

Determinants of Parental Compliance with Routine Childhood Immunization Schedule in Nassarawa State, Nigeria

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Received: 05 July 2017; Accepted: 17 July 2017

Citation: Umar Yunusa, Omolola Irinoye, Umar Lawal Bello, et al. Determinants of Parental Compliance with Routine Childhood Immunization Schedule in Nassarawa State, Nigeria. Int J Nur Care. 2017; 1(3): 1-7.

ABSTRACT

Background: Vaccine preventable diseases are major causes of child mortality which could have been prevented by routine immunization. Many children are not completely immunized due to non-compliance by their parents.

Aim: This study explored the determinants of parental compliance with routine childhood immunization schedule in Nassarawa state, Nigeria.

Methodology: An explanatory mixed method design was used in which 387 parents of children aged 12 to 23 months were recruited using multistage cluster sampling technique. A validated interviewer administered questionnaire (IAQ) was used to collect quantitative data. Focus Group Discussion (FGD) guide was used to collect qualitative data. Quantitative data was analysed using frequency tables and multinomial regression while qualitative data was analysed using content analysis.

Results: Findings showed that nearly 60.0% of the parents have low knowledge of routine immunization. Only one quarter (24.5%) of the surveyed children were completely immunized. Multinomial regression test showed that there was a significant association between the level of education of parents ($\beta = 0.815, P < 0.05$), number of children ($\beta = -0.424, P < 0.05$) and parents knowledge of immunization ($\beta = -3.735, P < 0.05$) with the completion of childhood immunization. The higher the values of the age and number of children delivered in a formal health care facility the higher the probability of them being completely immunized.

Conclusion: The study concluded that level of education, knowledge of immunization by parents, attendance of antenatal clinics by mothers and delivery of the child in a health facility are the determinants of parental compliance with routine childhood immunization.

Keywords

Compliance, Immunization, routine, childhood, Determinants.

but coverage of routine childhood vaccines remains lower than the global benchmark in Nigeria [3].

Introduction

Vaccine preventable diseases remain the most common causes of childhood mortality worldwide [1]. Sub-Saharan Africa accounts for above 100 deaths per 1000 live births [2]. Nigeria has the twelfth highest under- five mortality rate. Approximately one in four of these deaths are preventable through routine immunization,

The inauguration of the expanded program on immunization (EPI) by the WHO in 1974 has resulted to reduction of death of over two million children each year worldwide however, an estimated 3 million deaths still occur each year [4]. In Nigeria, the National Programme on Immunisation (NPI) is the country's initiative that took root in the World Health Organization WHO/ United Nations

Children Fund UNICEF expanded programme on immunization [5]. Despite this initiative, the completion of immunization in the country is still below the global standard [3].

Nigeria operates the immunization schedule of the expanded program on immunization which proscribes 5 visits to receive Bacille Calmette Guérin, Oral Polio Vaccine, Pentavalent Vaccine, Inactivated Polio Vaccine and Measles Vaccine. In 2004, Nigeria included Hepatitis B and Yellow fever vaccines in its schedule [6]. In 2006, the country initiated polio vaccination campaigns through the immunization plus days (IPDs) [7], and in 2012, it began the phased replacement of DPT vaccine with the Pentavalent vaccine which contains (DPT, Haemophilus influenza B and Hepatitis B) [7].

All the changes notwithstanding, immunization coverage has still not realized its potential as at the end of 2011 [8]. More than half of all the children that were incompletely vaccinated are from India (32%), Nigeria (14%) and Indonesia (7%) [9]. Reports of the 2013 Nigerian Demographic and Health Survey (NDHS) indicate that only 25% of children between the ages 12-23 months were fully vaccinated. Amongst them, only 21% of children age 12-23 months had received all of the recommended vaccinations before their first birthday. On the other hand, records from Nassarawa state showed that only 20.1% of eligible children have received all basic vaccines while 29.8% received no basic vaccines at all [7].

Factors implicated for parental non-compliance includes; lack of knowledge about immunization [10,11]. Socioeconomic status, particularly mother's education, family size income and race are factors that have consistently been shown to influence whether a child receives a vaccine or not [12]. Ease of access to health care services, such as short clinic waiting hours, and convenient location of health care facility are factors that contribute to parental compliance [13]. Significant association exist between compliance with routine immunization and parental level of education, mother's age, parity, family income, health care provider types, and place of birth of the child [14]. Also parents with highest educational qualification below secondary school level were more likely to be non-compliant with routine immunization [15-17]. Reasons for partial immunization include concerns by parents on the safety of vaccines, absence of personnel at the health facility, lack of information about the days of vaccination, social engagements, lack of money, schooling mothers and parents objection [18].

