Awareness And Willingness-To-Pay For Rotavirus Vaccine In Anambra State, Nigeria

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ABSTRACT

Rotavirus is the most common cause of severe diarrhea. Worldwide prevalence of the virus is high and Nigeria is yet to adopt the World Health Organisation (WHO) recommendation for global inclusion of rotavirus vaccine into the national program on immunization due to the high cost of the vaccine. The study assessed Nigerian mothers' awareness of rotavirus infection, the importance of the rotavirus vaccine, its acceptance, and their willingness-to-pay (WTP) value for the vaccine. A quantitative study was carried out at eligible immunization units in Anambra State, using a self-administered validated questionnaire. Yamane's sample size formula was used to get the sample size and data collected from eligible mothers were collated using Microsoft Excel, 2010. Various outcomes were determined with a Chi-square test using SPSS (Ver. 20.0 for Windows, Inc., Chicago, IL, USA). Of the 376 mothers assessed, the maximum amount most of the women were willing to pay was less than 1000 naira per dose of the vaccine. WTP amount and knowledge of RV infection were statistically associated with the level of education and average total income per month of the mothers ($p< 0.05$). There was no statistically significant difference in outcomes observed with the different study settings. There was poor awareness of rotavirus infection among mothers as well as poor awareness of the importance of the rotavirus vaccine, but most mothers were willing to pay a maximum of 1, 000.00 Naira [$3.0] per dose for the vaccine.

Keywords: awareness, rotavirus infection, rotavirus vaccines, willingness-to-pay

INTRODUCTION

Rotavirus has caused about one-third of deaths in children under-five years worldwide (John et al., 2014), the prevalence is worse in sub-Saharan countries with Nigeria being among the worst hit with a prevalence rate of 18.8% (Olorunfemi, 2016), where before the age of 5 years every child will have at least, one episode of the infection (Troeger et al., 2018). Infection from the virus has caused great health and economic burden worldwide with at least 1.5 million deaths, 12 million hospitalizations, and 125 million clinic visits each year among children less than 5 years of age (Rheingans et al., 2007). So far, advances in hygiene and sanitation have helped to reduce the predominance of other diarrhea-causing pathogens, without significant effect on rotavirus incidence (John et al., 2014), thus, adequate prevention of the infection through

vaccination is the key. Two rotavirus vaccines; Rotarix (RV1) and RotaTeq (RV5), have been licensed for global use in 2006 (Jonesteller et al., 2017; Velázquez et al., 2017). They have proved to be effective in children who received them, especially in developed countries (Jonesteller et al., 2017). A study by Rheingans et al, (2009), found out that based on current vaccination coverage and timing, rotavirus vaccination would annually prevent 228,000 deaths, 13.7 million hospital visits, and 8.7 million disability-adjusted life-years, saving $188 million in treatment costs and $243 million in societal costs (Rheingans et al., 2009). A systematic review of 48 peer-reviewed articles with post-licensure data from 24 countries showed median RV1 vaccine effectiveness (VE) of 84%, 75%, and 57% in countries with low, medium, and high child mortality, respectively, and RV5 VE of 90% and 45% in countries with low and high child mortality, respectively (Jonesteller et al., 2017).

According to National Demographic and Health Survey, (NDHS) done in 2013, each year, up to seven million children are born in Nigeria with each child experiencing an average of five episodes of diarrhea, and without intervention; many of these children become malnourished and may end up dead each year (Ezeh et al., 2015). Despite the high health and economic burden of the infection and recorded effectiveness of the vaccines in preventive care, these vaccines have not been included in the routine childhood immunization schedule in Nigeria as mandated by WHO in 2009 (Kurugöl, 2011; Troeger et al., 2018), and currently, only the elites who are aware of the benefits and can afford it, pay from their pockets and administer the oral vaccine to their children. Most mothers do not administer the vaccines to their children either because of inadequate awareness of their importance or due to the belief that childhood vaccines are free and thus not willing to pay for the vaccine.

