Original Research

A cross-sectional study to assess the immunization coverage and vaccine dropout rates among 12 to 23 months old children in a rural area of Tripura

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Abstract

Background: Vaccine-preventable diseases are major causes of under-5 mortality in India. As per World Health Organization (WHO) estimates, India has the largest dropout rate for three doses of DPT vaccine.

Objectives: To assess the immunization coverage and vaccine dropout rates among 12 to 23 months old children of Mohanpur area, Tripura.

Materials and Methods: A community-based cross-sectional study has been conducted among 330 children of 12 to 23 months age group from Mohanpur area, under the rural field practice area of Department of Community Medicine, Agartala Government Medical College, using Lot Quality Assurance Sampling (LQAS) technique for a period of one year. A pre-designed, pre-tested questionnaire has been used to collect required information with verification of immunization card and where the card is not available, by examination of scar mark or interviewing the respondent. Data has been analyzed using computer software SPSS version 21.0 and data are expressed in the form of diagrams and tables in percentages.

Results: Out of total 330 children between 12-23 months age group surveyed, 59.7% were males and 40.3% were females, and 300 (90.9%) were fully immunized, whereas 29 (8.8%) were partially immunized. This study also reveals BCG-DPT3 dropout rate to be 2.1%, BCG-Measles Dropout rate at 3.9% and DPT3-Measles dropout rate to be 1.8%.

Conclusion: Higher coverage of Full immunization and lesser dropout rates for individual vaccines in our study population indicates better access to immunization services by the selected rural population of Tripura.

KEY WORDS: Immunization coverage, Full immunization, Vaccine dropout rates, Rural, Tripura

Introduction

Infectious diseases are a major cause of morbidity and mortality in children. One of the most cost-effective and easy methods for the healthy well-being of a child is immunization. The goal of immunizing children against Tuberculosis, Polio, Diphtheria, Pertussis, Tetanus, Hepatitis B, and Measles, responsible for child mortality and morbidity, is indeed a noble one.[1] The most important indicators mentioned in the Millennium Development Goals (MDGs) for which India is a signatory, are the under-5 mortality rate (U5MR), Infant Mortality Rate (IMR), and proportion of one-year-old children immunized against measles (P1MV). About one-quarter or 25% of the under-5 mortality is due to vaccine-preventable diseases.[2]

Among the 22.6 million children who did not receive three DTP doses (DTP3) during the first year of life as per WHO estimate 2012, 16.3 million (72%) lived in 10 countries, among which 12.4 million (54%) lived in three countries: 30% in India (72% DTP3 coverage), 17% in Nigeria (41% DTP3 coverage), and 7% in Indonesia (64% DTP3 coverage).[3]

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There was a high BCG vaccination coverage (the first administered vaccine) and a low measles vaccination coverage (the last administered vaccine) estimated in a survey indicating a high dropout rate, ranging from 14% in Syedpur to 36% in Dhaka's zone 8. In Bangladesh, where resources are limited, results from surveys using LQA sampling enabled managers of the National Expanded Programme on Immunisation to identify areas with poor vaccination coverage.[4]

A cross-sectional study was conducted by UNICEF between March and July 2007 in Aden, Yemen during which time; mothers of 680 children from 37 clusters were randomly interviewed from that area. It was found that 83.1% children had full immunization, 10.4% had partial immunization and 6.5% were never immunized. The immunization card retention rate was 84.9%. The immunization coverage was 92.9% for BCG, 89.6% for OPV-3, 86.6% for DPT-3 and Hepatitis B vaccination, and 89.1% for Measles vaccine.[5]

In a cross-sectional study conducted in Nepal with the 30-Cluster sampling method, the coverage responses according to history from mothers was found to be 96.7%, 90.0%, 97.6% and 78.1% for BCG, DPT, Hepatitis B Vaccine-3, OPV-3, and Measles vaccine respectively. The dropout rate of BCG versus Measles vaccine was also very high. The District Health Office reports remarkably higher than the coverage of immunization obtained by the survey, showing additional number of the target children.[6]

A study was conducted in Dhaka District in October 2002, using a 30-Cluster cross-sectional design to assess the immunization coverage in Dhaka. Out of the total 63 unions, 30 clusters were selected randomly; probability proportionate to size sampling procedure was used. The study revealed the routine immunization coverage in Dhaka among children within 12 months of age by card and history was 97% for BCG, 97% for DPT-1 and OPV-1, 75% for DPT-3 and OPV-3, and 67% for Measles vaccine. Vaccination card retention rate for children was 84% and lack of knowledge of parents was the major reason for missed vaccination of the third dose of DPT and OPV.[7]

The current study is aimed at assessing the Immunization coverage and vaccine dropout rates among 12 to 23 months old children of Mohanpur area, the rural field practice area under Department of Community Medicine of Agartala Government Medical College, Tripura.

