

To Assess the Immunization Status as Regards BCG, OPV, DPT, Hep B and Measles and Factors Affecting it in Children (9months- 6years) Attending OPD/IPD Services of Pediatric Department At TMMC&RC, Moradabad

Jivesh Loona¹, Baljeet Maini², B. K. Guar³, Rupa Singh⁴

¹Postgraduate Student, Department of Pediatrics, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India, ²Professor, Department of Pediatrics, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India, ³Associate Professor, Department of Pediatrics, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India, ⁴HOD & Professor, Department of Pediatrics, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

Abstract

Introduction: To determine immunization status of children, to study the factors affecting immunization status of children. **Subjects and Methods:** This was a hospital based cross-sectional observational study. Patients: children who attended the OPD or admitted as in patients (IPD services) during the study period and the documents available with them. Inclusion Criteria: Children in the age group of (9 months–6 years) attending Paediatric OPD, Immunization clinic and children admitted in Paediatric ward. Exclusion Criteria: 1. Parents/ caregivers not giving consent. 2. Information of vaccination not available. Statistical Analysis: All the results obtained were subjected to statistical analysis using SPSS software version 24, Fisher's Exact test, Chi-square test and Student's 't' test were used for evaluation of level of significance. P-Value of less than 0.05 was taken as significant. **Results:** In total 360 cases were enrolled in this study. 150 (41.67%) of the children were fully immunized while 150 (41.67%) and 60 (16.66%) of the children were partially immunized and unimmunized respectively. BCG vaccination was done in 76.7 % of the children. DPT1, DPT2, DPT3 were given to 75 percent, 72.2 percent, 58.3 percent of the children respectively. OPV1 OPV2 OPV3 were given in 81.7 percent, 75.3 percent, 61.4 percent of the children respectively. Measles 1 vaccination was done in 62.2 percent of the children. Hep B1, Hep B2, Hep B3 vaccination was done in 75 percent, 72.2 percent, 58.3 percent of the children respectively. **Conclusions:** immunization status of study subjects was lower than the NFHS4 national and state data. Low parental education, home delivery, daily wage father's occupation, joint nature of family, low monthly income and increasing birth order were found to be significantly associated with partial/complete unimmunization. The factors such as gender and religion did not have any significant relationship to partial/complete unimmunization. More studies on the same subject will help to find local factors affecting immunization in various areas.

Keywords: BCG, OPV, DPT, Hep B, Measles.

Corresponding Author: Jivesh Loona, Postgraduate Student, Department of Pediatrics, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

E-mail: drjiveshloona@gmail.com

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Introduction

Across the globe, millions of children less than 5 years of age die annually from infections. A significant proportion of these infectious etiologies are vaccine preventable. In relation to this, immunization is the second cheaper means (first being clean drinking water) for reducing the mortality in infants.^[1]

In the year 1974, expanded program of immunisation (EPI) was started. In India, the preliminary EPI was restricted to diphtheria, tetanus toxoids, whole cell pertussis (DTwP), oral

poliomyelitis, and Bacillus Calmette Guerin BCG and mainly covered urban areas. In 1992, the Universal Immunization Program (UIP) was introduced which improved immunization coverage and extended the focus beyond infancy. Pulse polio immunization began in 1995. Hepatitis B immunization was introduced by some states couple of decades ago, followed by introduction of pentavalent vaccine (containing DPT, Hemophilus Influenzae type B vaccine (HiB) and hepatitis B) in last decade. Lately, Rotavirus vaccine and injectable polio vaccine have also been added in the schedule from 2019

onwards and government is making efforts to increase the umbrella size of vaccines for all children in India. Since 1992, UIP has been an integral part of the Child Survival and safe Motherhood Program, then from 1997 Reproductive and Child Health Program (RCH-I) & RCH-II and National Rural Health Mission since 2005.^[2]

Ideally, by the time an infant is 12 months old, all primary immunizations should be completed. We consider children aged 12-23 months as fully immunized if all primary immunization vaccines have been rendered to them.^[3] This protocol was adopted by all National Family Health Surveys (NFHS) to analyse immunization vaccine coverage rates. Latest available NFHS for Uttar Pradesh state is NFHS 4 (NFHS 5 has not provided data about UP state so far). As per immunization coverage rates reported by NFHS-4 (for all states), 91.9% children received BCG vaccination, and there was marked improvement in other vaccines too.^[4] In same survey, in Uttar Pradesh the corresponding figures, were lower than national average, albeit much better than NFHS 3.^[5] The correspondence figure of Moradabad, (a district in western Uttar Pradesh (UP), where our hospital is located), had similar figures as UP state.^[6] There was a wide variation in immunization coverage rates among various Indian states.^[4]