Immunization funding has risen in recent years due to global efforts by international organizations, but new vaccines are expensive and the funding gaps to scale up coverage of new vaccines are rising as well. Partly in consequence, since 2008, the Global Alliance for Vaccine Initiative (GAVI), a Public-Private Partnership (PPP), founded to accelerate the introduction of new vaccines in the poorest countries, has requested that GAVI eligible countries share the cost of the vaccine purchase (Saxenian et al., 2011). Low-income countries need to prioritize new vaccines introduction while taking into accounts the need for other health interventions to balance the potential benefits of new vaccines with financial challenges. Pending the decisions of the Nigerian government, this vaccine though subsidized is paid out of pocket by mothers and thus not yet a mandatory vaccine in the childhood immunization schedule as mandated by WHO in 2009 (Saxenian et al., 2011). Currently, the cost of the rotavirus vaccine from GAVI is on an average of $5.5 per dose (WHO, 2017). The cost of the vaccine together with the administration cost and cost for wastages brings the cost per dose in Nigeria to N9, 000.00 – N10, 000.00. ($19.2 -$21).To give a full dose of Rotarix, therefore, the mother should be willing to pay a minimum of eighteen thousand naira and RotaTeq a minimum of twenty-seven thousand naira ($ 55.5).

A person's willingness to pay (WTP), for an intervention or health service is a measure

of the value which the person places on certain aspects or attributes of health care services. Studies on WTP for vaccines have been employed in many disease states (Kim et al., 2014; Umeh et al., 2016) and their estimates are more informative to policymakers as they set priorities for health in the face of limited resources. A systematic review conducted by Kim et al., (2014), on WTP for vaccines in low and middle-income countries, found out that WTP varied widely across diseases in low and middle-income countries with consumers willing to pay substantially more for vaccines against chronic diseases with high mortality such as HIV/AIDS. Previous studies earlier carried out in Nigeria including the study by (Chukwuma & Itohan, 2018; Junaid et al., 2011; Kachi Udea et al., 2018; Tagbo et al., 2014) and many from other countries centered on the Prevalence of rotavirus infection, risk factors to getting the infection, and the genotypes of rotavirus. Richard D. Rheingans et al., (2009) worked on the economic cost of rotavirus gastroenteritis and the cost-effectiveness of vaccination in developing countries.

There is an existing gap in the awareness and knowledge of childbearing mothers on rotavirus infection and effectiveness of the vaccine in preventive care, their acceptance of the vaccine, and their WTP value considering that most mothers play the role of immunizing their children and the non-inclusion status of the vaccine in the compulsory childhood immunization schedule.Considering the prevalence of rotavirus in Nigeria, the health and economic burden of this viral infection, the proven effectiveness of the vaccines, and the need to prevent the infection and reduce child mortality due to diarrhea to a minimum level, this study, assessed the childbearing mothers' awareness on rotavirus infection and the importance of rotavirus vaccine, vaccine acceptance, and their WTP value for the vaccine out of pocket, bearing in mind the present cost of the vaccine. Findings from this study will provide adequate information to the policymakers which will be useful in strategic planning for the uptake of the vaccine. It will also provide useful information to the manufacturers and the Government on the awareness level of mothers on rotavirus infection and vaccines as well as their buying capacity. The study assessed Nigerian mothers' awareness of rotavirus infection, the importance of rotavirus vaccine and its acceptance, and their willingness-to-pay (WTP) value for the vaccine.

METHODS

Study location

Eight health facilities in Anambra State, comprising of the two tertiary hospitals in the state; Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi and Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) Awka and six other health facilities conveniently selected based on functional immunization units and coverage of the three senatorial zones in the State.

Study design

A quantitative, cross-sectional, survey-based study was carried out on childbearing mothers who were met at the eligible immunization units, who came for their child/children's immunization. The instrument used was a validated questionnaire adapted from a previous

WTP study by Umeh et al., in 2016, for Human Papilloma Virus Vaccine and modified to cover the objectives of the present study. Contingent valuation (CV) approach using the payment card technique was used to estimate the average maximum WTP amount per dose of the vaccine among the mothers (Umeh et al., 2016).

