

# Socio-demographic determinants of childhood immunization coverage in rural population of Bhojpur district of Bihar, India

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## ABSTRACT

**Introduction:** Avoidable sickness, disabilities and death among under 5 children are prevented by routine immunization against some specific diseases. The percentage fully immunized children was 69.9% in Bihar, India, and was almost same in rural area. Immunization coverage is also associated with various socio-demographic factors. The aim of this study is to assess the immunization coverage among children in rural areas of Bhojpur district and identify socio-demographic factors associated with it. **Methods:** A cross-sectional study was conducted in rural areas of Bhojpur district during January to May 2015. 2 stage cluster sampling was done. 36 villages were selected randomly as primary selection units and within each village, 10 children of age 12-36 months were selected from the sampling frame of all eligible children in selected village. A pre-designed, pre-tested checklist was used by the trained investigators during their visits. **Results:** A total of 360 children of age 12-36 months were included in the study, of which 65% of children were fully immunized, 33.9% were partially immunized, and 1.1% were not immunized at all. Mother's education (AOR 2.28 (1.28-4.05), *P* value = 0.005), place of birth (AOR 29.04 (10.75-78.43), *P* value = 0.0001) and availability of immunization card (AOR 120.04 (15.82-916.47), *P* value = 0.001) were significantly associated with immunization status. **Conclusion:** Immunisation coverage in this area was lower. Socio-demographic factors like mother's literacy, place of birth and availability of immunization cards were significantly associated with full immunization of children. It is needed to focus on health related education among parents regarding immunizing services.

**Keywords:** Dropout rate, full immunization, immunization coverage, socio-demographic determinants

## Introduction

Routine immunization is one of the most cost-effective public health intervention. The most vulnerable population group in the community for routine immunization are Under 5 children, adolescent and pregnant female. Avoidable sickness, disabilities and death among these group are prevented by immunization against some specific diseases. Thus, the major benefits of

immunization are to improve health, life expectancy and thereby positive impact on the social and economic growth of any community and nation. Vaccines prevent an estimated 2.5 million deaths every year worldwide<sup>[1]</sup> After the success of smallpox eradication programme, 27<sup>th</sup> World Health Assembly resolved to introduce Expanded Programme on Immunization (EPI), in May 1974. The EPI recommended the use of vaccines against six diseases- tuberculosis (BCG), diphtheria, tetanus, pertussis (DTP vaccine), measles and poliomyelitis.<sup>[2]</sup> The goal of Global Vaccine Action Plan as decade of vaccines (2011-2020) is to meet the vaccine coverage of 90% at national level and 80% every district or equivalent

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unit administrative unit and 19.5 million did not received the routine lifesaving vaccines.<sup>[1]</sup>

Government of India had also started its own Universal Immunization Programme (UIP) in 1985 and has made great progress in expanding Routine Immunization (RI) coverage across the country. As an integral part of RMNCH+A, UIP is a major key in achieving the MDG Goals 4 and 5 focusing on maternal and child survival.

There is increased accessibility of health care services in our country, still the utilization of health care services is low by the different segments of the society. Immunization coverage has also been steadily increasing in India but the average level remains less than the desired. In India, as per NFHS-4 (2015-16) survey, among children aged 12-23 months, the percentage who received specific vaccines was 91.9% for BCG, 72.8% for polio (3 doses), 78.4% for DPT (3 doses) and 81.1% for Measles and percentage of fully immunized children (age 12-23 months) was 62%, which is more than information of NFHS-3.<sup>[3]</sup> Similar scenario was depicted for immunization coverage in Bihar. Among the children aged 12-23 months, the percentage fully immunized children was 69.9% and was almost same in rural area.<sup>[4]</sup> Majority of the population in rural areas depend mainly on government agencies for health care, including immunization. Immunization coverage is also associated with various socio-demographic factors. Progress towards achievements of vaccination targets can be done by evaluation of immunization coverage.

The present study was carried out in rural areas of Bhojpur district to know the current level of immunization coverage. The objectives of present study are to assess the immunization coverage among children in rural area of Bhojpur district and to identify socio-demographic factors associated with it.

## Methods

**Study settings:** The coverage of routine immunization programme was conducted in rural area of Bhojpur district of Bihar. This district has an area of 2474 sq. kms. The population of children of age 0-4 years in this district is 9.7% of total population which is 2,720,155.<sup>[5]</sup> The district has 14 PHCs and 1007 villages.

