Original Research Article

A study of coverage of newer vaccines among children aged up to 2 years in rural areas of Kanpur

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Abstract

Background: Child immunization is one of the most cost-effective public health interventions. Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease. A study was done on completeness and timeliness of vaccination in Kanpur using data from cross sectional cluster survey 2020. **Aims:** To estimate the coverage of newer vaccines among children up to two years of age in rural field practice areas of the Department of Community Medicine, Rama Medical College, Hospital and Research centre, Kanpur. **Methods** It is a Cross-sectional observational study. A total cases of 213 children were assessed on newer vaccines through 30 cluster evaluation survey. The present study was conducted among the field practice areas of RHTC, Shivrajpur, attached to the Department of the Community Medicine, Rama Medical College, Hospital and Research Centre, Mandhana, Kanpur. **Results** Distribution of study population according to gender we have found out of 213 cases 102(48%)were male and 111(52%) were female children.In a total of 213 children evaluated, 63.85% received all the newer vaccines, 30.05% received at least one vaccine and only 6.10% received more than one vaccine but not received all newer vaccines.**Conclusion** A among the total of 213 children RVV-3, IPV and PCV-B coverage was 69.00 % and MR-2 and JE-2 coverage was 63.80%.Hospital is the main source of vaccination which was about 60.00 %. About 30 percent (64) children received at one vaccine like RVV/IPV/PCV. Main reasons for not received vaccine were not aware of time and place and inconvenient time and mothers illness.

Key Words: child immunization, cluster survey, IPV, RVV, PCV, JE, MR

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INTRODUCTION

Immunization is a proven tool for controlling and eliminating life-threatening infectious diseases and is estimated to avert between 2 and 3 million deaths each year. It is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations. It has clearly defined target groups; it can be delivered effectively through outreach activities; and vaccination does not require any major lifestyle change. Reports indicate a remarkable reduction in child mortality in countries with poorest child survival indicators following the introduction of immunization against vaccine preventable diseases.[1] In India, this Universal Immunization Program (UIP) is the largest in the world with annual cohorts of around 26.7 million infants and 30 million pregnant women.[2] The National Family Health Survey-4 (NFHS-4) 2015-2016 reports 62% of children

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aged 12--23 months were completely immunized in India (BCG, 3 doses of DPT, OPV, and one dose of measles each). As per this national survey, 61.3% and 63.9% children of 12-23 months age have been fully immunized in rural areas and urban areas of India, respectively. Puducherry has the highest (91.3%) and Nagaland has the lowest (35.7%) percentage in terms of immunization coverage while immunization coverage for Uttar Pradesh, Bihar, and Jharkhand were 51.1%, 61.7%, and 61.9%, respectively.[3] A study was done on completeness and timeliness of vaccination in Kanpur using data from cross sectional cluster survey 2020. The sampling method was based on WHO cluster sampling technique. The completeness criterion was set as 3rd dose of DPT, Hepatitis B, and polio vaccine (PV) and others new vaccination and timeliness criterion was set as 1st dose of Hepatitis B, PV, DPT, and measles containing vaccine (MCV) given on time i.e. at the respective time. They were found to vary with maternal education, birth delivery in hospital, socio-economic status, and age of mother, number of children, working or non working mother and prior experience. A vaccine is different from immunoglobulin in that the vaccines help in developing protective antibodies in the body of the individual to whom these are administered, and protection is available after a lag period of a few weeks to several months. However, immunoglobulin provides immediate protection. The vaccine administration is followed by two types of immune responses: Primary and secondary.[4]

Aims: To estimate the coverage of newer vaccines among children up to two years of age in rural field practice areas of the Department of Community Medicine, Rama Medical College, Hospital and Research centre, Kanpur.

MATERIALS AND METHODS

The present study was conducted among the field practice areas of RHTC, Shivrajpur, attached to the Department of the Community Medicine, Rama Medical College, Hospital and Research Centre, Mandhana, Kanpur.

Study population:

In this study, children aged ≥12 months to 24 months were assessed with a fixed range of date of birth in the rural field practice areas of the Department of Community Medicine, RMCH and RC, Mandhana, Kanpur. The study was conducted over a period of 1 year from 1st June 2019 to 31st May 2020.

Inclusion criteria:

Children aged ≥12 months to 24 months were evaluated in each cluster

Exclusion criteria:

Children aged more than 2 years of age

Children who would not be present at the time of interview.

Families, who would be uncooperative, would not be included under this study.