Study instrument

A previously validated semi-structured questionnaire by Umeh et al was adopted for the study with slight variations to meet the objectives of the study. The questionnaire was then face validated by three persons who are knowledgeable on the subject matter, and then pilot tested on twenty childbearing mothers in the immunization unit at Regina Caeli Hospital Awka. The instrument was then further modified based on the outcome of the face validation and pilot test to improve clarity and flow.

Sample size determination

Sample Size was calculated using the Yamane sample size formula given by (Yamane & Yamane, 2012);

Where; n = Sample size

N = Population of Anambra State; 4.1 million or female population in the state 2.5 million (Nwakeze & Kandala, 2011)[19]

e = Level of precision ± 5% or 0.05, with confidence interval set at 95%

Sample size (n) =399.96 i.e. 400 Childbearing mothers. An Extra 5% questionnaire was included to cover for improperly filled questionnaires giving a total of 420 questionnaires. The questionnaire instrument was distributed to the tertiary, secondary, and primary hospitals in the ratio of 2:1:1. This gave rise to a total of 84: 42:42. The instrument was distributed to all the eligible mothers who came for child immunization on the scheduled days in each of the study sites after receiving their informed oral consent.

Study criteria

All childbearing mothers who presented in any of the eligible hospitals for infant immunization within the study period, who can understand, read and write in English and who gave their oral informed consent were included for the study.

Data analysis

Data was collected, with the help of research assistants. The mothers were allowed sufficient time to fill the questionnaire and given biros to facilitate the process and ensure adequate retrieval of filled questionnaires the same day. Data collected from various hospitals were collated using Microsoft Excel, 2010. The data were inputted into the Statistical Package for Social Sciences (SPSS) version 20 and were presented as frequencies and percentages using descriptive statistics. The level of association between demographic characteristics and key variables was determined with a Chi-square test using SPSS (ver. 20.0 for Windows, Inc., Chicago, IL, USA). Statistical significance established was less than 0.05 ($p < 0.05$). All inappropriately filled or unfilled data were cleaned up before analysis in each section

Outcome measures

The outcomes measured were, the awareness status of the childbearing mothers on RV infection and the importance of RV vaccines, acceptance

level (demand) for the vaccine as well as the WTP value of the mothers for the vaccine.

RESULTS

The response rate was relatively high, of the 420 questionnaires produced, 405 were shared to all the eligible mothers present for assessment while 376 were retrieved giving a percentage retrieval of 92.8%. A total of 376 childbearing mothers participated in the study, with the largest group of participants being young mothers 219 (58.4%) in the age range of 20-30 years as shown in Table 1. Almost half of the mothers had tertiary education 159 (45.0) %, while only 10 (2.8) % of the mothers had no formal education. More than half of the respondents 201(60.3%) had their average monthly income below N50, 000. 00 and more than one-third of the mothers 137 (36.8) % were businesswomen. A total of 97 (31.3) % of the participants had between 6 – 10 occupants in their households as shown in Table 1.

Table 1: The Demographic Characteristics of the Childbearing Mothers

Variables	Category	n (%)
Age of respondents in years	20 -30	219 (58.4)
	31 – 40	138 (36.8)
	41 – 50	14 (3.7)
	Above 50	4 (1.1)
	Total	**375**
Tribe	Igbo	347 (94.8)
	Hausa	1 (0.3)
	Yoruba	11 (3.0)
	Others	7 (1.9)
	Total	**366**
Education	No education	10 (2.8)
	Primary	19 (5.3)
	Secondary	115 (32.6)
	Tertiary	159 (45.0)
	Post-tertiary	50 (14.2)
	Total	**353**
Average household income in Naira (N)/ month	< 50,000	201 (60.3)
	50,000 – 100,000	81 (24.3)
	100,000 – 250,000	26 (7.8)
	250,000 – 500,000	12 (3.6)
	>500,000	13 (3.9)
	Total	**333**
Occupation	No Job	39 (10.5)
	Farming	12 (3.2)
	Housewife	55 (14.8)
	Public servant	108 (29.0)
	Business	137 (36.8)
	Others	21 (5.6)
	Total	**372**
Number in household	1 – 5	166 (53.5)

	6 -10	97 (31.3)
	11 -15	16 (5.2)
	16 -20	13 (4.2)
	>20	18 (5.8)
	Total	**310**
Religion	None	22 (6.1)
	Traditional	31 (8.6)
	Roman Catholic	196 (54.6)
	Protestant	68 (18.9)
	Muslim	2 (0.6)
	Others	40 (11.1)
	Total	**359**

The results on awareness of RV infection and its consequences showed that a total of 61.6 % of the mothers were aware of the rotavirus infection as shown in figure 1 and for 43.4 % of the respondents, their source of information was from healthcare professionals. Approximately one-third of the mothers confirmed that their child/children have had RV infection as shown in Table 2.

