(RESEARCH ARTICLE)

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Determinants of willingness and level of COVID-19 vaccination uptake among intra-city transporters in Benin Metropolis, Nigeria

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Abstract

The COVID-19 pandemic was a litmus test for the epidemic preparedness and response mechanism of health systems. Road Transporters constitute a large at-risk group for spread and morbidity related to the disease. This study assessed determinants of willingness and level of COVID-19 vaccination uptake among intra-city road transporters in the Benin City Metropolis of Edo State Nigeria. An analytic cross-sectional design was utilized for this study using 389 structured questionnaires distributed among intra-city drivers selected via a multi-stage sampling technique across bus parks in Benin City metropolis. The mean age of respondents studied was 38.7 ± 9.3 years. Less than one-tenth 30 (7.7%) of respondents had taken the COVID-19 vaccine. Willingness to take COVID-19 vaccine was a significant determinant of uptake of COVID-19 vaccine (OR = 8.082; 95% Cl = 2.208 – 29.584; p = 0.002). There is need to initiate appropriate health promotional interventions to address vaccine hesitancy for improve vaccination uptake.

Keywords: COVID-19; COVID-19 Vaccine; Uptake; Vaccine hesitancy; Vaccine willingness

1. Introduction

COVID-19 was declared a public health emergency of international concern (PHEIC) on January 30th, 2020 and a worldwide pandemic on march 11th, 2020 by the World Health Organization (WHO)[1]. COVID-19 is a communicable respiratory disease which spreads directly from person to person through infected droplets projected during sneezing and coughing[2] or indirectly through physical contacts (e.g. hand shaking, hugging) or contact with surfaces contaminated with the infected droplet and then inoculated into their eyes, nose or mouth with their contaminated hands[3]. It is a highly transmissible disease which may present asymptomatic, mild to moderate symptoms or progress to viral pneumonia, multi-organ failure and even death[4]. Since its inception in Wuhan, Hubei Province of China in late December 2019, it has wrecked huge havoc impacting on the social, economic and health terrain [4-5]. Sources document that as at May 2023, it had spread to 231 countries and territories with over 678 million confirmed cases and more than 6 million deaths globally[5]. The global burden of the disease has put all stakeholders including the WHO and other allied bodies to work assiduously towards mitigating the disease and its effects worldwide. Efforts were instituted at all levels to prevent and control disease spread and effects, these control and preventive measures include the use of facemasks,

physical distancing, restriction of large gatherings, border closure, hygiene protocols, lockdowns and more recently vaccination[6]. Vaccination against COVID-19 has particularly received maximum attention worldwide with major attempts being made at sequencing viral strains and developing appropriate vaccines. It is documented that effective vaccine development averages 10 years, however the massive efforts towards COVID-19 vaccine development yielded some progress, making vaccines against COVID-19 available within a one-year timeframe[7]. Vaccination has been considered an effective preventive measure in reducing morbidity and mortality caused by infectious agents[8]. Highly effective vaccination programs have been known to reduce the global burden of vaccine preventable diseases including financial burdens and costs incurred by households [8]. The World Health Organization estimates that 3 million lives are saved each year through vaccination programs[1]. Developing a safe and effective vaccination program could be one of the primary strategies to finally win the war against the disease[9]. To achieve the necessary herd immunity to halt transmission of the virus, vaccinating more than 80% of the population is crucial and this will require strong acceptance and low hesitancy level throughout the population[10]. Issues of acceptance and public confidence may however be affected by the perception about safety and effectiveness of the vaccine in keeping with its rapid development and several socio-cultural factors[5].

Various studies have been carried out within different contexts and across different population groups demonstrating acceptance as well as the uptake of available vaccines. In a systematic review including 571 studies and 58 countries, Brazil reported the highest acceptance rate of 86.9% and Syria the lowest of 35.9%. The uptake of COVID-19 vaccination was lower in the Black population (59.2%, 40.5–77.8) than in the white and Asian population by 6.5% and 19.4% respectively. Amongst the Sociodemographic factors it was found that uptake rate for the lowest-level groups of education or income (around 45%) was lower than the highest-level groups by around 20%[11].