The immunisation surveys are usually done at large community level representing the community status of immunisation which includes all ill and healthy children. However, there is a paucity of data about immunisation status of hospitalised children and more-so from this region. As our hospital is a tertiary care centre (catering mainly to surrounding rural area) of western UP, the present study was undertaken to assess the immunization status of children (9months—6years, with a focus of knowing about the situation for all vaccines given upto 5 years age as per UIP) presenting to OPD and/or admitted as inpatient.

Subjects and Methods

It was a cross sectional study conducted in over a period of 1 year from January to December of 2019. Institute ethical clearance was obtained prior to start of the study.

Inclusion Criteria : Children in the age group of (9 months to 6 years) attending paediatric OPD, and/or children admitted in paediatric ward.

Exclusion Criteria: Patients with incomplete/unavailable immunisation records.

Method of Collection of Data

Written informed consent was obtained from parents of all children aged 9 months-6years and information was noted in a structured format regarding immunization status of the child.

Immunization status of these children was noted by seeing the immunization card. As we had children upto 6 as our study subjects, therefore for the sake of simplicity (as some new vaccines have successively been added in UIP in last few years), we collected data about only all those vaccines that were in use 6 years back. The vaccination status studied in this study included BCG, OPV, DPT, hepatitis B, Measles (9th month or (first dose)).

Pulse polio programme was not included in our study (considering its known robust universal coverage). Various factors affecting immunisation status were also studied. All the information was filled in a proforma and entire data was transported into Microsoft excel software.

Statistical Analysis

All the results obtained were subjected to statistical analysis using SPSS software 24. Chi-square test and Student's 't' test were used for evaluation of level of significance. 'P' value of less than 0.05 was taken as significant.

Results

Out of 360 cases for whom immunization data was completely available, 150 (41.67%) of the children were fully immunized while 150 (41.67%) and 60 (16.66%) of the children were partially immunized and unimmunized respectively [Table 1]. BCG vaccination was done in 76.7 percent of the children. DPT1 vaccination was done in 75 percent of the children, DPT2 in 72.2 percent and DPT3 in 58.3 percent of the children. OPV1 vaccination was done in 81.7 percent, OPV2 vaccination in 75.3 percent and OPV3 vaccination was done in 61.4 percent of the children. Measles 1 vaccination was done in 62.2 percent of the children. Hep B vaccination was done in 75% at birth, 6 weeks dose in 75 % and last dose in (58.3%) [Table 2]. In our study we found a significant relation of the association of birth order and immunization status. Sixty five (65) percent of the children first in birth order were fully immunized while 34% of the children in 2nd birth order respectively were fully immunized. Forty five percent of the children 3rd in order were completely unimmunized whereas none of the children 1st in order were unimmunized [Table 3]. Type of family and immunization status were also significantly associated. It was observed that nuclear families were associated with higher rate of complete immunization (64.7 percent) in comparison to partial immunization (58 percent) and complete unimmunization (30 percent). [Table 4]. Children with maternal education of post high school (22 percent) or graduation (53.3 percent) had higher complete immunization. Children with maternal education of upto middle school (42.7 percent) or high school (23.3 percent) and children with maternal education of upto primary school (63.3 percent) or middle school (26.7 percent) had higher incidence rate of partial immunization and complete unimmunization

Table 1: Distribution of children according to immunization status

Immunization status	Number	Percentage %
Fully immunized	150	41.67
Partial immunized	150	41.67
Unimmunized	60	16.66
Total	360	100

respectively [Table 5]. There was significant association between place of birth (home/institutional delivery) and immunization status. Among the fully immunized group, 100 percent of the children were born in hospital while in partial immunized and completely unimmunized groups, 82.7 percent and 25 percent of the children were born in hospitals [Table 6]. Father's occupation also had an association with immunization status. Fathers of nearly more than 40 percent of fully immunized children had arithmetic skilled jobs while 19.3 percent of the them had skilled jobs respectively [Table 7]. Fifty percent of fathers of the completely unimmunized group were daily wage workers [Table 8]. Lack of awareness of benefits and awareness of free vaccine were the cause of partial immunization and complete unimmunization in 29.52 percent and 41.90 percent of the patients respectively. Distance from the immunization centre and fear of side-effects was the cause of partial immunization and complete unimmunization in 52.38 percent and 60 percent of the patients respectively. Societal pressure/ false belief was the reason for complete unimmunization and partial immunization in 60 percent of the patients [Table 9].

