

SHORT TERM EVALUATION OF A RURAL IMMUNIZATION PROGRAM IN NIGERIA

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Background: Immunization remains the primary strategy in both the control and prevention of common childhood diseases, particularly in the developing world. Immunization and preprimary health care services were commenced in a rural community in Nigeria in 1998, when vaccine coverage for all Expanded Program on Immunization (EPI) diseases (tuberculosis, polio, diphtheria, pertussis, tetanus, measles, and hepatitis B) was considerably low with only 43% of children fully immunized.

Methods: Children aged 0-2 years and living in a rural community were recruited into the study. Data on vaccination history was collected by both vaccination card and maternal history. Three hundred and twenty-seven children were recruited into the study. Study participants were vaccinated for EPI diseases. Hepatitis-B vaccine was administered at birth, and a combined diphtheria and tetanus toxoids, and pertussis whole cell vaccine (DTP) plus hepatitis-B vaccine was administered in a single injection after six weeks.

Results and Conclusions: Two years after the program was started, immunization coverage rates were 94% for BCG, 88% for DTP (third dose), and 82% for measles. All antigens showed significant improvements from baseline values ($p < 0.0001$). Eighty four percent of children were fully immunized against all six diseases, compared with 43% at the commencement ($p < 0.0001$). Hepatitis-B coverage (three doses) was 58%. The vaccination program has significantly improved vaccination coverage and could be a model for under served, non-industrialized communities. (*J Natl Med Assoc.* 2003;95:175-179.)

Key words: Immunization ♦ vaccination
♦ coverage evaluation

Immunization remains a key strategy in both the control and eradication of the six common childhood diseases. Hepatitis-B has now been added as the seventh preventable disease.¹

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However, it has been observed that the momentum to sustain immunization is faltering.² Thus, activities to maintain or increase coverage such as National Immunization Days have been initiated in many countries.^{3,4} In Nigeria, such activities have shown relatively low increase in coverage rates, which have remained below 30% for three doses of DTP at 12 months of age.⁴⁻⁶ Evaluation of a vaccination program is important as it generates valuable information on coverage, service uptake, and utilization, and it enables service providers an opportunity to improve on the program.^{3,7-10}

This paper reports on a short-term (two-year) evaluation of a privately financed immunization program located in a rural community in mid-

western Nigeria. The project commenced services in 1998. Only 43% of children aged 0-2 years were found to be fully immunized at that time.¹¹ The objective of this study was to compare vaccination coverage obtained at the baseline and now.

METHODS

Background About the Community

The immunization program is located in Sabongidda-Ora in Edo State, mid-western Nigeria. The population of the town in 1991 was 8500 and is now estimated to be 11,423 using an annual growth rate of 3%. The actual coverage area of the program encompasses neighboring towns and villages with a total population of more than 50,000.

The community is quite rural, with occasional electricity and telephone facilities. There is pipe-borne water, though this is not available in every household. About 60% of households use pit latrines for sewage disposal. Subsistence farming is the major occupation, while many of the women are traders at local markets.

Immunization Service

Financed by GlaxoSmithKline (formerly SmithKline Beecham) Biologicals PLC, the project was designed to immunize children in the recipient community against all Expanded Program on Immunization (EPI) diseases, including hepatitis B, making this the only community in Nigeria currently receiving the hepatitis-B vaccine. The sponsors directly donate, or provide funds for the clinic, and for vaccines, medical supplies, cold chain equipment, and staff salaries. Because the project was considered to be distinct from the on-again off-again service provided by the local government, special approvals and buy-ins were obtained from various echelons of the community. These included village elders, the head chief, local government council head, State Ministry of Health, and area university medical faculty.

The community was mobilized through various meetings. Members of staff for the program

were drawn from the host community and consisted of a project nurse, clerk, janitor and security guard. The local physician volunteered to supervise when needed.