**Study design:** The present cross-sectional study was conducted in all 14 community development blocks of the district during January to May 2015.

### Operational definition

**Fully immunized:** A child who has taken all the vaccines and their required doses as per national immunization schedule (one dose of BCG, 3 doses of DPT, hepatitis B and OPV, one dose of measles vaccine) up to age of 12 months.

**Partially Immunized:** A child who has taken some vaccines or doses as per national immunization schedule up to age of 12 months.

**Non-immunized:** A child who have not taken any vaccine up to age of 12 months.

**Study Subjects:** Children of age 12-36 months were included in the study.

**Sampling size and technique:** Sample size was calculated on basis of immunization coverage of the Bihar.<sup>[4]</sup> To estimate the sample size for immunization coverage, the following formula was used:

$$N = 4P(1-P)/L^2$$

Where, N = required sample size; P = prevalence of immunization coverage in rural area = 69.9%,<sup>[4]</sup> L = desired level of relative precision of estimates  $\pm 10\%$ . Required sample size after calculation was 171 and was then multiplied by the design effect of 2 to account for cluster randomization. Thus, the minimum sample size required was calculated to be =  $171 \times 2 = 342$ . This was then further increased to 360 after adding 5% non-response rate and to distribute equal number of children in each of the 36 clusters. The total number of study subjects in the study were 360.

2 stage cluster sampling was done in the present cross-sectional study. Blocks were considered as strata and within each stratum, proportional allocation method was applied to select number of villages in proportion to size of the block. The villages of the district were considered as primary selection unit and 2-3 villages were selected in each block. Hence, the total number of villages selected were 36.

Within each primary selection unit, the first household was selected randomly and every next household was studied in a sequence, until a total of ten eligible children in the age group of 12-36 months were covered. Trained field interviewers collected the data after obtaining the verbal informed consent from the mother or the responsible caregiver.

**Data Collection:** Data was collected by using a pre-designed and pre-tested semi- structured questionnaire. The information regarding the households were collected in the initially. Information related to the place of birth of child, education and occupation of parents and other socio-demographic factors were collected. Immunisation status of child was based on the information on immunization card. For children without immunization cards, information from the mother or any other reliable and responsible person in the family stating about immunisation of the child was considered. BCG vaccination was also confirmed by presence of scar at appropriate place. The OPV given during pulse polio rounds was not considered for classification.

**Statistical Analysis:** Data were entered in the MS excel initially. Descriptive statistics used for socio-demographic details and vaccination coverage. Statistical analysis was performed

considering data as cluster sampling (SVY command in STATA version 10).

### Results

The present study showed that out 360 children of 12-36 months age who were evaluated for primary immunization, out of which 58.1% were male and 41.9% female. Among the respondents, 89.2% were Hindu by religion and 10.8% followed Islam. Majority of the children belonged to OBC (46.1%) and schedule caste (36.1%). As related to literacy status of parents, mothers (41.4%) and fathers (21.1%) were illiterate. Those who were literate, majority were educated up to high school. About 46.1% children were belonged to BPL family. In all, 61.1% children belonged to joint families. The birth order of majority of children (62.5%) were 2 or below, and about 85% children were delivered at institutions [Table 1].

The immunization card was available for 89.2% of the children. It was found that 65% of the children were fully immunized against six vaccine preventable disease and only 4 (1.1%) children were not immunized by any of the vaccines [Table 2]. Regarding individual vaccine coverage, the coverage was highest for BCG (98.1%), lowest for measles (77.5%). The third dose of DPT, Hepatitis B, and OPV were received by 81.9%, 81.7%, 81.4% children respectively. Only 15.6% children received vitamin A [Table 3]. Thus, the dropout rate for DPT, OPV and hepatitis B from first dose to third dose was 5.4 to 5.8%. The dropout rate for measles compared to BCG and DPT1 were 21.8% and 11.26%, respectively [Table 4]. The major reason for partial and non-immunization were non-availability of vaccine (76.2%) and children were outside their place of residence (15%) according to respondents.

