

## Immunization Coverage: Role of Sociodemographic Variables

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### Abstract

**Background** Children are considered fully immunized if they receive one dose of BCG, three doses of DPT and polio vaccine each, and one measles vaccine. In India, only 44% of children aged 12–23 months are fully vaccinated and about 5% have not received any vaccination at all. Even if national immunization coverage levels are sufficiently high to block disease transmission, pockets of susceptibility may act as potential reservoirs of infection.

**Aims and objectives** This study was done to assess the immunization coverage in and around tertiary care center and determine various sociodemographic variables affecting the same.

**Methods** Hospital based descriptive cross-sectional study. A total of 500 children aged between 1-5 years, admitted in Department of Pediatrics were asked to participate in this study. Information regarding vaccination, socio-demographic factors was collected from their parents and care takers. Accuracy and validity of information were confirmed by immunization card in possible situation and inspection for BCG scar.

**Result** 51.2% children were fully immunized, 45.6% were partially immunized and 3.2% children were unimmunized as per National immunization schedule. Percentage of completely immunized children was almost similar among males (53.1%) and females (48.3%) in the study population. Coverage of BCG was found to be the highest (95.1%) while that of measles was the lowest. P value <0.001, indicates significant relation between socio-economic status and immunization status. The main reason for noncompliance was given as child's illness at the time of scheduled vaccination followed by lack of knowledge regarding importance of immunization. Low education status of mother, high birth order, and place of delivery were found to be positively associated with low vaccination coverage.

**Conclusion** Regular IEC activities (group talks, role plays, posters, pamphlets, and competitions) should be conducted in the community to ensure that immunization will become a "felt need" of the mothers in the community..

**Key words:** BCG, DPT, IEC

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## Introduction

Immunization is the process of inducing immunity against a specific disease. It can be done by the vaccines, immunoglobulins, and antisera. Immunization plays an important role in reducing morbidity and mortality. Last week of April (24<sup>th</sup> to 30<sup>th</sup>) is celebrated as world immunization week. Vaccination is one of the most powerful and cost-effective weapon of modern medicine to control infectious disease. Some infectious diseases whose control is solely based on immunization are polio, diphtheria, tetanus, measles etc. Unfortunately, we do not have a vaccine for every infectious disease like malaria and diarrheal diseases.[1-3]

Vaccines are defined as a whole or parts of micro-organism administered to prevent an infectious disease. Immunization is primary focus of child health and many programs have been launched by government of India for better coverage as immunization is a primary level prevention. When immunization coverage reaches the figure of 80% or more, disease transmission pattern is severely disrupted and provides degree of protection even for remaining children who have not been immunized. This protection is because of "Herd Immunity".[4,5]

Every country has its own immunization schedule. A well thought immunization schedule must be epidemiologically relevant, immunologically effective, operationally feasible and socially acceptable. Choice of vaccines in National immunization schedule is based on consideration of disease burden, vaccine availability and cost effectiveness. Initially six vaccines were there, at present 13 vaccines are available in National Immunization Schedule (NIS). In 1995 pulse polio immunization campaign was launched, hepatitis B vaccine was introduced in 2002 in some states and became nation-wide in 2010. By 2010, second dose of measles and JE vaccine were added up. [6-9]

In an attempt to increase immunization coverage, mission Indradhanush was launched by the ministry of health and family welfare in December 2014 to attain 90% coverage of 7 vaccines (BCG, diphtheria, pertussis, tetanus, polio, measles hepatitis B) by 2020. By the end of 2014, the percentage of vaccination had gone up significantly. 91% for BCG, 83% for 3 doses of DPT, 83% for measles, 82% for 3 doses of OPV, 70% for hepatitis B and 20% for Hib. The success of the immunization programme is reflected by the elimination of polio and almost worldwide eradication. [10-11]

IPV was launched in 2015 and became nationwide in 2016 with the introduction of two new vaccines in NIS, Rota virus and HPV in some states. By 2017, measles-rubella vaccination campaign and pneumococcal conjugate vaccine were launched in some states.<sup>14</sup> Intensified mission Indradhanush was launched in October 2017 with objective of full immunization of >90% newborn by December 2018. It covers left out and drop out in selected 173 district and urban areas in 17 cities. Roughly 3 million children die because of VPDs with the disproportionate number of children residing in developing countries. Approximately 34 million children are not completely immunized, 90% of them residing in developing countries.[12]

In India, immunization services offered free of cost in public health facilities but immunization rate has not achieved its target. In an attempt to increase immunization coverage a new programme, HBYC (home-based care of the young child) was introduced in 2018. This encompasses counseling for immunization of 3 months to 15 months old children by ASHA workers.