Figure 1: Awareness Status of Mothers on RV infection

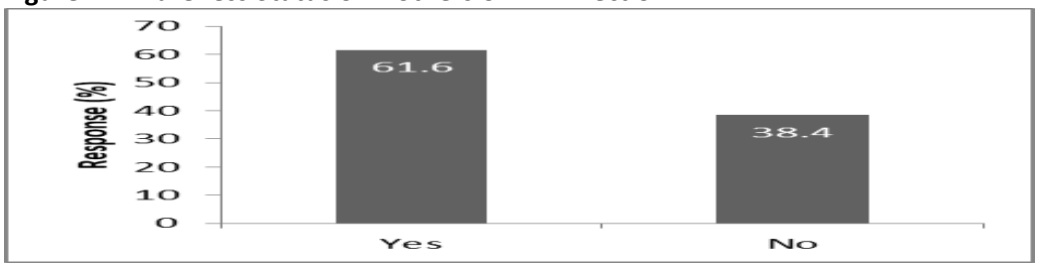


Table 2: Child Bearing Mothers Awareness of RV Infection and Source of Information

Awareness Assessment	**Category**	**n (%)**
Have you ever been told by a healthcare provider that your child had a rotavirus infection?	Yes	110 (30.0)
	No	233 (63.5)
	Not sure	24 (6.5)
	Total	**367**
Has any of your child/children ever had diarrhea for more than 5 days?	Yes	124 (34.4)
	No	236 (65.6)
	Total	**360**
Source of information on Awareness of Rotavirus Infection	Doctors, Pharmacist, Nurse	163 (43.4)
	Family or friends	44 (11.7)
	Newspapers or magazines	18 (4.8)
	Television	9 (2.4)
	Internet	11 (2.9)

	Cannot remember	3 (0.8)
	Others	5 (1.3)

From Table 3, further on the level of awareness of the childbearing mothers on RV infection showed that more than 70 % of the mothers were aware of all the symptoms of RV infection, its management procedure, and the import of RV Vaccine.

Table 3: Extent of Awareness of Childbearing Mothers on RV Infection and their willingness to pay for RV Vaccine

Knowledge of RV infection/WTP	**Category**	**n (%)**
Rotavirus infection causes diarrhea	Yes	183 (83.1)
	No	7 (3.2)
	I don't know	30 (13.6)
	Total	**220**
Rotavirus infection causes vomiting	Yes	176 (81.1)
	No	10 (4.6)
	I don't know	31 (14.3)
	Total	**217**
Rotavirus infection causes fever	Yes	158 (70.5)
	No	9 (4.0)
	I don't know	57 (25.4)
	Total	**224**
Mild cases of rotavirus infection can be managed with oral rehydration salts and zinc	Yes	153 (70.2)
	No	16 (7.3)
	I don't know	49 (22.5)
	Total	**218**
Severe cases will require hospitalization and intravenous rehydration infusion	Yes	172 (83.5)
	No	13 (6.3)
	I don't know	21 (10.2)
	Total	**206**
Rotavirus infection can be prevented through vaccination	Yes	171 (79.5)
	No	7 (3.3)
	I don't know	37 (17.2)
	Total	**215**

Most of the childbearing mothers (80.1) % showed great acceptance (sees Figure 2) and willingness-to-pay (WTP) out of their pockets for the RV vaccine based on the knowledge that they received. A majority of them, however, were willing to pay a maximum amount, less than N1, 000.00 (21.3) per dose to have their child or children vaccinated (see Figure 3). A very small number, 2.3 % were willing to pay between N9, 000.00 and N11, 000.00/ dose of the vaccine as shown in figure 3.

