

Original Research Article

## Immunization in Preschool Children: Grey Areas Associated with Coverage, Drop Outs and Adverse Effects

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### ABSTRACT

Immunization is one of the best indicators to evaluate the health services distributed across the population. It is also one of the most cost effective interventions to prevent a series of major illnesses particularly in environment where children are undernourished and die from preventable diseases. Hence the study was planned in urban as well as rural children, to assess the immunization status, reasons behind the drop outs and to assess the adverse effects of Immunization. 1000 children between age 1-5 years were recruited, 500 children from outpatient department of Santosh Hospital, Ghaziabad as representative of urban sector and 500 children from primary health center at rural Ghaziabad. Data was collected using a pre structured questionnaire. Out of 1000 children, 49.5% were fully immunized, while 34.5% received no immunization at all. There was no difference in immunization status of Male Vs Female in urban sector whereas, in rural sector a higher percentage of males (25.2%) fully immunized to 17% females, which was statistically significant. In urban sector individual vaccine coverage was BCG 89.8%, DPT3 88%, measles 83.8%, whereas rural sector reported 31.4% for BCG, 29% for DPT3 and 27.6% coverage for measles. The commonest reason for non-immunization in urban and rural sector was unawareness. Parent's education played a significant role in immunization status of child. In urban sector Odds Ratio (OR) for mother's education was 8.6 and OR for father's education was 14.1. In rural sector OR for mother's education is 1.64 and OR for father's education was 1.22. Few adverse effects were observed with these vaccine but none of them was serious or life threatening. The immunization status needs to be improved by increasing awareness, education, and counseling of parents and caregivers regarding immunizations and associated misconceptions as observed in the study.

**Key words:** Immunization, coverage, dropouts, children.

### INTRODUCTION

Immunization is one of the important indicators to evaluate the health services distributed across any population. Strengthening national immunization systems, especially in countries with the greatest number of under vaccinated children, should be a global priority to reduce morbidity and mortality from vaccine preventable diseases. <sup>(1)</sup> Globally,

approximately three million children die each year of vaccine - preventable diseases. Recent estimates suggest that approximately 34 million children are not completely immunized, with almost 98% of them residing in developing countries. <sup>(2)</sup> Out of these children, India shares a major part with one of the lowest immunization rates in the world along with the largest annual birth cohort. <sup>(3)</sup>

The expanded program of immunization was the first global Initiative at immunization, organized under the banner of WHO in 1974. India adopted this program in 1978. <sup>(4)</sup> The UIP (Universal Immunization Program) was introduced in Nov. 1985 by govt. of India to improve the coverage of immunization within the country with a shift of focus to immunization of children under 1 year of age, <sup>(5)</sup> providing free of cost vaccination for all infants against six diseases and this includes Single dose of BCG, three doses of DPT, three doses of OPV and one dose of measles. <sup>(6,7)</sup>

UIP was finely executed and was incorporated as an essential constituent of child survival and motherhood (CSSM) in 1992. Recently the UIP has become integral part of Integrated Management of Neonatal and Childhood Illness (IMNCI) program. <sup>(8)</sup> The health sector of this country is making admirable achievements in that several millions of potential life years, which have been saved from getting lost to vaccine preventable diseases through the universal immunization program (UIP). South East Asia Region (SEAR) director had declared 2012 as the year for intensifying Routine Immunization in the region, in view of poor Routine Immunization in few countries of SEAR. <sup>(9)</sup>

Despite the large scale provisions by the Govt., the rates of immunization are less than satisfactory. According to 3<sup>rd</sup> (National Family Health Survey) NFHS survey <sup>(10)</sup> conducted in year 2005-2006 the immunization coverage in India was 44% (males 45% and females 42%) and in U.P. the coverage was 23%. The district level household & facility survey 2008 (DLHS3) states that only 54% of children between 12-23 months were fully vaccinated, 41% were partially vaccinated and remaining 5% were non vaccinated. Out of these 54% fully vaccinated children ranges from as low as 13% in the Arunachal Pradesh to as high as 82% in TN. <sup>(11)</sup> Though it has improved during all these years in most of the places (according to successive NFHS surveys.)

