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Original Research Article

An Assessment of Knowledge, Attitude and Practices in a Defined Rural and Urban Population Influencing the Immunization Status of Children

Anjali Singh Kanwar[1], Avyact Agrawal[2], Ravishankar Uikey[3*]

[1]Ex- PG Resident, Department of Pediatrics, NSCB Medical College, Jabalpur, Madhya Pradesh, India
[2]Associate Professor, Department of Pediatrics, NSCB Medical College, Jabalpur, Madhya Pradesh, India
[3]Assistant Professor, Department of Pediatrics, NSCB Medical College, Jabalpur, Madhya Pradesh, India

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Corresponding author: Dr. Ravishankar Uikey
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Abstract:

Background: Individuals who encounter obstacles in obtaining immunization services are at a heightened risk of developing morbidities associated with vaccine-preventable illnesses. The spectrum of variables that may hinder immunization programmes and their health benefits includes affordability, accessibility, lack of knowledge, and other constraining elements.

Aims and Objectives: The present study aimed to assess the factors influencing the immunization status of children under five years in a defined rural and urban population and to evaluate the impact of National Immunization Schedule and assess the progress made in the areas studied.

Materials and Methods: The study was conducted as an OPD based cross sectional survey on children aged one month to sixty months in defined urban and rural areas from 01 March 2021 to 31 August 2022 where 608 children were randomly taken from the study areas which was the Department of Pediatrics Tertiary health care center, a community health center and Primary Health Centre belonging to central India. Our data were collected from the parents of the children coming to the study area. The immunization status of these children was analysed and the cause for partial immunization was studied. Data was analysed by using statistical software SPSS version 21. The chi-square test was used to compare various determinants. A p-value <0.05 was considered significant.

Results: The difference in fully and partially immunized status of children belonging to the rural and urban area was found to be statistically significant (p = 0.001). The association between immunization status with type of family and socioeconomic status was found statistically significant (p< 0.001). It was seen that among fully immunized children, highest proportion 50% was seen among children who were of birth order more than 2 and were residing in urban areas (p<0.05). In both rural and urban areas, household problems were the main reason for vaccine hesitancy. It was observed that 43.3% in rural and 22.8% in urban have delayed vaccination. The distribution of caregivers according to knowledge, attitude and practices regarding immunization was found to be statistically significant.

Conclusion: The importance of parental education in improving child health and the socioeconomic status of the family were found to be significant determinants of incomplete immunization. Coverage of optional vaccines was found to be very low in comparison with routine vaccines. From this study, policymakers and social workers can target young pregnant women to increase female education. These findings emphasize the need for regular monitoring and evaluation of immunization coverage to achieve the benefits of vaccination in all strata of society.

Keywords: Coverage; Vaccine; Immunization status; Rural population; Urban population.

Introduction

Immunization is a well-established strategy for the management and eradication of life-threatening communicable illnesses, with an estimated capacity to prevent more than 2 million fatalities annually. It is well recognized as a very economical health investment, employing established approaches that enhance its accessibility to communities that are typically difficult to engage with and particularly susceptible to health risks. Missing Routine Immunization (RI) can be life-threatening for infants. Immunization is one of the most effective and cost-effective ways to protect children's lives and futures. Vaccines are also critical to the prevention and control of infectious disease outbreaks. They underpin global health security and will be a vital tool in the battle against

antimicrobial resistance. [1] Knowledge (K), positive attitudes (A) and appropriate perceptions (P) about vaccination hence become one of the main tools to reduce the incidence of vaccine-preventable diseases (VPDs) thus reducing infant mortality and morbidity.

The Ministry of Health and Family Welfare of the government of India implemented the Expanded Programme of Immunization (EPI) in 1978, marking the inception of the immunization programme in India. The scheme underwent modifications in 1985 and was subsequently renamed as the Universal Immunization scheme (UIP). Its implementation was planned in a stepwise way, aiming to encompass all districts in the country by 1989-90.

This initiative stands as one of the largest immunization initiatives globally. Despite having been in operation for an extended period, the Universal Immunization Programme (UIP) has achieved a complete immunization rate of just 65% among infants and young children. [2] In December 2014, the Government of India initiated the "Mission Indradhanush" programme with the aim of enhancing and revitalizing immunization efforts to rapidly attain comprehensive coverage for children and pregnant women. The immunization programme "Intensified Mission Indradhanush" was begun on October 8, 2017, with the aim of considerably enhancing its effectiveness. [3]

In order to enhance the extent of routine immunization in the nation, the Government of India (GOI) has implemented "Intensified Mission Indradhanush 2.0." This initiative aims to ensure the provision of all available vaccines to previously inaccessible populations and expedite the immunization coverage of children and pregnant women in designated districts and blocks. The programme is scheduled to operate from December 2019 to March 2020. The primary objective of Intensified Mission Indradhanush 2.0 is to effectively diminish mortality rates among children below the age of five, with the overarching goal of attaining the Sustainable Development Goal of eradicating avoidable child fatalities by the year 2030. [4]

Despite the implementation of various maternal and child health programmes by the Government of India aimed at enhancing immunization coverage, it remains persistently low in a majority of regions within the country. This is particularly evident in rural areas and the north central parts of India, which are home to approximately three-fourths of the population. The concept of equity in immunization should extend beyond the provision of equal opportunities for vaccinating children in urban and rural areas. It is worth noting that such equality already exists, as vaccination is universally accessible to all infants throughout the country at no cost, facilitated by an extensive network of public sector institutions.