Figure 2: Childbearing Mothers Acceptance of RV Vaccine /Their Willingness to Pay for RV Vaccine

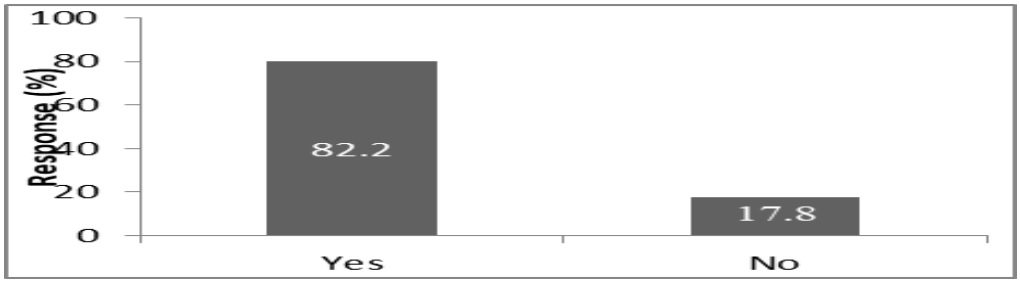
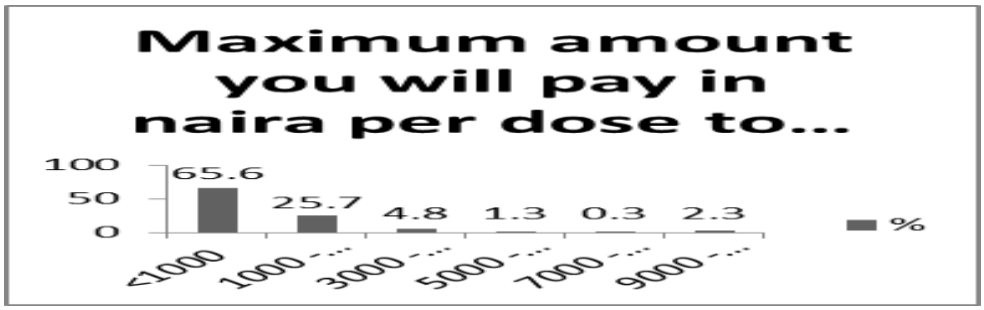


Figure 3: Maximum amount (in Naira) per dose of RV mothers are willing to pay



Level of education and average household income/month were variables persistently statistically associated with the awareness of the symptoms of RV infection and the maximum amount they were willing to pay as shown in Table 4. There was also no statistically significant association ($p>0.05$) between the awareness that RV infection causes fever and the willingness to pay for the RV vaccine with the studied demographic variables. The extent of awareness of RV infection, willingness to pay for RV Vaccine by the mothers showed statistically significant association ($p<0.05$) between both tertiary hospitals (NAUTH versus COOUTH) as well as between both tertiary hospitals (NAUTH + COOUTH) and all the six "secondary and primary health facilities used for the study as shown in Table 5.

Table 4: Association between Awareness of RV infection, willingness to pay for the Vaccines and some demographic features:

	Category	**χ2 (p-value)**
Rotavirus infection causes diarrhea	Number of children	26.911 NS
	Level of education	20. 683 NS
	Average household income	**36.238 (0.002) ***
	Number of people in the family	21.179 NS
Rotavirus infection causes vomiting	Number of children	31.521 NS
	Level of education	**26.452 (0.034) ***

	Average household income	**29.511 (0.014) ***
	Number of people in the family	23.068 NS
Rotavirus infection causes fever	Number of children	23.783 NS
	Level of education	24.11 NS
	Average household income	22.239 NS
	Number of people in the family	17. 601 NS
Mild cases of rotavirus infection can be managed with oral rehydration salts and zinc	Number of children	22.017 NS
	Level of education	**31.172 (0.008) ***
	Average household income	20.566 NS
	Number of people in the family	21.530 NS
Severe cases will require hospitalization and intravenous rehydration infusion	Number of children	30.793 NS
	Level of education	**40.688 (0.000*)**
	Average household income	9.275 NS
	Number of people in the family	21.604 NS
Rotavirus infection can be prevented through vaccination.	Number of children	11.537 NS
	Level of education	**29.926 (0.012*)**
	Average household income	14.111 NS
	Number of people in the family	20.083 NS
If these vaccines are not free and you have to pay for it, will you vaccinate your child against RV?	Number of children	16.005 NS
	Level of education	10.648 NS
	Average household income	4.230 NS
	Number of people in the family	6.967 NS
What maximum amount will you pay to have your child/children vaccinated against RV?	Number of children	43.897 NS
	Level of education	**45.937 (0.032*)**
	Average household income	**87.286 (0.000*)**
	Number of people in the family	35.964 NS

