Introduction

Immunization coverage is one of the indicators used to monitor progress towards achieving child survival and the strategy to reduce childhood morbidity and mortality. \(^1\) It is the process of inducing immunologic defence against infectious microorganisms without significant risk to the recipient. It can also prevent infectious diseases in an individual, restrict the spread of diseases in the community (by herd immunity) and may ultimately eradicate the disease. \(^2\)

The standard measure of vaccination coverage is the percentage of children who have received the requisite number of vaccine doses irrespective of the age at receipt of the vaccine. However, to have maximal protection against a VPD, a child should receive all immunizations within recommended intervals, thus a coverage rate of 95% is necessary for the sustained control of these VPDs. \(^3\) The World Health Organization (WHO), United Nations Children’s Fund (UNICEF), and National Programme on Immunization (NPI) guidelines stipulate that a child should receive four doses of Oral Polio Vaccine (OPV), three doses of Hepatitis B Vaccine, three doses of Diphtheria, Pertussis and Tetanus (DPT) / Pentavalent vaccines and one dose each of Bacille Calmette Guerin (BCG), measles and yellow fever vaccines. This is usually cost-effective in reducing morbidity and mortality rates from VPDs. \(^4\)

While immunization coverage in Nigeria increased from 12.9% in 2003 to 16.4% in 2007 and 22.7% in 2008, the coverage in the more recent times is quite encouraging. The coverage has more than tripled ever since 2008. \(^5\) However, there is need for caution, because pockets of susceptibility may act as potential reservoirs of infection as well as the general attitude of the people in terms of late presentation to the health facilities for treatment. Some local studies cited that some children are still never immunized despite high coverage in several places. The States of Bayelsa, Delta, Akwa-Ibom, Abia and Rivers in Nigeria have 13.2%, 39%, 3.5%, 4.8% and 2.2% of their infants still never immunized despite high coverage in several places. \(^6\) VPDs accounts for 17% of global total under-five mortality per year. In Nigeria, VPDs were responsible for 22% of child mortality amounting to over 200,000 deaths per year. \(^7,8\)

Several studies on immunization coverage were health facility based. Community evaluation of immunization coverage provides true evidence whether substantial progress towards achieving vaccination targets is being made, as well as true
Table 1: Socio-demographics.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Iju (%)</th>
<th>Ogbese (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>133 (46.7)</td>
<td>152 (53.3)</td>
<td>285 (50.89)</td>
</tr>
<tr>
<td>Female</td>
<td>147 (53.5)</td>
<td>128 (46.5)</td>
<td>275 (49.11)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2 years</td>
<td>128 (58.7)</td>
<td>90 (41.3)</td>
<td>218 (38.93)</td>
</tr>
<tr>
<td>2 years and above</td>
<td>152 (44.4)</td>
<td>190 (55.6)</td>
<td>342 (61.07)</td>
</tr>
<tr>
<td>Tribe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoruba</td>
<td>239 (57.5)</td>
<td>177 (42.5)</td>
<td>416 (74.29)</td>
</tr>
<tr>
<td>Hausa</td>
<td>5 (41.7)</td>
<td>7 (58.3)</td>
<td>12 (2.14)</td>
</tr>
<tr>
<td>Igbo</td>
<td>24 (29.6)</td>
<td>57 (70.4)</td>
<td>81 (14.46)</td>
</tr>
<tr>
<td>Others</td>
<td>12 (23.5)</td>
<td>39 (76.5)</td>
<td>51 (9.11)</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christianity</td>
<td>250 (50.1)</td>
<td>249 (49.9)</td>
<td>499 (89.11)</td>
</tr>
<tr>
<td>Islamic</td>
<td>29 (48.3)</td>
<td>31 (51.7)</td>
<td>60 (10.71)</td>
</tr>
<tr>
<td>Traditional</td>
<td>1 (100.0)</td>
<td>0 (0.0)</td>
<td>1 (0.18)</td>
</tr>
<tr>
<td>Mother’s level of education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>53 (31.4)</td>
<td>116 (68.6)</td>
<td>169 (30.18)</td>
</tr>
<tr>
<td>Secondary</td>
<td>139 (54.3)</td>
<td>117 (45.7)</td>
<td>256 (45.71)</td>
</tr>
<tr>
<td>Tertiary</td>
<td>87 (68.5)</td>
<td>40 (31.5)</td>
<td>127 (22.68)</td>
</tr>
<tr>
<td>None</td>
<td>1 (12.5)</td>
<td>7 (87.5)</td>
<td>8 (1.43)</td>
</tr>
</tbody>
</table>