Immunization services to the under-two-year-olds are provided three times a week in the clinic, with two days reserved for home visiting to offer vaccinations and follow-ups, if necessary, and other administrative duties. Standard EPI vaccination cards were provided to vaccinees for recording immunizations. The Nigerian National EPI schedule is followed with the exception that the hepatitis-B vaccination is modified to accommodate the use of a combined whole-cell DTP vaccine plus recombinant hepatitis-B vaccine to vaccinate against DTP and hepatitis-B with a single injection. As it is not possible to vaccinate children earlier than six weeks of age with this combined vaccine, additional hepatitis-B vaccine doses were provided at birth, as recommended in the EPI. Therefore, children receive four doses of hepatitis B vaccine, which has been shown to be effective.¹² The program also provides other primary health care services such as health education and treatment of common childhood illnesses.

Data Collection and Analysis

Children aged 0-2 years were included in the survey and data collection was through the review of vaccination cards and direct questioning of parents, similar to the procedure utilized at the start of the project.¹¹ The project nurse and clerk visited all the households in the community to document vaccinations received by each eligible child. Visits were repeated for children not met at home. Data was collected between February and March 2000. The information was elicited from the EPI card. Dates when such vaccines were administered were recorded on a register for future entry into a computer. Those that did not have the cards were asked orally if they received the vaccines at the appropriate times.

Data was analyzed using Epi-Info software v6.04c (CDC, USA & WHO, Geneva, Switzerland). Both descriptive and inferential sta-

Table 1. IMMUNIZATION COVERAGE

ANTIGEN	Baseline study ¹¹ % (N=229)	Present Study % (N=327)	X ²	p
BCG	75.1	94.2	39.95	0.0000
OPV ₀	N/A	72.2	-	-
OPV ₁	75.1	94.2	39.95	0.0000
OPV ₂	67.6	91.0	47.51	0.0000
OPV ₃	66.0	88.0	38.39	0.0000
DTP ₁	66.7	94.2	69.34	0.0000
DTP ₂	66.0	91.0	53.39	0.0000
DTP ₃	66.0	88.0	38.39	0.0000
Measles	43.7	82.2	88.16	0.0000
Fully immunized (6 diseases)	43.2	77.7	67.45	0.0000
Fully immunized (all 7 diseases)	N/A*	54.8%	-	-

* N/A-Not available

tistics were determined. Children were considered fully immunized against all six diseases if they had received BCG, three doses of DTP, three doses of oral polio, and one dose of measles vaccine. They were categorized as being fully immunized against all seven diseases if they received three doses of hepatitis-B vaccine in addition to the other antigens listed above. To measure the impact of the program, vaccine coverage rates obtained were compared with baseline rates.

RESULTS

A total of 327 children aged 0-2 years were recruited into the study. They consisted of 150 (48%) females and 171 (52%) males. The mean age was 1.09 ± 0.5 years. Two hundred and sixty-five (81%) had vaccination cards.

Table 1 shows the vaccination coverage for each antigen, compared with the coverage obtained prior to start of the program two years earlier. Nearly 80% of children were “fully vaccinated” against all the six antigens, which show a significant improvement over the baseline values (p<0.0001). The significant improvement was found for all antigens. One hundred and seventy-nine (55%) of the subjects were fully vaccinated against all seven diseases. There were no significant differences in the proportion of female

(125/156, 80.1%) and male (129/171,75.4%) children who were vaccinated, X²=0.78, p=0.376. However, children who had a vaccination card (217/265, 81.9%) were significantly more completely immunized than those who did not (37/62, 59.6%) X²=13.04, p=0.0003.

Table 2 shows hepatitis B coverage. Hepatitis-B vaccine received at six weeks (along with DTP first dose) had the highest coverage. Fifty eight percent received at least three doses of hepatitis-B vaccine with most of them receiving all four doses.

