



Parents' Acceptability and Health Workers' Perspectives of Pneumococcal Conjugate Vaccination for Under-Fives in Ile-Ife, Nigeria.

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KEYWORDS

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ABSTRACT

Background

Pneumococcus, apart from being the commonest bacterial cause of Respiratory tract infections (RTIs) also causes a wide array of morbidities which can all be prevented with the administration of potent Pneumococcal conjugate vaccine. Despite its effectiveness and availability, Pneumococcal vaccines are not part of routine immunization in Nigeria. This study assessed parents' acceptability and health worker's perspectives of Pneumococcal Conjugate Vaccination for under-fives.

Methods

The cross-sectional survey was conducted in Ife Central Local Government Area, Osun state. An interviewer-administered questionnaire was used to collect information from 400 parents of under-fives selected via multi-stage random sampling. In-depth interviews were conducted for the heads of immunization units in four selected facilities in the local government area. Data were analysed using SPSS version-16.

Result

More respondents were females, married and had tertiary education. About three-fifth (59.2%) of parents had good knowledge about RTIs though majority (79.00%) were unaware of Pneumococcal Conjugate Vaccine(PCV). most parents (93.5%) were willing to accept PCV for their children but only 43.5% of them could afford to pay for the cost of the vaccine at the prevailing market price. Most health workers (three out of four) interviewed were not aware of PCV. Most parents (96.25%) and all health workers interviewed wanted PCV incorporated into the National Program on Immunization (NPI). Parents with good knowledge about respiratory tract infections (RTIs) were significantly willing to accept PCV for their under-fives ($p= 0.005$). Younger parents less than 35years, parents with lower educational attainments and low income groups significantly could not afford to pay for the cost of vaccines. ($p=0.014, 0.001$ and <0.001 respectively).

Conclusion

Though almost three fifth of parents surveyed had good knowledge about RTIs, awareness about PCV was poor and most of them were unable to afford PCV. There is an overwhelming need to incorporate PCV in to the NPI, as both parents and health workers agreed. Aside from overcoming a major financial barrier to vaccine access, this will also make PCV widely available to parents who are already willing to accept the vaccine for their children.

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Introduction

Pneumococcal disease remains one of the most important causes of morbidity and mortality globally,¹ principally at the extremes of ages (the children and the elderly), but this spectre is worse among under-fives particularly in developing countries. *Streptococcus pneumoniae* which is the causative agent has been implicated in various morbidities ranging from mild catarrhal symptoms, superficial skin infections, to the invasive ones such as severe pneumonia, sepsis and meningitis among others.^{3, 4} Notable within this group of diseases is the invasive pneumococcal disease as it is the leading cause of vaccine preventable deaths of under-five children worldwide. According to the WHO, up to 1.6 million people die each year globally as a result of pneumococcal diseases - about half of them are children younger than 5 years of age in developing countries.⁵ The greatest burden of morbidity and mortality from pneumococcus arise from Pneumonia.⁶ Even though a considerable number of respiratory tract infections are of viral etiology, bacterial causes are also of prime significance as they could be primary causes or complicate RTIs of other etiology. Of all known bacterial causes, *Pneumococcus* is the commonest cause of RTIs.^{7, 8} Nasal carriage occurs frequently and as much as 20-60% of healthy children and 5-10% of adults may be carriers.³ There are about 91 serotypes of the bacteria based on capsular polysaccharide variation, though just 11 serotypes account for 80% of disease in under-fives.³ The serotypes commonly associated with invasive diseases in Nigeria includes but not limited to the following; 1, 2, 4, 5, 12, 19f, 25, 45, 41 and 48.^{9, 10}

At present there are two types of *Pneumococcus* vaccine which are; the Pneumococcal Polysaccharide vaccine (PPSV23 active against 23 serotypes) a killed vaccine with little immunogenicity in children but is licensed for routine use in adults. The second is the Pneumococcal Conjugate Vaccine (PCV) which is

effective in preventing pneumococcal disease; it is a killed vaccine in the form of a conjugated purified capsular polysaccharide. It is capable of inducing immunity in infants with antibody booster response to multiple doses of the vaccine and also confers some herd immunity.^{4, 11} These protective effects are of immense public health importance especially in the face of a rising trend of Pneumococcal resistance to antibiotics.¹² There are currently two commercially available PCV types in Nigeria namely; Synflorix (decavalent i.e active against 10 serotypes) and Prevnar 13 (triskaivalent i.e active against 13 serotypes) with both having a schedule of three doses at six, ten and fourteen weeks, though a fourth booster dose at 12-15 months is encouraged.

