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Acceptance of Childhood Rotavirus Vaccine Among Mothers at The Point of Rotavirus Vaccine Introduction: A case study from Awka Anambra State Nigeria

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Abstract

Background: Rotaviruses are the single most important cause of severe diarrhoeal illness in infants and young children worldwide. In Africa, Nigeria has one of the highest under 5 years rotavirus disease prevalence of 56% and mortality due to rotavirus accounted for an estimated 31,000 deaths in 2013. On 22 August, 2022, targeting universal immunization, the government of Nigeria through the National Primary Health Care Development Agency (NPHCDA), with support from the World Health Organization (WHO) and partners, introduced the rotavirus vaccine into Routine Immunization (RI) Schedule. The study aimed to assess parents' acceptance to have their children vaccinated against rotavirus

Methods: We conducted A descriptive cross-sectional questionnaire-based study among 217 childbearing mothers attending clinics of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), Awka Anambra State. Data analysis was performed with SPSS version 27.

Results: One hundred and sixty-six (166/217,76.5%) of respondents had heard of rotavirus infection., while 86.5% (142/166) of them had knowledge that vaccine is the main preventive measure and 69.3% (115/166) were aware of the recent rotavirus vaccine introduction into the National Immunization Programme (NIP). Ninety-one percent (91%) (169/217) were ready to accept rotavirus vaccine because it is safe and useful to the health of their children. Only 3.7% (7/217) of respondents had some safety concerns about rotavirus vaccine. Fifty percent (50%; 108/217) respondents had given their children rotavirus vaccines (either from private facilities before introduction into NPI or following the introduction. Regarding associated factors, women who had tertiary education were three times more likely than those with lower educational level to have knowledge of rotavirus (aOR=2.992; 95%CI=1.425-6.028; p=<0.001). Respondents emphasized the need for more information on the vaccine effectiveness and safety with the Medical Doctor having the highest confidence in the doctor to provide information about immunization.

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Introduction

Globally, rotaviruses are the primary cause of serious diarrheal disease in newborns and young children[1]. By the age of five years most children irrespective of socioeconomic setting will have been infected at least once [2]. In the course of the disease, many children will need medical attention due to extensive fluid loss. The burden of severe rotavirus illness and death is greatest in children from countries with low socioeconomic status, with more than 80% of rotavirus related deaths estimated to occur in Asia and sub-Saharan Africa [2][3]. In Africa, Nigeria has one of the highest under 5 years rotavirus disease prevalence of 56% [4] and mortality due to rotavirus accounted for an estimated 31,000 deaths in 2013[4][5].

Rotavirus vaccines should be included in all national immunization programmes and considered a priority, particularly in countries with high Rotavirus Gastroenteritis (RVGE) -associated fatality rates, such as in South and South-eastern Asia and sub-Saharan Africa. Introduction of rotavirus vaccine should be accompanied by measures to ensure high vaccination coverage and timely administration of each dose [6].

Currently available rotavirus vaccines are live, oral, attenuated rotavirus strains of human and/or animal origin that replicate in the human intestine to elicit an immune response. The first 2 rotavirus vaccines prequalified by WHO were: RotaTeq2 (Merck & Co. Inc., Whitehouse Station, NJ, USA) in 2008, and Rotarix (GlaxoSmithKline Biologicals, Rixensart, Belgium) in 2009. In 2018, two additional vaccines were prequalified by WHO: Rotavac (Bharat Biotech International Ltd, India) and ROTASIIL (Serum Institute of India, India) [6].

On 22 August, 2022, targeting universal immunization, the government of Nigeria through the National Primary Health Care Development Agency (NPHCDA), with support from the World Health Organization (WHO) and partners, introduced the rotavirus vaccine into the Routine Immunization (RI) Schedule. The introduction of the vaccine into the RI programme is in recognition of the magnitude of rotavirus-related diarrhoea disease burden and the immunization programme aims to avert over 50,000 child deaths from the disease annually. With this, the vaccine that costs around $11 USD or more per dose in some healthcare facilities across the country will be given free of cost to all infants at the age of 6, 10 and 14 weeks, along with other vaccines under the RI programme [7].

Few studies regarding the acceptability of rotavirus vaccination among parents have been published. Acceptance of health commodity like childhood vaccine is believed to be greatly dependent on awareness and willingness to access such services. It is believed [8] that low level of acceptance of vaccine maybe related to poor awareness and health seeking behavior of the people in a setting. This is strongly supported by Konwea and colleagues who outlined that acceptance of vaccine is influenced by parent's knowledge of the vaccine and its place in RI schedule [9].

A study conducted in Canada[10] in 2009 reported that 67% of parents accepted to give childhood vaccines including rotavirus to their children. In a US qualitative study [11], a lack of awareness on rotavirus diarhoea and a need for more information about the disease and the vaccine were found as barriers to receiving vaccine among parents. Parents generally deemed the vaccine to be acceptable and most of them reported that they would rely on their health care provider's recommendation for whether their child should receive the rotavirus vaccine.

This study aimed to assess parents' acceptance to have their child vaccinated against rotavirus.

Materials and Methods

Study Site

Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), formerly called Anambra State University Teaching Hospital (ANSUTH), is a state government owned tertiary heath care institution located in Awka, Anambra State, Nigeria. It is a teaching hospital for training of various medical personnel and is affiliated to the Chukwuemeka Odumegwu Ojukwu University. It offers the full range of medical services and diagnostics expected of a typical teaching hospital, including provision of good antenatal care (ANC) and Child Health Care (immunization) services.