Factors affecting immunization are knowledge and awareness of parents about immunization, education of parents, socio-economic status, number of children, the

area of habitat, religion, side effect of vaccines, dependency on health workers, cultural practices and myths about immunization. Some studies have been carried on children admitted in a tertiary care centre, but none was carried out in UP. In all studies, lack of awareness and knowledge about immunization have come out as a gist. So, the purpose of this study was to assess immunization status in 1 to 5 year age of children and awareness among their parents and spreading awareness about immunization and health programme.

### Materials and Methods

The Present study was conducted in the Department of Pediatrics GSVM Medical College, Kanpur from Feb. 2017 to Oct. 2018. A total of 500 children were studied. All the children aged between 1-5 years, admitted in Department of Pediatrics were asked to participate in this study. Information regarding vaccination, socio-demographic factors was collected from their parents and care takers. Accuracy and validity of information were confirmed by immunization card in possible situation and inspection for BCG scar.

**Study Design** Hospital based descriptive cross-sectional study.

### Methodology

#### Data Collection

- Informed oral written consent was taken from parents of the child.
- All children aged 1-5 years admitted in the ward of our Hospital were studied using National immunization schedule and their parents were interviewed regarding awareness of immunization.

The information was collected on pre-designed proforma and all the information was tabulated and interpreted through standard statistical methods and causes for partial and unimmunization were studied.

### Inclusion Criteria

- All children aged 1-5 years admitted to Pediatrics ward.

### Exclusion Criteria

- Children <1 year and >5 years.
- Children following IAP Schedule of immunization.
- Children whose parents did not give consent for the study.
- Children on long term steroid therapy.

**Analysis** Codes were prepared for each options of the questionnaire. Data was entered in excel sheet to prepare a master chart Chi square test was used to find out factors affecting immunization status. Children were classified as-

**Fully Immunized**-Who received all vaccine in proper doses and frequency as per national immunization program up to the age.

**Partially Immunized**-Who received some vaccine as per National Immunization schedule (NIS) but not completely, considered partially immunized.

**Unimmunized**-A child who had not yet received any vaccine appropriate for age though they might have received polio drops in the pulse polio programme were considered unimmunized

### Observation Chart

**Table 1: Age Distribution**

AGE GROUP	N=500	PERCENTAGE	COMPLETE	%
1-2 year	274	54.8%	161	58.7
2-3 year	78	15.6%	33	42.3
3-4 year	49	9.8%	15	30.6
4-5 year	99	19.8%	47	47.4

**Table 2: Immunization Status in Study Subjects**

	N=500	Percent
Completely immunized	256	51.2%
Partially immunized	228	45.6%
Unimmunized	16	3.2%

**Table 3: Immunization Status According To Gender**

	Completely Immunized	%	Partially Immunized	%	Unimmunized	%	Total	%
Male	161	53.1	131	43.2	11	3.6	303	60.6
Female	95	48.2	97	49.2	5	2.5	197	39.4

**Table 4: Distribution of Immunization Status According to Area**

	Completely immunized	%	Partially immunized	%	Unimmunized	%	Total	%
Rural	99	48	102	49.5	5	2.4	206	41.2
Urban	157	53.4	126	42.8	11	3.7	294	58.8

**Table 5: Immunization Status According to Religion**

Religion	Complete	%	Partial	%	Unimmunized	%	Total	%
Hindu	223	53	197	46.9	0	0	420	84
Muslim	33	41.2	31	38.7	16	20	80	16

**Table 6: Immunization Status According to Caste**

Caste	Complete	%	Partial	%	Unimmunized	%	Total	%
General	104	57.4	73	40.3	4	2.2	181	43
OBC	80	56.7	61	43.2	0	0	141	33.5
SC	42	42.8	56	57.1	0	0	98	23.3

**Table 7: Immunization Status According to Type of Family.**

	Complete	%	Partial	%	Unimmunized	%	Total	%
Joint	131	46.9	137	49.1	11	3.9	279	55.8
Nuclear	125	56.5	91	41.1	5	2.2	221	44.2