Other reasons for non-immunization include late reporting for immunization, non-administration of simultaneous injections, longer interval between DPT3 and Measles vaccine compared to that between the other vaccines in the schedule [19]. Additional reasons were because the parents forgot the immunization dates, misplaced immunization card, either child or mother was ill, travelled, were too busy, lack of money or have mixed up dates [20,21]. Non-immunization status of children was associated with Muslim religion and women in purdah [22]. Physical factor such as place of delivery has significant effect on child immunization [23,24]. Furthermore, psychological factors such as

attitudes, beliefs, negative experiences, knowledge, and hesitation have been found to be significantly associated with childhood immunization [25]. In addition, factors that can affect compliance include; ignorance, social cost of access to the service, quality of the immunization services, availability to remote areas, health personnel commitment and consistent availability [26].

Evidence from reviewed literatures showed that parental noncompliance is a major factor for non-immunization of children in Nigeria. However, there is a dearth of empirical data about the context of improving parental compliance. This study therefore examined the rate of parental compliance with routine immunization, the factors associated with the parental compliance rate and strategies for improving parental compliance rate.

Methodology

An explanatory mixed method research design was used for the study. Target population encompasses parents (mothers, fathers and caregivers) of children between 12-23 months and core community informants from Nassarawa state, Northern Nigeria. Ethical clearance with reference number IPH/OAU/12/457 was received from the Institute of Public Health of College of Health Sciences, Obafemi Awolowo University, Ile Ife.

Study Setting

Nasarawa State is one of the seven states that make up the North Central geopolitical zone in the north central part of Nigeria. The State was created on 1st October, 1996 from Plateau State by the military government of General Sani Abacha. Nasarawa State covers an area of 28,735 square kilometres. It has a population of 1,863,275 (2006 census figures) with a population density of 65 people/sq km. Dominant religions in the state are Islam and Christianity. Nasarawa State has 13 local government areas which are Akwanga, Awe, Doma, Karu, Keana, Kokona, Lafia, Nasarawa, Nasarawa Egon, Obi, Toto and Wamba. There are several ethnic groups but the major language of communication is Hausa.

Sample size and Sampling Technique

A sample size of 387 derived from the Cochran formula [27], ($n = p \times (1-p) \times z^2/d^2$ where n = sample size, $p = 0.50$, $z = 1.96$ and $d = 0.05$.) was used for the quantitative study. Multi-stage cluster sampling technique was used to collect data in four stages. At the first stage, a local government area was randomly selected from each of the 3 senatorial zones of Nassarawa state. At the second stage, two wards were selected from each selected local government areas (Lafia, Wamba and Keffi) using simple random sampling. At the third stage, households were randomly selected from the sampled wards after house listing in the wards. From each of the 6 selected wards, 67 households were randomly selected from where a parent (mother, father or an adult caregiver) of a child between 12 to 23 months was recruited for interview.

Inclusion Criteria

Only parents of children aged 12 to 23 months were recruited to participate in the study.

Exclusion Criteria

This comprise of parents whose children are either younger or older than the target age range of 12 to 23 months.

Study Instrument and Data Collection

Quantitative data was collected with an Interviewer Administered Questionnaire (IAQ) adapted from UNICEF [28]. For the qualitative survey, Focus Group Discussions (FGDs) were conducted with health care providers, community leaders, religious clerics and parents (compliant and non-compliant) by use of an FGD guide. Instruments were translated to common local language (Hausa) to elicit appropriate responses. Parental compliance was assessed based on the vaccines a parent immunized his/her child and is categorized into three as thus; completely immunized, partially immunized and not immunized. Completion of immunization or otherwise was determined by the child's immunization card and/or parental recall of child being immunized.

