

## ORIGINAL ARTICLE

**Immunization status of children and its decline with age: A hospital based study of 1000 children at a teaching hospital in western Uttar Pradesh**Satish Chandra Agrawal<sup>1</sup>, Anita Kumari<sup>2</sup>

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**Abstract**

**Background:** Despite the ongoing National Immunization Program, the immunization coverage in our country remains unsatisfactory, particularly in U.P.; moreover, a wide disparity is seen in the immunization coverage of children at different ages. **Objectives:** The present study was conducted to know the immunization status of children, up to the age of 6 years, and particularly to evaluate the same with regard to the age of the child. **Methods:** The present study was carried out as a cross sectional study, between September, 2012 and May, 2013 at the pediatric OPD of SRMS Institute of Medical Sciences, Bareilly. A total of 1000 children, aged up to 6 years were included. Immunization status with regard to the doses of BCG, OPV, DPT, DT and measles vaccine given at different time was assessed by interviewing parents and checking immunization cards. An endeavor was also made to know the various factors responsible for incomplete or no immunization through interviewing parents. **Results:** Over all, number of children with complete, partial and no immunization were 41.4%, 44.8% and 13.8% respectively. An inverse correlation exists between the age of the child and the vaccine acceptability - lesser the age, better is the coverage. Besides, a selective pattern is seen, the OPV-1 being the most preferred and DT booster (5-6 years) as the least preferred vaccine. **Conclusions:** There is need for improving the immunization coverage, particularly for the older children for reducing the burden of vaccine preventable diseases.

**Key Words**

Children; Immunization; Age

**Introduction**

Immunization is the most effective known intervention to reduce the childhood morbidity and mortality (1,2). Impressive gains in health care seen since independence notwithstanding, the immunization coverage in India, as shown by successive National Family Health Surveys, is far from satisfactory in most of the places (3,4,5). Moreover, wide disparity with regard to the coverage, among different parts of the country and different sections of the society exists, indicating the influence of various social, economic and

cultural factors (6). Most of these studies, carried out at the national and state levels and also in different small regions of the country, however, have been limited to the primary vaccination given in the first year and little is known about the status of older children, i.e., regarding the 1st and 2nd booster doses of the oral polio vaccine (OPV) and the diphtheria-pertussis-tetanus (DPT) or the diphtheria-tetanus (DT) vaccine (6-13). Some of the studies albeit, show relatively better immunization rate initially but a decline for the latter vaccines (5,9). Notwithstanding all the foregoing facts, there has been hardly any work done in this regard in Rohilkhand region, a cultural area with its

epicenter at Bareilly, situated in the western part of Uttar Pradesh (U.P.) The present study was carried out to have an idea about the immunization status of children from infancy onwards (up to 6 years of age), in and around Bareilly, and to know the reasons thereof.

### Aims & Objectives

The present study was carried out to have an idea about the immunization status of children from infancy onwards (up to 6 years of age), in and around Bareilly. The study was also aimed to know the status with regard to different immunization events and for different vaccines. An endeavor was made to particularly study the effect of age on the immunization status, besides finding out the reasons for partial or no immunization.

### Material and Methods

The present study was carried out between September, 2012 and May, 2013 at the pediatric outpatients department (OPD) of Shri Ram Murti Smarak (SRMS) Institute of Medical Sciences, Bareilly, a teaching hospital, attracting patients mainly from the adjoining rural and semi-urban areas, the children (brought as patients) serving as the study subjects. Children aged 6 months and above, up to 6 years, were included in the study; they were divided into 4 age groups, viz. those 6 months of age and above but below 9 months, those 9 months of age and above but below 18 months, those 18 months and above, but below 5 years of age, and the children between 5 years and 6 years. The purpose of forming these 4 age groups was to assess the immunization status with regard to the vaccines given under the National Immunization Program, at different ages of children. For assessment of the immunization status of children, only the vaccines used in the National Immunization Program were taken into account, viz., the bacillus Calmette Gurein (BCG) vaccine, the OPV, the DPT vaccine, the measles vaccine and the DT vaccine. The hepatitis B vaccine was not included in the present study as this was included by the U.P. government as a part of routine immunization only in late 2011 and is still not being given everywhere, especially at the peripheral health facilities (14). Similarly, special care was taken to see that the doses of OPV administered during the Pulse Polio Program (PPI) are not taken into account as quite often parents equate the doses administered during PPI with the regular OPV doses. The status was determined by history obtained from parents (preferably mothers), confirmed, wherever possible, by immunization cards. Complete immunization was defined as receipt of BCG vaccine and OPV soon after birth, and three subsequent doses of DPT and OPV for the 1st age group; all these vaccines and one dose of

measles vaccine for the 2nd age group; all the foregoing vaccines and the booster dose of DPT and OPV in the 2nd year for children for the 3rd age group; and all the foregoing vaccines plus the booster dose of DT and OPV between 5 and 6 years for the 4th age group. 'No immunization' was defined as failure to receive any vaccine listed above; all children who fell between complete and no immunization were considered to have partial immunization. Although, scientifically speaking, immunization and vaccination are not synonymous words, for the purpose of simplicity both the terms have been used interchangeably. Inquiry was also made from the parents of the 'partial immunization' to know which particular immunization events were given or omitted, to assess the parents' preference for some vaccines or vaccination events.