With regards to the Nigerian context, as at May 2023, 23 million Nigerians (accounting for 21% of the total eligible population targeted for COVID-19 vaccination) had received at least on dose of the vaccine, with only 15 million Nigerians being fully vaccinated[2]. The vaccine acceptance rates ranged from 20.0% to 58.2% across the different studies reviewed across the six geopolitical zones of Nigeria [12]. The vaccine acceptance ranged from 55.5% in Ondo, Edo, and Delta and 51.1% in Kano. Areas such as Bayelsa had acceptance rates as low as 24.6%. With respect to population groups the lowest COVID-19 vaccine acceptance rate (32.5%) was seen among health workers surveyed in all the six geopolitical zones of the country[12].Within adult populations, the acceptance rate was between 20.0% and 58.2%. University staff and students reported a prevalence rate of 34.7%, while a 24.6% acceptance rate was reported among patients in a tertiary health care facility.

A descriptive cross-sectional study[13] conducted among 482 security personnel from selected Security Agencies in Benin City, Nigeria in 2021 to assess the level of uptake of COVID-19 vaccination among security personnel in Edo State showed that the vaccination status of security personnel in Benin City, Edo State was slightly more than half 242 (50.2%) of security personnel studied. Two-fourth of those studied were vaccinated; this was attributed to massive public health campaigns on COVID-19 within the study location and the high level of involvement by security agencies and their personnel in Government effort to sensitize residents in the state[13].

 There is a dearth of study on COVID-19 vaccine uptake amongst transporter population. This is despite the fact that commercial transporters, their attendants and commuters in general have a higher likelihood for spread of infection due to overcrowding in public transport, and other activities including handling and exchange of currencies. Transportation plays an essential role in a city's socioeconomic development and continuous sustenance. Road Transporters constitute a large at-risk group for spread and morbidity related to the disease. This is largely due to the fact that they are exposed to large population of people on daily basis and within close proximity. As such efforts towards vaccination to help increase herd immunity amongst transporters is of immense importance. However, its pivotal role in the spread and transmission of infectious diseases cannot be overlooked as it generates a series of non-negligible health adversities including increased risk of disease, morbidity, and premature mortality[14]. Commercial vehicle drivers and conductors are exposed to a large variety of people with varying risk factors on a daily basis. It is therefore imperative to identify the level of uptake and factors influencing the uptake of COVID-19 vaccination among these groups of people. This study assessed determinants of willingness and uptake of COVID-19 vaccination among intra-city road transporters in the Benin City Metropolis of Edo State Nigeria.

2. Material and Methods

The study was carried out in selected parks in Benin City, Edo state Nigeria. Edo state is one of the 36 States in Nigeria located in the South-South geo-political zone. It was created on 27th August, 1991 from the northern portion of the now defunct Bendel state[15]. Benin City is the state capital and the largest urban center comprising three local government

areas, viz Oredo, Egor and Ikpoba-Okha but is however expanding to include Ovia North-East and Uhumnwonde. The city is primarily inhabited by the Benin ethic group [15, 16].

An analytic cross-sectional study design was carried out involving 389 transporters. The sample size was calculated using the Cochran formula taken into cognizance prevalence rate of 81.3% from a previous study a 10% non-response rate and a design effect of 1.5 [17-19]. A structured questionnaire was developed and standardized by the researchers to obtain data for the study. Pre-test was conducted among a comparable group of transporters in Okada, Edo State. Data collected was assessed for completeness, coded, subsequently entered and analyzed using IBM SPSS version 25.0 statistical software. Vaccine uptake was presented in simple frequency tables. Logistic regression models were used to assess the relationship between the variables.

Ethical clearance and approval was applied for and obtained from the Ethical Committee of the University of Benin Teaching Hospital, with ethical clearance number ADM/E 22/A/VOL. VII/14831292. Approval by the transporters was also sought before questionnaires were administered. Anonymity of respondents was assured in the study, while health education was administered to respondents following questionnaire.

3. Results

Table 1 Socio-demographic characteristics of the respondents (n = 389)

Variable	Frequency (%)
Age group	
16 – 25	33 (8.5)
26 – 35	111 (28.5)
36 – 45	158 (40.6)
46 – 55	65 (16.7)
≥ 56	22 (5.7)
Mean age ± SD = 38.7 ± 9.3	
Sex	
Male	389 (100.0)
Female	0 (0.0)
Religion	
Christian	363 (93.3)
ATR	16 (4.1)
Islam	10 (2.6)
Ethnic group	
Benin	170 (43.7)
Esan	63 (16.2)
Urhobo	51 (13.1)
Yoruba	38 (9.8)
Igbo	30 (7.7)
Etsako	26 (6.6)
Efik	8 (2.1)
Hausa	3 (0.8)

Occupation	
Driver	370 (95.1)
Conductor	19 (4.9)
Marital status	
Married	270 (69.3)
Single	92 (23.7)
Widowed	12 (3.1)
Cohabiting	11 (2.8)
Separated	3 (0.8)
Divorced	1 (0.3)
Highest level of education	
No formal education	61 (15.8)
Primary	141 (36.2)
Secondary	155 (39.8)
Tertiary	32 (8.2)