Data Analysis

All statistical data were entered in the Statistical Package for Social Sciences (SPSS) version 20.0 and analysed using descriptive statistics by presenting results in simple frequencies. Confidence interval was set at 95% and odd ratios for completion of immunization were generated. Likely hood ratio and multinomial logistic regression test were used to test the effects of the socio-demographic characteristics of the parents, their children and the health facility with the three categories of the dependent variables (completely immunized, partially immunized and unimmunized). Qualitative data was transcribed, re-translated and analysed using a manifest level content analysis.

Results

A total of 387 respondents participated in the quantitative study from Lafia (130), Keffi (129) and Wamba (128) local government areas of Nassarawa state. Both the quantitative and qualitative data were analysed and presented in a triangulation format. Findings from the study as indicated in Table 1 revealed that majority (90.7%) of the surveyed parents were mothers with half (50.3%) of them between the ages of 25 and 32 years and a mean age and SD of 31.39 ± 6.4 years. Nearly nine out of every ten (87.9%) of the respondents were married. Less than one third (32.8%) of the respondents completed secondary schools. The proportion of the surveyed respondents that are traders (30.0%) was slightly more than those that were house wives (28.9%) and more than two fifth (43.2%) of the respondents spouses were civil servants. More than one third (34.9%) of the surveyed respondents earned an average income of between ₦10,000 and ₦20,000 monthly. The parity of the surveyed respondents ranges from one to eight children with a mean \pm SD of 3.13 ± 1.72 children.

Table 2 showed that more than two fifth (41.1%) of the surveyed children were between the ages of 12 and 15 months. The mean age of the surveyed children is 16.74 months. Nearly three fifth (57.6%) of the surveyed children are males and less than nine out of every ten (85.5%) of the surveyed children were delivered in a health facility.

Type of respondent	Frequency	Percentage (%)
Mother	351	90.7
Father	24	6.2
Caregivers (adults in household as respondents)	12	3.1
Age of respondents (years)		
18-24	40	10.3
25-32	195	50.3
33-38	96	24.8
39-48	56	14.5
Mean: 31.39		Standard deviation: 6.422
Marital status		
Married	339	87.9
Single	12	3.1
Divorced	33	8.5
Widow	3	0.8
Religion		
Islam	307	79.3
Christianity	80	20.7
Educational qualification		
No formal education	60 (15.5)	60 (15.5)
Qur'anic education	47 (12.1)	29 (7.5)
Primary education completed	69 (17.8)	27 (6.9)
Secondary education completed	127 (32.8)	104 (26.9)
Tertiary education completed	84 (21.7)	167 (43.2)
Occupation		
Civil servant	72 (18.6)	167 (43.2)
Trader	116 (30.0)	92 (23.8)
Artisans	4 (1.0)	4 (1.0)
Farmer	24 (6.2)	68 (17.6)
House wife	112 (28.9)	4 (1.0)
Unemployed	59 (15.2)	24 (6.2)
Driver	0 (0.0)	28 (7.2)
Average monthly income (₦)		
<10000	36	9.3
10000 – 20000	135	34.9
21000 – 50000	116	30.0
>50000	100	25.8

Table 1: Distribution of respondents by socio-demographic characteristics.

Age (months)	Frequency	Percentage (%)
12-15	159	41.1
16-19	112	28.9
20-23	116	30.0
Mean \pm SD: 16.74 \pm 3.714		
Gender		
Male	223	57.6
Female	164	42.4
Place of birth		
Health facility	331	85.5
Home	56	14.5

Table 2: Distribution by characteristics of respondents children (N=387).

A four item knowledge scale which comprise of name, route of administration, number of doses and age of administering first dose of vaccines was developed. Each of the scale was scored between 0 to 7 for the seven surveyed vaccines (BCG, OPV, DPT, HBV, Measles vaccine, Yellow fever vaccine and vitamin A). These summed to a total of 28 scores. A score of 22 and above represents high knowledge, while 14 to 21 signified moderate knowledge and less than 14 denotes low knowledge. Findings indicated that about three fifth (59.5%) of the respondents had low knowledge of routine childhood immunization. Majority of the FGD informants stated that parents particularly women are fairly knowledgeable about routine immunization. However, the less knowledgeable parents (men) claim they support the women to immunize their children. Excerpts of responses are stated below;

"I believe parents particularly mothers are knowledgeable about immunization; this is because I always see women been educated on immunization during antenatal clinics". (FGD with religious leaders)

"More than half of the parents are fairly knowledgeable about the immunization as some of them know the specific vaccines as well as the time to be given the vaccines". (FGD with health workers).