Table 2: Determinant of immunization in the community.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Iju</th>
<th>Ogbese</th>
<th>χ²</th>
<th>P - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>primigravida</td>
<td>38 (13.6%)</td>
<td>30 (10.7%)</td>
<td>15.78</td>
<td>0.001</td>
</tr>
<tr>
<td>Multigravida</td>
<td>146 (52.1%)</td>
<td>191 (68.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand multigravida</td>
<td>96 (34.3%)</td>
<td>59 (21.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child socio economic class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>56 (20.0%)</td>
<td>54 (19.3%)</td>
<td>1.25</td>
<td>0.54</td>
</tr>
<tr>
<td>Middle</td>
<td>78 (27.9%)</td>
<td>90 (32.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>146 (52.1%)</td>
<td>136 (48.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>85 (30.4%)</td>
<td>133 (47.5%)</td>
<td>17.31</td>
<td>0.001</td>
</tr>
<tr>
<td>Antenatal</td>
<td>195 (69.6%)</td>
<td>147 (52.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

χ² - Chi-square Value, P – Significant value

Table 3: Patients’ perception of the immunization staff.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Iju town</th>
<th>Percentage (%)</th>
<th>Ogbese town</th>
<th>Percentage (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>How will you rate the hospital staff?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friendly</td>
<td>244</td>
<td>87.15</td>
<td>219</td>
<td>78.22</td>
<td>0.015*</td>
</tr>
<tr>
<td>Unfriendly</td>
<td>2</td>
<td>0.71</td>
<td>3</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>Bad</td>
<td>2</td>
<td>0.71</td>
<td>2</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>30</td>
<td>10.72</td>
<td>56</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>2</td>
<td>0.71</td>
<td>0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>The attitude of the staff is?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encouraging</td>
<td>257</td>
<td>91.79</td>
<td>237</td>
<td>84.64</td>
<td>0.038*</td>
</tr>
<tr>
<td>Discouraging</td>
<td>2</td>
<td>0.71</td>
<td>6</td>
<td>2.14</td>
<td></td>
</tr>
<tr>
<td>Committed</td>
<td>21</td>
<td>7.5</td>
<td>34</td>
<td>12.15</td>
<td></td>
</tr>
<tr>
<td>Not committed</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Environment of the clinic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>182</td>
<td>65.0</td>
<td>181</td>
<td>64.64</td>
<td>0.611</td>
</tr>
<tr>
<td>Relaxing/Conductive</td>
<td>19</td>
<td>6.79</td>
<td>14</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Clean enough</td>
<td>76</td>
<td>27.14</td>
<td>79</td>
<td>28.22</td>
<td></td>
</tr>
<tr>
<td>Manageable</td>
<td>3</td>
<td>1.07</td>
<td>6</td>
<td>2.14</td>
<td></td>
</tr>
<tr>
<td>The clinic is...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Far from town</td>
<td>57</td>
<td>20.36</td>
<td>70</td>
<td>25.0</td>
<td>0.15</td>
</tr>
<tr>
<td>Within reach</td>
<td>223</td>
<td>79.64</td>
<td>210</td>
<td>75.0</td>
<td></td>
</tr>
<tr>
<td>Staff commitment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too much delay</td>
<td>28</td>
<td>10.0</td>
<td>35</td>
<td>12.5</td>
<td>0.381</td>
</tr>
<tr>
<td>Can do better</td>
<td>78</td>
<td>27.86</td>
<td>88</td>
<td>31.43</td>
<td></td>
</tr>
<tr>
<td>Prompt services</td>
<td>174</td>
<td>62.14</td>
<td>157</td>
<td>56.07</td>
<td></td>
</tr>
</tbody>
</table>

**Likelihood ratio; *Fisher’s exact test
correlation of morbidity and mortality from vaccine preventable diseases. Such study will inform planners and policy makers on strategic changes required to achieve the desired National antigen cumulative coverage. The study therefore set out to assess the immunization coverage of the children under-5 in Akure North Local Government Area of Ondo State, Nigeria.