Despite its effectiveness and increasing availability, Pneumococcal conjugate vaccines (PCV) are yet to be fully deployed in developing countries where the highest burden of disease and deaths occur.¹³ Earlier, it was advocated that children with significantly higher risks of RTIs (such as asthmatics, sickle cell anaemics and HIV positive children) be immunized against pneumococcal disease. However, with increasing evidence from developed economies of the tremendous impact of PCVs on reduction in under-five mortality, WHO now recommends the inclusion of PCV into National immunization programs especially in countries that have under-five mortality rates greater than 50/1000 live births and high HIV prevalence.⁵

Nigeria, based on above criteria is more than qualified to have PCV incorporated into the routine immunization schedule of her National programme on Immunization (NPI) but this is yet to happen. Nigeria still has a high under-five mortality of 157/1000 (2008 NDHS).¹⁴ About one-fifth (17%) of these deaths are due to pneumonia,¹⁵ a sizeable portion of which pneumococcal conjugate vaccine could prevent.

While anticipating the incorporation of PCV into

routine immunization, there is the need for empirical evidence about parents' and health workers' perspectives on the vaccine as this will be very useful in ensuring the effective incorporation of PCV into the NPI schedule. It is also well documented in literatures that vaccine uptake is not only dependent on providing vaccines but also on the knowledge and attitude of parents,^{16,17} access to immunization clinics, appropriate staffing,¹⁸ availability of immunization consumables (such as syringes and needles) and costs incurred by parents.¹⁹

At present there exists sparse literature in Nigeria on the perspectives of parents and health workers about the newly licensed vaccine that is being considered for incorporation into the NPI schedule of routine immunizations.

Therefore, this study was conducted to assess health workers' perspectives, parents' knowledge about childhood respiratory illnesses, their awareness and willingness to accept PCV for their under-fives. Furthermore, the study sought to identify gaps that need to be addressed in ensuring optimal vaccine uptake in anticipation of a national PCV immunization programme.

Methods

The study was conducted in Ile-Ife, the headquarters of Ife Central Local Government Area (LGA) in Osun State, South Western Nigeria. The LGA is administratively made up of ten wards. Ile-Ife is a semi-urban town with a population of approximately 167,000 people.²⁰ The inhabitants largely belong to the Yoruba ethnic group. The major occupation are farming and trading. Other residents are civil servants and artisans. Ife Central LGA has four primary health centres that offer comprehensive immunization services involving all antigens namely: Urban Comprehensive health Centre, Eleyele, Comprehensive

Health Centre, Aderemi, Comprehensive Health Centre Enuwa and Obafemi Awolowo University Health Centre. The study is a cross sectional descriptive design employing both quantitative and qualitative research methods. The study population comprised of parents of under-fives and heads of immunization units in selected health facilities.

Sample size of respondents for the household survey was estimated using the Computer Programme for Epidemiologists (PEPI), version 3.01, employing the sample size formula for estimating single proportions as described by Armitage and Berry, and cited in Gahlinger and Abramson (1999).²¹ Since the proportion of parents that are aware of PCV was not known, 50% value was used to estimate sample size. Using a standard normal deviate of 1.96 at 95 percent confidence level and a maximal allowable difference from true proportion of 5 percent (0.05), a sample size of 384 was obtained. This was increased to 400 (by 4%) to account for possible cases of attrition.

Sampling technique: The 400 parents were selected from 400 households through a multistage sampling technique. Ife central LGA of Osun State consists of 400 enumeration areas (EAs). These EAs were the first stage sampling units. Ten percent (40) of the EAs were selected through a simple random sampling procedure. For all selected EAs, all the constituent households were listed. The second stage involved a systematic random sampling technique. From each EA household listing, a first household was selected by simple random sampling technique (by balloting), and one eligible respondent was interviewed from the initial household and subsequently from every other Kth household until 10 eligible parents were recruited in the EA. The K factor was derived from the formula $K = N/n$, where N is the total number of households and $n=10$. In each household, one consenting male or female parent of an under-five child was interviewed at a time.