The total number of children was 1000, with all the 4 age groups having a comparable size. Selection of children was done randomly, except for excluding critically ill patients. A proforma had been prepared to record the details, which were obtained from the parents. Parents were also interviewed in an effort to know the reasons for defaulting in the immunization of their child for which besides the preformed choices they were also given the option to give whatever reason, they thought, applied in the case of their child.

For statistical evaluation, Chi-square test was done and a p value of <0.05 was considered significant.

### Results

Regarding the overall immunization status, as can be seen in [figure 1](#), 414 children were found completely immunized, 448 children were partially immunized and the remaining 138 children had received no immunization. [Figure 2](#) depicts immunization status of the 4 age groups in a comparative fashion. [Figure 3](#) shows in a diagrammatic manner, rates of various immunization events to appreciate which events are preferred or neglected by parents for their children.

[Table 1](#) shows immunization status of children belonging to different age groups. As can be easily appreciated by this table and [figure 2](#), tendency is to have less and less immunization as the age of the child grows, the immunization rate being highest in the lowest age group and lowest in the highest age group. This difference is statistically extremely significant.

In cases of children with partial or no immunization, the reasons for not getting their children vaccinated or for not completing vaccination, based on the parents' answers are listed in [table 2](#). As in some cases more than 1 reason were cited, there is considerable

overlapping and the total sum is more than the total number of cases (or >100 in the case of percentage).

## Discussion

The overall immunization coverage (taking all vaccines together) in India, despite showing improvement remains far from satisfactory. As per the NFHS-3 data (2005-06), a slight improvement, from 42% to 43.5%, was noted since the last NFHS-2 in 1998-99 (4,5). But the figures from U.P. remained abysmally low, improving from 20% to only 23% during this period and full immunization coverage was lower than in any other state except Nagaland (5). However, unlike our study, the NFHS data covers the age group of 12-23 months only, as in most of the other studies. Other studies carried out in different parts of U.P. and adjoining states of North India observed complete immunization rates of 30%, 44% and 33.3% respectively (7,8,9). Interestingly, the studies made in and around Delhi show higher rates, varying from 69% to over 71%, though one of them gave a figure as low as 25% (10,11,12). As [figure 2](#) shows, the complete immunization coverage in our study (though with a different age composition) is 41.4%, which lies somewhere in the middle. The rates for partial immunization and no immunization in our study are 44.8% and 13.8% respectively, while the comparable rates in all these studies varied between 15% and 48%, and between 8.5 and 34% respectively (8-12). The vast difference between different coverage rates in these studies can be explained by differences in setting (rural, urban or urban slums; different parts of the country) and of course the facilities available in different parts of North India. All these studies, moreover, comprised much smaller samples (ranging from 100 to 510) than that of the present study. One large study, consisting of about 19000 children, carried out in 90 districts scattered in different parts of India, is worth mention, which gave rates of coverage in the districts lying in U.P. as 51%, 32% and 16% of the complete, partial and no immunization respectively (13). Probably more important than other factors that account for difference between the results of the present study and that of most other studies is the age group covered of the studied subjects, as outlined below.

One significant feature of the present study is that unlike most other studies which have taken the smaller age group to study the coverage of the vaccines given in the 1st year (up to measles vaccine), we have tried to assess the immunization status at different ages, including the age beyond 5 years so that the coverage of the DPT/DT and OPV booster doses could also be evaluated. It is rather strange and beyond

comprehension that nearly all studies done on immunization including the NFHS surveys, only the 1st year vaccines have been taken into account, most studies taking children between 12 and 23 months only. We could find only a handful of studies where higher age is covered; one such study, conducted in a teaching hospital in Delhi included 325 admitted children ranging 1-5 years and it found less than one-fifth children completely immunized and nearly one-third with no immunization (15). But it would be unfair to compare these results with those of the present study as the immunization status taken for the said study was for the vaccines administered in the first year only, even though the children up to 5 years. Only occasionally, a worker has ventured to go beyond that age; one such work studied 0-4 year old children but the focus was on categorization of children by use of private or public health-care facilities and the comparison between them, which is not relevant to the present study (16). We could find only one study which tried to look beyond and take into account the booster doses of DPT/DT and OPV, as we have tried to do in the present study; in a study comprising children <7 years, they found that, 77.2% children received primary vaccination, while the rates for the 1st booster and the 2nd booster doses (of OPV, DPT/DT) were 73.1% and 58.4% respectively (17).