Discussion

Two years following the commencement of our service, immunization coverage in the community had significantly increased for all antigens compared with the baseline values. Thus, with four out of every five children vaccinated, the community’s immunity against polio is assumed to be high. The vaccination coverage recorded in this community shows that there is a beacon of hope for eradicating these diseases in this community, in spite of the low figures for the country.^{5,6} The coverage figure is higher than what has been observed in Ethiopia (47%),¹³ and for a semi-urban riverine community in Nigeria (41%).¹⁴

Possession of the vaccination card, which showed a significant association with immunization status in this study, was observed in Uganda.⁸ We were unable to find an association with the sex of children, a finding also confirmed by other researchers.¹⁴ Furthermore, successful inclusion of hepatitis-B immunization has potential future promise of reducing cost and enhancing convenience by eliminating the separate injection or clinic visit that would otherwise be necessary. The program has been able to raise hepatitis-B coverage from a non-existent level to 52% for the third dose within two years.

The coverage rate for hepatitis-B third dose is comparable with the 57% obtained in Italy.⁷ Thus, almost three out of every five children may now have attained sero-protective status with most of them receiving a dose at birth, indicating that mothers brought their children to the clinic soon after birth. The wide gap between the hepatitis-B third dose and DTP third dose is because some children had commenced their immunization at other facilities before registering into our service. Elsewhere, it has been shown that incorporating hepatitis-B vaccine into the EPI increased coverage of all antigens to over 80%,^{15,16} indicating that this vaccine does not have any adverse effect on the coverage rates of other antigens. Using a combined vaccine is more likely to further raise the rate. In this host community, over half of the children may now be fully protected against all the seven diseases within two years, indicating that it will be possible to have an impact on hepatitis-B and other vaccine preventable infections in this community within a short time.

Moreover, it has been observed that perinatal transmission of hepatitis-B is far less important in Africa than in Asia because African women who are carriers of the infection tend to lose their hepatitis B 'e' antigen before reaching child bearing age.¹⁷ Thus, hepatitis B vaccine may then be given along with DTP, at six weeks to three months of age and may still be able to prevent most African children from becoming carriers.¹⁷ With this in mind, it would be possible to skip the dose at birth as

presently recommended in many African countries, and use a combined vaccine starting at six weeks to protect against diphtheria, pertussis, tetanus and hepatitis B. This option is also cost-saving as it will eliminate the cost of providing the hepatitis-B vaccine dose at birth. Furthermore, it offers the possibility of a higher coverage for hepatitis-B as it is incorporated with DTP, and may offer earlier protection (at four or five months of life) than what one would obtain at nine months of age if the hepatitis-B vaccine was administered along with the measles vaccine, as presently recommended in Nigeria. It is well known that measles coverage is the lowest among all the EPI antigens.

Table 2. HEPATITIS B VACCINATION COVERAGE

Hepatitis B Dose	COVERAGE (N=327) n (%)
At birth (HB0)	131 (40.1)
First dose (HB1)	218 (66.7)
Second dose (HB2)	198 (60.6)
Third dose (HB3)	171 (52.3)
At least 3 doses	191 (58.4)

The success of this rural immunization program lies in a number of factors. These include the commitment of the sponsors of the program who have paid sufficient attention to vaccine logistics, a strict commitment to measurable goals, regular supervision, good community participation, free services, enthusiasm shown by mothers in bringing their children for vaccinations, and home visiting by staff. Home visiting has been found in a controlled trial to significantly improve vaccine coverage in Ghana.¹⁸ Thus, it is possible to raise immunization coverage rates from low to high figures if sufficient attention is paid to most of these factors. Despite the small population of the community, we believe that the success of this program is reproducible on a larger scale.

In summary, after two years of running the immunization program, immunization coverage has risen from 43% to 78% with a significant impact on all antigens. We suggest that the combined hepati-

tis-B vaccine be considered for use on a nationwide basis to quickly raise hepatitis B coverage. We also recommend that mothers should be mobilized to commence immunization of their children as soon as possible after birth. Finally, this program demonstrates the value of corporate citizenship to medically under-served communities.

As of mid-July 2002, when review of this manuscript was nearing completion, the community's local government was no longer providing immunizations, making our program the only source of such care, and further demonstrating its usefulness.

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