Sampling technique:

World Health Organization's (WHO) standard Extended Programme on Immunization (EPI) 30 cluster sampling technique will be used for assessing the vaccine coverage in the present study.[64]

Total population of Shivrajpur was 20815. Coverage of newer vaccines were calculated by using 30 cluster sampling technique. So, sampling interval was calculated firstly,

$$\text{Sampling interval} = \frac{20815}{30} = 694$$

Afterwards, random number was selected less than 694 by applying currency note technique.

Random number was 212, then 1st cluster was located in the Dubiana village. For the selection of 2nd cluster, cluster interval was added with 212, so it was 212+694= 906 and in the same method 3rd cluster was selected 906+694= 1600, every time 694 was added to find out subsequent clusters, shown the each cluster and name of the village in the following table.

Table 1: Total Population of (RHTC)Shivrajpur

Sl. No.	Name of the Village	Population	Cumulative population	No of cluster
1	Dubiana	776	776	1
2	Bhatpura	970	1746	2,3
3	Mahipalpur	935	2681	4
4	Munderi	256	2937	5
5	Thathiniwada	472	3409	
6	Kanthiniwada	561	3970	6
7	Muhpocha	1009	4979	7
8	Mirpur bilhan	835	5814	8,9
9	Rajepur	1350	7164	10,11
10	Kakupur rabban	1575	8739	12,13
11	Kakurhalbal	356	9095	
12	Kakupur nihal	856	9951	14, 15
13	Kakupur sitaram	1972	11923	16, 17

14	Chakbaka	834	12757	18,19
15	Chatarpur	1017	13774	20
16	Sughardeva	1881	15655	21,22,23
17	Durgapurwa	295	15950	
18	Gopalpur	1000	16950	24,25
19	Raninivada	350	17300	26
20	Dinkarpur	452	17752	
21	Banshiniwada	997	18749	27
22	Sabalpur	340	19089	28
23	mukkapurwa	865	19954	29
24	Bairi	861	20815	30
	Total	**20815**		

Tools of study:

Predesigned and pretested schedule. Child coverage form, Reasons for not receiving vaccination form

Methods of data collection:

Table 2

Sl. No.	Name of the Village	Total Population	12-24 months children
1	Dubiana	776	14
2	Bhatpura	970	23
3	Mahipalpur	935	19
4	Munderi	256	7
5	Thathiniwada	472	13
6	Kanthiniwada	561	6
7	Muhpocha	1009	22
8	Mirpur bilhan	835	19
9	Rajepur	1350	22
10	Kakupur rabban	1575	29
11	Kakurhalbal	356	8
12	Kakupur nihal	856	17
13	Kakupur sitaram	1972	39
14	Chakbaka	834	19
15	Chatarpur	1017	19
16	Sughardeva	1881	37
17	Durgapurwa	295	7
18	Gopalpur	1000	18
19	Raninivada	350	5
20	Dinkarpur	452	7
21	Banshiniwada	997	19
22	Sabalpur	340	9
23	mukkapurwa	865	16
24	Bairi	861	16
	Total	**20815**	**410**

In the present study, ≥12 months to 24 months children were assessed, their date of birth range from 16/11/2018 to 15/11/2019. Total population of shivrajpur village were 20815 (Source- Field practice area of Shivrajpur). According to National House Hold Survey –IV,[5] up to 24 months children was 1.94% to 2.0 % in total population. So our estimated children's aged ≥12 months to 24 months were 410 i.e 1.96% in RHTC field practice area of shivrajpur with a population of 20815. Village wise children were shown in the above table. From each village children aged ≥12 months to 24 months were listed beforehand by the help of health workers of RHTC. Two health volunteers were engaged in each cluster to finish the coverage in one day. It was taken two months to complete the whole logistics. 1st cluster was located in Dubiana village (Total population of Dubiana village is 776) about 14 children expected to be available in the said village. Accordingly 30 clusters were selected within the village listed above. In the 1st cluster 7 children were assessed using predesigned and pretested child coverage form. Information was collected regarding newer vaccines along with availability of Immunization card (Mother and child protection card), gender wise distribution children in each cluster with sibling interval as well as source of vaccines. From the listed houses, 7 consecutive houses were visited for data collection, if any house was locked, next listed house was visited to collect the required information. In each cluster information of 7 children

were collected. It was also noted that if more than one children aged 12-24 months were available in any house, they were also included. So, in 30 clusters 213 children were covered for evaluation of newer vaccines. Information was also collected from mother regarding reasons for not receiving routine immunization as well as newer vaccines. Data thus gathered was compiled and coverage of each newer vaccines in percent (%). After having the coverage report, the mothers meetings were arranged twice in a week about the utility of Routine Immunization (RI) along with newer vaccines and their availability. 8 meetings per months continued for 3 months with a total of 24 meetings for 24 villages.