Data Collection Techniques

Quantitative: A structured interviewer administered household questionnaire was used to collect information on socio-demographic characteristics of the study participants, their knowledge about respiratory tract infections awareness about PCV. After the knowledge and awareness based questions, information about PCV and current market price were provided, questions were then asked on willingness to accept PCV at no cost and ability to pay for PCV for their under fives at prevailing market price for a complete regimen of three doses. Other information elicited included perception about incorporating PCV into the NPI schedule. The questionnaires were pretested in different EAs located in another LGA (Ife-East LGA), after which necessary corrections were made before the commencement of the study.

Qualitative: Qualitative data were collected using in-depth interviews (IDI) in all the four health centres offering comprehensive immunization services. One IDI was conducted per facility with the respective heads of immunization units.

Parameter and Scoring: Nine questions were used to assess parents' knowledge about RTIs. Questions were asked about causes, modes of transmission, clinical symptoms of RTIs and appropriate treatment and prevention modalities. One point was allotted to each correct answer. Parents' knowledge was adjudged as follows, 0-3; poor knowledge, 4-5; fair knowledge and good knowledge with score of 6-9.

Data analysis: The statistical package for social sciences (SPSS) version 16 was used for data analysis. Discrete variables were summarized using frequency tables and percentages. Tests of association between selected variables and respondents' willingness to accept vaccination were done using Chi square tests of statistics. A p-value of less than 0.05 was regarded as statistically significant. All interviews were

recorded on tape, transcribed on to text and validated. Interview summary sheet were used for the qualitative data and data were presented using a ZY table.

Ethical considerations: Permission was obtained from the Research and Ethics committee of the institute of public health, Obafemi Awolowo University, Ile-Ife. Informed consent was obtained from every respondent prior to data collection.

RESULTS

Table I shows the socio demographic characteristics of the 400 Parents' of under-fives (in Ife central local government area) that participated in the survey. About half (50.2%) of respondents were aged between 25 and 34, while about two-thirds (68.2%) were females and majority (72.8%) were Christians. Slightly above half (56.2%) of parents surveyed had acquired tertiary education. Majority (62.6%) of respondents were traders and civil servants with almost half (47%) earning incomes between 18,000 and 49,000 naira.

Table II shows the ranked scores of parents' knowledge about RTIs and their perceived risk and preventive factors of RTIs. About three-fifths (59.2%) of parents had good knowledge about RTIs . about half of respondents perceived cold weather to be a predisposing factor to RTIs while a minority (12%) felt teething could also be a risk factor. Wearing of adequate clothing for children was identified as a preventive factor against RTIs by 60.5% of respondents while almost half (46.5%) felt vaccination may protect against RTIs.

Table III shows Parents' Awareness and source of information about PCV. Majority (88%) of the parents were aware that vaccines can prevent RTIs also, about four-fifths of parents were aware that some vaccines on the NPI schedule can prevent against some RTIs. However only one-fifth (21%) of respondents were aware of PCV. For those that were aware their major source of information was healthcare workers.

Table I: Socio-Demographic Characteristics of Respondents.

Characteristics	Frequency (N=400)	%(Total = 100)
Age(years)		
15-24	45	11.25
25-34	201	50.25
35-44	136	34.00
>45	18	4.50
Gender		
Male	127	31.80
Female	273	68.20
Marital status		
Single	45	11.20
Married	313	78.20
Divorced	19	4.80
Separated	16	4.00
Widowed	7	1.80
Religion		
Christianity	291	72.80
Islam	100	25.00
Traditional	9	2.20
Occupation		
Farming	11	2.75
Trading	123	30.75
Civil servant	131	32.75
Artisan	63	15.75
Student	38	9.5
Unemployed	34	8.5
Educational attainment		
None	4	1.00
Primary	37	9.25
Secondary	134	33.50
Tertiary	225	56.25
Monthly Income (Naira)		
<18,000	85	21.25
18,000-29,000	84	21.00
30,000-49,000	108	27.00
50,000-99,000	69	17.25
>100,000	54	13.50

Table 2: Parents' Knowledge, perceived Risk and Preventive Factors of Respiratory Tract Infections.

