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Immunization coverage in a rural area of Bareilly district: a cross-sectional community-based study

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ABSTRACT

INTRODUCTION: Infectious diseases are a major cause of morbidity and mortality in children. Immunization remains a cost-effective method for child survival against vaccine-preventable diseases. Despite all the interventions put in by the government for 100% immunization coverage, there remain pockets of low coverage, especially in rural areas.
Our aim was to estimate the immunization coverage and assess sociodemographic factors associated with immunization among children aged 12-23 months in a rural area of Bareilly.
METHODS: The present cross-sectional study was carried out in the field practice area under RHTC from January 2016 to June 2016 using a 30 by 7 cluster sampling technique. A total of seven children aged 12-23 months were interviewed from each cluster on a preformed, pretested, and semi-structured questionnaire, thus giving a sample size of 210. Statistical analysis was done using the Chi-square test.
RESULTS: More than two-thirds (69%) of study participants were completely vaccinated, whereas about 31% were partially or not vaccinated. Immunization coverage was found to be highest for BCG (80.4%) and lowest for the third dose of DPT (69.0%). The most common reason for partial or non-immunization was found to be unawareness (45.5%) and fear of side effects (43.9%).
CONCLUSION: There is a need to create awareness and increase knowledge among caretakers of children about the importance and benefits of getting immunization for their children as a major step toward achieving Sustainable Development Goals (SDGs) goals.

Keywords: Immunization, Vaccination Coverage, Vaccination, Vaccine Preventable Diseases

INTRODUCTION

Vaccination use has one of the most effective impacts on human health. Thucydides, a Greek historian in 496 B.C., observed that those who survived smallpox would never get re-infected

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ultimately leading to Edward Jenner's historic cowpox experiment in 1796. Since then, vaccination has proved to be a vital element in the battle against infectious diseases. After their acceptance as a public health intervention, vaccines have played a vital role in reducing morbidity and mortality due to vaccine-preventable diseases globally. Vaccines in Routine Immunization (RI) are considered one of the most cost-effective methods a nation can adopt to benefit its people. The 27th World Health Assembly (1974) recommended the use of vaccines to protect against six diseases: tuberculosis, diphtheria, tetanus, pertussis, measles, and poliomyelitis. This program was the starting point for a dramatic change in the world's public health strategy [1].

Immunization is one of the key interventions to achieving the Millennium Development Goals (MDGs), especially the goal to reduce deaths among children under five years old [2]. Childhood vaccinations are effective in protecting children against vaccine-preventable diseases in low and middle-income countries [3, 4]. Vaccines prevent more than 2.5 million child deaths per year [2].

The first vaccine to be introduced in India was BCG in 1962 as part of the National Tuberculosis Control Program. Over the years, various new vaccines have been introduced, and many milestones have been achieved. GOI declared the year 2012-13 as the "year of intensification of routine immunization". Despite so many efforts from the government and international health agencies, immunization coverage is quite low in India and specifically in the Uttar Pradesh province of India. As per National Family Health Survey (NFHS) III data, only 43.5% and 23% of children aged 12-23 months in India and Uttar Pradesh, respectively, are fully immunized, which is much less than desired goal [5].

Barriers to full vaccination coverage in other settings have been described and include lower parental education [6–8], low income [7-9], female gender of the child [10, 11], traditional and Muslim religions [12, 13], place of delivery, mothers receiving a postnatal check-up after two months of birth [14], household assets and expenditure, ethnicity, age and parity [15] were documented in Asian and African countries. Furthermore, mothers' knowledge about child immunization, postponing child immunization and perceived health institution support [16], institutional delivery and antenatal care (ANC) attendance [17], tetanus toxoid vaccine, place of residence, and household visited by health workers [18], women's decision-making autonomy, number of children under five years old in the household, mother's education and proximity to health facilities [19] were factors identified through small scale studies in the country. The purpose of this study was to estimate the immunization coverage among children aged 12-23 months of age in a rural area of Bareilly. We also studied the association of various sociodemographic factors with the utilization of immunization services.

METHODS

Study design

A cross-sectional study was conducted by the Department of Community Medicine, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, in a rural area of Northern India's Bareilly District from January 2016 to June 2016. There are fifteen blocks under Bareilly District, out of which Bhojipura Block was selected by purposive sampling method. Out of 103 Villages under the Bhojipura block, 24 Villages are the rural field practice area of the Department of Community Medicine, Shri Ram Murti Smarak Institute of Medical Sciences (SRMS IMS) were selected for the study.

