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Determinants of COVID-19 Vaccine Acceptance in the Ashaiman Municipality of the Greater Accra Region in Ghana

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Abstract: ***Background: The COVID-19 pandemic has affected all countries of the world and resulted in more than one million deaths worldwide and as of2nd May 2021, about 779 deaths were recorded in Ghana. With the economic disruption that characterized the advent of this pandemic and the fear of subsequent waves, every country was considering vaccines as the best hope against the pandemic. As COVID-19 vaccines have been developed, one of the questions being asked is what determines its acceptance by the world with regards to our experience, knowledge, attitudes, beliefs, and understanding of vaccines. Methodology: This was a quantitative cross-sectional study conducted in the Ashaiman Municipality of Ghana between January and March 2021 among 267 randomly selected participants aged 18 years and above. Analysis was done using Fisher's Exact estimation and Multivariate logistic regression models with a p-value < 0.05 as the threshold for statistical significance respectively. Results: Of the 267 study participants, 155 (58.05%) reported they would not accept the COVID-19 vaccine even if it was available for uptake. Female study respondents were more likely to accept the COVID-19 vaccine [OR = 2.4, 95%CI=1.33-4.48] compared to their male counterparts. Study participants who would accept the COVID-19 vaccine [OR=16.4, 95%CI=6.41-41.76] were also highly likely to do so as soon as the vaccine is approved and is available compared to their counterparts who would not accept the vaccine. Those who indicated their trust in the government for a good vaccine also showed a high likelihood of accepting the COVID-19 vaccine [OR=6.4, 95%CI=3.08-13.20] compared to their counterparts who would not accept the COVID-19 vaccine. More study participants who had adequate prior knowledge about vaccines 224 (83.90%) would accept the COVID-19 vaccine compared to the remaining 43 (16.10%) who would accept the vaccine anyway but do not have good knowledge about vaccines. Again, a good number of study participants 180 (67.42%) who had been vaccinated in the past would readily accept the COVID-19 vaccine than their remaining 87 (32.58%) counterparts who had no vaccines in the past. Those who disagreed that COVID-19 was deadly had a lower likelihood [OR=0.79, 95%CI=0.26-2.43] to accept the COVID-19 vaccine compared to the base group who agreed that COVID-19 is a deadly disease. Conclusion: Gender, ethnicity, how soon vaccines are made available, adequate knowledge about COVID-19 and vaccines, past vaccine uptake, trust in government, perceived risk of COVID-19, trust in vaccines as a remedy for the spread of COVID-19, among others were found to be significant determinants of the acceptance of the COVID-19 vaccine. Earlier and adequate education on vaccination should be created to influence vaccine uptake. Government, healthcare workers, and other stakeholders in health should work to earn the trust of people as trust issues affect vaccine uptake.***

Keywords: Vaccine Knowledge, Vaccine Acceptance, Vaccine Hesitancy, COVID – 19

1. Introduction

The COVID-19 pandemic has affected all countries of the world and resulted in more than one million deaths worldwide. As of January 8, 2021, over 50, 000 cases and 779 deaths were recorded in Ghana (Habersaat & Jackson, 2020) .

With the economic disruption that characterized the advent of this pandemic and the fear of subsequent waves, every country was considering a vaccine as the best hope against the pandemic. However, with rife hesitancy issues and the fear, attitudes, and misconceptions about vaccines and factors that affect the acceptance and the coverage that is needed to protect against the spread of diseases such as COVID-19, there has been the unanimous questioning of what factors will determine its acceptance by the world, specifically by the people of Ashaiman Municipality.

The purpose of the study was to assess the knowledge level of study respondents in respect to COVID-19 and vaccines as well as analyze basic demographic and other factors that influence vaccine acceptance. The outcome of this study will enable government, public health officials, and other stakeholders in health to begin planning effective messaging, techniques, and policies to promote the vaccine and its acceptance in our communities.

2. Methods

Data for the study were collected using a structured questionnaire made up of a mix of both closed and open-ended questions. The questionnaires were administered at homes and workplaces of the respondents who were at least eighteen (18) years of age across the municipality. Participants responded to a 7-item construct on knowledge about the COVID-19 pandemic as well as questions relating to their knowledge and past experiences with vaccines and whether or not they have ever been vaccinated in the past. Additionally, study participants were to indicate a "Yes" or "No" answer if they would accept a COVID-19 vaccine should one be approved and available in Ghana. Other

questions sought to determine the perceptions and how participants rated their susceptibility to the virus that causes the COVID-19 disease. Answers to questions on other factors that influence vaccine acceptance were also provided by study participants.