Discussion

Each country's immunization programme involves selected vaccines which are given to target population. The developing country still has high morbidity and mortality rates despite these efforts. Hence vaccine coverage rate is the most important factor determining success of such programmes. [7-9]

Immunization coverage of different vaccines

BCG vaccination was documented in 76.7 percent of the children. This is lower than other studies by Chhabra et al, [7] Bhatia et al, [10] NFHS-4 (India). [4] for UP in NFHS 4, figure for BCG vaccination was 87.6%, [5] and for Moradabad district, it was 85%. [6] In previous NFHS-3 UP, BCG immunization coverage was only 61%. [8] Our results are close to NFHS 4 data and show much better immunization coverage than NFHS-3. DPT1 vaccination was done in 75 percent of the children. In study by Chhabra et al it was 81.54%. [7] In study by Agrawal SC et al it was 74.8%, [9] according to NFHS-4 India data it is 89.5% while for UP data is 83.7% and by NFHS-3 UP data is 55.7%. [8] DPT2 vaccination was done in 72.2 percent of the children. In study by Chhabra et al it was

76%. [7] In study Agrawal SC et al it was 65.6%, [9] according to NFHS-4 India data it is 85% while for UP is 77% and by NFHS-3 UP data is 43.6%. [8] while rates of immunization of BCG upto DPT 2nd dose were fairly seen to be near 75%, the rates for DPT 3rd dose dropped to 58.3 percent of the children. This drop was documented also in study by Chhabra et al, [7] Agrawal SC et al. [9] according to NFHS-4 India data also, there was a drop to 78% while for UP it was 66%. [5] Corresponding figure by NFHS-3 for UP data was mere 30%. [8] finding of our study regarding drop in vaccination by 3rd dose of DPT, is thus in tune with earlier available data of NFHS4, and other workers. Same trend was seen for OPV vaccination. In our study the immunization coverage trend for OPV (from zero dose to 3rd dose) was similar to DPT series of primary immunization. Across other studies and NFHS4 data, same trend has been seen with OPV vaccination too. Similar to DPT, OPV administration also lower than other workers (Chhabra et al, Agrawal SC et al 76%, and NFHS-4 India and UP data). Hep B1, Hep B2, Hep B3 vaccination was done in 75 percent, 72.2 percent, 58.3 percent of the children respectively. According to NFHS-4 India data it is 82% for HEP B1, 77% for HEP B2 and 62% for HEP B3 while for UP is 76% for HEP B1, 69% for HEP B2, and 53% for HEP B3. Measles 1 vaccination was done in 62.2 percent of the children, which was again lower than earlier NFHS4 data for state and India. [4,5] Chhabra et al reported measles vaccination similar to our study (65%). [7] Bhatia et al however reported a higher figure of 76%. [10] NFHS-3 UP data for measles 1st dose was mere 38%. Findings of our study are thus in tune with other available data in terms of improvement in measles vaccination along with other vaccines, from NFHS3 upto this study.

All above discussed vaccines showed lower coverage in our study as compared to NFHS-4 nation and UP data and other available studies. Our study is a hospital based study from a rural area. The low rates of immunisation can be due to regional factors. Being a hospital study, these findings can not be generalized to whole community.