Study Design

This is a descriptive cross-sectional study conducted among child bearing mothers attending Antenatal clinics, General Out Patients Department, presenting their children to Children Out Patients department and immunization clinics of Chukwuemeka Odimegwu Ojukwu University Teaching Hospital, Awka Anambra State Nigeria between February and March 2023.

Sample size calculation

The number of samples [217] was determined based on the formula of Lwanga et al,[12] considering a 10% improperly filled questionnaires. Confidence interval was set at 95%. A 14% prevalence of awareness of rotavirus from previous study [8] was used in this calculation.

Inclusion and exclusion criteria

Participation was open to parents and legal guardians of newborns or young children who were willing to participate and provided informed consent, and who shared or hold sole responsibility for the health and welfare of the child. Mothers who were not willing to participate or failed to give consent were excluded from participating.

Data tool and data collection

A structured and validated questionnaire was used as tool to collect data from participants. The interviewers were resident doctors trained on administration and interpretation of the questionnaires in both English and the local languages as the case maybe. After explaining the purpose of the study to the participants, their informed consent was obtained and the questionnaire administered to them. Information in the questionnaire collected include basic demographics of the participants, Knowledge, and rating of knowledge of rotavirus disease, source of knowledge of rotavirus disease, knowledge of the preventive methods, current vaccine, acceptance and likelihood of recommending these vaccines to other mothers.

Determinants of socio-economic status of participants

There is no consensus on various socioeconomic classifications in Nigeria, because of the unstructured nature of the society. However, the system of Ibadin and George [13] which was a slight modification of Oyedeji et al[14] was used to determine monthly income and individual educational level as independent determinants of socio-economic status. Income included all possible sources of income available to the individual. Therefore, for the purpose of this study, participants were categorized into three classes, according to their reported income. Low-income earners received 30,000 Naira (₦) or less per month – the minimum wage in Nigeria. The middle-income class earned ₦100,000 or less per month which is about the salary level of a newly employed Nigerian graduate. The upper income class earned more than ₦100,000 per month, (one US dollar is equivalent to 876 Naira [July 24 2023]). Educational level was defined as the highest level of individual education completed, and was categorized into four groups: No formal education; primary (1-6 years); secondary (7-12 years); and, tertiary (>13 years).

Data analysis

Data was entered and analyzed with SPSS version 27. Discrete variables were summarized using frequency tables and percentages, while quantitative variables were analyzed using mean and standard deviation. Tests of association between selected variables and respondents' variables were done using Pearson Chi-square or Fisher exact or as appropriate. A multivariate logistic regression using a stepwise model selection was conducted and the adjusted odd ration (aOR) and its corresponding 95% confidence interval (CI) were analyzed to identify risk factors associated with knowledge of rotavirus disease. All test were two tailed and the results were evaluated at a significant level of less than 0.05.

Ethical Consideration

Ethical approval for this study was obtained from ethics and research committee of Chukwuemeka Odumegwu Ojukwu

University Teaching Hospital, Awka Anambra State Nigeria (COOUTH/CMAC/ETH.CVol.1/FN: 04/251).

Results

Participants Demographics

All the 217 prospective participants approached in this study responded yielding a 100% rate. Respondents consist of mothers and women of child bearing age whose mean age was 31.72±5.65 and 135 (62.2%) of them aged between 25 to 34 years. The mean age of the mother's index child was 12.6±13.7 months and 134 (61.8%) of them were < 12 months of age. Majority 85 (39.2%) of study respondents were recruited from immunization clinic, 212 (97.7%) are married and 211 (97.2%) have Christianity as religion. About 106 (48.8%) had between 2 to 3 children, 169 (77.9%) of them were urban dwellers and 167 (77%) had tertiary education, 165 (76%) of their husbands also had tertiary education. Majority of respondents 52 (24.5%) earn between 50,000 to 99,000 Naira as average monthly income, 109 (50.2%) of them jointly take action on their child's immunization matters and 121 (56.5%), 60 (28.0%) of their index children had up to date immunization and fully immunized status respectively (Table 1).

Table 1. Main Characters of the subjects

Character	Frequency	%
Age of Participants (n=217)	**Mean 31.72 (SD ± 5.65) Range = 34**	
<= 24 years	22	10.1
25 to 34 years	135	62.2
35 to 44 years	53	24.4
>= 45 years	7	3.2
Age of Index Child (n=217)	**Mean 12.60 (SD ± 13.7) Range = 86**	
< 12 months	134	61.8
12 to 26 months	63	29
25 to 41 months	8	3.7
>= 42 months	12	5.5
Clinic from where they were recruited		
Immunization Clinic	85	39.2
Post-natal Clinic	5	2.3
Children Out Patient	72	33.2
Children Emergency Room	22	10.1
Mother and Child Clinic	6	2.8
Antenatal Clinic	27	12.4
Married Status		
Married	212	97.7
Single	4	1.8

Single	4	1.8
Divorcee	1	0.5
Religion		
Christianity	211	97.2
Islam	2	1.0
Others	4	1.8
# of Children		
1 child	67	30.9
2 - 3 children	106	48.8
>= 4 children	41	18.9
Missing Data	3	1.4
Place of Residence		
Urban	169	77.9
Semi urban	43	19.8
Rural	4	1.8
Missing Data	1	0.5
Mothers Highest Education		
Primary	2	0.9
Secondary	48	22.1
Tertiary	167	77
Fathers Highest Education		
None	1	0.5
Primary	1	0.5
Secondary	45	20.7
Tertiary	165	76
Non Applicable*	5	2.3
Mothers Average Income (N) (n=212)		
<18,000	20	9.4
18,000 to 29,000	47	22.2
30,000 to 49,000	48	22.6
50,000 to 99,000	52	24.5
100,000 to 120,000	24	11.3
>120,000	21	9.9
Who takes decision on Childs Immunizations (n=217)		
Father	6	2.8
Mother	102	47
Both Parent	109	50.2
Index Childs Immunization History (n=214)		
Fully immunized =/>15mths	60	28
Up2Date < 15mths	121	56.5
Unimmunized =/>15mths	8	3.7