2.1 Sample Size

The total population in the Ashaiman Municipality at the time of the study was 190, 972. This is made up of 93, 727 males and 97, 245 females. Out of this population, those who were at least 18 years of age according to the 2010 Population and Housing Census (PHC) was 130, 109 (GSS, 2014) . The sample size for the study was determined using the Cocran formula (Delİce, 2001) .

$$n = \frac{z^2 \times pq}{e^2},$$

where
n= required sample size,
e=sampling error,
p =prevalence,
q=1-p, and
z = critical value.

The prevalence in a related std Krefis *et al*., (2010) in Ghana was determined as 79.6%. Therefore, for sample size n, sampling error (e) = 0.5, p = 0.796, q = 1-p, and z = 1.96.

$$n = \frac{1.96)^2 \times 0.796 \times 0.204}{(0.05)^2} = 249.53 \approx 250.$$

A 10% non-response rate was generated (25) and added to the estimated sample size. This, therefore, brought the operational sample needed for the survey to about275 respondents. The systematic sampling technique was then adopted in selecting the study participants,

2.2 Statistical Analysis

Univariate analysis involving the use of frequencies and percentages were used to describe the socio-demographic characteristics of the study participants. Chi-square tests were further used to assess the level of associations between selected socio-demographic factors and vaccine acceptance. Finally, multivariate logistic regression models with a statistically significant value set at p-value < 0.05 were constructed on selected predictor variables using "Vaccine acceptance" as the dependent variable. Data were analyzed using *StataCorp.2007. Statistical Software. Release 14. StataCorp LP, Collage Station, TX, USA*

3. Results

Out of the 275 respondents that were consented and enrolled on the study, 267 provided all the needed responses for full analysis resulting in a 97.07% response rate for the project. The age of respondents ranges between 18 to 61 years with the average age being 30 (± 9.4years). The ages of study participants were put in age groups as 18-35 years, 36-49 years and 50-61 years. Study respondents in the 18-35-year age group form the majority 154 (57.68%) in the study, followed by the 36-49-year age group 92 (34.46%) while respondents in the 50-61-year age group formed the least number 21 (7.87%) of study participants (**Fig.1**).

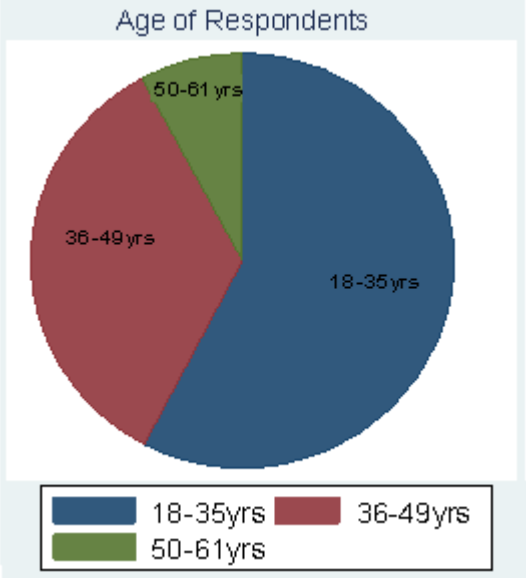

Figure 1: Distribution of Respondents by Age Groups

The total number of females for the study were169 (63.3%) whilst their male counterparts were 98 (36.70%). Study participants who were single at the time of participation were found to be the majority 152 (56.93%) while their counterparts who are divorced, separated or widowed formed the least 14 (5.24%) in this category. At least, 22% of study participants had basic level education comparable to 37% and 39% of those who had second cycle and tertiary level educations respectively. In terms of religion, respondents of the Christian faith represent a vast majority of 223 (83.52%) of study participants with their Islamic and Traditionalist counterparts representing 32 (11.99%) and 12 (4.49%) respectively. The results also show that most respondents 93 (34.83%), earned greater than GH₵ 1000 per month, 66 (24.72%) earned between GH₵600 and GH₵ 1000 per month, while 58 representing 21.72% reported earning less than GH₵ 300 per month (**Table 1**).