Taking the figures for the different age groups ([figure 2](#)), the noteworthy finding in our study is that while over 50% children below 9 months are fully immunized, the percentage drops sharply in successive higher age groups, the lowest percentage of 31% being in the 4th age group. The 3rd and 4th age groups show a very high percentage of partial immunization, 49.39% and 56.19% respectively, which has the inescapable inference that while parents are more or less particular about the early vaccines, they attach little importance to the vaccine doses given subsequently. In the absence of other similar studies it is not possible to compare our results with others regarding this aspect.

Besides taking a general view according to the children's age, we also tried to go deeper and studied the coverage of the individual vaccines and different vaccination events, including the doses of the same vaccine, in an effort to know as to which vaccines or vaccination events are the most preferred or neglected ones. Several facts emerge from this data ([figure 3](#)). Firstly, there is a substantial disinclination for the vaccination events falling at a later age and this declining trend is maintained even for the subsequent doses of the same vaccine, so much so that the rates for OPV-1 (76.2%) and DPT-1 (74.8%) are much better than those for OPV-3 (61.2%) and DPT-3 (51.92%) respectively and even than OPV-2 and DPT-2. A look at

figure 3 makes it abundantly clear that there appears to be an inverse correlation between the age of the child and the vaccine acceptability; lesser the age, better is the coverage and lower is the default rate. However, the scenario is not so simple; exception being the BCG and to a lesser extent the OPV-0, which, though are the earliest vaccines to be given, are taken only by 56.2% and 67.2% children respectively, which indicate that apart from the age of the child, parents also tend to show inclination or disinclination for different vaccines; and this is another significant finding. While the most preferred immunizations is OPV-1 (76.2%), DPT-1 (74.8%) being the closed second, the most defaulted vaccination event is the DT booster-2, given only to 30.17% children (69.83% default rate), OPV- 2nd booster being the close 2nd (64.46%) to be missed out. The NFHS-3 report also shows a significant decline in coverage for each subsequent dose of DPT/OPV, and between the third dose of DPT/OPV and measles vaccine, suggesting that coverage rates declined as children grew older (5). Moreover, the NFHS-3 data also found a consistent difference between the coverage of DPT and OPV, though both of them are ideally given at the same session, indicating thereby a selectivity pattern among parents for individual vaccines. The present study not only shows slightly different rates for OPV and DPT doses meant for the same session but also between OPV-0 and BCG (both given at the same session). This selective pattern was also observed by some other workers, all these studies, like the present study, show the measles vaccine as the least preferred and the BCG as the 2nd least preferred vaccine in the first year (8,12,17). Besides a selectivity pattern, another factor that could particularly be responsible for the difference between the rates of BCG and OPV-0 is that while OPV is available freely at several general practitioners' clinics, same is not true for BCG vaccine, which also requires special equipment and training and therefore is not as freely available.

While doing the present study, an attempt was also made to find, through interviewing parents, the reasons for not getting their children immunized (as per schedule or not at all). The reasons are listed in [table 2](#). The most commonly observed reason for partial or no immunization was lack of proper knowledge about the time of the next dose or the correct schedule. Other noteworthy reasons were forgetfulness, illness of some other person in the family, some domestic problem, or simply lack of initiative or concern. Apprehension of adverse effect was also cited as a reason by an appreciable number of parents. Most other workers also have mentioned almost similar reasons (7-11).

**Strengths and limitations of the study:** The present study had a reasonably large sample, larger than most studies carried out in other similar regions of the country; therefore, the results carry a good credibility. However, being hospital based, this study cannot be taken as truly reflective of the community. An ideal set-up is a randomized field study which could better represent a community.

## Conclusion

There is still a deep need for improving the overall immunization coverage and efforts are required particularly to improve the coverage among the older children so that the burden of vaccine preventable diseases could be reduced substantially.

## Authors Contribution

Though the concept and design were mainly by the first author, both authors have contributed sufficiently in the intellectual content, interpretation of data and preparation of the manuscript.