<sup>(10,12,13)</sup> several studies suggests the poor status of Uttar Pradesh in this sector. <sup>(14-17)</sup>

Hence this study was undertaken with a view to ascertain the immunization status of children in Ghaziabad, a district of the most populous Indian state, Uttar Pradesh, in the Preschool age group and to find out the various reasons responsible for the suboptimal coverage of immunization, drop outs and adverse effects of these vaccines, if any. This study would serve as an impact study for estimating the effectiveness of the different programs launched by the Government and also suggest ways and means to make them more effective.

## **MATERIALS AND METHODS**

This is a one year Cross- sectional observational study conducted on 1000 children. 500 children between the age group of 1 - 5 years attending the pediatric outpatient department of Santosh hospital, Ghaziabad and 500 children from primary health care center in rural Ghaziabad were enrolled in this study. Demographic and socioeconomic data were recorded using a pre structured questionnaire, as several studies supported the demographic and socioeconomic influence on immunization of a particular area. <sup>(18-22)</sup> Parental education was also incorporated as several studies support role of parental education in Immunization. Though most of the studies talk about maternal education here in our study we have considered Father's education as well. <sup>(23-25)</sup> The immunization status of the enrolled children was assessed as per the national immunization program. All children between 1 - 5 years were included irrespective of caste, creed and immunization status, whether fully or partial was decided on the basis of immunization cards as documentary evidence. Immunocompromised children and mother not in possession of immunization card were excluded. Age group of 1 - 5 years was selected because 90% of immunization is complete by 1 year and 100% completed by 5 years. Hence this age group would

indicate about the coverage rate appropriately. Prior consent was taken from the mother and confidentiality of the identity was maintained. The work was approved by Ethical committee of the Institution. Details of Immunization pertaining to BCG, DPT three doses and three doses of OPV and measles and DPT 1<sup>ST</sup> and 2<sup>nd</sup> booster with OPV was noted. At the same time the drop out Immunization was noted and reasons for not giving Immunization to baby were also noted. The receiving of BCG was also confirmed by presence of BCG scar. A note was also made about the side effects of any vaccination noted by the parents. The data was tabulated and analyzed, by the Z-test for proportions, Logistic Regression and Chi-Square test, P value < 0.05 was considered significant in all cases. ODD'S Ratio was also calculated for immunization status in urban and rural population for educational status of the parents, as an attribute affecting Immunization status.

## RESULTS

In our study of 1000 urban and rural combined, 345 (34.5%) children between 1-5 years were completely unimmunized and 495 (49.5%) were fully immunized appropriate for age. 77.8% patients were fully immunized in urban sector Vs 21.2% in rural setting ( $p < 0.05$ ). Also only 5.2% children were unimmunized in urban setting Vs 63.8% in rural setting ( $p < 0.05$ ) (Table 1). In the urban setting there was no significant difference between immunization status of males and females 78.18% males while 77.33% females were fully immunized and equivalent no of males (5.45%) and females (4.88%) were unimmunized. However in rural setting there was a significant difference between male and female immunization status. However there was no significant difference between partially immunized and unimmunized males and females. 25.2% males as compared to 17% females were fully immunized in the rural sector. On comparison between urban and rural males

the difference was significant when fully immunized status and unimmunized status was taken into account. Similarly, there was a significant difference between fully immunized females and unimmunized females in urban Vs rural setting. 78.2% urban males Vs 25% rural males were fully immunized ( $p < 0.05$ ) and 77.3% urban females Vs 17% rural female babies were fully immunized ( $p < 0.05$ ). (Table 2)

In urban sector individual vaccine coverage was 89.8%, DPT3 88%, measles 83.8%, whereas rural sector reported 31.4% for BCG, 29% for DPT3 and 27.6% coverage for measles. The difference in vaccination coverage in urban and rural areas was evident where in almost all vaccines the coverage is at least two-third less than in urban. As evident in study there is a significant difference in all vaccines between urban and rural setting. P value in all vaccines was  $< 0.0001$ . (Table 3)

The most important reason for letting a child remain unimmunized in urban setting was unawareness, another cause is fear of reactions while other causes highlighted for drop outs were, fever, family disapproval, migration, child illness or mother being ill. In the rural background also unawareness was the most common reason cited by mother along with unawareness of where the facility of immunization was available. Other reasons remained same. (Table 4)

In urban setting, Dropout rate between BCG and DPT3 was 7.57% and between BCG and measles was 10.47% as against rural dropout rate of BCG to DPT3 was 19.4% and between BCG and measles was 22.2% ( $p < 0.05$ ). The dropout rates were much higher in rural than urban.