Univariate analysis was carried out to assess the effect of various potential socio-demographic variables on coverage. Crude odds ratio with 95% confidence interval for variables is presented in Table 5. Variables like religion, caste, education of parents, type of family, birth order, and place of delivery and availability of immunization cards were found to be associated with full immunization of children in study area. Multivariate logistic regression model was used to assess the effect of potential variables after controlling the confounding factors [Table 6]. Full immunization status was considered as depend variable in logistic regression model. It was found that mothers education (Adjusted OR 2.28 (1.28-4.05), *P* value = 0.005), place of birth (Adjusted OR 29.04 (10.75-78.43), *P* value = 0.0001) and availability of immunization card (Adjusted OR 120.04 (15.82-916.47), *P* value = 0.001) were significantly associated with immunization status.

### Discussion

The present study described the primary immunization coverage in rural areas of Bhojpur district in Bihar. The present also

**Table 1: Socio-Demographic profile of Study Subjects**

Specification	Study Subjects	
	No.	%
Sex		
Male	209	58.1
Female	151	41.9
Religion		
Hindu	321	89.2
Muslim	39	10.8
Caste		
General	64	17.8
OBC	166	46.1
SC/ST	130	36.1
Literacy-Mother		
Illiterate	149	41.4
Primary	48	13.3
Middle	83	23.1
High School	49	13.6
Intermediate	15	4.2
Graduate & Above	16	4.4
Literacy-Father		
Illiterate	76	21.1
Primary	26	7.2
Middle	92	25.6
High School	82	22.8
Intermediate	46	12.8
Graduate & Above	38	10.6
BPL Status		
Yes	166	46.1
No	194	53.9
Birth order		
≤2	225	62.5
>2	135	37.5
Place of Birth		
Institutional	307	85.3
Home	53	14.7

**Table 2: Immunization status of children be 12-36 months**

Immunization Status	No.	%
Fully Immunized	234	65
Partially Immunized	122	33.9
Not Immunized	4	1.1

identified the socio-demographic factors related to partial and non-immunization among the children.

The present study showed that full immunization coverage was 65% which was lower than the immunization coverage of Bihar.<sup>[4]</sup> It was also noticed in the present study that about 1-1% of children had not received any vaccine at all. Full immunization among children of age group 12-23 months had shown varied coverage in our country. As per NFHS- 4, the percentage of fully immunized children of age 12-23 months in rural area our country was 61.3% and was lower than the immunization coverage among these age group children in our study area.<sup>[3]</sup> Studies conducted in various place in our country also showed

**Table 3: Coverage level of different vaccines under National Immunization Schedule (n=360)**

	Vaccine	Yes	%
BCG		353	98.1
OPV	OPV1	311	86.4
	OPV2	306	85
	OPV3	293	81.4
DPT	DPT1	311	86.4
	DPT2	306	85
	DPT3	294	81.9
Hepatitis B	HepB1	311	86.4
	HepB2	306	85
	HepB3	294	81.7
Measles		279	77.5
Vitamin A		46	15.6

**Table 4: Dropout Rates**

Drop-out rate	No	%
DPT1-DPT3	17	5.47
OPV1-OPV3	18	5.80
HEPB1- HEPB3	17	5.47
DPT1- Measles	35	11.26
BCG-Measles	77	21.82

**Table 5: Socio-demographic characteristics of subjects in relation to immunization status**

Characteristics	Partial & not immunized (n=126)	Immunized (n=234)	Crude odds ratio (95% CI)	P
Gender				
Male	78	131	0.78 (0.50-1.21)	0.278
Female	48	103	1 (ref)	
Religion				
Hindu	118	203	0.44 (0.20-0.99)	0.049
Muslim	8	31	1 (ref)	
Caste				
General	18	46	1.40 (1.10-1.79)	0.006
OBC	49	117	1.98 (1.19-3.29)	0.0049
SC/ST	59	71	1 (ref)	
Mother's Education				
Illiterate	67	82	1	0.001
Literate	59	152	2.10 (1.35-3.27)	
Father's Education				
Illiterate	38	38	1	0.002
Literate	88	196	2.22 (1.33-3.72)	
Below Poverty Line				
Yes	64	102	1	0.191
NO	62	132	1.35 (0.86-2.08)	
Type of Family				
Joint	42	178	1	0.000
Nuclear	84	56	6-75 (3.84-10.51)	
Place of Delivery				
Home	48	5	1	0.001
Institutional	78	229	28 (10.82-73.33)	
Birth Order				
>2	58	77	1	0.015
≤2	68	157	1.74 (1.11-2.71)	
Availability of Immunization Card				
No	38	01	1	0.000
Yes	88	233	100 (13.6-743)	