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**Tables**

**TABLE NO. 1 IMMUNIZATION STATUS OF CHILDREN FROM DIFFERENT AGE GROUPS**

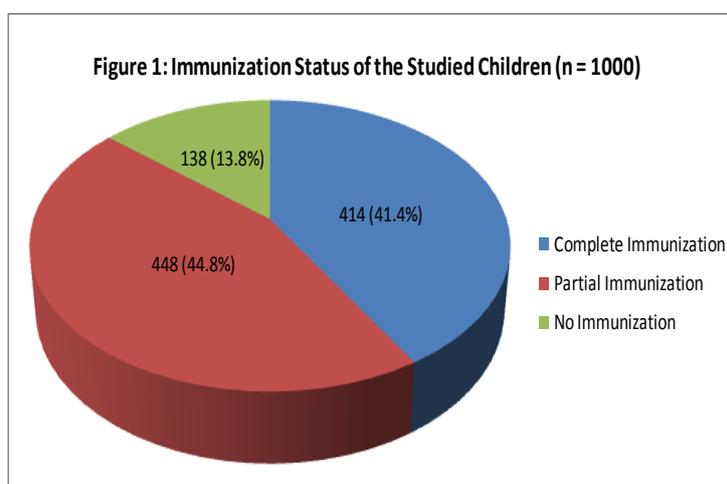
S.N.	Age group	No of children	Complete immunization	Partial immunization	No immunization	p value
1.	6 mo - < 9 mo	248	125 (50.40%)	85 (34.28%)	38 (15.32%)	0.000
2.	9 mo – < 18 mo	265	122 (46.03%)	106 (40.00%)	37 (13.96%)	
3.	18 mo - <5 yr	245	92 (37.55%)	121 (49.39%)	32 (13.06%)	
4.	5 – 6 yrs	242	75 (31.00%)	136 (56.19%)	31 (12.81%)	
<b>Total No.</b>		<b>1000</b>	<b>414 (41.4%)</b>	<b>448 (44.8%)</b>	<b>138 (13.8%)</b>	

**TABLE NO. 2 REASONS OF DEFAULTING FOR IMMUNIZATION (PARTIAL + NO IMMUNIZATION - N = 586)**

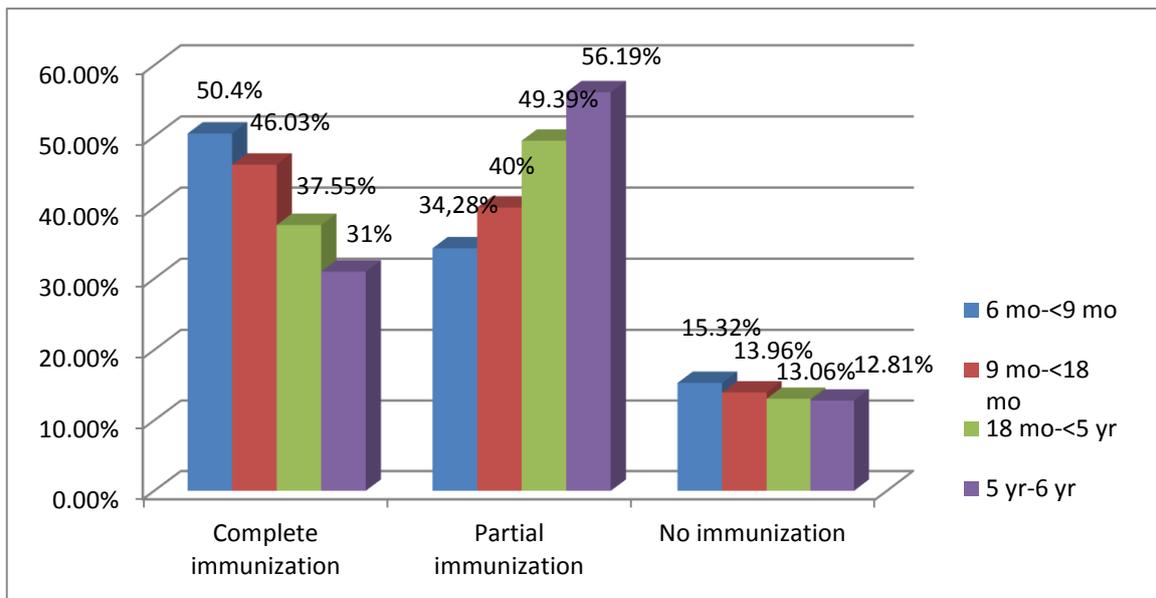
S.N.	Reasons	Number	Percentage*
1.	Lack of knowledge	307	52.38
2.	Forgetfulness	232	39.59
3.	Illness of the child	205	34.98
4.	Family problems (illness of other family member(s), death in the family, marriage etc.)	127	21.67
5.	Lack of initiative (non-visit of health worker, health facility situated far away from home)	111	18.94
6.	Fear of adverse effect of vaccine	84	14.33
7.	Did not get time (busy in work)	72	12.28
8.	Bad experience following vaccination (death, illness in family, neighborhood)	57	9.72
9.	Others (migration etc)	55	9.38

**Figures**

**FIGURE NO. 1 IMMUNIZATION STATUS OF THE STUDIED CHILDREN (N=1000)**



**FIGURE NO. 2 IMMUNIZATION STATUS, AGE WISE, OF STUDIED CHILDREN (N = 1000)**



**FIGURE NO. 3 DIFFERENT IMMUNIZATION EVENTS (IN PERCENTAGES)**