Data analysis:

The obtained data were analyzed by using statistical package for social sciences (SPSS-Vertion19) software and Microsoft Excel and the appropriate statistical test was applied.

RESULTS

A total of 213 children were assessed on newer vaccines through 30 cluster evaluation survey.

Table 1: Gender wise distribution of study population (n=213)

Male	Female	Total
102	111	213
48 %	52%	100%

In table no 1. Distribution of study population according to gender we have found out of 213 cases 102(48%) were male and 111(52%) were female children.

Table 2: Distribution of study population according to sibling interval (n=211)

Sibling interval	Number	Percent
< 12 month	03	1.40
12-24 month	77	36.50
> 24 month	131	62.10

Sibling interval was 62.10% for more than 24 months followed by 36.50% for 12-24 months

Table 3: Gender distribution among study population according to recipient of RVV(n=149) and IPV (n=148)

Name of the vaccine	Male	Female	Total
RVV-1	73	76	149
RVV-2	72	75	147
RVV-3	72	75	147 (69.00)
	IPV		
IPV-1	**73**	**75**	**148 (69.40)**
IPV-2	**73**	**75**	**148 (69.40)**
	PCV		
PCV-1	75	73	148
PCV-2	75	73	148
PCV-B	74	73	147(69%)

RVV-3 coverage was 69% (147) with a total of 213 children. Hospital was the main source of vaccination which was about 59.80 %, followed by health centre/sub-centre 26.80 %, Outreach centre 6.70 % and Private clinic 6.70%. IPV-1 and 2 coverage was 69.40%, Hospital is the main source 62.90% followed by HC/SC 16.30% PCV coverage was 69.00 %. Hospital was the main source of vaccine 64.10% followed by Outreach 14.90% and HC/SC 14.20%. MR-2 and JE-2 coverage was 63.80% (136) out of 213 children. Hospital was the main source of vaccination 65.50% followed by Outreach 14.40 and lowest was private hospital 7.20%.

Table 4: Distribution of study population according to reasons for coverage failure (n=64)

Reasons	Respondent	Percent
Need not aware	05	7.0
Need to return not known	02	2.8
Place/Time not known	20	28.2
Fear of reactions	04	5.7
Contraindications not clear	03	4.2
No faith in immunization	01	1.4
Rumours	02	2.8

Place too far	02	2.8
Time inconvenient	12	17.0
Vaccinator absent	03	4.2
Vaccine not available	01	1.4
Ill mother/family problem	11	15.5
Child ill/not brought	03	4.2
Others	02	2.8
Total	**71**	

Table 4 presents the various reasons for coverage failure among study population. The most common reason was place and time not known involving 28.2% of the total respondents followed by time inconvenient (17%) and ill mother or family problem (15.5%). The other reasons observed were need not aware (7%), fear of reactions (5.7%), contraindications not clear (4.2%), vaccinator absent (4.2%), child ill or not brought (4.2%). The least common reasons were need to return not known (2.8%), rumours (2.8%), place to far (2.8%) and others (2.8%).

Table 5: Coverage of children on newer vaccines (n=213)

Complete coverage	Partial coverage		Total children
	At least one vaccine	More than one vaccine	
136	64	13	213
63.85 %	30.05 %	6.10 %	100 %

In a total of 213 children evaluated, 63.85% received all the newer vaccines, 30.05% received at least one vaccine and only 6.10% received more than one vaccine but not received all newer vaccines.