the higher primary immunization coverage as compared to our study.<sup>[6-9]</sup> Poor immunization coverage has also been noticed in study conducted in Delhi and Uttar Pradesh.<sup>[10-12]</sup> Major reason for partial and non-immunization was non availability of vaccine (76.2%) as reported in our study and it was in similar to the findings of other studies.<sup>[7,13]</sup>

Overall, the BCG and Measles vaccination coverage in the present study were 98.1% and 77.5%, respectively. Other studied had reported almost similar coverage with respect to BCG and Measles vaccination.<sup>[6,8,12,14]</sup> The extent of BCG vaccination observed in the present study was found to be higher as compared to overall BCG coverage in Bihar. The higher coverage of BCG was may be because of more institutional deliveries in the study area. The percentage of institutional deliveries in our study was 85.3% which was found to be higher than number of institutional deliveries in Bihar.<sup>[3]</sup> Similar pattern of high BCG coverage and institutional deliveries were noticed in other studies.<sup>[7,9]</sup> It is evident that almost all the children who are delivered at hospital are provided with BCG vaccine immediately after birth. However, coverage of the measles vaccine was less as compared to the figures for state.<sup>[4]</sup> The first dose of Vitamin A dose was received by only 15.6% children in our study



**Table 6: Logistic Regression Model for the Characteristics associated with Immunization Status**

Characteristics	Adjusted odds ratio (95% CI)	P
Mother's Education	2.28 (1.28-4.05)	0.005
Place of Birth	29.04 (10.75-78.43)	0.0001
Availability of immunization card	120.04 (15.82-916.47)	0.001

which was lower than study conducted in Etawah<sup>[6,11]</sup> and the important reason behind this was the poor supply of vitamin A during outreach session. Therefore, high dropout rates were observed from BCG to measles and DPT-1 to measles in the present study. The dropout rate from DPT1 to DPT3 was also high in our study. These dropout rates were consistently higher than the studies conducted in different part of our country and in Bangladesh.<sup>[6,8,15]</sup> This might be due to the long interval between third dose of DPT, OPV/hepatitis B to measles. Poor supply of vaccine was also an important factor for drop out. Pentavalent vaccine was introduced in Bihar during January 2015. The study period was also in the phase of replacement of DPT by pentavalent vaccine. This may also cause the poor supply of vaccines, and hence result in dropout among eligible children.

Social and demographic factors influence childhood immunization. After performing adjusted analysis, primary immunization of children was strongly influenced by mother's literacy, place of birth and availability of immunization card out of various socio-demographic determinants in our study. Maternal education was one of the factors that was significantly associated with immunization coverage. Previous studies have shown similar significant association between immunization coverage and maternal literacy.<sup>[7,10,16,17]</sup> It was observed in our study that immunization card was available for 89.2% children which was higher than the data for Bihar and the study conducted in rural area of Pune.<sup>[4,8]</sup> This indicates the awareness about importance of immunization card with respect to immunization of children among the parents. The place of birth was found to be one of the determinants of immunization coverage. About 75% of children delivered at a health facility having received full immunization as found in our study and it was significantly associated immunization coverage. The finding of our study is consistent with the findings from other studies which showed a strong association of hospital-based child births with status of full immunization.<sup>[10,17,18]</sup> Similarly, the study conducted at urban area in Lucknow showed that children born at home were found to be either partially or non-immunized.<sup>[7]</sup>

## Conclusion

The study concludes the poor immunization coverage in rural area of Bhojpur district. Important socio-demographic determinants like literacy status of mothers, place of birth and availability of immunization cards were significantly associated with full immunization of children. Gender of child and economic status has no effect in immunization coverage. Drop-out rate

was maximum for Measles from BCG and followed by 1<sup>st</sup> dose of DPT. Major Reason for Partial Immunization was non availability of vaccines as per the view of the caregivers of the partially immunized children. The study recommends increasing the awareness among family members about the need complete immunization of all children in order to prevent childhood deaths and life-long disability. It is also required to strengthen the outreach session to address the issues related to uninterrupted supply of vaccines. Hence, the initiatives like Intensified Mission Indradhanush (IMI) by Government of India will might increase the immunization coverage.