Immunization status

In present study, 42 percent of the children were fully immunized, while 41 percent and 17 percent of the children were partially immunized and unimmunized respectively. These figures are less than (According to the latest data available of NFHS 4) overall figure of 51% for UP state

Table 2: BCG; DPT (3 doses), DPT 1, DPT 2, DPT 3; OPV (3 doses), OPV 1, OPV 2, OPV 3; Measles; HEP B(3doses), HEP B1, HEP B2, HEP B3,vaccination coverage

Vaccine		Number	Percentage %
BCG		274	76.7
DPT	DPT1	270	75
	DPT2	260	72.2
	DPT3	210	58.3
OPV	OPV1	294	81.7
	OPV2	271	75.3
	OPV3	221	61.4
Measles		224	62.2
HEP B	HEP B1	270	75
	HEP B2	260	72.2
	HEP B3	210	58.3

Table 3: Association of birth order and immunization status

Birth	Fully immunized		Partial immunized		Unimmunized		Total n	p- value
	No.	%	No.	%	No.	%		
One	98	65.3	20	13.3	0	0.0	118	<0.05
Two	51	34.0	80	53.3	8	13.3	139	38.61
Three	0	0.0	45	30.0	27	45.0	72	20
Four	1	0.7	4	2.7	23	38.3	28	7.78
Five	0	0.0	1	0.7	2	3.3	3	0.83
Total	150	100	150	100	60	100	360	100

Table 4: Association of type of family and immunization status

Family	Fully immunized		Partial immunized		Unimmunized		Total n	p- value
	No.	%	No.	%	No.	%		
Joint	53	35.3	63	42.0	42	70.0	158	<0.05
Nuclear	97	64.7	87	58.0	18	30.0	202	56.11
Total	150	100	150	100	60	100	360	100

and 49% for Moradabad district. Present study shows marked improvement in immunization as compared to NFHS -3 data in which the figure of fully immunized children in UP was mere 23%. As present study was hospital based, mostly catering to rural area population, the immunization figures can be explained on local demographic reasons. In the study by Kurane et al (2018, India), authors found 65% children were fully immunized & 34% were partially immunized. Other studies done in India have reported similar findings (Manjunath V et al, Agrawal SC et al and Nath B et al). [7-9,11,12]

Birth order and immunization status

In this study a direct relation of the association of birth order and immunization status was observed. Children first in birth order, were more completely immunized. Sixty five percent of

the children first in birth order were fully immunized. While corresponding figures were Thirty four percent of the children in 2nd birth order respectively were fully immunized. Whereas 45 percent of the children 3rd in order were unimmunized, none of the children 1st in order were totally unimmunized. Our results are thus similar to earlier studies by Ntenda PAM, Kurane et al. [12,13]

Family type and immunization status

This study showed that there is significant association of type of family and immunization status. Nuclear families were associated with higher rate of complete immunization in comparison to joint family. Our results indicate that having more children in the family decreases the overall complete immunization status. We could not find such similar studies

Table 5: Association of maternal education and immunization status

Maternal	Fully immunized		Partial immunized		Unimmunized		Total		p- value
	No.	%	No.	%	No.	%	n	%	
Illiterate	1	0.7	2	1.3	6	10.0	9	2.50	<0.05
Primary school	1	0.7	14	9.3	38	63.3	53	14.72	
Middle school	16	10.7	64	42.7	16	26.7	96	26.67	
High school	15	10.0	35	23.3	0	0.0	50	13.89	
Intermediate or posthigh school	33	22.0	28	18.7	0	0.0	61	16.95	
Graduate	80	53.3	7	4.7	0	0.0	87	24.17	
Post graduate	4	2.7	0	0.0	0	0.0	4	1.10	
Total	150	100	150	100	60	100	360	100	

Table 6: Association of birth place and immunization status

Birth	Fully immunized		Partial immunized		Unimmunized		Total		p- value
	No.	%	No.	%	No.	%	N	%	
Hospital	150	100.0	124	82.7	15	25.0	289	80.23	<0.05
Home	0	0.0	26	17.3	45	75.0	71	19.72	
Total	150	100	150	100	60	100	360	100	

Table 7: Association of father occupation and immunization status

Father profession	Fully immunized		Partial immunized		Unimmunized		Total		p- value
	No.	%	No.	%	No.	%	N	%	
Profession	18	12.0	0	0.0	0	0.0	18	5.0	<0.05
Semi Profession	26	17.3	1	0.7	0	0.0	27	7.5	
Arithmetic skill jobs	61	40.7	44	29.3	0	0.0	105	29.2	
Skilled	29	19.3	54	36.0	24	40.0	107	29.7	
Semi-skilled	13	8.7	36	24.0	6	10.0	55	15.3	
Daily wage	3	2.0	15	10.0	30	50.0	48	13.3	
Total	150	100	150	100	60	100	360	100	

analysing the issue of type of family and immunization status, in the available literature.