Table 1: Socio-Demographic Characteristics of Respondents

Variable, N =267	Categories	n (%)
Age Group	18-35yrs	154 (57.68)
	36-49yrs	92 (34.46)
	50-61yrs	21 (7.87)
Gender	Male	98 (36.70)
	Female	169 (63.3)
Marital Status	Single	152 (56.93)
	Married	101 (37.83)
	Divorce/Separated/Widowed	14 (5.24)
Highest Educational Level	Basic	61 (22.85)
	Second Cycle	100 (37.45)
	Tertiary	106 (39.70)
Occupation	Public/Civil Servants	85 (31.84)
	Self Employed	64 (23.97)
	Students	65 (24.34)
	Others	53 (19.85)
Ethnicity	Ewe	95 (35.58)
	Akan	86 (32.21)
	Ga Dangme	50 (18.73)
	Others	36 (13.48)
Religion	Christianity	223 (83.52)
	Islamic	32 (11.99)
	Traditional	12 (4.49)

Income (GH₵)	<300	58 (21.72)
	300-500	50 (18.73)
	600-1000	66 (24.72)
	>1000	93 (34.83)

To find out how much knowledge and understanding study participants have about the pandemic they were asked to respond to the constructs in **Table 2** below on a four-point Likert scale namely; Agree (A), Strongly Agree (SA), Disagree (D) and Strongly Disagree (SD). The scale was later merged by putting together Agree and Strongly agree together to be 'Agree' and Disagree and Strongly Disagree to be 'Disagree'. These constructs indicate perceptions, straightforward knowledge and attitudes about the pandemic. They sought to solicit the knowledge level of study participants about COVID-19. The results indicate that 245 (91.76%) of the respondents have adequate knowledge about how the virus that causes COVID-19 spreads and therefore agreed that the disease is spread through droplets from infected persons directly or from infected surfaces. However, 22 (8.24%) of the respondents thought otherwise about the means of spread of the disease. Similarly, a considerable number of respondents 218 (81.65%) agreed to the fact that elderly people (aged ≥70 years) and people living with underlying health conditions are more affected by COVID-19 whilst fewer of their counterparts 49 (18.35%) disagreed.

On whether study respondents perceived that COVID-19 is deadly, 229 (85.77%) indicated that the disease was indeed deadly whilst 38 (14.23%) did not see that the disease is deadly. Again, study respondents indicated strongly by numbers that COVID-19 patients could not get healed automatically without taking any medication 189 (70.79%) whilst 78 (29.21) did say that COVID-19 patients could get well even without taking any medication. Respondents also showed they know the common symptoms of the disease as 239 (89.51%) indicated that the common symptoms of the disease include continuous coughing, fever and tiredness. The remaining 28 (10.49%) however had a different view. A good number of the respondents 240 (89.89%) indicated their disagreement with the construct that COVID-19 is a disease for the rich whilst the remaining 27 (10.11%) agreed that the disease is for the rich.

Table 2: Knowledge of respondents about COVID-19

Construct	Agree n (%)	Disagree n (%)
1) COVID-19 is spread through droplets from infected persons directly or from infected surfaces	245 (91.76)	22 (8.24)
2) It is possible to tell by looking if one has COVID-19	58 (21.72)	209 (78.28)
3) Elderly people (aged ≥70 years) and people with underlying health conditions are more affected by COVID-19	218 (81.65)	49 (18.35)
4) COVID-19 is deadly	229 (85.77)	38 (14.23)
5) COVID-19 patients get healed automatically after sometime even without taking any medication	78 (29.21)	189 (70.79)
6) The common symptoms of COVID-19 include continuous coughing, fever and tiredness	239 (89.51)	28 (10.49)
7) COVID-19 is a sickness for the rich	27 (10.11)	240 (89.89)

3.1 Vaccine Knowledge and Acceptance

Results from **Table 3**. below comprised questions or constructs that aim to find out vaccine knowledge and acceptance from study respondents. By the results, 224 (83.90%) indicated that they know and have heard about vaccines whilst the remaining 43 (16.10%) have not heard or known about vaccines. When asked if they knew whether they had ever been vaccinated, 180 (67.42%) answered in the affirmative whilst the other 87 (32.58%) indicated that they did not know if they ever vaccinated. A good number of the respondents172 (64.42%) agreed that a vaccine is a sure hope to curb the spread of the pandemic but 95 (35.58%) did not think so. Exactly 155 (58.05%) of the respondents admitted that they would not accept a COVID-19 vaccine if one is approved and is available in Ghana. However, 112 representing 41.95% felt otherwise and indicated that they would accept the COVID-19 vaccine upon its approval and availability.