The study population comprised people residing in the 24 villages under Bhojipura Block. The study sample included 30 clusters from a Bhojipura block population selected per the 30-cluster sampling method as recommended by WHO [20]. Seven children aged 12-23 months from each cluster were interviewed using a pre-tested and pre-designed questionnaire, thus obtaining a sample size of 210.

Selection of study clusters

A list of all 24 villages with their population under RHTC was obtained and arranged in cumulative frequency. A sampling interval of 1751 was obtained by dividing the total population by 30 i.e. no. of clusters as below.

Sampling interval = Total population / Total no. of clusters

= 52543 / 30

= 1751 (approx..)

The first randomly generated cluster with a table of random numbers was 1230. The first cluster with a cumulative frequency equal to or more than

1230 was selected as the first cluster. Afterwards, subsequent clusters were selected by adding sampling intervals to a number that identified the location of the previous cluster. Thus 30 clusters were selected in this way. The first household was selected randomly in each cluster, and every next household was studied in a sequence until a total of seven eligible children in the age group of 12–23 months were covered in one cluster. On reaching the selected household, the mother of the eligible child (12–23 months) was interviewed. If no child belonging to the target population was found, next households were checked until an eligible child was found. The age of children included in the study was checked by birth certificate, immunization card or by asking the parents (using a standardized Indian calendar and major holidays as reference points) when it was not available.

The immunization status of children was defined as:

Complete Immunization: Children have received BCG, measles, and three doses of DPT, hepatitis B, and OPV each (excluding OPV-0).

Partial/Incomplete Immunization: Children who have received at least one of the above-mentioned vaccines.

Unimmunized Children: Children have not received any vaccine.

Formulae used to calculate the drop-out rate for

DPT I to DPT III

(No. of children received DPT I - No. of children received DPT III) x 100/ No. of children who received DPT I

OPV I to OPV III

(No. of children received OPV I - No. of children received OPV III) x 100/ No. of children who received OPV I

BCG to Measles

(No. of children received BCG - No. of children received Measles) x 100/ No. of children who received BCG

We included all the children in the age group of 12-23 months who are living in the rural field practice area of the Department of Community Medicine, SRMS IMS Bareilly. Children not accompanied by parents or caretakers at the time of three consecutive visits and study respondents whose parents refused or denied to be part of the study are excluded. WHO's 30 cluster sampling method was used for the evaluation of immunization coverage [20]. Thirty clusters in the community were demarcated based on their population and sector-wise distribution as represented in Table 1.

A preformed and pretested, semi-structured questionnaire was used to collect information from mothers regarding sociodemographic parameters, their child's immunization status, and reasons for noncompliance. Information was collected to maintain the utmost privacy as per the convenience of respondents. The time required to complete one interview was 5–7 minutes. The collected data was numerically coded and entered in Microsoft Excel 2007 and appropriate statistical software. Chi-square tests were used for statistical analysis. Ethical clearance for the study was taken from Institutional Ethical Committee (IEC), Shri Ram Murti Smarak Institute of Medical Sciences (SRMS IMS) Bareilly.

RESULTS

The distribution of the study population was that the majority of the study population was Hindu religion (66.6 %) and the remaining were Muslims (33.3 %). The study shows that majority of parents of study subjects were illiterate and belonged to lower-middle and lower-class socioeconomic status (Table 2).