This study observed that only 83.14% babies demonstrated a BCG scar in whom history of BCG vaccination was positive. Commonest side effect observed with Immunization is fever, but no serious or life threatening adverse effect is seen with any of these vaccines in any category.

Both mother's education and father's education had an impact on immunization

status. The child had 8.6 times more chances of getting immunized if mother's education was more than primary; on the other hand a child had 1.42 times more chances of getting immunized if father's education was more than primary. In rural setting mother's education more than

primary had an impact of only 1.6 times and father's education only 1.22 times in immunizing their children. This is in sharp contrast to urban setting hence in rural setting other factors also seems to be operable which are more significant than education status of parents.

**Table 1: Demographic Profiles of Children**

Parameters		URBAN				RURAL				
		Fully Immunized	Partially Immunized	Unimmunized	Total	Fully Immunized	Partially Immunized	Unimmunized	Total	
Sex	Male	215(78.18)	45(16.36)	15 (5.45)	275	64 (25.20)	34 (13.44)	155 (61.26)	253	
	Female	174(77.33)	40(17.77)	11(4.88)	225	42 (17.00)	41 (16.60)	164 (66.40)	247	
	Total	389 (77.80)	85(17)	26 (5.20)	500	106 (21.20)	75 (15)	319 (63.80)	500	p<0.05
Agewise	1 to 2 yr	131(78.6%)	26(15.5%)	10 (5.9%)	167	29 (21.80%)	16 (12.03%)	88 (66.17%)	133	p<0.05
	2 to 3 yr	74 (64.9%)	34(29.8%)	6 (5.3%)	114	34 (28.81%)	12 (10.17%)	72 (61.02%)	118	p<0.05
	3 to 4 yr.	61 (80.3%)	10(13.2%)	5 (6.5%)	76	21 (18.75%)	21 (18.75%)	70 (62.50%)	112	p<0.05
	4 to 5yr.	123(86.2%)	15(10.4%)	5(3.4%)	143	22 (16.05%)	26 (18.98%)	89 (64.97%)	137	p<0.05
Education Mother	<Primary	105(69.08%)	27 (17.77%)	20(13.15%)	152	33 (15.94)	29 (14.01)	147 (71.01)	209	
	>Primary	284(81.61%)	58 (16.67%)	6 (1.72%)	348	73 (24.91)	46 (15.70)	172 (58.70)	291	
Education Father	<Primary	19(63.34%)	1 (3.33%)	10 (33.33%)	30	23 (17.97)	19 (14.84)	86 (67.19)	128	
	>Primary	370(78.72%)	84 (17.88%)	16 (3.40%)	470	83 (22.31)	56 (15.5)	233 (62.63)	372	

**Table 2: Immunization Status of Subjects**

	No. of subjects Immunized	Percentage Immunized	Urban	Rural	P value
Fully Immunized	495	49.5%	389	106	<0.05
Partially Immunized	160	16%	85	75	
Unimmunized	345	34.5%	26	319	<0.05

**N=1000**

**Table 3: Individual Vaccination Coverage (URBAN & RURAL)**

	URBAN		RURAL		P value
	Given	Percentage	Given	Percentage	
BCG	449(500)	89.80%	157(500)	31.40%	<0.05
DPT3	440(500)	88.00%	145(500)	29.00%	<0.05
Measles	419(500)	83.80%	138(500)	27.60%	<0.05
DPT Booster1	315(390)	80.77%	92(418)	22.01%	<0.05
DPT Booster2	43(53)	81.13%	2(17)	11.76%	<0.05