"Actually I as a parent don't know much about immunization but my wife does very well because they are the ones that are being educated in the hospital". (FGD with non-compliant parent).

On the sources information about immunization to parents, informants stated that the health workers, immunization cards and the media are the major sources of knowledge. Excerpts of responses are stated below;

"The people are educated on immunization by health workers and the immunization schedules written on the child's immunization card". (FGD with compliant parent).

"Most parents adhere to appointment dates written on the immunization card" (FGD with religious leaders).

One quarter (24.5%) of the surveyed children were completely immunized while about half (50.4%) of the surveyed children were partially immunized and about one quarter (25.1%) were not immunized at all. A large proportion of the FGD informants stated that more than half of parents in the state comply with the immunization schedule. Excerpts of responses are stated below.

"Most parents take their children for the first vaccine (BCG), while only about half of the parents take their children to complete other immunizations". (FGD with health workers).

"More than 90% of parents take their children for immunization, because during immunization days you will see a lot of parents with their children there". (FGD with compliant parent).

"Really from what I see, those that don't accept immunization are negligible". (FGD with community leaders).

"It's just about 10% of parents that do not immunize their children". (FGD with religious leaders).

"What I know is that even if there are those that don't take their children for immunization they will just be around 5% to 10%". (FGD with non-compliant parent).

Reasons stated by respondents for parents not completely immunizing their children are because; the parents forgot (16.8%), believed that their children are too young to be fully vaccinated (13.7%), misplaced their child's immunization card (12.4%), distant health facilities (8.5%), industrial actions and irresponsible attitudes of health care providers (7.9%). On the other hand, Informants of the FGD were of the view that ignorance, husband's refusal, lack of awareness, cultural and religious restraints are the main reasons why parents do not comply with routine immunization schedule; Excerpts of responses are stated below.

"I think ignorance, cultural and religious factor are the major reasons why parents don't immunize their children". (FGD with health workers).

"Sometimes it is the husbands that are responsible for preventing their wives from immunizing the children." (FGD with health workers).

"Some parents are just not willing to immunize their children". (FGD with compliant parents).

"Poverty is the reason why some parents refuse to comply". (FGD with non-compliant parent).

"People are made to believe that polio vaccine kills children after birth and if the children grow up, their legs will not be strong". (FGD with health workers).

"The nature of job/occupation parents do can make them to forget about their child's immunization". (FGD with religious leaders).

"Reasons why parents don't like going to the hospital to immunize their children is the long queue, insincerity by government on the safety of vaccines and long waiting hours in the hospital" (FGD with community leaders).

Findings as indicated in Table 3 showed that more than half (53.7%) of the surveyed children were immunized in Primary Health Care (PHC) facilities. Close to half of the respondents (46.5%) use motorcycle to go to the health facility. Two fifth (40.1%) of the surveyed respondents travelled for less than 5km to the health facilities and it takes less than 20 minutes for more than half (51.4%) of the surveyed respondents to travel.

Likelihood Ratio tests on the association between socio-demographic characteristics of parents and completion of immunization showed that with the exception of parental age ($p=0.092 > 0.05$), other predictor variables; which are education, occupation, parity, income, and knowledge are significant with p values < 0.05 . Hence, there was a significant association between the characteristics and parental compliance. Similarly, likelihood ratio test on the association between child characteristics and completion of immunization shows that age and place of delivery of child,

are significant $p < 0.05$. Hence there was a significant relationship between socio-demographic characteristics of child and parental compliance with routine childhood immunization. Likelihood ratio test on the association between the characteristics of health facility in which the surveyed children are being immunized and their completion of immunization shows that all the predictor variables; type of health facility, means of transportation, distance to health facility in kilometres and distance in time ($p = 0.000$) are significant with $p < 0.05$. Hence, there was a significant association between the characteristics of health facility and compliance with immunization.