*p<0.05: statistically significant, ϯ NS = p>0.05ie not significant, ǂ X^2 = Chi square value

Table 5: Comparison of the Awareness of RV Infection, Willingness to pay for RV Vaccines between Childbearing Mothers in the Health Facilities

Knowledge of RV Infection	**Hospital comparison**	**χ2 (p-value)**
Rotavirus infection causes diarrhea	NAUTH versus COOUTH	23.087 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	90.959 (0.000*)
Rotavirus infection causes vomiting	NAUTH versus COOUTH	25.502 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	86.813 (0.000*)
Rotavirus infection causes fever	NAUTH versus COOUTH	46.434 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	81.756 (0.000*)
Mild cases of rotavirus infection can be managed with oral rehydration salts and zinc	NAUTH versus COOUTH	31.491 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	80.115 (0.000*)
	NAUTH versus COOUTH	14.186 (0.003*)

Severe cases will require hospitalization and intravenous rehydration infusion	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	62.820 (0.000*)
Rotavirus infection can be prevented through vaccination.	NAUTH versus COOUTH	20.546 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	76.773 (0.000*)
If these vaccines are not free and you have to pay out of your pocket by yourself, will you vaccinate your child against RV?	NAUTH versus COOUTH	7.425 (0.024*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	11.772 (0.003*)
What maximum amount will you pay/ dose to have your child/ children vaccinated against RV?	NAUTH versus COOUTH	30.028 (0.000*)
	Teaching hospitals (NAUTH & COOUTH) versus secondary and primary hospitals	15.256 (0.018*)

***p<0.05*: statistically significant.

DISCUSSION

The awareness of RV infection and the basic symptoms of the infection was a little above average among the childbearing mothers assessed. The acceptance/ WTP for the rotavirus Vaccine was very high among the mothers irrespective of the type of health facility. This study also established the maximum amount that most childbearing mothers in Anambra State are willing to pay for the vaccination of their under-five years' children against RV infection. Total rejection of RV vaccines despite their importance was observed in 17.8% of the mothers. This study has useful implications for increasing the uptake of the RV vaccine and planning for its inclusion in the childhood immunization schedule. Firstly, the demand for the RV vaccine is quite high as over three-quarters of the mothers were willing to pay for the RV vaccination of their children. This high acceptance level is similar to a study on the assessment of factors influencing acceptance of a new rotavirus vaccine among healthcare providers and consumers by Patel et al., in 2007 (Patel et al., 2007).

The study recorded high acceptance by parents. Major determinants to parents' acceptance of the vaccine and their WTP amount were level of education and average monthly household income respectively. A similar result was got in a study by Dube et al., in their study on the determinants of parents' decision to vaccinate their children against rotavirus: results of a longitudinal study (Dubé et al., 2012). Household income and perception of the moral correctness of having their children immunized which can be improved upon through adequate awareness and education was persistently influential. High acceptance and demand for the vaccine point to a high likelihood of RV vaccination program success in Nigeria as fundamental to the success of such a program is the recipients' willingness to accept the vaccine. This high demand could be emphasized in other to increase uptake and the possible inclusion of the vaccine in the immunization schedule. While waiting for the inclusion of the vaccine in the National immunization program, interventions that improve understanding of the infection and possible positive attitudes towards RV

vaccines could be adopted. The level of education was statistically significant to the awareness of RV infection and its symptoms. To improve further on this, educational interventions directed to parents and mothers in particular on RV infection and the Vaccine's effectiveness can be an option in raising the awareness and acceptance level of the vaccine (Jonesteller et al., 2017; Velázquez et al., 2017). Those who have had an experience of the RV infection could be co-opted to provide first-hand information to the targeted mothers, as was in the case of Yusuf Ibrahim, a community immunization advocate who changed his anti-vaccine belief after doctors explained to him that Pneumococcal Vaccine could have spared his daughter from a near-fatal case of pneumonia (DeLiveriNg together | Nigeria, 2018).

