

# Knowledge, Attitude and Compliance with Full Immunization of Children Against Vaccine Preventable Diseases among Pregnant Mothers in Sokoto, Nigeria

K.J. Awosan<sup>1</sup>, M.T.O. Ibrahim<sup>2</sup>, E.U. Yunusa<sup>3</sup>, B.A. Isah<sup>4</sup>, M.O. Raji<sup>5</sup>, N. Abubakar<sup>6</sup>

## ABSTRACT

**Introduction:** Despite the fact that immunization is proven to be the most successful and cost-effective public health intervention in reducing childhood morbidity and mortality, full immunization coverage remains abysmally low in Nigeria, with a concomitant high burden of vaccine preventable diseases (VPDs) among children. This study aimed to assess the knowledge, attitude and compliance with full immunization of children against VPDs among pregnant mothers in Sokoto, Nigeria.

**Material and Methods:** A cross-sectional study was conducted among 220 randomly selected pregnant mothers attending the antenatal care (ANC) clinic of UDUTH, Sokoto, Nigeria. Data were collected with a set of structured, pretested, interviewer-administered questionnaire.

**Results:** The mean age of the respondents was  $28.12 \pm 5.58$  years. Most of them were married (91.8%), Muslims (76.8%) and had at least secondary education (79.1%). Whereas less than half of respondents had good knowledge of VPDs (49.1%) and benefits of immunization (44.1%), most of them (91.8%) had good knowledge of the National Immunization Schedule. Although, most of the respondents showed positive attitude towards childhood immunization, only about two-thirds (65.5%) had their youngest child fully immunized. The main reasons given by the respondents whose children were never vaccinated were husbands' disapproval (52.6%) and lack of information on the immunization schedule (26.3%).

**Conclusion:** These findings underscore the need for health workers to also educate mothers on the VPDs and the benefits of immunization while educating them on the National Immunization Schedule. In addition, interventions for promoting immunization acceptance by mothers should be designed to involve their husbands.

**Keywords:** Knowledge, Attitude, Compliance, Full Immunization, VPDs, Pregnant Mothers

diseases) among children in the country. According to the National Demographic and Health Survey 2013, only 25% of children aged 12 – 24 months were fully vaccinated in Nigeria, and the neonatal, infant and under-five mortality rates remain persistently high at 37, 69 and 128 deaths per 1,000 live births respectively.<sup>2</sup>

Although, the low immunization coverage in Nigeria has been mostly attributed to poor knowledge, compliance, accessibility and inappropriate attitude among others factors; poor compliance with full immunization is believed to be the most significant reason for low immunization coverage in the country due to socio-cultural obstacles to acceptance of immunization.<sup>3</sup>

Reasons underlying poor immunization coverage has been studied by different researchers world-wide and beside other factors, parental knowledge and belief has been documented to influence immunization uptake.<sup>4</sup> Other factors that have been found to influence compliance with full immunization of children against VPDs include lack of services due to system weakness, low public awareness, fear and misconceptions.<sup>5</sup> Reports from studies have shown that uptake of immunization services depends not only on provision of these services but also on other factors including knowledge and attitude of mothers, accessibility to immunization services, and the adequacy of the services in terms of manpower and material resources (particularly availability of consumables).<sup>6,7</sup>

A focal point in the epidemiology and control of infectious diseases is the concept "herd immunity" which refers to the resistance to the spread of an infectious disease within a population that results if a sufficiently high proportion of

<sup>1</sup>Department of Community Health, Usmanu Danfodiyo University, Sokoto, <sup>2</sup>Al-Hikmal University, Ilorin, <sup>3</sup>Department of Community Health, Usmanu Danfodiyo University, Sokoto, <sup>4</sup>Department of Community Health, Usmanu Danfodiyo University, Sokoto, <sup>5</sup>Department of Community Health, Usmanu Danfodiyo University, Sokoto, <sup>6</sup>Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