Objectives

i. To assess the immunization coverage among 12 to 23 months old children of Mohanpur, the rural field practice area under Department of Community Medicine of Agartala Government Medical College, Tripura.
ii. To assess the vaccine dropout rates among 12 to 23 months old children of Mohanpur area, Tripura.

Materials and Methods

Study design: The present one is a community-based cross- sectional study.

Study setting: Rural field practice area of Agartala Government Medical College under Mohanpur community health center.

Study area: All twenty-two sub-centres under Mohanpur community health center have been included in the study considering each sub-centre as one lot.

Study population: Children of 12 to 23 months age group residing in the area under Mohanpur community health center.

Study duration: One calendar year (from November to October 2014).

Sampling technique: Lot Quality Assurance Sampling Technique (LQAS) to calculate the required total sample population and the number of children required for each lot (sub-centre). Children from each lot have been selected from the immunization register available at each sub-centre by lottery method. Then those children were visited at their homes for the collection of data regarding full immunization coverage and verification of immunization status.

Sample size calculation: Sample size is calculated by following steps -

i. First, an estimate of total sample size is made based on ±5% accuracy level and 95% confidence limit using Lemeshow and Taber-LQAS table, which gives a sample size of 384 children.[8]
ii. Estimation of target population=total population × birth rate of state in rural×(1 – infant mortality rate of the state, rural)÷1000
    Total population under Mohanpur community health center area is 1,04,830.
    (Birth rate of Tripura, rural areas= 15.6 per 1000 population
    Infant mortality rate of Tripura, rural areas= 29 per 1000 live births) [9]
    Therefore, target population = 104830×15.6× (1-29÷1000) ÷1000 = 1588.
iii. Sampling fraction (%)= total sample size÷ target population ×100 = 384÷1588 ×100= 24.181%
    As sampling fraction should be less than 10% total sample size is reduced by the formula
    Revised total sample size= total sample size÷ (1 + sampling fraction) = 384÷ 1.241 = 309.4.
    For the convenience of calculation, a total sample size of 310 was considered for initial assessment.
iv. Number of lots studied: here we have taken all the 22 sub-centres under Mohanpur community health center as 22 distinct lots.
v. The minimum lot sample size = revised total sample size÷ number of lots = 310÷ 22 = 14.09.
    Therefore, 15 children have been selected from each lot.
    The final sample size = 15× 22 = 330.

Inclusion criteria:

i. Children whose parents gave consent for participating in the study.

Exclusion criteria:

i. Children who were not resident in Mohanpur area for more than 6 months.

ii. Children whose caretakes were not available on the day of the family survey.

Operational definitions:

Full immunization: defined as immunization of a child with one dose of BCG, 3 doses of DPT, OPV, Hepatitis B Vaccine and one dose of Measles vaccine within the age of one year.

Partial Immunization: immunization status of a child who is not fully immunized but has received at least one vaccine within the age of one year.

Non-Immunization: immunization status of a child who has not received any vaccine as per National Immunization Schedule within one year age.

Study tool: A pre-designed and pre-tested, semi-structured questionnaire, translated into both Bengali (local language by an expert) and English (for those respondents who do not understand Bengali), has been used to collect the required information.

Data collection procedure: Information was collected by using the questionnaire and immunization cards were verified physically to validate information and confirm the appropriate date of vaccination. Where immunization card was not available verification was done by examining BCG scar and interviewing the respondent during the home visit for every child.

Data analysis: The information collected using the above-mentioned method, is converted into a computer-based spreadsheet. All data have been expressed in terms of numbers and percentages. Data analysis has been done using SPSS version 21.0 statistical software.

Informed consent: A written informed consent was taken from the parents of all the study children. The consent form printed in either local language (Bengali) or English (for those who don't understand Bengali) was duly signed by the respondents of the study. Confidentiality regarding the information has been maintained throughout the whole study period.

Ethical consideration: has been taken from the Institutional Ethics committee, Agartala Government Medical College before the commencement of the study.

Results

Out of the total 330 children between 12-23 months age group surveyed, the majority (59.7%) are males and 40.3% are females. Most of the children (90.9%) are found to be fully immunized, and the rest, 8.8% are partially immunized and 0.3% non-immunized (Figure 1).