Delayed immunization < 15mths	25	11.7

Single mothers/divorcees

Knowledge of Rotavirus among the respondents

Out of the 166 (76.5%) of respondents that had knowledge of rotavirus, 142(85.5%) knew that vaccination was the main preventative measures, 144(84.9%) understood that rotavirus is major cause of Acute gastroenteritis (AGE) among under 5 years old children. A third of those who had knowledge of rotavirus were aware that the virus can be transmitted by contaminated surfaces (37.35%) and 115 (69.3%) were aware of rotavirus vaccine availability in the National immunization schedule (Table 2).

Table 2. Respondents Knowledge about rotavirus

Item	Frequency	%
Have heard about Rotavirus infection	166/217	76.5
Knowledge that Vaccination is the main preventive measure (n= 166)*	142	85.5
Aware rotavirus vaccine is now introduced into Nigeria NPI (EPI) (N=166)*	115	69.3
Happy Rotavirus Vaccine is now introduced (n=166)*	161	97
Rotavirus vaccine prevents all diarrohea diseases among Children (n=166)*	115	69.3
Rotavirus is the major cause of diarrhoea among U5 (n=166)*	141	84.9
Modes of Rotavirus Transmission		
Contaminated surfaces, hands, water and Foods*	62	37.35
Person to person*	14	8.43
Contaminated environment*	52	31.33
Will you Recommend Rotavirus vaccine to other Mothers?*		
Yes	149	89.76
No	7	4.22
May be	10	6.02

Calculated only among those (166) participants that had knowledge of Rotavirus

Table 3 partly showed the multivariate stepwise logistic regression analysis results on the factors affecting mothers' knowledge of rotavirus. The findings demonstrated that only one factor was significantly associated with knowledge of rotavirus. Mothers with tertiary education were about 3 times (aOR = 2.992; 95% CI =1.485 – 6.028; p=<0.001) likely to have good knowledge of rotavirus infection than mothers with lower educational level. Mothers whose average monthly income was higher(>N120,000) (aOR = 0.106, 95% CI =0.107 – 0.937) and those classified as having higher socio-economic status (aOR =0.366, 95% CI 0.134 – 0.995) had lower odds of having good knowledge of rotavirus infection. However, these analyses showed no link between knowledge of rotavirus and age range, marital status, religion, place of

residence and occupation of the respondents.

Table 3. Multivariate regression analysis of factors associated with knowledge of rotavirus and maternal belief about rotavirus vaccine among the study participants.

	Knowledge of Rotavirus			**Maternal Belief about Rotavirus Vaccine**		
	Yes 166 (76.5%)	**aOR (95% CI)**	***p-value***			
Age Range				**Accept rotavirus vaccine because it is safe (n=198, 91.2%) N(%)**	**Considers rotavirus vaccine useful to the child(n=189, 87%) N(%)**	**Considers rotavirus vaccine harmful to the child (n=8) N(%)**
<= 24 years *(Ref)*	17(7.8)	1	_	20(10.1)	18(9.6)	1 (12.5)
25 to 34 years	100(46.1)	1.050 (0.367 - 3.001)	0.928	123(62.1)	119 (63.3)	6 (75.0)
35 to 44 years	44(20.3)	0.598 (0.258- 1.334)	0.209	48(24.2)	45 (23.9)	0 (0)
>= 45 years	5(2.3)	1.170 (0.218- 6.269)	0.855	7(3.7)	7 (3.7)	1 (12.5)
				p=0.913	*p=0.079*	p=0.270
Marital Status						
Divorced *(Ref)*	1(0.5)	1	_	1 (0.5)	1 (0.5)	0 (0)
Married	163(74.7)	1.235 (0.135 - 11.301)	0.852	194 (98.0)	185 (97.9)	7 (87.5)
Single	2(1.4)	1.087 (0.111 - 10.680)	0.943	3 (1.5)	3 (1.6)	1 (12.5)
				p=0.001	p=0.304	p=0.237
Educational Level						
Secondary *(Ref)*	29(13.4)	1	_	43 (21.7)	43 (22.9)	2 (25.0)
Tertiary	137(63.1)	2.992 (1.485 - 6.028)	**<0.001**	153 (77.3)	144 (76.6)	6 (75.0)
				p=0.001	*p=0.304*	*p=0.292*
Religion						
Others *(Ref)*	4 (1.8)	1	_	*2 (1.0)*	2 (1.1)	0 (0)
Christianity	161 (74.2)	1.553 (0.177 - 13.605)	0.691	*192 (98.0)*	183 (97.9)	8(100)
Islam	2 (0.9)	3.300 (0.203 - 53.717)	0.402	*2 (1.0)*	2 (1.1)	0 (0)
				p=0.983	*p=0.962*	*p=0.972*
Place of Residence						