Materials and Methods

Study area

The study was conducted in the Akure North Local Government Area (ANLGA) of Ondo State in January 2016. It has a population of 171,450 based on a 2016 projection of the 2006 Nigerian national population. ANLGA is one of the 18 Local Government Areas that constitute the State. It is divided into 12 administrative wards namely: Ayetoro, Igbaro, Ilu-Abo, Isimaja, Moferere, Oba-Ile, Odo-Oja, Ogbese, Oke-Afa, Oke-Iju, Oke-Ore, and Osi-Igoba. Vaccination roles are being played by multiple stakeholders including Governments, development partners and the NGO, with Primary Health Care centres assuming implementation roles. Study design was community-based, descriptive and cross-sectional.

Study population

Consisted of eligible mothers and children resident in Akure North LGA. The study subjects included care-giver/mother-children pairs in which the children are aged one to five years living in the houses selected for the study.

Inclusion criteria

These included (1) consenting care-giver/mother-children pair and (2) respondents resident in the study location.

Exclusion criteria

These included (1) respondents who have lived in the catchment area for less than six months and (2) mothers whose children are less than one year or greater than five years of age.

Sampling size estimation

Using the modified Leslie Fisher’s formular for the calculation of sample size for population less than 10,000, and National Demographic Health Survey, 2013 (NDHS) immunization coverage, a sample size of 255 was obtained. This was raised to 280 to allow for cases of non-response. The estimated sample size of 280 was made to apply to each of the two communities, giving a total figure of 560.

Sampling method

A multi stage sampling method was employed in sample selection. In Stage I, two community wards (Ogbese and Oke-Iju) were selected from the 12 using simple random sampling employing simple ballotting. These two communities have human populations of 25,797 and 10,806 respectively. There were about 2,150 houses in Ogbese while 600 houses were in Oke-Iju. The population for children aged 1-5 years in Ogbese and Oke-Iju were 4,863 and 2,037 respectively.

In Stage 2 and using the National Population Census (NPC) enumeration areas (EAs) as the stratifying factor, six EAs were selected using stratified random sampling technique. In Stage III and in an EA, a systematic random sampling technique (following the listing of the sampling frame) in which one-in-seven (for Ogbese) and one-in-two houses (for Oke-Iju) was employed to accommodate the population difference.

Research instruments and data collection

A semi-structured interviewer-administered questionnaire meant to elicit socio-demographic information of mother, knowledge of vaccination schedule, knowledge about vaccine preventable diseases, sources of immunization information, place of antenatal care, and immunization coverage by show of immunization card.
diseases and historical recall of vaccines received by the child was used.

**Ethical clearance**

To conduct this study was obtained from the Obafemi Awolowo University Research and Ethics committee. Written informed consent was obtained from the mothers.

**Data analysis**

Data collected with the questionnaires were checked for errors, entered into the computer and analyzed using SPSS version 21 (Chicago II, USA). Dropout rate which is the percentage of the children dropping out from those who started immunization were calculated. Confidence limit for the study was set at 95%; thus significance level was set at $p < 0.05$.

**Results**

The total number of mother-child pairs recruited for the study was 560, with equal numbers (280) from each of the two Wards [Table 1]. Altogether, there were 285 (50.89%) males and 275 (49.11%) females. Majority of the study subjects 416 (74.3%) were of Yoruba tribe while more than two-third were Christians 499 (89.1%).

Figure 1 shows that 90.3% of the respondents from Iju and 70.7% from Ogbese got their information about immunization from the hospital source (through antenatal clinics and health workers) and Figure 2 shows that more than 90% of all the mothers in both communities had antenatal care in the hospitals.

Figure 3 shows the immunization coverage for Iju and Ogbese. There was high immunization coverage for the various vaccines in both communities except HIB and pentavalent vaccines. Meanwhile, 94.6% of the children had full immunization in both communities altogether. Figure 4 shows the dropout rate. BCG/DPT1 was 7.3%, DPT1/DPT3 was 31.3% and DPT3/Measles was 35.8%.