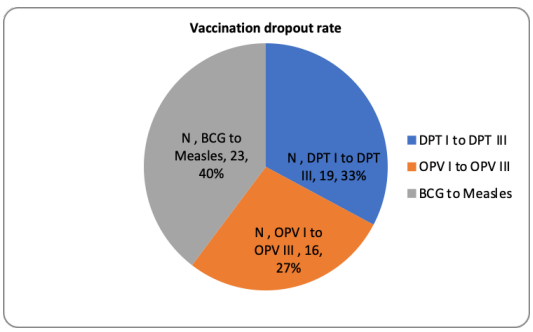

Figure 1: Vaccination dropout rate in the study population

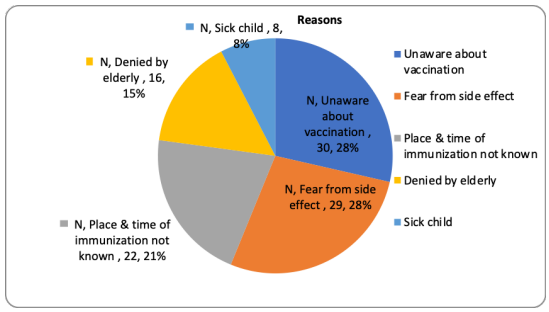

Figure 2: Reasons for partial or no vaccination in study population

Table 1: List of Villages with total and cumulative population along with identified clusters

S. No	Village Name	Total Population	Cumulative Population	Clusters
1	Atapatti Janubi	1727	1727	1
2	Bhagwatipur	578	2305	
3	Chatiya	591	2896	
4	Miyanpur	974	3870	2
5	Ghoor	3401	7271	3,4
6	Ishapur Gautiya	669	7940	
7	Jamuniya Jagir	1170	9110	5
8	Jataua	2420	11530	6
9	Milak Imamnagar	562	12092	7
10	Samaspur	612	12704	
11	Atapatti Sumali	1026	13730	8
12	Chadaha	3944	17674	9,10
13	Dhimni	443	18117	11
14	Parsunagla	1187	19304	
15	Ishapur	2364	21668	12
16	Jafarpur	1072	22740	
17	Jannak Jagir	1155	23895	13
18	Kamua	1135	25030	14
19	Kuna Tanda	929	25959	
20	Dhaura	11280	37239	15,16,17,18,19,20,21
21	Tanda	10240	47479	22,23,24,25,26,27
22	Sabzipur Khata	1973	49452	28
23	Mudiya Hafiz	1551	51003	29
24	Khajua Jagir	1540	52543	30
Total Population		52543		

BCG coverage in the study was found to be 80.4% and Measles coverage was 69.5 %. The lowest coverage was for third dose of DPT (69.0%) and the Measles vaccine (69.5%) (Table 3).

The dropout rate was found to be highest between complete immunization BCG and Measles vaccine (13.6%) and lowest between OPV I & OP VIII dose (1.9%) (Figure 1).

In the study, we found that the most common reasons for partial or no vaccinations were unawareness and fear of side effects. Other reasons given by respondents included place & time of immunization were not known or denied by the elderly and sick children (Figure 2).

In the study we have found that the factors such as caste, mother's literacy status, father's literacy status, socioeconomic status, and religion were found to be statistically significant, Chi-square test was applied and it was seen that the p-value is <0.5 in all the factors. This means that these factors play an important role in routine immunization coverage (Table 4).

DISCUSSION

In the study, we had found that 69% of study participants were completely vaccinated whereas about 31% were partially or not vaccinated. The maximum coverage was seen for the BCG vaccine (80.4%) followed by 1st dose of DPT with a coverage of 78.1%. The lowest coverage was seen for third

dose of DPT (69.0%) and the Measles vaccine (69.5%). Reasons for partial or no vaccination were also assessed in the study and it was seen that unawareness about vaccination and fear of side effect were major reasons. Kadri et al. conducted a study on immunization coverage in Gujrat found that 70.3% of children were fully immunized, 29.7% were partially immunized and none were unimmunized [21]. Singh et al. in their north Indian study in 2011 found that 40% of their study population were completely immunized whereas 40.5% and 19.5% were partially immunized and unimmunized respectively [22]. In a recent study in Vellore, southern India, vaccination coverage among children from the surveyed communities was also suboptimal.

Table 2: Sociodemographic Profile of study subjects

Socio Demographic Characteristics	No. (%)
1. Religion	
• Hindu	140 (66.6)
• Muslim	70 (33.4)
2. Caste	
• General	142 (67.7)
• OBC (other backward class)	44 (20.9)
• SC (schedule caste)	24 (11.4)
3. Mother's Literacy Status	
• Illiterate	106 (50.4)
• Primary	74 (35.2)
• Middle	18 (8.5)
• High School	10 (4.7)
• Intermediate	02 (0.9)
4. Father's Literacy Status	
• Illiterate	86 (41.5)
• Primary	62 (29.2)
• Middle	34 (16.0)
• High School	14 (6.6)
• Intermediate	10 (4.7)
• Graduate & Above	04 (1.9)
5. Socio economic status	
• Middle	36 (17.1)
• Lower middle	85 (40.4)
• Lower	89 (42.3)

The proportions of fully vaccinated children were 65% (95% CI: 53–76%) and 77% (95% CI: 58–88%) based on information from vaccination cards or parental recall and vaccination cards alone, respectively [23].