Rural *(Ref)*	4(1.8)	1	_	*4(2.0)*	3(1.6)	1(12.5)
Semi-urban	33(15.2)	1.049 (0.476 - 2.311)	0.906	40(20.2)	37(19.6)	0(0)
Urban	129(59.4)	1.053 (0.433 - 2.101)	0.905	*154(77.8)*	149(78.8)	7(87.5)
				p=0.511	*p=0.328*	*p=0.409*
Occupation						
Unemployed / Housewife *(Ref)*	17 (7.8)	1	_	21 (10.6)	21 (11.1)	1 (12.5)
Artisan	14 (6.5)	2.327 (0.942 - 5.748)	0.067	17 (8.6)	17 (9.0)	0 (0)
Trading	42 (19.4)	1.010 (0.491- 2.076)	0.978	50 (25.3)	49 (25.9)	2 (25.0)
Students	2 (0.9)	0.860 (0.691- 1.102)	0.233	4 (2.0)	2 (1.1)	0 (0)
Civil Servants	19 (8.8)	0.658 (0.213 - 2.032)	0.458	22 (11.1)	18 (9.5)	2 (25.0)
Other Professionals	72 (33.2)	0.544 (0.277- 1.070)	0.078	84 (42.4)	82 (43.4)	3 (37.5)
				p=0.001	***p=0.001***	*p=0.069*
Average Monthly Income (n=212)						
<18,000 *(Ref)*	20(9.4)	1	_	19(9.6)	3(0.7)	0(0)
18,000 to 29,000	47(22.2)	0.812 (0.283 - 2.335)	0.7	45(22.7)	8(4.4)	1(12.5)
30,000 to 49,000	48(22.6)	1.062 (0.386 - 2.984)	0.908	43(21.4)	16(8.8)	0(0)
50,000 to 99,000	52(24.5)	0.386 (0.125 - 1.194)	0.099	48(24.2)	41(22.7)	2(25.0)
100,000 to 120,000	24(11.3)	0.559 (0.153 - 2.041)	0.379	22(11.0)	50(27.0)	3(37.5)
>120,000	21(9.9)	0.106 (0.107 - 0.937)	**0.044**	21(10.6)	59(32.6)	2(25)
				p=0.234	*p=0.445*	*p=0.897*
Socio-Economic Status (n=212)*						
Low *(Ref)*	67(31.6)	1	_	63 (32.0)	53 (28.6)	4 (50.0)
Middle	100(47.2)	0.742 (0.374 - 1.473)	0.334	91 (46.2)	89 (48.1)	4 (50.0)

High	45(21.2)	0.366 (0.134 - 0.995)	**0.049**	43 (21.8)	43 (23.2)	0 (0)
aOR: Adjusted Odd Ratio; CI: Confidence Interval;				***p=0.049***	*p=0.095*	*p=0.516*

Beliefs of mothers about Rotavirus vaccine

Table 3 also assessed the maternal belief about rotavirus vaccine and it was observed that 91.2% (198/217) of the mothers would be willing to accept rotavirus vaccine for their children and among those women, being married (p=0.001), being educated (p=0.001) and having a job (p=0.049) were significant factors to their accepting the vaccine for their children. No difference between mothers age range, place of residence, religion and socio-economic status (p>0.05) was found. We also observed that 87% (189/217) of the mothers believed the vaccine is useful to their children while 3.7% (8/217) of the mothers thought that rotavirus vaccine is harmful to their children and majority (87.5%, 7/8) of these women had some safety concerns and 12.5% (1/8) do “not want the vaccine for their children now” was their reasons of refusing rotavirus vaccines for their children.

Attitude towards Vaccine Generally

On a scale of one to five with one being ‘not likely at all’ and five being ‘most likely’, the mean score for those that responded that they would prefer to get information about vaccines from medical doctor was 5, and those that will prefer from their child nurses was 4, the least mean [2] obtained were from those that would prefer a traditional birth attendant (TBA), School teachers or traditional rulers. (Figure 1). Of the 214 (98.6%) participants who gave immunization information about their index child’s immunization status, 56.6% (60/214) were up to date, 3.7% (8/214) children were under immunized, 11.7% (25/214) children had delayed immunization and 28% (60/214) were fully immunized (Table 4). Using respondents index child as a reference on the issue of who takes decisions concerning child’s immunization in the family, about half (50.2%; 109/214) of the respondents replied that both parents were responsible for this decision while 47% of mothers answered they take charge on issues concerning child immunization matters. Another important information from this study is the general immunization status of the index child. It was observed that 56.6% (121/214) of the index children of respondents had their immunization up to date, 28% (60/124) index children were fully immunized, 11.7% of them had delayed immunization and 3.7% (8/124) were under immunized (Table 4). We also asked if the index child had received rotavirus vaccine, and 49.8% (108/217) children had received the vaccine, 32.7% had not, 5.5% (12/217) of them were not sure if the child received and 12% (26/217) children had no information and therefore classified as missing data. Further evaluation of the 71 children that had not received the vaccine was done and it showed that 45.07% (32/71) children were outside the recommended age window, 29.58% (21/71) mothers lacked knowledge of the vaccine and its availability in the country’s routine immunization While 9.86% mothers did not want their children to receive the vaccine, 15.46% said their child’s doctors was yet to recommend the vaccine for their children (Table 4).