Table 3: Vaccine Knowledge and Acceptance

Construct	Yes n (%)	No n (%)
Have you heard or know about vaccines?	224 (83.90)	43 (16.10)
Do you know if you have ever been vaccinated?	180 (67.42)	87 (32.58)
Will you accept a COVID-19 vaccine if one is approved and available in Ghana?	112 (41.95)	155 (58.05)
	Agree n (%)	Disagree n (%)
A vaccine is a sure way or hope of stopping the spread of COVID-19	172 (64.42)	95 (35.58)

3.2 Socio-Demographic Factors that Influence Vaccine Acceptance among Respondents

The results of **Table 4**below show that majority of study respondents who would not accept the vaccine 133 (85.81%) are of the Christian denomination. Their counterparts who are Muslims 14 (9.03%) and Traditionalists 8 (5.16) would also not accept the vaccine. However, 90 (80.36%) Christians, 18 (16.07%) and 4 (3.57%) would accept the vaccine. More female respondents 81 (72.32%) would receive the vaccine than their male counterparts 31 (27.68%). Of those who would not receive the vaccine, females formed the majority 88 (56.77%) and males the least 67 (43.23%).

Among Public/Civil Servants 45 (40.18%) would receive the vaccine whilst 40 (25.81%) would not. Of those who are self-employed, the majority 43 (27.75%) would not receive the vaccine whilst 21 (18.75%) indicated that they would receive the vaccine. Forty-one (41) students representing 26.45% would not receive the vaccines. However, the remaining students 24 (21.43%) would receive the vaccine. Respondents who fall under the category of Other Occupations who would not accept the vaccine were 31 (20.0%) and those who indicated they would receive the vaccine in that category were 22 (19.64%).

A Fisher's Exact Chi-Square test for association between the selected socio-demographic variable and the vaccine acceptance status of the respondents revealed a statistically

significant association between the participants' ethnic groupings and gender at an observed p-value of <0.001 and 0.010 respectively. All other indicators showed no statistical significance given their observed p-values were more than the chosen alpha (α) level of 0.05.

Table 4: Bivariate analysis of socio-demographic factors that influence VA

Factors	Vaccine Acceptance		P – Value
	Yes n (%)	No n (%)	
Education	0.108		
Basic	20 (17.86)	41 (26.45)	
Second Cycle	40 (35.71)	60 (38.71)	
Tertiary	52 (46.43)	54 (34.84)	
Gender	0.010*		
Male	31 (27.68)	67 (43.23)	
Female	81 (72.32)	88 (56.77)	
Income	0.081		
<300	21 (18.75)	37 (23.87)	
300-500	19 (16.96)	31 (20.00)	
600-1000	23 (20.54)	43 (27.74)	
>1000	49 (43.75)	44 (28.39)	
Age Group	0.140		
18-35yrs	59 (52.68)	95 (61.29)	
36-49yrs	46 (41.07)	46 (29.68)	
50-61yrs	7 (6.25)	14 (9.03)	
Marital Status	0.112		
Single	60 (53.57)	92 (59.35)	
Married	49 (43.75)	52 (33.55)	
Divorced/Separated/Widowed	3 (2.68)	11 (7.10)	
Ethnicity	<0.001*		
Ewe	31 (27.68)	64 (41.29)	
Akan	47 (41.96)	39 (25.16)	
Ga Dangme	14 (12.50)	36 (23.23)	
Others	20 (17.86)	16 (10.32)	
Occupation	0.071		
Public/Civil Servants	45 (40.18)	40 (25.81)	
Self Employed	21 (18.75)	43 (27.74)	
Students	24 (21.43)	41 (26.45)	
Others	22 (19.64)	31 (20.00)	
Religion	0.214		
Christian	90 (80.36)	133 (85.81)	
Moslem	18 (16.07)	14 (9.03)	
Traditionalist	4 (3.57)	8 (5.16)	