**Table 8: Vaccination Card Among Study Subjects.**

Vaccination Card	N=500	Percent
Available	423	84.6
Not available	77	15.4

**Table 9: Immunization Status According to Socio-Economic Status.**

Class	Complete	%	Partial	%	Unimmunized	%
Upper	12	100	0	0	0	0
Upper Middle	38	80.8	9	19.1	0	0
Lower Middle	58	33.9	102	59.6	11	6.4
Upper Lower	122	55.7	92	42	5	2.2
Lower	26	50.9	25	49	0	0

**Table 10: Immunization Status According to Birth Order.**

Birth Order	Complete	%	Partial	%	Unimmunized	%	Total	%
1 <sup>st</sup>	123	54.9	96	42.8	5	2.2	224	44.8
2 <sup>nd</sup>	91	54.8	70	42.1	5	3	166	33.2
3 <sup>rd</sup>	31	43.6	40	56.3	0	0	71	14.2
4 <sup>th</sup>	11	47.8	12	52.1	0	0	23	4.6
>4th	0	0	10	62.5	6	37.5	16	3.2

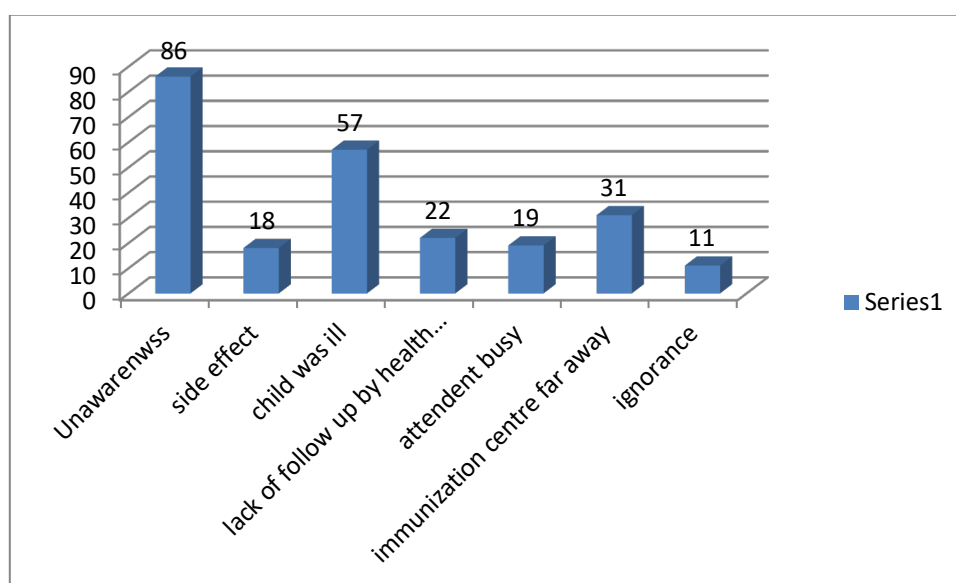
**Table 11: Overall Coverage of Vaccines**

Class	Number n=500	%
BCG	479	95.8
OPV	458	92.6
Penta	428	85.6
IPV	377	75.4
Measles	392	78.4
JE	394	78.8
Vit A	392	78.4

**Table 12: Dropout Rate of Vaccines**

VACCINES	DROP OUT
BCG-Penta	10.64%
Penta-Measles	2.3%
Measles-JE	5.74%
BCG-Measles	12.7%
Penta1-Penta 2	1.4%
Penta 2- Penta 3	2.6%
Penta 3-Booster1	51.3%
Booster1-booster2	89%

**Reasons for Incomplete Immunizations.**



## Results

In our study, 500 children were included for assessment of immunization status. Subjects were distributed according to age group. Maximum subjects belonged to 1-2 years 274 (54.8%) and maximum immunization was found among children between 1 to 2 years of age (58.7%). P value <0.001 indicates a significant association between age and immunization status. Among 500 subjects studied, 256 (51.2%) were completely immunized, 228 (45.6%) were partially immunized and 16 (3.2%) were unimmunized.