Table 1 shows the socio-demographic characteristics of the respondents. Age was categorized into four groups. Age category 16 – 25 consisted 33 (8.5%) respondents, 26 – 35 consisted 111 (28.5%) respondents, 36 – 45 consisted 158 (40.6%) respondents, 46 – 55 consisted 65 (16.7%) respondents, 56 and above 22 (5.7%) respondents. Mean age was 38.7 with a standard deviation of 9.3. Christian religion consisted 363 (93.3%) of respondents. Benin ethnic group consisted 170 (43.7%) of respondents while Esan, Urhobo, Yoruba consisted 63 (16.2%), 51 (13.1%) and 38 (9.8%) respectively. Hausa were the least ethnic group represented 3 (0.8%). The respondents consisted of 370 (95.1%) drivers and 19 (4.9%) of conductors. Two hundred and seventy (69.3%) were married, 92 (23.7%) were single, 12 (3.1%) were widowed and 11 (2.8%) were cohabiting. Secondary level of education was the highest level obtained by 155(39.8%), primary level by 141(36.2%), no formal 61 (15.8%) and tertiary 32 (8.2%).

Table 2 Awareness and source of information on COVID-19 vaccination among respondents (n = 389)

Variable	Frequency (%)
Heard of COVID-19	
Yes	389 (100.0)
No	0 (0.0)
Source of information (multiple response)	
Radio	376 (96.7)
Television	370 (95.1)
Friends	276 (71.0)
Social media	251 (64.5)
Fellow transporters	132 (33.9)
Newspapers	40 (10.3)
Health workers	17 (4.4)
Heard about COVID-19 vaccine	
Yes	384 (98.7)

No	5 (1.3)
Source of information (multiple response)	
Radio	372 (96.9)
Television	367 (95.6)
Social media	246 (64.1)
Friends	156 (40.6)
Fellow transporters	40 (10.4)
Health workers	10 (2.6)
Newspapers	8 (2.1)

Table 2 shows that all 389 (100.0%) of respondents were aware of COVID-19. Source of information for the transporters included radio 376 (96.7%), television 370 (95.1%), friends 276 (71.0%). Health workers contributed the least source of information 17 (4.4%). Three hundred and eighty-four respondents (98.7%) had heard of COVID-19 vaccine. Source of information was television for 367 (95.6%), radio 372 (96.9%), social media 246 (64.1%). Newspapers were the least source of information 8 (2.1%).
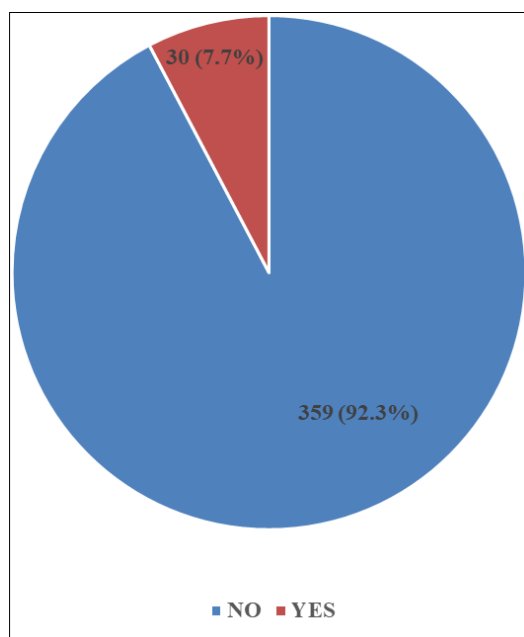
Table 3 Uptake of COVID-19 vaccine among the respondents (n = 389)

Variable	Frequency (%)
Have you taken COVID-19 vaccine	
No	359 (92.3)
Yes	30 (7.7)
Reason for taking vaccine (multiple response n = 30)	
To protect family friends	25 (83.3)
Vaccination reduces chance of getting disease	21 (70.0)
Vaccination is required to stop COVID-19 spread	15 (50.0)
Mandatory in my workplace	0 (0.0)
Which of the vaccines have you taken (n = 30)	
Oxford AstraZeneca	22 (73.3)
Moderna	8 (26.7)
Pfizer	0 (0.0)
Johnson and Johnson	0 (0.0)
I don't know	0 (0.0)
Moderna (n = 8)	
One	0 (0.0)
Two	8 (100.0)
Booster dose	0 (0.0)
Pfizer	
One	0 (0.0)
Two	0 (0.0)