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## Conflicts of interest

There are no conflicts of interest.

## References

1. WHO | Global Vaccine Action Plan 2011-2020 [Internet]. WHO. [cited 2019 Apr 01]. Available from: [http://www.who.int/immunization/global\\_vaccine\\_action\\_plan/GVAP\\_doc\\_2011\\_2020/en/](http://www.who.int/immunization/global_vaccine_action_plan/GVAP_doc_2011_2020/en/).
2. WHO | National programmes and systems [Internet]. WHO. [cited 2019 Apr 01]. Available from: [http://www.who.int/immunization/programmes\\_systems/en/](http://www.who.int/immunization/programmes_systems/en/).
3. National Family Health Survey [Internet]. [cited 2019 Apr 01]. Available from: [http://rchiips.org/nfhs/factsheet\\_nfhs-4.shtml](http://rchiips.org/nfhs/factsheet_nfhs-4.shtml).
4. Annual Health Survey 2012-13 Fact Sheet Bihar. 5. <http://www.censusindia.gov.in/2011-Common/CensusData2011>.
5. Census of India Website : Office of the Registrar General & Census Commissioner, India [Internet]. [cited 2019 Apr 01]. Available from: <http://censusindia.gov.in/2011-Common/CensusData2011.html>.
6. Goyal S, Kumar V, Garg R. Evaluation of primary immunization coverage among children in a rural block of district Rohtak, Haryana, India. *Int J Community Med Public Health* 2017;4:1612-9.
7. Gupta P, Prakash D, Srivastava JP. Determinants of immunization coverage in Lucknow District. *N Am J Med Sci* 2015;7:36-40.
8. Gupta PK, Pore P, Patil U. Evaluation of immunization coverage in the rural area of Pune, Maharashtra, using the 30 cluster sampling technique. *J Family Med Prim Care* 2013;2:50-4.
9. Datta A, Baidya S, Datta S, Mog C, Das S. A study to find out the full immunization coverage of 12 to 23-month old children and areas of under-performance using LQAS technique in a rural area of Tripura. *J Clin Diagn Res* 2017;11:LC01-4.
10. Devasenapathy N, Jerath SG, Sharma S, Allen E, Shankar AH, Zodpey S. Determinants of childhood immunisation coverage in urban poor settlements of Delhi, India: A cross-sectional study. *BMJ Open* 2016;6:e013015.
11. Singh CM, Kaushik A, Jain PK, Kumar S, Srivastava DK, Singh NP, *et al.* Immunization coverage in Etawah: A border district of Uttar Pradesh. *Indian J Community Health* 2012;24:134-9.

12. Vohra R, Bhardwaj P, Srivastava JP, Gupta P, Vohra A. Immunization coverage and its determinants among 12-23 months old children of Lucknow. *Mullar J* 2013;4:90-5.
13. Joshi HS, Gupta R, Singh A, Mahajan V. Assessment of immunization status of children between 12-23 months in Bareilly District. *Nepal J Epidemiol* 2011;1:47-50.
14. Murugesan D, Ramasubramanian R. A study on immunization coverage of 12-23 months children in urban areas of Kanchipuram district, Tamil Nadu. *Int J Community Med Public Health* 2017;4:4096-100.
15. Adhikary M, Haque R, Tanira S. Determinants of child immunization under expanded programme on immunization (EPI) in a rural setting of Bangladesh. *J Dhaka Med Coll* 2013;22:201-6.
16. Johri M, Subramanian SV, Sylvestre MP, Dudeja S, Chandra D, Koné GK, *et al.* Association between maternal health literacy and child vaccination in India: A cross-sectional study. *J Epidemiol Community Health* 2015;69:849-57.
17. Maina LC, Karanja S, Kombich J. Immunization coverage and its determinants among children aged 12-23 months in a peri-urban area of Kenya. *Pan Afr Med J* 2013 [cited 2019 Apr 18];14. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3597865/>.
18. Kulkarni S, Chavan M, Chavan M, Chavan M. A study to assess the immunization coverage in an urban slum of Mumbai by lot quality technique. *Int J Med Public Health* 2013;3:21-5.