**Corresponding author:** K.J. Awosan, Department of Community Health, Usmanu Danfodiyo University, Sokoto, Nigeria

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## INTRODUCTION

Despite the fact that immunization is proven to be the most successful and cost-effective public health intervention in reducing childhood morbidity and mortality (as it averts 2 to 3 million deaths every year), the global vaccination coverage has remained stalled at 86% since 2010, with no significant changes during the past years.<sup>1</sup> Of the estimated 19.5 million infants that were not reached with routine immunization services worldwide in 2016, 60% of them live in 10 countries including Nigeria. Of serious concern is the abysmally low full immunization coverage in Nigeria with a concomitant high mortality (largely attributed to vaccine preventable

individuals are immune to the disease particularly through vaccination (as it provides a measure of protection for those who are not immune); and for herd immunity to occur, the mass vaccination (critical immunization threshold) of the vaccines must be achieved.<sup>8,9</sup> To achieve the critical vaccination coverage for most of the vaccine preventable diseases, the Global Vaccine Action Plan 2011-2020 endorsed by the World Health Assembly in 2012, calls on all countries to reach  $\geq 90\%$  national coverage for all vaccines in the respective countries' routine immunization schedule by 2020.<sup>10</sup>

Although, most of the World Health Organization's (WHO's) regions reached more than 80% of their target populations with three doses of diphtheria, pertussis and tetanus (DPT) vaccine in 2013, coverage with these vaccines remained short of the 2020 goal of 90% national coverage for all vaccines, particularly in the African (75%) and South-East Asia (77%) regions.<sup>11</sup> In addition, a review of the trend of full immunization coverage in low- and middle-income countries showed conspicuous inequalities among and within countries, and Nigeria is among the eight low-income countries that have been identified as having the greatest within country disparity in vaccination coverage.<sup>11</sup>

Reports from the National Demographic and Health Survey 2013 showed wide variations in vaccination coverage and under-5 mortality rates across Nigeria with an inverse relationship between vaccination coverage and under-5 mortality. While the proportion of children aged 12-23 months that were fully vaccinated in Nigeria ranged from 10% in the North West Zone (the study area) to 52% in the South-East and South-South Zone, the under-five mortality ranged from 185 deaths per 1,000 live births in the North-West Zone to 90 per 1,000 live births in the South-West Zone.<sup>2</sup>

The low immunization coverage in Nigeria plausibly explains the persistence of the transmission of the vaccine preventable diseases in the country as the herd immunity remains low. It is therefore evident that in addition to the attendant waste of resources, non-compliance with full immunization of children threatens and could reverse the gains of the childhood survival interventions over the past decade. This study was conducted to assess the knowledge, attitude and compliance with full immunization of children against VPDs among pregnant mothers in Sokoto, Nigeria. The findings of the study would be useful to policy-makers and program managers in identifying and addressing the obstacles to acceptance of immunization against vaccine preventable diseases.

## MATERIAL AND METHODS

A cross-sectional study was conducted among pregnant women attending the antenatal clinic of the Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria in August and September 2014. Those who have had a previous delivery and whose last child is alive and up to one year of age were considered eligible for enrollment into the study. The sample size was estimated at 218 using the Fisher's

formula for calculating sample size for cross-sectional studies,<sup>12</sup> an 85.0% prevalence of awareness that childhood vaccination prevents life-threatening diseases from a previous study,<sup>13</sup> a precision level of 5%, and an anticipated participant response rate of 90%.

The eligible participants were selected by systematic sampling technique; one of three pregnant women presenting consecutively at the ANC clinic and meets the eligibility criteria was enrolled into the study over a ten clinic day period until the required sample size was obtained.

## Data Collection

A standardized, structured, interviewer-administered questionnaire was used to obtain information on participants' socio-demographic characteristics, knowledge of immunization, attitude to childhood immunization and compliance with full immunization. It was reviewed by researchers in the Department of Community Health, Usmanu Danfodiyo University, Sokoto, Nigeria. The necessary correction was made based on their inputs to ascertain content validity. The questionnaire was pretested on 20 pregnant women attending the antenatal clinic of Primary Healthcare Center Yar-Akija, Sokoto, Nigeria. Five resident doctors assisted in questionnaire administration after being trained on the conduct of survey research, the objectives of the study, and questionnaire administration.