3.3 Other Factors Influencing Vaccine Acceptance

In Table 5 below, of the 112 respondents who said that they would accept the vaccine, 74 (66.07%) indicated that they would accept the vaccine and would do so as soon as the vaccine is approved and is available. The remaining respondents 38 (33.93%) however indicated that even though they would accept the vaccine, they would not do so as soon as the vaccine is available. On the construct of if respondents have ever been vaccinated, 87 (77.68%) who reported that they had vaccinations in the past also indicated that they would accept the COVID-19 vaccine. On another hand, 93 (60.0%) who had been vaccinated in the past would not accept the COVID-19 vaccine. Respondents who do not have trust in government 125 (80.65%) to procure good vaccines would not accept the COVID-19 vaccine. Of the 112 who said that they trust the government 89 (79.46%) said they would accept the COVID-19 vaccine. Study respondents who agreed that a vaccine is a sure hope against the spread of COVID-19 94 (83.93%) also indicated that they would accept the COVID-19 vaccine. A good number of respondents 87 (77.68%) who would accept the vaccine also indicated that nothing else is as important to them as taking the vaccine. Those who would not take the vaccine in this category 76 (49.03%) also indicated that even though they would not take the vaccine, what they would do apart from going for the vaccine is not as important as going for the vaccine.

Study participants who would accept the COVID-19 vaccine were also highly likely [OR=16.4, 95%CI=6.41-41.76] to do so as soon as the COVID-19 vaccine was approved and available compared to their counterparts who would not accept the vaccine. Those who indicated their trust in the government for a good vaccine also showed a high likelihood of accepting the COVID-19 vaccine [OR=6.4, 95%CI=3.08-13.20] compared to their counterparts who would not accept the COVID-19 vaccine. More study participants who had adequate prior knowledge about vaccines 224 (83.90%) would accept the COVID-19 vaccine compared to the remaining 43 (16.10%) who would accept the vaccine anyway but do not have good knowledge about vaccines. Again, the majority of study participants180 (67.42%) who had been vaccinated in the past would readily accept the COVID-19 vaccine than their 87 (32.58%) remaining counterparts who had no vaccines in the past. Those who disagreed that COVID-19 was deadly had a lower likelihood [OR=0.79, 95%CI=0.26-2.43] to accept the COVID-19 vaccine compared to the base group who agreed that COVID-19 is a deadly disease.

Table 5: Bivariate Analysis of Other Factors Influencing Vaccine Acceptance

Factors	Categories	Vaccine Acceptance		*P – Value*
		Yes n (%)	No n (%)	
Will you accept the vaccine as soon as it is available?	Yes	74 (66.07)	7 (4.52)	<0.001*
	No	38 (33.93)	148 (95.48)	
Do you know if you have ever been vaccinated?	Yes	87 (77.68)	93 (60.00)	0.002*
	No	25 (22.32)	62 (40.00)	
Do you trust the government to procure good vaccines for us?	Yes	89 (79.46)	30 (19.35)	<0.001*
	No	23 (20.54)	125 (80.65)	
Do you think there is enough vaccine education/ information around?	Yes	48 (42.86)	51 (32.90)	0.123
	No	64 (57.14)	104 (67.10)	
COVID-19 is deadly	Agree	102 (91.07)	127 (81.94)	0.050
	Disagree	10 (8.93)	28 (18.06)	
COVID-19 affect my livelihood	Agree	100 (89.29)	134(86.45)	0.574
	Disagree	12 (10.71)	21 (13.55)	
Is a vaccine a sure hope against the spread of COVID- 19?	Agree	94 (83.93)	78 (50.32)	<0.001*
	Disagree	18 (16.07)	77 (49.68)	
Do you think there is something more important than going for the COVID-19 vaccine?	Yes	25 (22.32)	79 (50.97)	<0.001*
	No	87 (77.68)	76 (49.03)	

3.4 Assessing Demographic Factors Influencing Vaccine Acceptance

From **Table 3.4** below, the likelihood of vaccine acceptance for those in the 36-49 years age group was high (OR=1.36, 95% CI=0.612-3.012) compared to their counterparts in the 18-35-year group adjusting for all other variables. Respondents who are in the 50-61-year group are 0.014 times less likely to accept the COVID-19 vaccine compared to their counterparts in the reference age group (18-35 yr.), adjusting for all other variables. After adjusting for gender, females were found to be more likely (OR=2.44, 95% CI=1.329-4.480) to accept the COVID-19 vaccine comparable to their male counterparts adjusting for other variables.