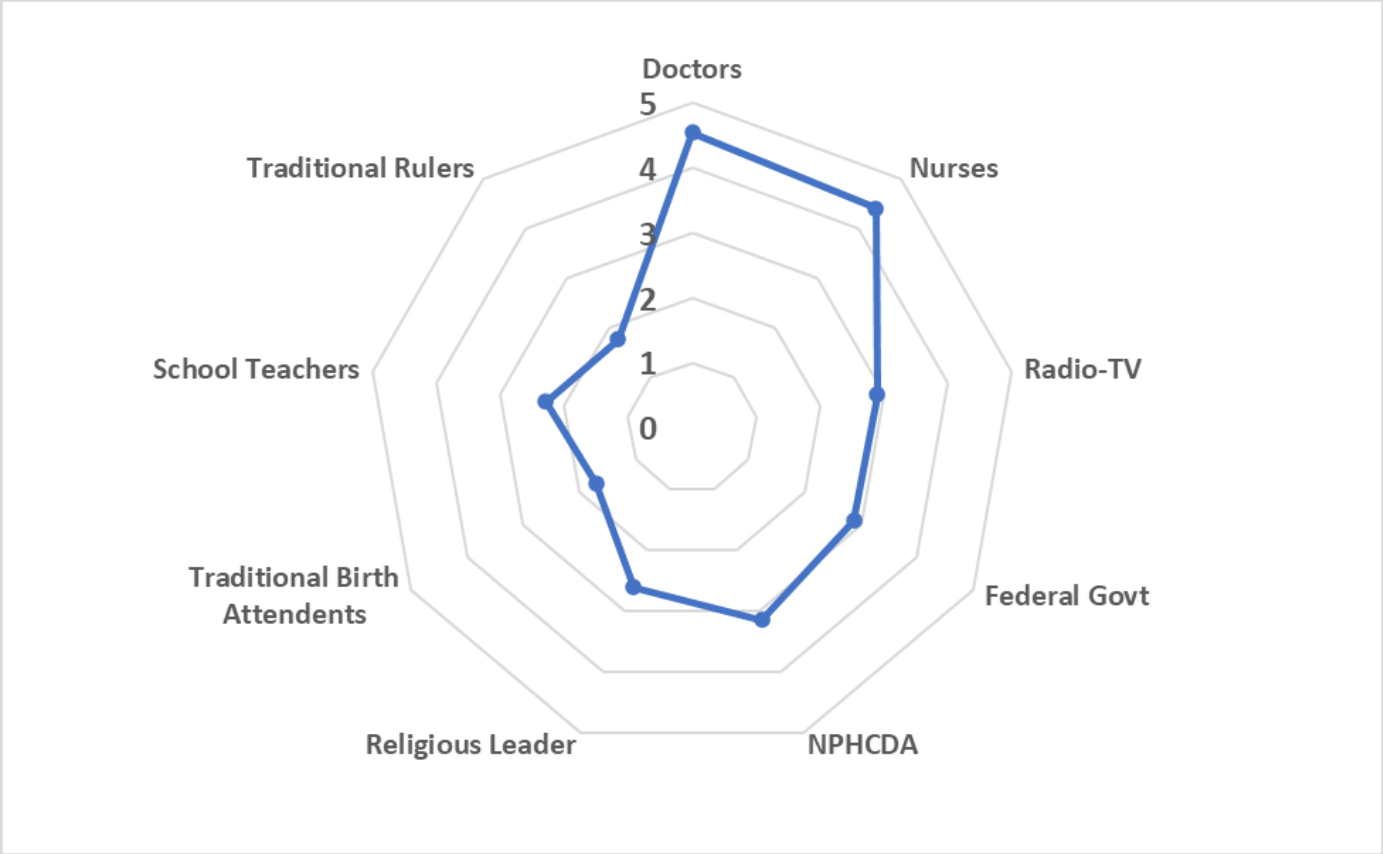

Figure 1. Scale rate of different media to communicate information on vaccines

NPHCDA= National Primary Health Care Development Agency

Table 4. Attitude about Vaccines and Rotavirus Vaccine

Belief	n	%
Who takes decision on Childs immunization (n=217)		
Father	6	2.8
Mother	102	47
Both Parents	109	50.2
Index Child Immunization History (n=214)		
Child fully immunized (age = or above 15months)	60	28
Child immunization upto date (age < 15 months)	121	56.6
Child under immunized (age= or greater than 15 months)	8	3.7
Child had delayed immunization (age < 15 months)	25	11.7
Have your Child already received rotavirus vaccines (n=217)		
Yes	108	49.8
No	71	32.7
Not Sure	12	5.5
Missing data	26	12
Reason for not giving your child rotavirus vaccine (n=71)		
Child outside age bracket	32	45.07
Lacked knowledge of the vaccine	21	29.58
Do not want the vaccine for my child	7	9.86
Not yet recommended by child Doctor	11	15.49

Discussion

This study assessed parents' (mothers) acceptance to have their child(ren) vaccinated against rotavirus at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka Anambra State Nigeria. Majority (76.5%) of participants had knowledge of rotavirus disease and 84.9% knew that the virus is the major cause of U5 AGE. About eighty-four percent (84 %) were aware that vaccination was the main preventative measures against the virus. Our findings agree with that of Ajeagu et al, [15] in earlier work in Anambra where 61.6% of mothers investigated were aware of rotavirus and also with the report of some other investigators Pratiwi et al., [16] in Indonesia with 76.92% awareness, >80% awareness from mainland Europe by Bennnghoft et al., [17] and 82.6% good knowledge about rotavirus reported in Italy by Di-Martino et al., [18]. Similarly, some other researchers in Nigeria, Babatola et al.,[8] reported poor awareness of rotavirus and the AGE caused by it, as only 14% of their study participants. Our finding is also in contrast with that of an Indian study [19] where only 25% of participants had knowledge of rotavirus and majority of them were not aware of availability of the vaccine, and 84% by Ullah et al., [20] poor knowledge of the virus in Perhawar-Pakistan. In arears where knowledge of the virus and rotavirus vaccine was poor, it could be as a result of limited dissemination of the correct health education, health promotion where issues centering on availability of life saving vaccines were not given to be public. This could be corrected by urgent improvement in the knowledge of people through effective recommendation of vaccines and general health education during hospital visits especially during antenatal and post-natal visits by mothers and women of

reproductive age.