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 20.0 software. Respondents' knowledge of the child that requires immunization and its benefits was scored and graded on a 7-point scale. One point was awarded for a correct response, while a wrong response or a non-response received no points. This gives a minimum score of '0' and a maximum score of '7' points. Those that scored  $\geq 4$  of 7 points were considered as having 'good' knowledge, while those that scored  $< 4$  of 7 points were graded as having 'poor' knowledge. Respondents' knowledge of vaccine preventable disease, as well as their knowledge of the National Immunization Schedule was scored and graded on an 8-point scale. One point was awarded for a correct response, while a wrong response or a non-response received no points. This gives a minimum score of '0' and a maximum score of '8' points. Those that scored  $\geq 5$  of 8 points were considered as having 'good' knowledge, while those that scored  $< 5$  of 8 points were graded as having 'poor' knowledge. Vaccination status was assessed by vaccination card and mothers' recall. A fully immunized child was defined as one who had received one dose of Bacille Calmette Guerin (BCG), three doses of oral polio vaccine (OPV), three doses of Diphtheria-Pertussis-Tetanus (DPT) vaccine, three doses of hepatitis B vaccine (HBV), and one dose of measles vaccine by 12 months of age.

Institutional ethical clearance was obtained from the Ethical Committee of the Usmanu Danfodiyo University Teaching Hospital, Sokoto. Permission to conduct the study was obtained from the Head of Department of Obstetrics and Gynecology, and the Chief Nursing Officer in-charge of the

clinic. Informed written consent was also obtained from the participants before questionnaire administration.

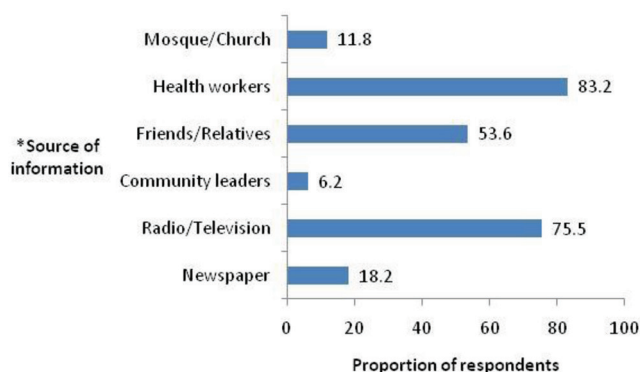
## STATISTICAL ANALYSIS

Frequency distribution tables were constructed; and cross tabulations were done to examine the relationship between categorical variables. The Chi square test was used for bivariate analysis involving categorical variables. All levels of significance were set at  $p < 0.05$ .

## RESULTS

### Socio-demographic Characteristics of Respondents

All the questionnaires administered to the 220 pregnant women enrolled into the study were completely filled and used for analysis giving a response rate of 100 percent. The



\*Multiple responses allowed

**Figure-1:** Sources of information on immunization against VPDs

Variables	Frequency (%) n = 220
Age groups (years)	
< 20	6 (2.7)
20 – 29	131 (59.5)
30 – 39	74 (33.6)
≥ 40	9 (4.1)
Marital status	
Married	202 (91.8)
Separated	4 (1.8)
Divorced	8 (3.6)
Widowed	6 (2.7)
Religion	
Islam	169 (76.8)
Christianity	51 (23.0)
Level of education	
Primary and below	46 (20.9)
Secondary and tertiary	171 (79.1)
Occupation	
Housewife	137 (62.3)
Petty trader	25 (11.4)
Businesswoman	20 (9.1)
Civil servant	31 (14.1)
Professional	7 (3.2)
Number of children alive	
1 – 4	181 (82.3)
≥ 5	39 (17.7)

**Table-1:** Socio-demographic characteristics of respondents

ages of the respondents ranged from 18 to 44 years with a mean age of  $28.12 \pm 5.58$  years. Majority of the respondents (59.5%) were aged 20-29 years. Most of the respondents were married (91.8%); and a majority of respondents were Moslems (76.8%), had secondary education and above (79.1%) and were housewives (62.3%). The respondents had between 1 and 12 children (mean =  $2.9 \pm 1.9$ ), with most of them 181 (82.3%) having 1 to 4 children [Table 1].