Another very important solution to achieving high RV vaccine uptake/acceptance is to properly orient the health care professionals, especially those in the antenatal and immunization units first who will then provide first-hand information to the mothers especially during their visit to antenatal and immunization schedule for their children. The healthcare professionals are the key to the general populace acceptance because even if the vaccine is free, uptake of the vaccine will depend on whether the healthcare professionals have accepted the vaccine and are willing to inform mothers on the effectiveness of the vaccine and the need for use. RV Vaccines and some other newer childhood vaccines are quite expensive, and for low and middle-income countries to co-sponsor the supply of the vaccines as agreed by GAVI Alliance, they will have to choose from their scale of preference on the inclusion of the vaccine and payment for it against all other healthcare needs (Ngabo et al., 2015). To circumvent this, since most mothers were willing to pay in this study, co-payment by the government to augment that paid by the individual is an option. The disadvantage to the co-payment, however, is that it may skew the vaccination program to favor only those that can afford the vaccine. Alternatively, the vaccine should be given free to children with suppressed immunity such as those born by non-adherent HIV positive mothers and those whose parents' average household income per month falls below N50, 000.00, as this represents families whose infants are prone to high risk of contracting infections including RV infection. This will ensure an equity-sensitive vaccination program This decision agrees with a study on targeted rotavirus vaccination of high-risk infants; a low cost-effective alternative to universal vaccination (Bruijning-Verhagen et al., 2013). How for this to be done without bias is left for the clear conscience of the healthcare providers. Involvement of more Pharmaceutical companies in vaccine production to reduce monopoly and price hike is also a very good option. The total rejection of the vaccine is not acceptable and calls for more education and attitudinal change by mothers.

This study has some limitations; first, the WTP value obtained in the study has to be considered in the light of bias that is associated with open-ended elicitation format and WTP surveys in general. Respondents could have been influenced by the range of values chosen for the payment scale question design rather than their true maximum WTP values. Some respondents stated no WTP value as shown in

supplementary Table 1 which was cleaned off for not being in line with the set objective. Some stated very low WTP value especially if they feel that vaccination should be paid for by the government. The small sample size of respondents, 17.8% that rejected the vaccine could have induced a systematic bias. Despite these limitations, this is the first study that assessed childbearing mothers' awareness of rotavirus infection and its symptoms, acceptance, and WTP value for RV vaccination in Nigeria. The timeliness of this study makes the findings useful for RV vaccination planning in Nigeria to meet with the Millennium Development Goal 4 which rests on reducing child mortality.

CONCLUSION

The findings showed that childbearing mothers in Anambra State have a good level of awareness of rotavirus infection, which could be improved. The majority of the mothers accepted RV vaccination of their children. This high acceptance should present an opportunity for increased uptake of the RV vaccine in the country through inclusion in the childhood immunization schedule. However, most mothers were willing to pay a maximum amount, which is one-ninth of the landing cost per dose of the vaccine, and therefore the required government should set priorities to further reduce the cost of the vaccines considering its certified benefits. The awareness level of mothers could be improved through adequate advocacies and sensitization through healthcare professionals and other means of certified information dissemination.

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Competing interests: The authors declare that they have no competing interests

Ethics approval and consent to participate

The study was conducted following the ethical standards of the Helsinki Declaration (1964, amended most recently in 2008) of the World Medical Association. Ethical approval to carry out this study was gotten from Nnamdi Azikiwe University Teaching Hospital Ethics Committee on 12 July 2018 with Reference number NAUTH/CS/66/VOl11/071/2018/035. Oral consent was sought from the eligible mothers after the introduction and briefing on the objectives of the study. The confidentiality and anonymity of the study participants were maintained by not including any identity identifier in the questionnaire.

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