Immunization uptake among mother’s parity was significantly different (15.78; $p < 0.05$) between the two communities likewise in the source of information [Table 2]. Meanwhile, child socio-economic class was not significant determinant (17.31; $p < 0.05$) of immunization coverage between the two communities.

The patient perception on the immunization staff was shown in Table 3. Majority of the subject studied rated immunization staff to be friendly. Nevertheless, there was significant difference ($p < 0.05$) in staff relationship with the patient between the towns studied. Likewise, there was significant difference ($p < 0.05$) in attitude of staff between the towns, 6 (2.14%) subject studied from Ogbese and 2 (0.71%) from Iju rated the attitude of the staff to be discouraging. Only 2 (0.71%) of subject studied from Ogbese reported that the staff were not committed. The perception of the subject studied on the environment and distance of the clinic from Ogbese was not significantly different ($p >0.05$) from Iju. More than half; 174 (62.14%) and 157 (56.07%) of subject studied from Iju and Ogbese respectively, identified prompt service delivery by the immunization staff.

**Discussion**

The immunization coverage in this current study was 94.6% and it was higher than the figures recorded from other parts of Nigeria, like 72.2% in imala, Ogun State, [10] 76.9% in Igo-Ora, Oyo state, [10] 47.2% in Ondo State, 62.4% in Imo State, 1.4% in Sokoto State and the national figure of 25.3%. [11] Other countries like Ghana (70%), Sudan (75.1%) Ibnouf et al., [12] USA (86-90%) USAID, [13] Pakistan (71.9%) Shaikh et al. [14] and India (39%) Banerjee et al., [15] UK (99.5%) and South Africa (90.4%) had been also reported.

The coverage for the individual antigen in this current study is high except for HIB and DPT3. These high levels of coverage of the rest of the vaccines may be attributable to the quality of information provided to mothers at the health facilities, the more frequent use of local Polio Immunization Days (LIDs), Immunization Plus Days, mop ups and other vaccination campaigns to pre-empt or respond to disease outbreak. The mothers are given moral support in form of gifts (mosquito nets, vests, kegs, water guards and celebrations) when they endeavour to complete their children’s immunization schedules; which is called “Moyege” in the local language meaning “I am free.” NDHS [11] reported 62.3% for BCG in Nasarawa, 60.1% for DPT1 and 34.1% for DPT3. There is however a dropout rate of 7.25% for BCG/DPT1, 31.3% for DPT1/DPT3 and 35.75% for DPT3/Measles. The dropout rates in this study was higher than dropout rate of DPT3/Measles (1.8%) recorded by Datta et al., [16] DPT1/DPT3 of 13.4% [17] and 0.0%, [18]

Lower socio-economic class mother were likely to be less informed about immunization has revealed in the present study. This was in supported by Mosiur and Sarker [19] that rich family will be more likely vaccinate their children than poor family. It was also revealed in this study that multigravidas are more likely to have good knowledge about vaccination than primigravidas. Source of information mentioned by most of the mothers was antenatal and this due to the fact that almost the entire mother attends antenatal care in the hospital, not elsewhere.

More than three-quarter of mother in these communities acknowledged that the clinic is very close to their residence and also that the staff are prompt in service delivery. Nevertheless, far distances to clinic and staff attitude are still challenging immunization coverage as mentioned by a few of the mothers. According to Ibnouf et al., [12] distance of walking from the residence to the clinic for the accessibility of vaccination is one of the principal factors affecting immunization status.

In the communities studied, mothers from Iju have more knowledge about vaccination than mothers from Ogbese. This is more likely to literate level, some mothers have no education and many of them were of primary education in Ogbese community. Educational levels also determine mother’s perception and knowledge in taking vaccination for their children [20-22] while the findings of Omole and Owodunni, [23] and Tagbo et al. [24] were not in agreement with this.

**Conclusion**

Despite the fact that immunization coverage of the children under 5 was high in AKNLGA, Ondo State must work harder...
to keep up the high figures they have and also improve on the few lapses on the parts of some of the inhabitants who need more information and community mobilization to comply with the immunization schedule at all levels.

**Conflict of Interest**

The authors disclose that they have no conflicts of interest.

**References**