**Table 4: Reason for Unimmunization**

Reason For Unimmunization	Urban		Rural	
	N=26	Percentage	N=319	Percentage
Unawareness (61.74%)	21	80.77%	192	60.19%
Don't Know Place & How (22.03%)	0	0%	76	23.82%
Fear Of Reaction (16.23%)	5	19.23%	51	15.99%

**Table 5: Reason for Drop Outs**

Reason For Drop Outs	Urban		Rural	
	N=85	Percentage	N=75	Percentage
Fever (37.5%)	34	40.00%	26	34.67%
Family Disapproval (18.12%)	16	18.82%	13	17.33%
Migration (20%)	14	16.47%	18	24%
Child Illness (11.88%)	10	11.76%	9	12%
Mother Illness (12.5%)	11	12.95%	9	12%

**Table 6: Adverse effects related to vaccines**

Adverse effects	BCG N=606	DPT3 N=585	Measles N=557	DPT Booster1 N=407	DPT Booster2 N=47
Fever	4	30	3	36	33
Febrile convulsions		1		1	
Generalized rash		2		1	
Headache					6
Hot abscess		4		1	
Induration		5		1	
Localized redness and pain		5		2	
Vomiting		2		5	

## DISCUSSION

Immunization in India is a Herculean task. The figures are startling, 25 million newborn children born annually who are targeted for immunization through 9 million immunization sessions and 25,000 cold chain points. Despite all the efforts of the government the immunization status in India is far from satisfactory. Data from our study when compared to NFHS 3 is still startling which had recorded 44% complete immunization status and only 5% completely unimmunized (national figures). In 2009, the Coverage Evaluation Survey gave a reliable figure of complete immunization at 61%, divided as 67.4% in rural areas and 58.5% in rural areas. <sup>(26)</sup> Only 8% were completely unimmunized.

In the national data NFHS 3 there is some difference in immunization status between males (45%) and females (42%). But a significant difference was observed in a study by D. Kumar et al <sup>(27)</sup> where 34.6% males were immunized in contrast to 3.95% in females. However in our study only rural sector showed significant difference in fully immunized category (25.2% males as compared to 17% females) otherwise Male : Female ratio in both urban and rural setting were comparable in our study.

In urban setting, Dropout rate between BCG and DPT3 was 7.57 % and between BCG and measles was 10.47% as against rural setting where BCG to DPT3 drop was 19.4% and between BCG and measles was 22.2% ( $p < 0.05$ ). The dropout rates were much higher in rural than urban. On comparing the data with the Coverage Evaluation Survey 2009 it was concluded that in Uttar Pradesh 30.9% drop out present between BCG & measles and between BCG & DPT3 it was 24%. Awasthi et al has described a drop out of 23.16% between DPT 1 and DPT 3, 13.12% between DPT 3 and measles, and overall dropout rate of 33.24%. <sup>(28)</sup>

In our study both mother's education and father's education had an impact on immunization status. The child had 8.6 times more chances of getting immunized if

mother's education was more than primary; on the other hand a child had 1.42 times more chances of getting immunized if father's education was more than primary. In rural setting mother's education more than primary had an impact of only 1.6 times and father's education only 1.22 times in immunizing their children. This is in sharp contrast to urban setting. Hence in rural setting other factor also seems to be operable which are more significant than educational status of parents. By NFHS 3 also it was clearly evident that the education of mother played a significant role in providing vaccination by generating awareness and removing false beliefs. A strong positive relationship existed between mother's education and children's vaccination coverage. The study by Devendra Kumar also proved this point as they had 50% of children fully immunized when mother had more than primary education and only 5% when mother had education less than primary. A very similar trend was seen among unimmunized children with 44.6% mothers (<primary) and 7.6% (>primary) in their study.

This study highlights the vast difference in the immunization status between urban and rural sectors in India. Education of parents, especially mother seems to be an important determinant for immunization coverage but in rural setting other factors also seems to be operable which are more significant than education status of parents. The efforts of the government, both financial assistance and commitment have rendered the Country Polio free. Similar kind of commitment by increasing awareness, education, and counseling of parents and caregivers regarding immunizations and associated misconceptions can also go a very long way in improving the health delivery system in our Country.

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