The likelihood for those who were married and or divorced/separated/widowed were 0.05 and 0.64 times less likely respectively, compared to their single counterparts adjusting for other variables. There is a higher likelihood (OR=1.95, 95% CI=0.839-4.506) of those who had Second Cycle education to accept the vaccine, compared to their counterparts who had only Basic education adjusting for all other variables. Those with Tertiary education also are 1.46 times more likely to accept the vaccine compared to their counterparts who had Basic education controlling for all other covariates. Study participants who are Self Employed and those who are Students are found to be 0.62 and 0.74 times less likely to accept the COVID-19 vaccine compared to their Civil/Public Servant counterparts adjusting for all other variables. Those study participants who fall in the Oher work category are found to be 0.43 times less likely to accept the vaccine holding all other variables constant.

The likelihood of study participants who earned GH₵300-GH₵500 was found to be 0.49 times less likely in comparison to those who earned less than GH₵300 holding all other variables constant. Similarly, those who earned between GH₵600-GH₵1000 and those who earned greater than GH₵1000 per month were found to be 0.72 and 0.40 times respectively less likely to accept the COVID-19 vaccine respectively in comparison to their counterparts who earned less than GH₵ 300 holding all other variables constant.

Table 3.6: Multivariate Logistic Regression Analysis of Demographic Factors Influencing Vaccine Acceptance.

Factors	Unadjusted p-value	COR (95% CI)	Adjusted p-value	AOR (95% CI)
Age Group				
18-35yrs	Reference	1		1
36-49yrs	0.074	1.610 (0.955-2.714)	0.452	1.358 (0.612-3.012)
50-61yrs	0.659	0.805 (0.307-2.110)	0.983	0.986 (0.267-3.638)
Gender				
Male	Reference	1		1
Female	0.010	1.989 (1.181-3.352)	0.004	2.440 (1.329-4.480)
Marital Status				
Single	Reference	1		1
Divorced/Sep/Widowed	0.195	2.391 (0.640-8.928)	0.249	0.362 (0.645-2.038)
Married	0.069	3.455 (0.909-13.128)	0.893	0.946 (0.423-2.118)
Highest Edu. Level				
Basic	Reference	1		1
Second Cycle	0.359	1.367 (0.701-2.664)	0.121	1.945 (0.839-4.506)
Tertiary	0.042	1.974 (1.024-3.805)	0.454	1.461 (0.542-3.940)
Occupation				
Civil/Public Servants	Reference	1		1
Self Employed	0.015	0.434 (0.221-0.851)	0.067	0.384 (0.138-1.068)
Students	0.052	0.520 (0.269-1.006)	0.084	0.256 (0.055-1.199)
Others	0.192	0.631 (0.316-1.261)	0.182	0.568 (0.248-1.303)
Ethnicity				
Akan	Reference	1		1
Ewe	0.003	0.402 (0.220-0.735)	0.002	0.347 (0.177-0.680)
Ga Dangme	0.003	0.323 (0.153-0.683)	0.005	0.308 (0.136-0.699)
Others	0.927	1.037 (0.474-2.268)	0.571	1.357 (0.472-3.904)
Religion				
Christianity	Reference	1		1
Islamic	0.093	1.900 (0.899-4.014)	0.423	1.507 (0.552-4.116)
Traditional	0.630	0.739 (0.216-2.527)	0.782	1.238 (0.273-5.621)
Income (GH₵)				
<300	Reference	1		1
300-500	0.847	0.926 (0.423-2.02)	0.335	0.509 (0.129-2.010)
600-1000	0.727	0.873 (0.407-1.872)	0.092	0.278 (0.063-1.232)
>1000	0.095	1.817 (0.9011-3.664)	0.491	0.601 (0.141-2.563)

From **Table** 3.7 below, the results indicate those study participants who would accept the COVID-19 vaccine are 16.36 times more likely to do so as soon as the vaccines are approved and available in Ghana compared to their counterparts who would not receive the vaccines immediately it is available adjusting for all other variables. The results also found that those who trustedthe government that a good vaccine would be procured for us are 6.37 times

more likely to receive the vaccine compared to the base group who do not trust the government holding all other variables constant. There is a lower likelihood [OR=0.79, 95%CI=0.26-2.43] for those who disagree that COVID-19 is deadly to receive the vaccine compared to their counterparts who said COVID-19 is a deadly disease adjusting for all other variables.