### Awareness of immunization against VPDs by respondents

All the respondents were aware of immunization against vaccine preventable diseases. Most, 183 (83.2%) of the 220 respondents obtained information on immunization against VPDs from health workers. Other major sources of information include radio/television 166 (75.5%) and friends/relatives 118 (53.6%). Only a few respondents obtained information on immunization against VPDs from church/mosque 26 (11.8%) and community leaders 14

Variables	Correct response Frequency (%) n = 220
Both sick and healthy children require immunization	154 (70.0)
Benefits of immunization**	
Prevents diseases	210 (95.5)
Cures diseases*	136 (61.8)
Reduces disease severity	178 (80.9)
Provides life-long protection from some diseases	93 (42.3)
Makes child grows faster*	76 (34.5)
Makes child more brilliant*	76 (34.5)
Knowledge grade	
Good	98 (44.5)
Poor	122 (55.5)
**Multiple responses allowed	
*The correct response is no	

**Table-2:** Respondents' knowledge of the child that requires immunization and its benefits

Variables	Correct response Frequency (%) n = 220
Vaccine preventable diseases	
Measles	211 (95.9)
Poliomyelitis	215 (97.7)
Tuberculosis	105 (47.7)
Tetanus	141 (64.1)
Whooping cough	152 (69.1)
Hepatitis	91 (41.4)
Yellow fever	94 (42.7)
H. influenza	23 (10.7)
Knowledge grade	
Good	108 (49.1)
Poor	112 (50.9)

**Table-3:** Respondents' knowledge of vaccine preventable diseases

Variables	Correct response Frequency (%) n = 220
Aware that there are specific periods for the vaccinations	
Yes	211 (95.9)
No	9 (4.1)
Knew the timing of the National Immunization Schedule as:	
At birth	211 (95.9)
At 6 weeks	201 (91.4)
At 10 weeks	160 (72.7)
At 14 weeks	159 (72.3)
At 6 months	200 (90.9)
At 9 months	204 (92.7)
At 1 year	202 (91.8)
During house to house vaccination	210 (95.5)
Knowledge grade	
Good	202 (91.8)
Poor	18 (8.2)

**Table-4:** Respondents' knowledge of the National Immunization Schedule

Attitude to childhood immunization	Positive response Frequency (%) n = 220
Considers vaccination as safe for her child	209 (95.0)
Considers it necessary to fully immunize her child against childhood VPDs	205 (93.2)
Would like to fully immunize her new baby after delivery	212 (96.4)
Would recommend full immunization of children to her friends, relatives and other women	211 (95.9)
Would buy the vaccines if they are no longer available free of charge to ensure that her child is fully immunized	200 (90.9)

**Table-5:** Respondents' attitude to childhood immunization

(6.2%) [Figure 1].

**Respondents' knowledge of the child that requires immunization and its benefits**

Majority of respondents 154 (70.0%) knew that both sick and healthy children require immunization. Most of them also knew that immunization prevents diseases (95.5%) and also reduces the severity of diseases (80.9%) Majority of respondents misunderstood immunization to cure diseases (61.8%), and about a third of respondents misunderstood it to make child grow faster (34.5%) or become more brilliant (34.5%) [Table 2]. Less than half 98 (44.5%) of the 220 respondents had good knowledge of the child that requires immunization and its benefits. A significantly higher proportion 83 (47.7%) of the 174 respondents with secondary and tertiary education had good knowledge of the child that requires immunization and its benefits compared to 14 (30.4%) of the 46 respondents with primary education and below ( $\chi^2 = 4.400, p = 0.036$ ).

Variables	Frequency (%)
Youngest child ever immunized (n = 220)	
Yes	201 (91.4)
No	19 (8.6)
Youngest child fully immunized (n = 220)	
Yes	144 (65.5)
No	76 (34.5)
Child ever experienced adverse effects following immunization (n = 201)	
Yes	123 (61.2)
No	78 (38.8)
Type(s) of adverse effects following immunization (AEFI) experienced by child* (n = 123)	
Fever	123 (100)
Pain at injection site	109 (88.6)
Skin rashes	4 (3.2)
Diarrhea	2 (1.6)
Convulsion	1 (0.8)
Main reason for not immunizing youngest child (n = 19)	
Did not consider it necessary	1 (5.3)
Religion is against it	1 (5.3)
Husband's disapproval	10 (52.6)
Health facility too far from their home	2 (10.5)
Lack of information on immunization schedule	5 (26.3)
*Multiple responses allowed	

**Table-6:** Compliance with full immunization among Respondents

**Respondents' knowledge of vaccine preventable diseases**

Although, less than half 108 (49.1%) of the 220 respondents had good knowledge of childhood vaccine preventable diseases, most of them knew poliomyelitis (97.7%) and measles (95.9%) as childhood vaccine preventable diseases. Whereas, about a third of respondents knew whooping cough (69.1%) and tetanus (64.1%) as childhood vaccine preventable diseases, less than half of respondents knew the other childhood vaccine preventable diseases [Table 3]. A significantly higher proportion 97 (56.1%) of the 174 respondents with secondary and tertiary education had good knowledge of childhood vaccine preventable diseases as compared to 12 (26.1%) of the 46 respondents with primary education and below ( $\chi^2 = 12.349, p < 0.001$ ).