An important observation made in this study is the high level of knowledge of, how the virus can be transmitted, and vaccination as the main preventive measures against the virus. This level of knowledge of the participants indicates good degree of health education, health promotion about rotavirus in the study environment, more so being a tertiary health facility. This finding was in keeping with an earlier study in the same Anambra state by Ajeagu et al [15]. The respondent's knowledge of the virus and vaccination, significantly increased with educational level and this finding is in keeping with a study by Zaidi et al., [21] in Karachi Pakistan and also that of Angelillo et al.,[22] in Italy where knowledge and attitude to rotavirus vaccination increased with increase in level of education. This could be as a result of high literacy level, leading to more exposure to information. When parents have good knowledge of a vaccine especially a newly introduced one, it would mean that children born of such parents might have good access and uptake of the vaccine and other childhood vaccines thereby resulting to better health of their child(ren).

Regarding socioeconomic factors associated with willingness to accepting rotavirus vaccine, being married (p=0.001), having education (p=0.001), having employment (p=0.001) and Socio-economic status (p=0.049) were significantly related to accepting the vaccine because it is safe. This is in keeping the work in Nigeria by Ajeagu et al., [15], Oleribe et al., [23] who reported educational level, average household income, being employed as part of the predictors of mothers accepting rotavirus and newly introduced vaccines. It also agrees with a work in Turkey [19] where significant factors of parents accepting rotavirus vaccines included level of education of respondents information from a pediatrician, cost / availability of the vaccine, parents job types and timely information on need for the vaccine. This is however in contrast to the work in Ekiti state Nigeria [8] where none of the studied socioeconomic factors of the mother was a significant factor in accepting rotavirus vaccine by mothers. It is in contrast also with an Italian work of Di-Martino et al., [18] where sociodemographic characteristics were not significantly associated with the willingness to vaccinate against rotavirus. The reason for this discrepancy could be attributed to the fact that the Ekiti state study respondents, unlike this present study, had very poor knowledge of the virus, the disease it causes and the availability of vaccines.

Though majority of respondents (91.2%) agreed that they are willing to accept the vaccine for their children because it is safe, 8 (3.7%) considered the newly introduced vaccine dangerous to their children and majority (87.5%) of these said they will not be willing to accept the vaccine due to concerns related to safety while the reminder 12.5% expressed strong desires to get more information about the vaccine considering safety based on what was said in their community about COVID-19 vaccines. Similar findings were reported by Babatolu et al [8] in Nigeria where 28% respondents were not willing to accept the vaccine, Napolitano et al [24] in Italy with 11% parents not willing to accept the vaccine and Sitaresmi et al [25] in Indonesia; the most common issue raised was that the vaccine was not included in the Indonesian NIP, therefore, parents perceived it as not important. "If [a vaccine] is not obligatory, it means it is not important, right?" besides for most Muslims in Indonesia, halal status is a significant factor influencing their decision not to vaccinate. The respondents in the current study were mostly Christians and religious beliefs was not a major factor. In all these studies, many of the respondents who were not willing to accept the vaccine expressed very strong desire to receive more information about the vaccine. This was consistent with the report of Wu et al [26] from Connecticut USA.

Like in most countries, one-on-one conversation with health care workers (HCWs) were regarded as most preferred source of information on vaccination. Majority (73.15%) of study respondents reported Medical Doctors as the first in their top five source of information on matters relating to vaccinations followed by Nurses (62.33%). This is in line with a finding in Yagyakarta Indonesia [25] where participants reported receiving information on vaccination from their HCWs and this helped them have better uptake of rotavirus vaccine for their children. The Italian study by Napolitino et al [24] and Marchetti et al., [27] and a Canadian survey [10] showed that 95.2% of parents who vaccinated their children were regularly informed by their HCWs (Doctors) and this practice has brought about vaccine uptake for their children. In Sweden [28], the success recorded in immunization of children was also attributed to the role played by HCWs in having face -to-face conversation on need for vaccine uptake for their children.

Another important finding from this study was that half of the parents (Father and mother) who participated in this study jointly take decisions on matters concerning their children RI. This is in line with previous publications from Ghana [29], Nigeria [30] and a survey from six countries [31] which documented that in settings were fathers joined their wives in taking decisions on the child's immunizations, it could lead to greater probability of accepting and completing all RI vaccines. In the Ghana study [29], it was noted that father's involvement in decisions concerning child's immunization led to five times chances of completing all RI vaccines. The same can be seen in our study where majority of these children either completed their immunization or were up to date. This can also be explained further by 49.8% of the index child(ren) that have received rotavirus vaccine and the 89.76% of mothers who were willing to recommend the rotavirus vaccine to other mothers.

Study limitations

This study was conducted in a single tertiary health institution in Anambra State and its findings cannot be generalized to rest of Nigeria. Again, mothers' information on their child(ren) immunization status were obtained verbally without sighting the immunization cards, so mothers' response can be subjected to recall bias.