Characteristics	Frequency	%
Perceived Risk Factors*		
Cold weather	208	52.00
Exposure to Germs	128	32.00
Dust/Pollution	113	28.25
Cold drinks	85	21.25
Contact with persons having RTIs	119	29.75
Teething	48	12.00
Preventive Factors*		
Adequate clothing	242	60.50
Application of mentholated products	18	4.50
Avoid contact with persons having	146	36.50
RTI Vaccination	186	46.50
Knowledge	400	%
Good knowledge	239	59.75
Fair Knowledge	139	34.75
Poor knowledge	22	5.50

Table III: Parents' Awareness and Source of Information about PCV.

Awareness	Frequency	%
Aware that vaccines can prevent RTI		
Yes	352	88.00
No	48	12.00
Total	400	100
Aware that some vaccines on NPI schedule prevent RTIs		
Yes	340	85.00
No	60	15.00
Total	400	100
Aware of a vaccine to prevent respiratory tract infections not on NPI schedule called PCV		
Yes	84	21.00
No	316	79.00
Total	400	100
Source of information about PCV		
Media	13	15.50
Health Seminar/Talk	6	7.20
Friends/Relatives	17	20.20
Health care workers	48	57.10
Total	84	100

Table IV shows parents' willingness to vaccinate their Under-fives. Most parents (93.50%) were willing to vaccinate their under-fives and three-fifths of respondents (59.2) preferred the Prevnar 13 with activity against more serotypes. However, only 43.5% of parents will be able to pay for the vaccine at prevailing market cost of N25,000, though majority of parents want PCV incorporated into the NPI schedule.

Table V shows the association between parent's characteristics and willingness to accept PCV. Parents who had good knowledge about RTIs were significantly more willing to accept PCV for their under-fives $p=0.005$. However, parents' age, marital status and educational attainment were not significantly associated with willingness to accept PCV

for their children as $p>0.05$.

Table VI shows the association between parents' characteristics and self reported ability to pay for vaccination at prevailing market cost. Parents ability to pay for PCV at the prevailing market cost was significantly associated with their increasing age $p=0.014$ also, parents with tertiary education significantly reported being able to afford payment for vaccine at the prevailing market price ($p<0.001$) also, parents with higher income significantly reported being able to afford PCV at the prevailing market price ($p<0.001$) though, there was no significant relationship between parents marital status and ability to afford vaccines at the prevailing market price.

Table IV: Parents' Opinion about Vaccine, Cost and Incorporation into NPI Schedule.

Variable	N=400	% (100)
Willing to vaccinate at no cost		
Yes	382	93.50
No	18	6.50
Preferred PCV type:		
Synflorix	191	40.8
Prevnar 13	209	59.2
Able to afford the amount		
Yes	174	43.50
No	226	56.50
Incorporate PCV in the NPI schedule		
Agree	385	96.25
Disagree	15	3.75

In-depth interviews of heads of immunization units revealed that only half of them were aware of vaccine preventable RTIs not yet on the NPI schedule, but only one head of immunization unit was aware of PCV. However all heads of immunization clinics interviewed had positive attitude towards the vaccine, as they were all willing to recommend the vaccine to their clients and they all advocated that government should incorporate PCV into the NPI schedule. Below are some excerpts

from the interviews

“most of our mothers, even parents in general cannot afford these vaccines, hence the Government should please incorporate these vaccines in the NPI as it will be beneficial to these children”

Another immunization unit head had this to say:

“I'm of the opinion that the vaccines should be incorporated in the NPI schedule as this will not only remove the burden of the costs on parents, but will also help people know that these vaccines are available in Nigeria”.