Among 500 subjects, 303 (60.6%) were males, 197 (39.4%) were females. Among the males, 161 (53.1%) were completely immunized, 131 (43.2%) partially immunized and 11 (3.6%) were unimmunized. In females, 95 (48.2%) were completely immunized, 97 (49.2%) were partially immunized and 5 (2.5%) were unimmunized. P value was > 0.05, which showed that gender was not significant for immunization coverage.

Among 500 studied subjects, 206 (41.2%) belonged to rural area and 294 (58.8%) belonged to urban area. In rural area, 99 (48%) children were completely immunized, 102 (49.5%) were partially immunized and 5 (2.4%) children were unimmunized. In urban area 157 (53.4%) were completely immunized, 126 (42.8%) were partially immunized and 11 (3.7%) were unimmunized. P value is > 0.05, indicates that no significant relation exists between area and immunization coverage.

Among 500 subjects, 420 (84%) children were Hindus and 80 (16%) were Muslims. In Hindus, 223 (53%) were completely immunized, 197 (43.2%) were partially immunized and no one child remained unimmunized. In Muslims, 33 (41.2%) were completely immunized, 31 (38.7%) were partially immunized and 16 (20%) were unimmunized. P value is

<0.001, indicates that significant relation exists between religion and immunization status.

Among 420 subjects studied, 181 (43%) belonged to general, 141 (33.5%) belonged to OBC and 98 (23.3%) belonged to SC community. In General community, 104 (57.4%) were completely immunized, 73 (40.3%) partially immunized and 4 (2.2%) children were unimmunized. In OBC community, 80 (56.7%) were completely immunized, 61 (43.2%) were partially immunized, and not anyone remained unimmunized. In SC community, 42 (42.8%) were completely immunized, 56 (57.1%) partially immunized and no one remained unimmunized. P value <0.001, indicates a significant relation between caste and immunization status. Among 500 study subjects, 423 (84.6%) had vaccination card and 77 (15.4%) had no vaccination card.

In upper class, 100% of children were completely immunized. In upper middle class, 80.8% children had complete and 19.1% partial immunization status. No one remained unimmunized in upper middle class. In lower middle class, 33.9% of children were completely immunized, 59.6% partially immunized and 6.4% remained unimmunized. In upper lower class, 55.7% children were completely immunized 42% partially immunized, and 2.2% were unimmunized. In lower class, 50.9% were completely immunized, 49% partially immunized and no one was unimmunized. P value <0.001, indicates significant relation between socio-economic status and immunization status.

Children who were 1<sup>st</sup> in birth order, had maximum immunization coverage (44.8%). Minimum immunization coverage was in birth order >4 (3.2%). P value is <0.001, indicates the significant relation between birth order and immunization status. As birth order increased, immunization coverage decreased.

### Statistical Analysis:

The collected data was summarized by using frequency, percentage, mean & S.D. To compare the qualitative outcome measures Chi-square test or Fisher's exact test was used. To compare the quantitative outcome measures Independent t test was used. If data was not following normal distribution, Mann Whitney U test was used. SPSS version 22 software was used to analyse the collected data. p value of <0.05 was considered to be statistically significant.

### Discussion

The present study was conducted during the period of August to November 2018. In this present hospital based descriptive cross – sectional study, we found that 51.2% children were fully immunized, 45.6% were partially immunized and 3.2% children were unimmunized as per National immunization schedule. Percentage of completely immunized children was almost similar among males (53.1%) and females (48.3%) in the study population.

Only 24.8% parents knew that vaccine was used to prevent diseases. 51.4% were aware that children should be immunized up to 5 years of age according to national immunization schedule. 43.2% parents knew that BCG vaccine is given just after birth. 77.2% parents knew that oral polio drop should be given up to 5 years of age. Only 18.6% parents told that vaccines could be given during common cold and fever. Study findings showed higher immunization coverage of 80.95% as compared to NFHS-3 data (43.5%). The results were supported by report of Sharma B and Mahajan H, which showed immunization coverage of Maharashtra to be above 70% [1].

The overall coverage for different vaccines ranges from 97.14% for BCG vaccine to 87.61% for measles, which was above the 85% target set by Universal Programme of Immunisation (UIP) in India. A study

conducted by Gill N et al on immunization status of India showed BCG and measles coverage of 86% and 67% respectively. Similar results were found by Yadav et al. in an urban slum of Jamnagar where coverage of BCG was maximum (94.75%) followed by OPV (84.7%) and, DPT (81.4%) and that of measles was the least (75.7%). Although DPT and polio vaccinations are given at the same time as part of the routine immunization programme, the coverage rates are higher for Polio than DPT, probably because of the Pulse Polio Programme [2-4].

