind vaccine hesitancy. This is also similar to the report in the study of (Lazarus, et al. [28]) where the alleged side effects of the vaccine as well as the increased chances of death and a lack of trust in the government fuelled vaccine hesitancy, while (Ekwebene, et al. [29]) also reported that fear of side effects was the most identified perceived barrier to COVID-19 vaccine acceptance. Furthermore, the study by (Fu, et al. [30]) reported that the majority of vaccine refusers in China stated that they require additional research to confirm the safety and effectiveness of vaccination before acceptance, while a large proportion of the non-vaccinated respondents in Pakistan believed that the vaccines were unsafe and considered it useless (Zakar, et al. [31]). Also, (Magadmi and Kamel [19]) reported that beliefs and lack of confidence in the safety and effectiveness of vaccination were the main barriers preventing the acceptance of COVID-19 vaccination among the population, while (Bell, et al. [32]) reported that the presence of different types of vaccines and their short time of development has been associated with an increased level of vaccine hesitancy. (Fares, et al. [25]) also reported that the reasons for vaccine hesitancy were the absence of enough clinical trials, in addition to fear of side effects of the vaccine, while (Akinyemi, et al. [33]) reported that presence of misconception had a negative effect on the uptake of COVID-19 vaccine.

Further results revealed that having received the vaccine or anybody in the household and having any side effects from the COVID-19 vaccine were seen to have a statistically significant effect on the hesitance towards the uptake of the vaccine. However, contrary reports can be found in the result of the study of (Alghamdi, et al. [24]) which showed a significant association between age, education, and occupation, as well as the study of (Amuzie, et al. [20]) where younger age, single, lower income, and profession (Doctor), Nurse and other allied health professionals were associated with vaccine hesitancy. Also, (Sethi, et al. [10]) reported that smokers, as well as respondents with no known illness and the possibility of the COVID-19 vaccine having side effects were the major reasons for not accepting approved vaccines. (El-Elimat, et al. [34,35]) also reported the influence of age and being employed on COVID-19 vaccine hesitancy.

## Conclusion

As the COVID-19 pandemic continues to wreak global havoc on lives and livelihoods, the development of the COVID-19 vaccine represents a possible light of hope for the future, while vaccine hesitancy stands as a very significant challenge towards the eradication of the disease. In this study, the level of vaccine hesitancy was 13.7%, with a significantly higher level observed among the urban populace, while lacking of trust for the vaccine, the safety of the vaccine, fear of adverse effects, having received the vaccine or anybody in the household and having any side effects from COVID-19 vaccine were identified as factors associated with vaccine hesitancy. Hence, the study recommends the implementation of intense COVID-19 vaccination campaigns, especially via the Internet and social media platforms to share verified information regarding the COVID-19 vaccines, as well as the importance of vaccination, and the negative implication of refusing the vaccine. This will help quench the spread of various unverified information in these media and encourage the populace to get vaccinated.

## Conflicts of Interest

The authors hereby declare no conflict of interest.

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