Table 3.7: Multivariate Logistic Regression Analysis of Other Factors Influencing Vaccine *Acceptance*

Factors	Unadjusted p-value	COR (95% CI)	Adjusted p-value	AOR (95% CI)
Will Get Vaccinated as soon as the vaccine is approved and available				
No	Reference	1		1
Yes	<0.001	41.173 (17.544-96.627)	<0.001	16.356 (6.406-41.760)
Ever Been Vaccinated?				
No	Reference	1		1
Yes	0.003	2.320 (1.340-4.016)	0.691	1.172 (0.535-2.569)
Trust in Government for a good vaccine?				
No	Reference	1		1
Yes	0.001	16.123 (8.783-29.597)	<0.001	6.371 (3.077-13.189)
Enough Vaccine Education/Information Around?				
No	Reference	1		1
Yes	0.097	1.529 (0.925-2.527)	0.603	1.227 (0.568-2.648)
Priority on Vaccine Acceptance				
No	Reference	1		1
Yes	0.001	0.276 (0.160-0.477)	0.923	0.962 (0.434-2.128)
COVID-19 is Deadly				
Agree	Reference	1		1
Disagree	0.039	0.444 (0.206-0.958)	0.681	0.790 (0.258-2.426)
COVID-19 Affected your Livelihood				
Agree	Reference	1		1
Disagree	0.488	0.766 (0.360-1.629)	0.465	1.508 (0.501-4.534)
Is a vaccine a sure hope against the spread of COVID-19?				
Agree	Reference	1		1
Disagree	0.001	0.194 (0.107-0.351)	0.042	0.432 (0.192-0.970)

4. Discussion

The importance of vaccines cannot be undermined in eras gone by, in the recent past and the present. Vaccines have helped our world from a total wipeout of dangerous diseases many times and it is therefore not surprising when people say that vaccines represent one of the greatest achievements of science and medicine in the battle against disease (Kennedy *et al.*, 2011) . Vaccines have brought to the minimum or in some instances a total eradication of diseases like smallpox, polio, rubella, measles among others. Even as we see a tremendous result from the use of vaccines, there remain issues of hesitancy to vaccine uptake in the 21st century due to some multifaceted underlying factors some of which are social, cultural, religious, political and economic in nature. The discussions of this Chapter look at the knowledge, attitudes and perceptions about COVID-19 as a disease and vaccine as hope for the remedy for the spread of this pandemic.

4.1 Knowledge Level of Respondents about COVID-19

The knowledge about a disease comprises beliefs, perceptions, risks, one's perceived susceptibility among others. This study measured knowledge of respondents across seven different constructs (Table 4.3) and the results indicated that the majority of respondents were aware of the disease in terms of mode of transmission, individuals who are at higher risk of the disease, severity of the disease, common symptoms and both right and wrong perceptions about the disease. This corroborates a study that was carried out in Malaysia that adequate knowledge about a disease impacts population's understanding of how they could be affected by the disease (Wong *et al.*, 2020) . Schmid *et al.*, 2017 are of the view that without adequate knowledge about a particular disease, individuals may not be able to identify the severity and susceptibility to a particular disease and these may turn out to be barriers to interventions meant to curb the problem at hand. Malik *et al.*, 2020 also indicated that several factors are responsible for the acceptance of a new vaccine and mentioned misinformation, lack of trust in the health system among others. Specifically, 245 (91.5%) of study participants agreed to the construct that COVID-19 is spread through droplets from infected persons directly and from infected surfaces while only 22 (8.24%) indicated otherwise about the means of spread of the pandemic.

Study participants also indicated their good knowledge about the pandemic as the majority disagreed that COVID-19 patients get healed automatically after sometime even without taking any medication. Most study participants were able to identify that the common symptoms of COVID-19 include continuous coughing, fever and tiredness.

In a cross-sectional study conducted in the Philippines on the Knowledge, attitudes and practices of COVID-19 among income-poor households, it was indicated that understanding public perceptions and their responses to COVID-19 is a critical factor that informs the planning and implementation of effective pandemic responses. This study also concluded that the knowledge about populations about a disease will serve as a guide for public health responses (Lau *et al.*, 2020) . In a related study on knowledge, attitude, and

perceptions towards the 2019 Coronavirus Pandemic in Egypt and Nigeria, most respondents in the study correctly identified several symptoms of COVID-19 and therefore concluded that most of their respondents (62%) had satisfactory knowledge level about the disease and also attributed these to the fact that respondents were well educated. They however acknowledged that their findings fall short of an earlier knowledge, attitude and perceptions study done on COVID-19 in China and Iran (Elnadi *et al*., 2021) . The participants in this study can be said to model the study by Elnadi *et al* (2021) as 61 (22.85%) of study participants in Ashaiman had at least basic education, 100 (37.45%) had second cycle education and a majority 106 (39.70%) had tertiary education. This heretofore suggests that study participants in the Ashaiman Municipality have adequate knowledge that would form the basis for appropriate decisions about the various COVID-19 intervention strategies including the acceptance of the COVID-19 vaccine.