Variable	Frequency	Percentage (%)
Completion of Immunization		
Completely Immunized	95	24.5
Partially Immunized	195	50.4
Not Immunized	97	25.1
Facilities where children were immunized		
Primary Health Care centre	208	53.7
health post	48	12.4
Secondary health facility	83	21.4
Not vaccinated	48	12.4
Means of transportation to facility		
Walking	91	23.5
Motorcycle	180	46.5
Tricycle	12	3.1
car/taxi	56	14.5
Not vaccinated	48	12.4
Distance to facility in Km		
<5	203	40.1
between 5 to 10	96	24.8
between 11 to 20	24	6.2
don't know	16	4.1
Not vaccinated	48	12.4
Duration of transport to facility in minute N=339		
<20	199	51.4
20 to 40	116	30.0
41 to 60	24	6.2
Not vaccinated	48	12.4

Table 3: Distribution by Completion of Immunization and characteristics of health facilities where children are immunized N=387.

Table 4 shows that increase in values of age, occupation, parity and knowledge of immunization results to decrease in non-immunization. However an increase in the values of educational qualification, parity and knowledge of immunization decrease the odds of completing immunization. Table 5 reveals that the higher the age of the child and the higher the number of children been delivered in the health care facility then the higher the probability of the being completely immunized. Table 6 showed that of all the characteristics of health facility, only type of facility is significantly associated with child immunization status of being completely or partially immunized.

Variables	B	Std. Error	Sig.	OR (CI)	
Completely immunized	Intercept	.933	1.502	.535	-
	Age	-.045	.040	.263	.956 (0.884-1.034)
	Education	.815	.142	.000	2.260 (1.712-2.984)
	Occupation	-.181	.121	.134	.834 (0.658-1.057)
	Parity	-.424	.155	.006	.654 (0.483-0.887)
	Income	.001	.263	.998	1.001 (0.598-1.674)
	Knowledge	-3.735	1.320	.005	.024 (0.002-0.317)
Partially immunized	Intercept	4.905	1.337	.000	-
	Age	-.075	.035	.032	.928 (0.867-0.993)
	Education	.954	.130	.000	2.595 (2.012-3.346)
	Occupation	-.373	.112	.001	.689 (0.553-0.857)
	Parity	-.335	.127	.008	.715 (0.558-0.918)
	Income	-.888	.242	.000	.411 (0.256-0.660)
	Knowledge	-1.804	1.100	.101	.165 (0.119-1.420)

Table 4: Effect of socio-demographic characteristics of parents on completion of immunization. REF: Not Immunized; B: Coefficient, OR: Odds Ratio, CI: Confidence Interval, REF: Reference Variable.

Variables	B	Std. Error	Sig.	OR (CI)	
Completely immunized	Intercept				
	Age	.152	.047	.001	1.165 (1.061-1.278)
	Male	-.252	.343	.462	.777 (0.397-1.522)
	Health centre delivery	18.764	.000	-	140.983 (140.983-140983)
Partially immunized	Intercept	-1.880	.812	.021	-
	Age	.027	.041	.507	1.027 (0.949-1.112)
	Male	.217	.293	.460	1.242 (0.699-2.207)
	Health centre delivery	2.554	.364	.000	12.861 (6.304-26.237)

Table 5: Effect of characteristics of children on completion of immunization. REF: Not Immunized; B: Coefficient; OR: Odds Ratio; CI: Confidence Interval.

Variables	B	Std. Error	Sig.	OR (CI)	
Completely immunized	Intercept	.199	.722	.783	-
	Type of health facility	-.064	.039	.099	.938 (0.870-1.012)
	Means of transportation	.893	.305	.003	2.443 (1.345-4.439)
	Distance in kilometres	1.084	.454	.017	2.957 (1.214-7.202)
	Distance in minutes	-1.862	.427	.000	.155 (0.067-0.358)
	Partially immunized	Intercept	1.577	.626	.012
Type of health facility		-.060	.038	.113	.941 (0.874-1.014)
Means of transportation		.330	.292	.258	1.390 (0.785-2.462)
Distance in kilometres		.014	.403	.972	1.014 (0.460-2.235)
Distance in minutes		-.288	.309	.351	.750 (0.409-1.373)

Table 6: Effect of characteristics of health facility on completion of immunization. REF: Not Immunized; B: Coefficient; OR: Odds Ratio; CI: Confidence Interval, REF: Not Immunized.