(Table 1) reveals, BCG vaccination coverage is 99.7%, Measles vaccination & HBV coverage 95.45% and coverage for DPT and OPV is 97.3%.

(Table 2) shows, that out of 30 children of 12 -23 months age group who were not fully immunized, most of them i.e. 14 (46.7%) missed Measles vaccine, followed by 3rd dose of DPT, OPV and Hepatitis B vaccine in 8 (26.7%), no dose of Hepatitis B Vaccine in another 7 (23.3%) and not received any vaccine in 1 (3.3%) child in the order of decreasing frequency. Overall there is no gender difference between the children not fully immunized.

(Table 3) shows the dropout rates of different vaccines. This study reveals BCG-DPT3 dropout rate to be 2.1%, BCG-Measles Dropout rate as 3.9% and DPT3-Measles dropout rate to be 1.8%.

Table 1: Individual vaccine coverage among the study children

Name of Vaccines	Vaccine Coverage No. (Percentage)
BCG	329 (99.7%)
Measles	315 (95.45%)
DPT and OPV	321 (97.3%)
HBV	315 (95.45%)

Table 2: Missed vaccines by the study children

Variables	Male	Female	Total (Percentage)
Measles Vaccine	9	5	14 (46.7%)
No dose of HBV	0	7	7 (23.3%)
No third dose of DPT, OPV, HBV	5	3	8 (26.7%)
No vaccines given at all	1	0	1 (3.3%)
Total	15 (50%)	15 (50%)	30 (100%)

Table 3: Dropout rates of different vaccine.

Variables	Frequency	Percentage
BCG – DPT-3 dropout	7	2.1%
DPT-3 – Measles dropout	6	1.8%
BCG – Measles dropout	13	3.9%

Discussion

This study reveals that out of the total 330 children between 12-23 months age group, 59.7% were males and 40.3% were females. It has also been found that 90.9% children are fully immunized, 8.8% partially and 0.3% non-immunized. BCG vaccination coverage is 99.7%, Measles vaccination coverage 95.76% and coverage for the third dose of DPT/OPV/HBV is 97.6%. The present study clearly shows that there is higher coverage of BCG and Measles vaccine among children of 12-23 months in Mohanpur area. Also, the dropout rate of BCG-DPT3 vaccine is 2.1%, BCG-Measles dropout rate is 3.9% and DPT3-Measles dropout rate is 1.8% and there is no gender difference between the children who are not fully immunized.

CES reports (2009) (Coverage Evaluation Survey) shows BCG vaccination coverage is 74.2% and for Measles vaccine it is 68.8%, among children of 12-23 months age group in Tripura. The BCG-DPT3 dropout rate is 4.9% and BCG-Measles dropout rate is 7.3%, which is almost double than findings in our study. In India, the overall dropout rate for BCG-DPT3 is 18% and BCG-Measles is 15%, which is quite higher.[10] The District Level Household and Facility Survey (DLHS-4)(2012-13) shows that in Tripura, the coverage of BCG vaccine is 75.3% in overall, in rural areas it is 72.7% and in west Tripura district overall 78.4% and in rural areas BCG vaccination coverage is 71.4%. Measles vaccination coverage overall in Tripura is 61.2% and in the rural areas, it is 57.5%; in west Tripura district overall 64.7% and in rural areas of west Tripura it is 57.1%.[11] In a similar study conducted in Lucknow by R Vohra et al, it was found that the overall dropout rate for BCG to Measles was 28.93% and DPT3 to Measles was 17.885.[12] Bholanath et al in their study found BCG-Measles dropout rate as 33.24% and DPT-3 to Measles as 13.12% in urban slums of Lucknow[2] in contrast to only 3.9% of BCG-Measles dropout rate and 1.8% of DPT3-Measles dropout rate in our study. Sharma et al[13] again found BCG to Measles dropout rate as 60.2% in the slums of Surat which is very high.

In this study by using LQAS technique it has been found that immunization coverage in our study area is quite higher as compared to the national average as well as the overall state scenario. This can also be an overestimate because the sampling frame in this study was designed based on the immunization register available at each sub-centre and if registers are not maintained properly or if children without full immunization were not registered at all, there may be a false-high estimate of full immunization coverage. This possible limitation can be overcome by doing a further household survey and with better knowledge of each sampling area and total target population.

Lesser dropout rates for different vaccines in our study population also indicates better access to immunization services by the rural population of Tripura.

Conclusion

Higher coverage of Full immunization and lesser dropout rates for individual vaccines in our study population indicates better access to immunization services by the selected rural population of Tripura.

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