Parental education and immunization status

It was observed in this study that children with higher parental education had better immunization, whereas children with lesser educated parents had higher incidence of incomplete immunization. Among children whose paternal education was upto high school only, only 10% were fully immunized. The

children whose parents were educated till graduate level, 56% were fully immunized, only 15% partially immunized and none of their children remained unimmunized. Similar results have been obtained in studies by Tikmani SS et al, Ntenda PAM, Kumar D et al and Kurane et al studies.^[12-15] More educated parents are expected to be more aware to health benefits of immunisation and the utilisation of health facilities.

Institutional delivery and immunization status

Table 8: Distribution of children according to causes for partial immunization and un-immunization

Causes for partial immunization and un-immunization	Number	Percentage%
Awareness of benefits	62	29.52
Awareness of free vaccine	88	41.90
Distance from immunization center	162	77.14
Fear of side effects	110	52.38
Societal pressure/ false belief	126	60.00
Total	210	100

In our study majority of children 80% were born in hospital and this was much in concordance to results of NFHS-4. The hospital born children were more immunized as compared to home delivered children. Among the unimmunized group most of the children were born at home (75%) while it was exactly opposite for fully immunized children. Similar results have been found in studies by Natu SA et al and NFHS-4 India data.^[4,16] utilisation of institutional services for delivery is intimately connected to factors like parental awareness and easy accessibility of health resources. These same factors influence the vaccination too.

Paternal occupation and immunization status

Father's occupation had significant impact on immunization. In our study those children whose father's occupation was arithmetic skill jobs and skill jobs were more immunized than the children whose fathers were in semi-skilled/daily wage jobs. Similar observation has been recorded earlier too.¹⁶ Parental education, occupation and income are some of those factors which are generally very deeply and strongly intertwined. In this study, all these factors including type of parental occupation were significantly seen to be influencing the immunization status.

Parental Attitude and belief related factors affecting immunization

Societal pressure/false belief were the reason for un-immunization and partial immunization in 60 percent of subjects in this study. Kumar D et al, had also reported this cause for lack of immunization in a majority of subjects. Fear of side effects, difficulty to cover the distance upto immunisation centre were also important cause of partial/complete unimmunization in many patients. In the study by Kurane et al reported that 18% of children in their study were partially immunized/unimmunized due to lack of facility nearby(India).^[12,14]

Lack of awareness of benefits and awareness of free vaccine availability were also the cause of poor immunization in 29.52 percent and 41.90 percent of the patients respectively. In a study from Pakistan, Tikmani SS et al, also reported these factors to be responsible for lack of immunization.^[15]

Child gender and religion

It was a very heartening observation that the factors such as gender and religion were found to be non-significant in our study. In north Indian population utilisation of health services has been reported to be gender biased. This fact is highlighted by some earlier studies where girl child is generally underprivileged in society in terms of nutrition and immunization. Also, unlike some previous reports from same state, no religious community was seen to have predilection for being under or no immunization. This is a definitely a very promising trend and possibly reflects a major shift in the dynamics of immunization in this region.

According to our present study certain factors had a significant impact on immunization status. Factors such as increasing birth order, home delivery, low parental education, daily wage father's occupation and joint family nature were found to be significantly associated with partial/ unimmunization.

According to NFHS4 data of UP total of 53.2% of male and 48.7% of female are fully immunized and 53% of Hindu and 43.8% of Muslims are fully immunized.

Conclusion

In this study we found immunization status lower than the national and state data (NFHS4). Low parental education, home delivery, daily wage father's occupation, joint family nature, low mean monthly income and increasing birth order were found to be significantly associated with partial/ completely unimmunization. The factors such as gender and religion were found to have no significant impact on immunization status of children. We recommend more such studies which will help us to find local factors affecting immunization, particularly in semiurban /rural areas. Studies of this type shall definitely help to identify the gaps and factors affecting immunization in local population.

Limitations

1. Since our study is the hospital based study with limited sample size, therefore our data cannot reflect on actual immunization status of community.
2. Since our institute is situated in the rural area catering mostly the rural population with low socioeconomic status, thereby we cannot relate it with the urban area population immunization status.
3. Optional vaccines are not included in our study.

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