Discussion

Compared to other studies on immunization, this study is unique as it collected qualitative data from community leaders, health care workers and religious clerics. This was done to elicit responses on reasons for the persistence in the low completion rate of routine immunization despite the efforts by government and other agencies. The study revealed that majority of the surveyed respondents stated that immunization prevents children from diseases and disabilities. Few of the respondents demonstrated a high knowledge of routine immunization. The high number of respondents with low knowledge poses as a challenge to action on childhood immunization program. FGD findings corroborated the observation that women have a fair knowledge of routine immunization. However, the less knowledgeable parents who incidentally are men claim they support the women. Recent advocacy for men's better involvement in reproductive and child health makes demands for efforts to increase men's knowledge in these areas in order to be more supportive.

It was observed that the health care centres and media are the major sources of knowledge of routine immunization to respondents. This corroborates the findings of the FGD participants who stated that the health care workers, children immunization cards and the media are the major sources of knowledge of routine immunization to parents. This places a question on the adequacy of health education provided to mothers in particular during antenatal care and the mass media. This finding validates that of study conducted by Abdul Raheem [18]. Hence, there is the need to consistently evaluate the content and modalities of the education on immunization provided to women.

With the observation that only about one quarter of the surveyed children were completely immunized. The low completion rate may not be unrelated to the low to average level of education and knowledge of routine immunization amongst the respondents which validates the findings of the NDHS 2013 [7]. However the result showed that there is an increase of about 5% in the proportion of fully vaccinated children compared with that of NDHS 2013 data of Nasarawa state. The findings are much higher when compared with the average in Northern Nigeria were only about 10% of the children in the region receive all the routine vaccines [29]. It however contradicts findings of study conducted to assess the completion and compliance of childhood vaccination in the United States which showed that an estimated 70% of children completed all the recommended six doses of vaccines by 24 months of age [30]. From the FGD, there is a general notion that parents comply but this is contrary to the quantitative data. Hence there is need of a regular feedback to the people on the level of performance about the rate of parental compliance.

The PHC continues to be the main point of contact for immunization as would be expected as the PHCs are more accessible. The primary mode of transport to the PHC is the motorcycle; it therefore becomes necessary to ensure safety of the mother and the child. In order to reduce the incidence of forgetting immunization appointment days by parents, modern means of reminding parents such as use of

text messaging, phone calls and mails should be instituted. The misconceptions by some parents about the safety of vaccines must be clarified. In addition, community and religious leaders should show example to their followers by immunizing their children first. More equipped health care facilities should be built to overcome the issue of distant facilities. These findings are contrary to that of Abdul Raheem [18]. However, the findings validate results of study by Balogun et al. [20]. On the other hand, majority of the respondents who completely immunized their children stated that they did so because they believe that immunization prevents children from disease and disability. This shows that there is an association between the parental knowledge of immunization and completeness of immunization. This validates results of study by Oluwadiya, et al. [11]. FGD findings observed that reasons for non-compliance or non-completion include; ignorance, husbands' refusal, lack of awareness, safety of vaccines, cultural and religious restraints. This finding is also in line with the health promotion model by Nola J. Pender. Therefore, education on the importance of immunization should go beyond the hospital settings to the level of the community.

There was a significant association between socio-demographic characteristics of parents and their compliance with childhood immunization schedule. This is similar to findings of study conducted [14,15]. It was further observed that increase in values of age, formal occupation, parity and level of knowledge of immunization results to decrease in non-immunization. Age and place of delivery of a child are significantly associated with parental compliance. This is similar to findings of study by Rafiqul et al. [23]. There was however no relationship between the sex of the child and completion of immunization. This is contrary to findings by the WHO [31], however, other similar survey showed that there was no statistically significant relationship between sex and completion of immunization [32,33].

Conclusion and Recommendations

The result of the study indicates that the determinants that can enhance parental compliance with routine immunization includes; parents with at least secondary school education, being a housewife, moderate level of knowledge of immunization, regular attendance of antenatal clinic, acceptance of immunization by husbands, giving birth in a formal health care facility, remembering immunization dates by parents, availability of immunization cards and clarification of misconceptions about immunization and involving community leaders as well as clerics in the immunization programs. Other determinants include building more equipped health facilities, employment of responsive health care providers and ensuring the availability of vaccines.

It is recommended that all pregnant women are encouraged to attend antenatal clinics and deliver in health facilities. Education on immunization should go beyond hospital setting to level of the community. The contents of the education need to be reviewed regularly so as to contain items that can drive parents to comply with immunization. Immunization outreach services should be re-strategized to ensure that more communities and vaccines are

covered. Furthermore, religious and community leaders should be actively involved in the immunization process.

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