Table 3: Distribution of vaccines received by 12-23 months children

Vaccine	Received	Not received
	No. (%)	No. (%)
BCG	169 (80.4)	41 (19.6)
DPT I	164 (78.1)	46 (21.9)
DPT II	146 (69.6)	64 (30.4)
DPT III	145 (69.0)	65 (31.0)
OPV 0	166 (79.0)	44 (21.0)
OPV I	163 (77.6)	47 (22.4)
OPV II	159 (75.7)	51 (24.3)
OPV III	147 (70.0)	63 (30.0)
Hep B I	152 (72.3)	58 (27.7)
Hep B II	149 (70.9)	61 (29.1)
Hep B III	147 (70.0)	63 (33.0)
Measles	146 (69.5)	64 (30.5)

Thus, it is evident that vaccination coverage in different states is variable [23]. In an analysis of State-Specific Differences in Childhood Vaccination Coverage in Rural India, it was reported that full vaccination coverage within the country could be explained by a complex interplay of the individual- and state-level factors. On an individual level, children living in bigger households, born in non-institutional settings, and female had lower odds of complete vaccination. At a state level, individuals had the lowest full vaccination coverage in the mid-range of poverty levels by state, whereas wealthier and poorer states had higher vaccination coverage. A greater average population per PHC was also associated with decreased odds of full vaccination [24]. It was found in NFHS 3 survey (2005-06) that only 23% of children in the age group 12-23 months were fully immunized, BCG coverage was 61% and Measles vaccine coverage was only 37.7% [5]. The dropout rate was found to be highest between complete immunization BCG and Measles vaccine (13.6%) and lowest between OPV I & OPV III dose (1.9%) in our study, on the contrary Singh et al in their study found that the

Table 4: Distribution of vaccines received by 12-23 months children

Specifications	Complete Immunization	Partial/ No Immunization	Total No.	Statistical Significance
1. Caste				
• General	107	35	142	Chi square= 11.66
• OBC	28	16	44	df = 2
• SC	10	14	24	p value = 0.002
2. Mother's Literacy Status				Chi square= 12.58
• Illiterate	62	45	107	df = 1
• Literate	83	20	103	p value = 0.0003
3. Father's Literacy Status				Chi square= 13.38
• Illiterate	48	39	87	df = 1
• Literate	97	26	123	p value = 0.002
4. Socio economic status				
• Middle	22	14	36	
• Lower middle	50	35	85	Chi square= 12.22
• Lower	73	16	89	df = 2
				p value = 0.002
5. Religion				Chi square= 9.33
• Hindu	105	33	138	df = 1
• Muslim	40	32	72	p value = 0.002

drop-out rate for DPT Ito DPT III approximately 19.4%, OPV Ito OPV III 15.6%, maximum drop-out was found for complete immunization i.e. 48.1% [22].

Summan et al examined the association between the quality of public health facilities and child vaccination outcomes in rural India using data from the nationally representative Integrated Child Health and Immunization Survey (2015–2016) which covered 1,346 public primary health sub-centers and 44,571 households. The distribution of infrastructure quality contributed to increased gaps in full immunization and OTV between rich and poor households, while greater proximity to vaccination site for poorer households reduced these gaps [25].

The findings from the household survey must be interpreted in the light of its small sample size and representative of only one block of Barielly district, which limits generalizability to the other communities in northern India.

CONCLUSION

Routine immunization of all children against Vaccine-Preventable Diseases has been recognized as a cost-effective intervention for child survival. The community should be educated on the benefits of routine immunization by creating awareness and increasing knowledge of caretakers. The present study points toward the need to strengthen the immunization coverage in rural areas and that there should be efforts for information, education, and communication activities aimed to educate the community about immunization services. Pulse polio days should be seen as an opportunity

for advocacy of routine immunization to the community, especially in rural areas.

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