Conclusion

In Awka Anambra State Nigeria, acceptance of the newly introduced rotavirus vaccine was high, awareness of the severity of rotavirus disease and the availability of the vaccine in NPI was also high. Though many respondents were ready to accept the vaccine for their children, there still exist some effectiveness and safety concern which need to be addressed through more public awareness and campaigns.

References

1. ^*Lanata, C. F., Fischer-Walker, C. L., Olascoaga, A. C., Torres, C. X., Aryee, M. J., Black, R. E., & Child Health Epidemiology Reference Group of the World Health Organization and UNICEF (2013). Global causes of diarrheal disease mortality in children <5 years of age: a systematic review. PloS one, 8(9), e72788.*

https://doi.org/10.1371/journal.pone.0072788

2. [a, b, c]*Parashar, U. D., Gibson, C. J., Bresee, J. S., & Glass, R. I. (2006). Rotavirus and severe childhood diarrhea. Emerging infectious diseases, 12(2), 304-306. https://doi.org/10.3201/eid1202.050006*
3. [^]*Vizzi, E., Piñeros, O., González, G. G., Zambrano, J. L., Ludert, J. E., & Liprandi, F. (2011). Genotyping of human rotaviruses circulating among children with diarrhea in Valencia, Venezuela. Journal of medical virology, 83(12), 2225-2232. https://doi.org/10.1002/jmv.22211*
4. [a, b]*Tagbo, B. N., Mwenda, J. M., Armah, G., Obidike, E. O., Okafor, U. H., Oguonu, T., Ozumba, U. C., Eke, C. B., Chukwubuike, C., Edelu, B. O., Ezeonwu, B. U., Amadi, O., Okeke, I. B., Nnani, O. R., Ani, O. S., Ugwuezeonu, I., Benjamin-Pujah, C., Umezinne, N., Ude, N., Nwodo, C., … Nwagbo, D. F. (2014). Epidemiology of rotavirus diarrhea among children younger than 5 years in Enugu, South East, Nigeria. The Pediatric infectious disease journal, 33 Suppl 1, S19–S22. https://doi.org/10.1097/INF.0000000000000047*
5. [^]*Tate, J. E., Burton, A. H., Boschi-Pinto, C., Parashar, U. D., & World Health Organization–Coordinated Global Rotavirus Surveillance Network (2016). Global, Regional, and National Estimates of Rotavirus Mortality in Children <5 Years of Age, 2000-2013. Clinical infectious diseases: an official publication of the Infectious Diseases Society of America, 62 Suppl 2, S96–S105. https://doi.org/10.1093/cid/civ1013*
6. [a, b]*World Health Organization. Rotavirus vaccines WHO position paper-July 2021. Weekly Epidemiological Record, 96 (28): 301 – 219. Available from https://www.who.int/publications/i/item/WHO-WER9628*
7. [^]*World Health Organization. Nigeria to avert 50,000 deaths in children annually, introduces rotavirus vaccine into vaccination schedule. Available from https://www.afro.who.int/countries/nigeria/news/nigeria-avert-50000-deaths-children-annually-introduces-rotavirus-vaccine-vaccination-schedule#:~:text=Nigeria%20to%20avert%2050%2C000%20deaths%20in%20children%20annually%2C%20introduces%20rotavirus%20vaccine%20into%20vaccination%20schedule*
8. [a, b, c, d, e]*Babatola, A. O., Ojo, T. O., Ogundare, E. O., Ajite, A. B., Oluwayemi, I. O., Wuraola, I.,... Olatunya, O. S. (2020). Awareness and acceptability of rotavirus vaccine among mothers of under-five children attending children outpatient clinic of ekiti state university teaching hospital. Nigerian Journal of Medicine/ the Nigerian Journal of Medicine, 29(1), 1. https://doi.org/10.4103/1115-2613.284867*
9. [^]*Konwea, P. E., David, F. A., & Ogunsile, S. E. (2018). Determinants of compliance with child immunization among mothers of children under five years of age in Ekiti State, Nigeria. Journal of Health Research/Warasan Wichai Witthayasat Kanphaet, 32(3), 229-236. https://doi.org/10.1108/jhr-05-2018-024*
10. [a, b]*Dubé, È., Bettinger, J. A., Halperin, B., Bradet, R., Lavoie, F., Sauvageau, C.,... Boulianne, N. (2012). Determinants of parents' decision to vaccinate their children against rotavirus: results of a longitudinal study. Health Education Research, 27(6), 1069-1080. https://doi.org/10.1093/her/cys088*
11. [^]*Patel, M. M., Janssen, A. P., Tardif, R. R., Herring, M., & Parashar, U. D. (2007). A qualitative assessment of factors influencing acceptance of a new rotavirus vaccine among health care providers and consumers. BMC pediatrics, 7, 32. https://doi.org/10.1186/1471-2431-7-32*
12. [^]*Lwanga, Stephen Kaggwa, Lemeshow, Stanley & World Health Organization. (1991). Sample size determination in health studies: a practical manual / S. K. Lwanga and S. Lemeshow. World Health Organization.*