Rehman SU et al studied coverage and predictors of routine immunization among 12-23 months old children in disaster affected communities in Pakistan. Age, religion, cast, birth order, socio economic status had significant role in influencing the immunization. The prime reason behind partial immunization as per our study was unawareness of vaccination schedule and inter current illnesses of the children. Gender, area of residence and type of family did not affect the immunization status of child. Maximum complete immunization was found in 1-2 year of age group.[5]

Evaluation of vaccination coverage and Dropout rates among children of age 0–5 years in slums of Amritsar city was done by Singh J et al. Whereas Athar Ansari et al with an effort with UNICEF studied routine immunization coverage in underserved children of Aligarh (India). There was significant association between immunization status of the children and mother's education status, birth order, and place of delivery. A study done by Athar Ansari M et al. found significant association between maternal education and child immunization status.[6-8]

Oyo-Ita A et al gave interventions for improving coverage of child immunization in low-and middle-income countries. Tadesse H et al gave predictors of defaulting from completion of child

immunization in south Ethiopia. Usman HR et al did a randomized controlled trial to improve childhood immunization adherence in rural Pakistan: redesigned immunization card and maternal education. The most common reasons for not immunizing the child as cited by respondents were illness of the child (29.52%), unawareness of the need for immunization (8.1%), being busy with other works (5.24%) and visit to native place (3.81%). [9-11]

A study conducted by Danis K et al showed that the major causes for incomplete immunization were illness of child (30.8%), unawareness (23.1%), and migration to native place (23.1%). Another similar study by Usman HR et al. showed that visit to native place (14.7%), carelessness (11.7%), sickness of child (11.7%), and lack of knowledge (10.4%) were reasons for incomplete immunization. A study in urban slums of Lucknow by Vohra et al found that children born at home were found less likely to receive any vaccination. Studies done by Oyo-Ita A et al. and Saeterdal et al revealed that birth order was inversely related to vaccination coverage.[12-14]

Total 43% children belonged to general caste, 33.5% belonged to OBC and 23.3% children belonged to SC. 57.4% of general, 56.7% of OBC and 42.8% of SC were completely immunized. Status of complete immunization was almost equal in general and OBC category but was much lower in SC. This difference is statistically significant and require more studies to find out the reason behind this. Total 84% children were Hindus and 16% children were Muslims. 53% among the Hindus, 41.2% among the Muslims, children were completely immunized and difference was statistically significant. No child was found unimmunized in Hindu population but 20% children were found unimmunized in Muslim population. Further studies are

required to explore the reason for such a specific difference.[15-17]

Drop rate for BCG to pentavalent 1 was 10.64%, similarly dropout from BCG to measles was 12.7%. Dropout rate of pentavalent 1 to pentavalent 2 was 1.4%, pentavalent 2 to pentavalent 3 was 2.6%. It indicates that system is not able to hold the child once registered. Steps for improvement should focus on reducing the drop rate from BCG to pentavalent and measles. Age, religion, cast, birth order, socio economic status had significant role in influencing the immunization. The prime reason behind partial immunization as per our study was unawareness of vaccination schedule and inter current illnesses of the children. Children belonging to upper class were 100% completely immunized. In upper middle class 80.8% children in lower middle class 33.9%, in upper lower class 55.7% and in lower class 50.9% children were completely immunized respectively. In lower class immunization coverage was higher than lower middle class.[18-19]

### Conclusion

Age, religion, cast, birth order, socio economic status had significant role in influencing the immunization. The prime reason behind partial immunization as per our study was unawareness of vaccination schedule and inter current illnesses of the children. Gender, area of residence and type of family did not affect the immunization status of child. Maximum complete immunization was found in 1-2 year of age group.

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### What this study add to existing knowledge

Majority of the parents (40.8%) gained the knowledge of immunization from ASHA/health worker, 32% from Doctors, 16% from media (newspaper, television) ,7.2% from relatives and neighbors and only 2.6% parents were themselves aware of immunization.so, we need to strengthen the immunization monitoring system and promote ASHA health worker with regular follow up for effective and 100% immunization coverage.

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