4.2 Vaccine Knowledge and Acceptance Among Study Participants

According to (Sallam, 2020) vaccine acceptance is not merely dependent on efficacy and safety. To many researchers, vaccine hesitancy is a complex situation. Pinto *et al*., (2019) indicated in a study that most parents who sent their children for vaccination did that based on conformity and the fewer parents who decided not to comply with vaccinations for their children looked at a lot of information about vaccination. In this study, participants indicated that they had known and heard about vaccines before this study. Participants also had taken some vaccines in the past. Study participants 172 (64.42%) also indicated that a vaccine is a sure hope of reducing the spread of the COVID-19 pandemic and showed as well that they would take the COVID-19 vaccine should it be approved and available in the country (**Table 4.4).**

In this study, those who were married showed less acceptance to the COVID-19 vaccine 49 (43.75%) compared to their single counterparts 60 (53.57%). That is entirely different in a 2020 study on determinants of vaccine uptake in Saudi Arabia where it was indicated that vaccine acceptance among the married group was high (Malik *et al*., 2020a) . In that same study by Malik *et al*, it was noted that study participants who had a history of being vaccinated against flu were more likely to report their intention to be vaccinated (Malik *et al*., 2020a) .

Similarly, results from this study (**Table 3**.) indicates that those study participants who had ever been vaccinated also show a strong interest in taking up the COVID-19 vaccine. Again, (Larson *et al*., 2018) mentioned that vaccine acceptance is affected by trust issues across various dimensions such as trust issues with the product, providers, policymakers, governments among others. The majority of study participants 119 (98.81%) indicated they trusted the government to procure a 'good' vaccine for uptake. A study by (Pinto *et al*., 2019) showed that healthcare professionals play a vital role in influencing vaccine acceptance. They were indicated to be the most trusted source of information regarding vaccines. This study in quizzing participants found that of the 267 study participants, 174 (65.17%) said they would trust healthcare professionals for accurate vaccine information. Another study corroborates that finding and indicates that, "trusted sources of information and guidance are fundamental to disease control" (Lazarus *et al*., 2020) . So, the trust of study participants in healthcare professionals is key and advantageous to develop necessary education to influence the population of Ashaiman to accept the COVID-19 vaccine.

4.3 Socio-Demographic and other Factors that Influence Vaccine Acceptance

Social and demographic factors have been known to be the basic influencing determinants in many findings about humanity. Other factors including prevailing political conditions, the state or condition of health systems, infrastructure, availability or scarcity of resources among others are also known to influence health behaviour choices.

Of the 267 study participants, 112 (41.95%) indicated their intention that they would accept the vaccine if one is approved and is available soon. This indicates a fewer number who are willing compared with the greater number of participants who would not accept the vaccine. This is contrary to a study conducted in the USA where out of 672 participants, 450 (67%) said they would accept a COVID-19 vaccine if it is recommended for them. In that same study, it was found that vaccine acceptance differed by demographic characteristics which indicated generally a higher likelihood of vaccine acceptance comparing education, race/ethnicity, age and gender (Malik *et al*., 2020b) . The study in Ashaiman also mirrors similar findings where vaccine acceptance differed on age, gender, marital status, education, occupation, ethnicity, religious affiliation and income factors.

The best model to predict the acceptance of the COVID-19 vaccine in Ashaiman Municipality has the demographic characteristics of gender and ethnicity as predictor variables. Other factors such as how soon the vaccine is made available, past vaccine uptake, trust in government, perceived risk of COVID-19, trust in vaccines as a remedy for the spread of COVID-19, and personal priorities attached to going for the COVID-19 vaccine as predictor variables are best for modelling the acceptance of the COVID-19 vaccine in the Ashaiman Municipality.

5. Conclusion

To conclude, at least 50% of the sample for this study would not accept the COVID-19 vaccine. It is therefore relevant for stakeholders in health to carefully design and use appropriate targeted messaging and influencing techniques to increase the willingness of people to take up the COVID-19 vaccine. Also, trust issues were affecting the willingness to take up vaccines. Healthcare workers, government and other stakeholders should improve on policy, education and practice to make people trust more in their activities.

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