DISCUSSION

This study was cover the children aged ≥12 months to 24 months, in the rural field practice areas of the Department of Community Medicine, RMCH and RC, Mandhana, Kanpur, Bihar. The study was conducted over a period of 1 year from 1st June 2019 to 31st May 2020. Total population of Shivrajpur was 20815. Coverage of newer vaccines were calculated by using 30 cluster sampling technique. In the present study, 13 to 24 months children were assessed their date of birth range from 16/11/2018 to 15/11/2019 within the study period. A total of 213 children were assessed on newer vaccines through 30 cluster evaluation survey. In our study, the corrected percentage of newer vaccine immunization is found to be RVVand PCV-69%, IPV-69.4%, and MR and JE- 63.8 % respectively. However, above coverage was more than that of the NFHS-4 report (coverage) of Bihar.[6] This increase possibly could be the active involvement of all stakeholders at survey level area in increasing awareness generation.[7] The full immunization coverage of children in other studies across the country revealed a similar pattern. Research conducted by Naveen *et al.* in tribal area of Parol, Thane district Maharashtra FIC was found to be 71.1%,[8] Murhekar *et al.* from Tamil Nadu reported FIC to be 79.9%,[9] Datta *et al.* in rural area of Tripura had highlighted it as 91.67%.[10] Another focal study from Surajgarha Block, Lakhisarai district by Kumar *et al.* in Bihar was 55.2%,[11] and in rural Uttar Pradesh it was 50% as per Ahmad *et al.*[12] The full immunization coverage is much lower in the studies from Bihar and Uttar Pradesh and this may be attributed by the lower awareness level and less health services utilization in both the territories. In this study, the valid immunization coverage was 63.8% which is comparable to the study by Murhekar *et al.* in Tamil Nadu, where it was 78.8% [9] and 79.4% as per the study by M. Joy *et al.* in Kochi, Kerala.[13] In Bihar, almost 63.8% and 55.4% of the deliveries are institutional as per NFHS4 and DLHS4, respectively.[14] whereas institutional delivery rate is more than 90% in southern states of India. In present study, 70% children have received one or more than one vaccines but did not complete their immunization till the time of survey and 30% children were unimmunized. Other studies conducted by Vohra *et al.* in Lucknow district[15] and Nath B in urban slums of Lucknow district[16] showed that lack of awareness was the major contributor for the higher dropout rate. In present study, the main reason cited by most of the respondents was unavailability of child on the day of vaccination followed by place and time not kown. Madhvi *et al.* from Kakinada, Andhra Pradesh showed that the most common reasons for partial/no immunization are ill child (27.5%), lack of knowledge about vaccination (25.12%), migration to other places with no knowledge of place and time of vaccination (17.5%).[17] In our study RVV-3 coverage was 69% (147) with a total of 213 children. In this study we have found IPV-2 coverage was 69.40%. Indian government has also made efforts to rapidly increase immunization coverage through special immunization drives under the Mission Indradhanush programme, whose aim was to achieve full immunization coverage (i.e. greater than 90%) by December 2018. This programme, which focuses on children younger than 2 years and pregnant women, has helped strengthen the overall immunization system and increase coverage. The close tracking and immunization of

eligible recipients of inactivated poliovirus vaccine combined with the more appropriate distribution of vaccine has contributed to a rapid increase in the coverage of fractional-dose inactivated poliovirus vaccine, which reached 73.8% by June 2017.[18] In our study, PCV coverage was 69.00 %. It has been estimated that in India incidence of pneumonia among under-fives is 0.37 episodes/year, resulting in 43 million new cases. Of all pneumonia cases, 7-13% are severe enough to require hospitalization. Pneumonia causes an estimated 408,000 deaths among under-fives contributing to 19% of child mortality in India.[19] Several types of JE vaccines have been developed since the 1950s, and 3 have been widely used for immunizations. The inactivated MBDV needs to be administered in multiple doses, can cause serious hypersensitivity in some vaccinees, and can potentially cause neurological side effects.[20] Moreover, its manufacturing process is less stringent than that for cell culture–derived vaccines. The live attenuated SA-14-14-2 vaccine[21] is efficacious but produced in primary cells, which are less preferred than continuous cell lines for vaccine production. In this study of 213 children, 63.85% received all of the newer vaccines, 30.05% received at least one vaccine, and only 6.10% received more than one vaccine but not all of the newer vaccines. Immunization are components of primary care, and the current report, which was conducted at the grassroots level in 59 low-performing blocks in Bihar, found that factors such as population indifference, poor supply chain, and logistic are some of the barriers that need to be tackled at the primary care level in order to achieve better FIC. Community preparedness may be measured and compared at a glance.

CONCLUSION

To meet its global commitment of achieving the sustainable development goal three, recently four new vaccines have been introduced in the India's Universal Immunization Program (UIP), including rotavirus vaccine (RV), pneumococcal conjugate vaccine (PCV), measles-rubella (MR) vaccine, and human papillomavirus (HPV), by reducing the mortality and morbidity due to diarrhea, pneumonia, measles, rubella among under-five children, and cervical cancer among adults**.** A among the total of 213 children RVV-3, IPV and PCV-B coverage was 69.00 % and MR-2 and JE-2 coverage was 63.80%. Hospital is the main source of vaccination which was about 60.00 %. About 30 percent (64) children received at one vaccine like RVV/IPV/PCV. Main reasons for not received vaccine were not aware of time and place and inconvenient time and mothers illness.

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