Table V. Association between Parent's Characteristics and Willingness to accept PCV

Characteristics	Willing to accept PCV		Not willing to accept PCV		Total	Statistic Comparison
	N=	%	N=18	%		
	382					
Age(years)						
15-24	42	93.3	3	6.7	45	$\chi^2=0.70$
25-34	192	95.5	9	4.5	201	Df=3
35-44	131	96.3	5	3.7	136	P=0.861
>45	17	94.4	1	5.6	18	
Educational attainment						
None	2	50.0	2	50.0	4	$\chi^2=9.370$
Primary	31	83.8	6	16.2	37	Df=3
Secondary	128	95.5	6	4.5	134	P=0.025
Tertiary	216	96.0	9	4.0	225	
Knowledge about RTIs						
Poor	25	86.2	4	13.8	29	$\chi^2=10.51$
Fair	125	93.3	9	6.7	134	Df=2
Good	232	97.9	5	2.1	237	P=0.005
Marital status						
Single	42	93.3	3	6.7	45	$\chi^2= 6.17$
Married	299	95.5	14	4.5	313	Df=4
Divorced	15	78.9	4	21.1	19	P=0.187
Separated	15	93.8	1	6.2	16	
Widowed	6	85.7	1	14.3	7	

Table VI. Association between Parents' Characteristics and Ability to Pay for Vaccination at Prevailing Market Cost

Characteristics	Able to afford PCV market cost		Not able to afford PCV market cost		Total	Statistic Comparison
	N=	%	N	%		
Age(years)						
15-24	14	31.1	31	68.9	45	$\chi^2=10.61$
25-34	78	38.8	123	61.2	201	df=3
35-44	72	52.9	64	47.1	136	p=0.014
>45	10	55.6	8	44.4	18	
Educational attainment						
None	2	50.0	2	50.0	4	$\chi^2=74.90$
Primary	7	18.9	30	81.1	37	df=3
Secondary	25	18.7	109	81.3	134	p<0.001
Tertiary	140	62.2	85	37.8	225	
Marital status						
Single	21	46.7	24	53.3	45	$\chi^2=5.78$
Married	140	44.7	173	55.3	313	df=4
Divorced	4	21.1	15	78.9	19	p=0.216
Separated	5	31.2	11	68.8	16	
Widowed	4	57.1	3	42.9	7	
Income(₦)						
<18,000	17	20	68	80	85	$\chi^2=66.91$
18,000-29,000	19	22.6	65	77.4	84	df=4
30,000-49,000	55	50.9	53	49.1	108	p<0.001
50,000-99,000	43	62.3	20	37.7	69	
>100,000	40	74.1	14	25.9	54	

*LR χ^2 = Likelihood ratio Chi square (where > 75% of the cells had counts less than 5)

Table VII: Health Workers' Attitudes towards Pneumococcal vaccination of under-fives

Facility	Aware of VPRTI	Aware of PCV	Aware of the cost	Will recommend PCV to clients	Supports PCVs incorporation in NPI
1. UCHC, Eleyele	+	+	-	+	+
2. PHC, Aderemi	-	-	-	+	+
3. PHC Enuwa	-	-	-	+	+
4. O.A.U, Health Centre	+	-	-	+	+

VPRTI = vaccine preventable respiratory tract infections

PCV = Pneumococcal conjugate vaccine

KEY: + = positive opinion expressed

- = no expression of opinion

DISCUSSION

In view of the increasing advocacy for the incorporation of PCV into NPI schedule by stakeholders in the country, it is essential to assess parents' and health workers' perspectives about the vaccine as they will be in position to either use or recommend the vaccine. Hence, the results of this survey are providing information in this regard so as to influence policy makers and motivate further research with the ultimate aim of ensuring an effective immunization programme with PCV.

Most Parents in our survey had fair to good knowledge about RTIs, this was not unexpected as majority of them had at least secondary school education.

Exposure to cold was the most common identified risk factor for RTIs by parents; in fact more parents chose this factor far above such factors as exposure to germs and contacts with infected persons. This may largely be based on the wide held belief that cold predisposes to RTIs, though extreme cold was identified in the literature, as being associated with increased incidence of RTIs in temperate regions.^{22,23}

This assertion needs to be verified through research in a tropical setting like ours and may be a key area for health education efforts as parents might tend to prevent children more from colds than from exposure to more compelling predisposing factors for example exposure to infected persons. It is interesting to note that about 10% of parents believe teething could predispose to RTI. This may be linked with the documented belief among parents that teething may be associated with various symptoms including those of RTIs²⁴ hence, the popularity of teething mixtures and formulas among parents of under-fives.