Booster dose AstraZeneca (n = 22)	
One	4 (18.2)
Two	18 (81.8)
Booster dose	0 (0.0)
Johnson	
Single dose	0 (0.0)
Booster dose	0 (0.0)
Place vaccinated (n = 30)	
Hospital	30 (100.0)
Home	0 (0.0)
Workplace	0 (0.0)
School	0 (0.0)
Church	0 (0.0)
Mosque	0 (0.0)
Market	0 (0.0)
Experience side effect with vaccine (n = 30)	
Yes	28 (93.3)
No	2 (6.7)
Side effect post vaccine uptake (multiple response n = 28)	
Headaches	22 (78.6)
Fatigue	17 (60.7)
Muscle aches	7 (25.0)
Fever	4 (14.3)
Vomiting	3 (10.7)
Pain at injection site	1 (4.0)
Have proof of vaccination (n = 30)	
Yes	30 (100.0)
No	0 (0.0)
Shown proof of vaccine (n = 30)	
COVID-19 vaccine card	27 (90.0)
NPHCDA text message	3 (10.0)
E-copy of card	0 (0.0)
Willing for additional booster shots (n = 30)	
No	27 (90.0)
Yes	3 (10.0)

Table 3 assessed the uptake of the COVID-19 vaccine. Results showed 30 (7.7%) had taken the vaccine, of which 26 (86.7%) were fully vaccinated and 4(13.3%) were not fully vaccinated. More so, reasons given for vaccination were; to

protect family and friends 25 (83.3%), reduction in the chance of getting the disease 21 (70.0%) and stopping the spread of COVID-19 15 (50%). Twenty-two (73.3%) had taken the Oxford AstraZeneca with 4 (18.2%) and 18 (81.8%) having taken one and two doses of the vaccine respectively while 8 (26.7%) had taken the Moderna vaccine of which all of them had taken two doses. All who had the vaccine were vaccinated in the hospital 30 (100.0%), 28 (93.3%) experienced side effects such as headaches 22 (73.3%), fatigue 17 (56.7%), fever 4 (13.3%) and muscle aches 7 (23.3%). All 30 (100.0%) respondents had proof of vaccination either vaccine card 27 (90.0%) or NPHCDA text message 3 (10.0%). Only 10.0% (3) of those vaccinated would be willing for additional booster doses.

Figure 1 Level of uptake of COVID-19 vaccine amongst the respondents

7.7% (30) of respondents studied had taken the COVID-19 vaccine while three hundred and fifty-nine (92.3%) had not been vaccinated.

Table 4 Factors associated with uptake of COVID-19 vaccine among respondents

Variable	Have you taken COVID-19 vaccine		Chi square (χ^2)	P-value
	Yes (n = 30) Freq (%)	No (n = 359) Freq		
Grouped age				
16 – 25	2 (6.7%)	31 (8.6%)	1.898	0.754
26 – 35	10 (33.3%)	101 (28.1%)		
36 – 45	10 (33.3%)	148 (41.2%)		
46 – 55	5 (16.7%)	60 (16.7%)		
≥ 56	3 (10.0%)	19 (5.3%)		
Religion				
Christian	30 (100.0%)	333 (92.8%)	1.669	0.382
Islam	0 (0.0%)	26 (7.2%)		
Ethnic group				
Benin	11 (36.7%)	159 (44.3%)	1.777**	0.971
Esan	5 (16.7%)	58 (16.2%)		

Etsako	3 (10.0%)	23 (6.4%)		
Yoruba	3 (10.0%)	35 (9.7%)		
Hausa	0 (0.0%)	3 (0.8%)		
Igbo	2 (6.7%)	28 (7.8%)		
Urhobo	5 (16.7%)	46 (12.8%)		
Efik	1 (3.3%)	7 (1.9%)		
Marital status				
Never married	8 (26.7%)	95 (26.5%)	2.453	0.783
Ever married	22 (73.3%)	263 (73.5%)		
Highest level of education				
No formal education	0 (0.0%)	61 (17.0%)	38.494	<0.001*
Primary	3 (10.0%)	138 (38.4%)		
Secondary	17 (56.7%)	138 (38.4%)		
Tertiary	10 (33.3%)	22 (6.1%)		
Level of knowledge of COVID-19 vaccine				
Good	10 (26.3%)	28 (73.7%)	20.479	<0.001*
Poor	20 (5.7%)	331 (94.3%)		
Attitude to COVID-19 vaccine				
Positive	30 (100.0%)	80 (22.3%)	82.449	<0.001*
Negative	0 (0.0%)	279 (77.7%)		
Willingness to take the COVID-19 vaccine				
Willing	27 (40.9)	39 (59.1)	123.076	<0.001*
Unwilling	3 (0.9)	320 (99.1)		