**Respondents' knowledge of the National Immunization Schedule**

Almost all, 211 (95.9%) of the 220 respondents were aware that there are specific periods for childhood immunization according to the National Immunization Schedule, and that it is given at birth. Most of them also knew the other periods for childhood immunization as shown in Table 4. Most, 202 (91.8%) of the 220 respondents had good knowledge of the National Immunization Schedule, but there was no association between good knowledge of the National Immunization Schedule and any of the respondents' socio-demographic variables.

**Respondents' attitude to childhood immunization**

Most, 209 (95.0%) of the 220 respondents consider

vaccination as safe for their children. Most of them also showed positive attitude towards childhood immunization, as they consider it necessary to fully immunize their children (93.2%), would like to fully immunize their new baby after delivery (96.4%), recommend full immunization of children to their friends, relatives and other women, and even pay for the vaccines should the free vaccines become unavailable (90.9%) [Table 5].

#### Compliance with full immunization among respondents

Most, 201 (91.4%) of the 220 respondents reported that their youngest child was ever immunized, but only 144 (65.5%) reported having their youngest child fully immunized. Majority, 123 (61.2%) of the 201 respondents whose youngest child was ever immunized reported adverse effects following immunization (AEFI). Of these, the most commonly experienced AEFI were fever 123 (100%) and pain at the injection site 109 (88.6%). Of the 19 respondents whose youngest child was never immunized, the main reasons cited were disapproval by the husband 10 (52.6%), and lack of information on the immunization schedule 5 (26.3%) [Table 6]. A significantly higher proportion 128 (73.6%) of the 174 respondents with secondary and tertiary education had their youngest child fully immunized as compared to 16 (34.8%) of the 46 respondents with primary education and below ( $\chi^2 = 4.143$ ,  $p = 0.042$ ). Similarly, a significantly higher proportion 92 (85.2%) of the 108 respondents with good knowledge of childhood vaccine preventable diseases had their youngest child fully immunized as compared to 52 (46.4%) of the 112 respondents with poor knowledge of childhood vaccine preventable diseases ( $\chi^2 = 21.310$ ,  $p < 0.001$ ).

## DISCUSSION

This study assessed the knowledge, attitude and compliance with full immunization of children among pregnant mothers in Sokoto, North-western Nigeria. Awareness of immunization against vaccine preventable diseases was high (100%) among the respondents in this study, and most of them (83.2%) obtained information on it from health workers. This finding is in consonance with the finding in studies conducted in Lagos<sup>14</sup> and Riyadh<sup>15</sup> that reported health workers as the main source of information on immunization against VPDs. On the contrary, only 16% of the respondents in a study conducted in the United Arab Emirate<sup>13</sup> obtained information from health workers, and another study conducted in Libya<sup>16</sup> also reported community leaders as the main source of information on immunization against VPDs. The finding in this study is re-assuring as it suggests that health workers in Sokoto, Nigeria educate their clients on immunization against VPDs during the antenatal and postnatal clinic visits. This is supported by the finding in a study conducted in Ethiopia<sup>17</sup> in which the mothers confirmed that health professionals counsel them on child immunization during the antenatal and postnatal clinic visits. Even though, less than half of the respondents in this study (44.5%) had good knowledge of the child that requires immunization and its benefits, majority of them (70.0%) knew that both healthy and sick children should be immunized,