https://apps.who.int/iris/handle/10665/40062

13. ^*Ibadin, M. O., & Akpede, G. O. (2021). A revised scoring scheme for the classification of socio-economic status in Nigeria. Nigerian Journal of Paediatrics, 48(1), 26-33. https://doi.org/10.4314/njp.v48i1.5*
14. ^*Oyedeji, G. A. (1985). Socio-economic and cultural background of hospitalized children in Ilesa. Niger. J. Paediatr., 12, 111-117.*
15. a, b, c*Ajagu, N., Ugoma, M.., Okafor, O..., Ekwunife, O., Ogbonna,. B.., Okpalanma,. N.., Mmaduekwe,. H.., & Aghahowa, S. (2022). Awareness And Willingness-To-Pay For Rotavirus Vaccine In Anambra State, Nigeria. Journal of Current Biomedical Research, 2(1), 50-63. https://doi.org/10.54117/jcbr.v2i1.7*
16. ^*Pratiwi, A. D., Endarti, D., Andayani, T. M., & Kristina, S. A. (2020). Parent's knowledge on rotavirus diarrhea and vaccine in Indonesia. Vaccine Research, 7(1), 38-43. https://doi.org/10.29252/vacres.7.1.38*
17. ^*Benninghoff, B., Pereira, P., & Vetter, V. (2020). Role of healthcare practitioners in rotavirus disease awareness and vaccination - insights from a survey among caregivers. Human vaccines & immunotherapeutics, 16(1), 138-147. https://doi.org/10.1080/21645515.2019.1632685*
18. a, b*Di Martino, G., Mazzocca, R., Camplone, L., Cedrone, F., Di Giovanni, P., & Staniscia, T. (2023). Attitudes and Beliefs towards Rotavirus Vaccination in a Sample of Italian Women: A Cross-Sectional Study. Vaccines, 11(6), 1041. https://doi.org/10.3390/vaccines11061041*
19. a, b*Gündoğdu, Z., & Sezer, O. Y. (2023). Changing parental attitudes towards rotavirus vaccine. Curēus. https://doi.org/10.7759/cureus.35348*
20. ^*Ullah, S., Malik, F. R., Qureshi, S. H., & Ullah, A. (2019). Knowledge Assessment of Rota Virus Vaccine And Its Association With Maternal Education: A Cross Sectional Study Among Mothers Visiting Kuwait Teaching Hospital-Peshawar, Pakistan. Khyber Medical University Journal. https://doi.org/10.35845/kmuj.2019.19326*
21. ^*Zaidi, T. H., Zafar, M., Naz, R., Ahmed, S. S., Saleem, I., Sundardas, K.,... Siraj, T. (2021b). Knowledge and attitude regarding rotavirus and its vaccination among medical students in Karachi, Pakistan. Public Health in Practice, 2, 100171. https://doi.org/10.1016/j.puhip.2021.100171*
22. ^*Angelillo, I. F., Ricciardi, G., Rossi, P., Pantisano, P., Langiano, E., & Pavia, M. (1999). Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. Bulletin of the World Health Organization, 77(3), 224-229*
23. ^*Oleribe, O. O., Kumar, V., Awosika-Olumo, A., & Taylor-Robinson, S. D. (2017). Individual and socioeconomic factors associated with childhood immunization coverage in Nigeria. the Pan African Medical Journal, 26. https://doi.org/10.11604/pamj.2017.26.220.11453*
24. a, b*Napolitano, F., Adou, A. A., Vastola, A., & Angelillo, I. F. (2019). Rotavirus Infection and Vaccination: Knowledge, Beliefs, and Behaviors among Parents in Italy. International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health, 16(10), 1807. https://doi.org/10.3390/ijerph16101807*
25. a, b*Sitaresmi, M. N., Seale, H., Heywood, A. E., Padmawati, R. S., Soenarto, Y., Macintyre, C., & Atthobari, J. (2022). Maternal knowledge and attitudes towards rotavirus diarrhea and vaccine acceptance in Yogyakarta, Indonesia: a qualitative study. Paediatrica Indonesiana, 62(5), 333-340. https://doi.org/10.14238/pi62.5.2022.333-40*
26. ^*Wu, A. C., Wisler-Sher, D. J., Griswold, K. J., Colson, E. R., Shapiro, E. D., Holmboe, E. S., & Benin, A. L. (2007).*

Postpartum mothers' attitudes, knowledge, and trust regarding vaccination. Maternal and Child Health Journal, 12(6), 766-773. https://doi.org/10.1007/s10995-007-0302-4

27. ^*Marchetti, F., Verazza, S., Brambilla, M., & Restivo, V. (2022). Rotavirus and the web: analysis of online conversations in Italy during 2020. Human vaccines & immunotherapeutics, 18(1), 2002087. https://doi.org/10.1080/21645515.2021.2002087*
28. ^*Sjögren, E., Ask, L. S., Örtqvist, Å., & Asp, M. (2017). Parental conceptions of the rotavirus vaccine during implementation in Stockholm: A phenomenographic study. Journal of Child Health Care, 21(4), 476-487. https://doi.org/10.1177/1367493517734390*
29. a, b*Brugha, R., Kevany, J., & Swan, A. V. (1996). An investigation of the role of fathers in immunization uptake. International Journal of Epidemiology, 25(4), 840-845. https://doi.org/10.1093/ije/25.4.840*
30. ^*Rammohan, A., Awofeso, N., & Fernandez, R. C. (2012). Paternal education status significantly influences infants' measles vaccination uptake, independent of maternal education status. BMC Public Health, 12(1). https://doi.org/10.1186/1471-2458-12-336*
31. ^*Raji, M. O., Sani, A., Ibrahim, L. S., Muhammad, H., Oladigbolu, R. A., & Kaoje, A. U. (2019). Assessment of the knowledge of fathers, uptake of routine immunization, and its associated factors in a rural community of North West Nigeria. Annals of African Medicine, 18(2), 97. https://doi.org/10.4103/aam.aam_41_18*