Generally, high levels of awareness exist among our respondents that vaccines can prevent RTIs but most(79%) of them were unaware of PCV. this may be due largely to the fact that PCV was recently introduced to the country in 2010 and only available in few immunization centres for a fee. This may also explain why more than half of Parents that were aware of

PCV got to know from health workers; more so immunization knowledge of parents is a reflection of the quality of information provided at health facilities.²⁵

Majority of parents were willing to vaccinate if the cost is free, this wide acceptability may be explained by the fact that parents would naturally want to prevent illnesses in their children, more so if this beneficial act (vaccination) is done at minimal cost to them. This is in consonance with studies by Bair et al in 2008 that suggested that parents view vaccines in good esteem as a favourable preventive measure as compared to curative health measures and this may explain the wide acceptance of new vaccines observed among parents in their survey.²⁶

More parents preferred The 13 serotype vaccine to the 10 valent probably because they felt their children will derive more protection from it since it has more serotype coverage. However only 43.5% of parents said they would be able to afford the market cost of the vaccine thereby suggesting that cost could be a major factor that can hinder parents from obtaining PCV for their under-fives. This may explain why most (96.25%) parents want PCV incorporated into the NPI schedule of routine immunization, as vaccines available on the NPI schedule are provided free of charge to all those who are eligible.²⁷

An expected finding was that the association between parents with good knowledge about RTIs and their willingness to accept PCV for their under-fives was statistically significant ($p < 0.05$). This is similar to findings in a multinational study assessing parents' attitudes to administering a new vaccine that showed that parents with better knowledge about causes and risks for the vaccine preventable diseases of interest were more willing to accept such new vaccines²⁸.

This suggests that better knowledge among parents may empower them to make wise decisions on issues bothering on the health of their under-fives. Ongoing health education for parents may therefore be a major

tool to ensure optimal vaccine uptake not only for PCV but for all antigens on NPI schedule especially in the current national efforts to stamp out polio from Nigeria. However, parents' age, marital status and educational attainments had no significant relationship with willingness to accept PCV for their children.

Age was a significant factor in parents' ability to afford PCV costs as more parents from lesser age groups (15-34 years) were unable to afford the current market costs compared to their older counterparts aged 35 years and beyond. This may suggest that younger parents who are in their prime reproductive years with a higher likelihood of having more under-fives than the older parents may not be able to provide some protection against a major killer disease for their children owing largely to cost.

More parents with tertiary education significantly reported being able to pay for PCV at current market costs than parents with lower educational attainments; this may be explained in the sense that higher educational status may translate to higher earning powers and income among such parents.

Income was significantly associated with ability to afford costs of PCV as parents with higher incomes were more likely to afford the vaccines. This is expected as parents with more income are more likely to afford the high cost of PCV. However, relationship between marital status of parents and ability to afford PCV costs was not statistically significant.

Though all health workers interviewed were unanimous in their appeal for the inclusion of PCV in the NPI schedule, there exists no previous studies on health workers perspectives on PCV in Nigeria for comparison at the time of this write-up.

Limitations

As with all cross sectional surveys, this survey is subject to response and recall biases. Also, since the survey held in one LGA, this may not be representative of the entire population of Osun State. The current cost of the vaccines was (N18,000 naira or \$105) at the time of

this write up and this may change due to fluctuation in market prices. The opinions expressed by an interviewed mother or father may not necessarily be the joint opinion of both parents.

CONCLUSION

Most Parents in Ife Central LGA were willing to accept PC vaccination for their under-fives. Also parents' acceptability of the vaccine was strongly associated with having good knowledge about RTIs. As such health education geared towards improving parents' knowledge about RTIs will be helpful in the design and implementation of a successful PCV immunization programme. Furthermore, all Heads of immunization clinics were willing to recommend the vaccines to clients and support the incorporation of PCV into the NPI schedule. There is an overwhelming need to incorporate PCV in to the NPI, as both parents and health workers agree on this. Aside from overcoming a major financial barrier to vaccine access, this will also make PCV widely available to parents who are already willing to accept the vaccine for their children. Getting children immunized against pneumococcus; a major contributor to child mortality will surely enhance Nigeria's prospects of achieving MDG 4 target of reducing under- five mortality.

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