* = statistically significant; ** = Fisher's exact

Table 4 shows factors associated with uptake of COVID-19 vaccine. Chi-square method was the test statistic used to evaluate the relationship between the variables. Age group (p = 0.754) religion (p = 0.382), ethnic group (p = 0.971) and marital status (p = 0.783) did not show significant statistical relationship as a factor influencing the uptake of the vaccine. The highest level of education (p < 0.001), level of knowledge on COVID-19 vaccine (p < 0.001), attitude towards COVID-19 vaccine (p < 0.001) and willingness to take the COVID-19 vaccine (p < 0.001) were found to be factors significantly influencing the uptake of COVID-19 vaccine amongst the respondents.

Table 5 Determinants of uptake of COVID-19 vaccine among respondents

Factors	B(Regression co-efficient)	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Knowledge of COVID-19 vaccination					
Poor	-1.120	0.326	0.103	1.034	0.057
Good		1			
Willingness to take COVID-19 vaccine					
Willing	2.090	8.082	2.208	29.584	0.002*
Unwilling		1			

R² = 24.4% - 58.2%, **CI** = Confidence interval, **OR** = Odds Ratio *Statistically significant (p<0.050)

Table 5 shows that willingness to participate in COVID-19 vaccination was a significant determinant of uptake of COVID-19 vaccine. Respondents who were willing to take COVID-19 vaccine were more than 8 times more likely to have taken the COVID-19 vaccine (OR = 8.082, Cl = 2.208 – 29.584, p = 0.002).

4. Discussion

This study identified that over nine-tenth of respondents studied were aware of COVID-19 and COVID-19 vaccine in the Benin City metropolis, with the mass media and social media being the predominant source of information. This is not unusual as the global COVID-19 pandemic promoted a lot of information (verifiable and non-verifiable) sensitization through mass media and social media platforms. These findings have been corroborated by previous studies[12-13,20,22-23]. The greatest proportions of the respondents studied were within the 36-45 years age group this was in keeping with the productive age group of workforces.

Furthermore, in relation to vaccine uptake this study identified that only one-tenth of the intra-city transporters studied had been vaccinated against COVID-19. This further portrays deep-rooted hesitancy towards COVID-19 vaccination in the study area. These findings contrast finding from a Chinese study were four-fifth of study population with intention to be vaccinated got vaccinated[17]. Higher rates of COVID-19 vaccination uptake were reported from an American study which demonstrated two-third vaccine uptake[21] and amongst security personnel in Benin City which showed that half of the respondents had been vaccinated[13,22]. It is plausible that differences in level of education and level of exposure to information towards COVID-19 vaccination may have accounted for these huge gaps in vaccine uptake in the different population of comparison. Empirical evidence from this study suggests that the willingness towards COVID-19 vaccination had a profound impact on actual COVID-19 vaccine uptake. This very important finding has been buttressed by previous studies [17,20,22-23] as willingness towards vaccination acceptance was a significant determinant of actual COVID-19 uptake. It was also observed and identified that nine-tenth of respondents who were previously vaccinated were unwilling or hesitant to receive additional dose of COVID-19 vaccine. This may be attributed to the deep rooted socio-cultural and religious bias associated with COVID-19 vaccination in addition to the high prevalence of adverse event following immunization (AEFI) reported in over nine-tenth of respondents studied. The implication of this finding is the need for more strategic interventions targeted on health education towards COVID-9 vaccination, vaccine safety and availability, as important parameters to seriously address in order to help reduce vaccine hesitancy and enhance COVID-19 vaccination uptake across target population in the study area. Health education interventions have been previously highlighted in previous studies [20, 22] among study populations in the study area as a vital strategy to reduce vaccine hesitancy and improve COVID-19 vaccine uptake.

5. Conclusion

Less than one-tenth of respondents studied have taken at least one dose of the COVID-19 vaccine. Willingness towards COVID-19 vaccination was identified as a significant determinant of vaccination uptake. There is need to initiate appropriate health promotional interventions to address vaccine hesitancy for improved vaccination uptake.

Compliance with ethical standards

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Disclosure of conflict of interest

Authors declare that this manuscript is free of any form of competing interest whether financial or otherwise.

Authors declaration

We the authors certify that this work has not been published anywhere else and that all authors contributed significantly to this work.

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