and most of them (95.5%) knew that immunization prevents diseases (95.5%) and also reduces their severity (80.9%). This is in agreement with the finding in a study by Qidwai et al,<sup>18</sup> that reported that 94% of respondents knew that immunization prevents diseases. Likewise, whereas less than half 108 (49.1%) of the 220 respondents had good knowledge of VPDs, most of them knew poliomyelitis (97.7%) and measles (95.9%) as childhood VPDs. It appears the health workers in Sokoto, Nigeria only focused on the need to immunize all children whether healthy or sick, and gave top priority to poliomyelitis (being one of the diseases targeted for elimination in Nigeria), and measles (being one of the epidemic prone disease in Nigeria),<sup>19</sup> when they should have given the mothers detailed information on the vaccine preventable diseases and the benefits of immunization. The Health Belief Model (HBM) posits that messages will achieve optimal behavior change if they successfully target perceived barriers, benefits, self-efficacy and threat<sup>20</sup>; and in health decision-making, individuals are expected to navigate choices involving weighing risk for consequences with benefits of action.<sup>21</sup> It is therefore imperative for health workers to provide mothers with adequate information on the VPDs and benefits of immunization in order to promote acceptance of immunization against VPDs by them.

Although, compliance with full immunization of children against childhood VPDs was sub-optimal among the respondents in this study (65.6%), it is much higher than the finding of the National Demographic and Health Survey 2013, that showed that only 25% of children aged 12 – 24 months were fully vaccinated in Nigeria, with North-western Nigeria recording an abysmally low 10% full vaccination coverage.<sup>2</sup> This could be due to the positive attitude towards childhood immunization by most of the respondents in this study and their relatively high educational attainment, in view of the association between full immunization of children and education level of mothers in this study, with a significantly higher proportion of mothers with secondary and tertiary education (73.6%) fully immunizing their children as compared with those with primary education and below (34.8%). This is further corroborated by the finding in a community based study in the neighboring Zamfara State<sup>22</sup> in which only 21% of mothers had formal education and only 7.6% of children were fully immunized; and another study in neighboring Kaduna State<sup>23</sup> in which only 33.8% of mothers completed secondary school, and only 15.6% of children were fully immunized.

This study also found an association between good knowledge of VPDs and compliance with full immunization of children among the respondents with a significantly ( $p < 0.05$ ) higher proportion of respondents with good knowledge of VPDs having their children fully vaccinated (85.2%) as compared with those with poor knowledge of VPDs (46.4%). In addition to establishing associations between compliance with full immunization of children and maternal education as well as good knowledge of VPDs among mothers, several studies have also established association between compliance with full immunization of children and

other maternal characteristics such as maternal knowledge of routine immunization, maternal employment, antenatal clinic utilization, access to healthcare facilities / distance from health facilities, access to immunization information, and retention of immunization card among others.<sup>11,17,22,24,25</sup> It is therefore necessary to consider these factors in the design of interventions for promoting acceptance of immunization by mothers.

Even though, the full vaccination coverage in this study (65.6%) is far below the 2020 target of 90%, it on a par with, or even higher than the full vaccination coverage obtained in studies conducted in many sub-Saharan Africa countries including Senegal (62.8%),<sup>24</sup> Gambia (52%),<sup>26</sup> and Ethiopia (36%),<sup>27</sup> thus highlighting the inadequacies and inequalities in full vaccination coverage across the continent. While these findings support the earlier submission by Restrepo-Mendez et al,<sup>11</sup> on the inequalities in full immunization coverage in low and middle income countries (particularly in sub-Saharan Africa), they also provide evidence on the poor performance of the health sector in these countries<sup>28</sup>; and this underscores the need for the Governments of the respective countries to strengthen their health systems by fully implementing the recommendations of the Quagadougou declaration on primary health care and health systems in Africa.<sup>29</sup>

Even though, only a few (8.6%) of the respondents in this study reported that their children were never vaccinated (with husbands disapproval and not considering it necessary to vaccinate their children being the most common reasons cited by them), it is a cause for concern, as it is believed that as long as a single child remains infected with polio, children in all countries are at risk of contracting polio.<sup>30</sup> This finding shows that in addition to educating the public on the importance of immunization, it has become necessary that interventions for promoting immunization acceptance by mothers be designed to include their husbands.

## CONCLUSION

This study showed sub-optimal compliance with full immunization of children against VPDs despite good knowledge of the National Immunization Schedule and positive attitude towards immunization by the respondents; but considerable gaps exist in the knowledge of VPDs and benefits of immunization. Health workers should also educate mothers on the VPDs and the benefits of immunization while educating them on the National Immunization Schedule. In addition, husbands should be involved in interventions for promoting immunization acceptance by mothers.

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