Additionally, this field of study focuses on the identification of demographic groups that are most susceptible to maintaining a lack of vaccination, as well as the efforts made to address and rectify any disparities or inequities that may exist. Therefore, a study to compare the immunization status of children above one month to the age of 5 years in Urban and Rural areas is required to focus on the challenges of immunization at various levels of hospitals i.e. Rural and urban.

Aims and Objectives:

The present study aimed to assess the factors influencing the immunization status of children under five years in a defined rural and urban population and to evaluate the impact of National Immunization Schedule and assess the progress made in the areas studied.

Materials and Methods:

The study was conducted as a OPD based cross sectional survey on children aged one month to sixty months in defined urban and rural areas from 01 March 2021 to 31 Augest2022 where 608 children were randomly taken from the study areas which was the Department of Pediatrics Tertiary health care center, a community health center and Primary Health Centre belonging to central India. The research was accepted by the Institutional Ethical Committee and complete informed written consent was acquired from the patients.

Inclusion criteria: All the children from age one month to 60 months went through immunization at the study area.

Exclusion criteria: children less than 1 month and above 60 months of age.

Sample size calculation: $N = Z^2pq/d^2$ (N=sample size, p = prevalence in the population, q = 1 – p, d = Absolute precision), where, Z= 1.96 at 93% CI, p = 30.37% i.e. 0.3037, Z = 1-p i.e. 1 – 0.3037 = 0.6969, d = 5% i.e. 0.05, so, n = 324.94. By adding a 10% non-responding rate, Sample size (n) = 324.5 + 32.45 = 356.95 rounded off to 360.

Data collection:

Our data were collected from the parents of the children coming to the study area. The immunization status of these children was analyzed and the cause for partial immunization was studied. An oral questionnaire proforma was prepared and a written National Immunization Schedule was adopted to assess their Immunization status and social factors influencing immunization coverage and caregiver knowledge about vaccines, and attitude towards immunization. Ideally, National

Immunization Schedule was considered to assess their Immunization status. All the information was filled, studied, tabulated, and interpreted through standard statistical methods.

Statistical analysis:

Codes were prepared for the options of the questionnaire. Data were entered in an excel sheet to prepare a master chart and Data was analyzed by using statistical software -SPSS version 21. The chi-square test was used to compare various determinants. A p-value <0.05 was considered significant.

Results:

Table 1 depicts the distribution of study participants according to immunization status. It can be seen that 256 (84.5%) in the urban areas were fully immunized while 255 (83.6%) in the rural areas were fully immunized. On applying $\chi 2$ statistic, this difference was found to be statistically not significant. (p=0.08)

Table 1: Distribution of study participants according to immunization status

Immunization status	Rural (N=305) N (%)	Urban (N=303) N (%)	Total (N=608)N (%)	P- Value
Fully Immunized	255 (83.6)	256 (84.5)	511 (84.0)	0.08
Partially Immunized	50 (16.4)	47 (15.5)	97 (16.0)	

Table 2 shows the association between the age of the study participants and their immunization status (fully or partially immunized) as per their place of residence (rural or urban). Out of 608 study participants, 511(84%) were fully immunized and 97 (16%) were partially immunized. The difference in fully and partially immunized status of children belonging to the rural and urban area was found to be statistically significant (p = 0.001).

The association between the gender and immunization status with the urban/rural location was not found to be statistically significant (p>0.05).

The association between immunization status with type of family and socioeconomic status was found statistically significant (p< 0.001). It was seen that among fully immunized children, highest proportion 50% was seen among children who were of birth order more than 2 and were residing in urban areas. Among partially immunized similar finding was seen. This association was also found to be statistically significant (p<0.05).

Table 2: Factors affecting immunization status

Variables		Fully Immunized (N = 511)		Partially Immunized (N= 97)		Total (N=608) N (%)	
		Rural n (%)	Urban n (%)	Rural n (%)	Urban n (%)	Rural n (%)	Urban n (%)
Age (in months)	1-12	167 (65.5)	101 (39.5)	21 (42.0)	07 (14.9)	188 (61.7)	108 (35.7)
	13-24	22 (8.6)	80 (31.3)	28 (56.0)	10 (21.3)	50 (16.4)	90 (29.7)
	25-36	26 (10.2)	0 (0)	0 (0)	24 (51.1)	26 (8.5)	24 (7.9)
	49-60	40 (15.7)	75 (29.3)	01 (2.0)	06 (12.8)	41 (13.4)	81 (26.7)
	P-Value	**0.001***		**0.001***		**0.001***	
Gender	Male	158 (62.0)	141 (55.1)	28 (56.0)	22 (46.8)	186 (61.0)	163 (53.8)
	Female	97 (38.0)	115(44.9)	22 (42.0)	25 (53.2)	119(39.0)	140 (46.2)
	P-Value	**0.11**		**0.36**		**0.07**	
Type of family	Single parent	15 (5.9)	54 (21.1)	01 (2.0)	08 (17)	16 (5.3)	62 (20.5)
	Nuclear	127 (49.8)	130 (50.8)	11 (22.0)	32 (68.1)	138 (45.2)	162 (53.5)
	Joint	113(44.3)	72 (28.1)	38 (76.0)	07 (14.9)	151 (49.5)	79 (26.0)
	P-Value	**<0.0001***		**<0.0001***		**<0.0001***	
Socio-economic status of family	Upper	0 (0)	98 (38.3)	0 (0)	14 (29.8)	0 (0)	112 (37.0)
	Upper Middle	0 (0)	103 (40.2)	0 (0)	31 (66.0)	0 (0)	134 (44.2)
	Upper lower	130 (51.0)	08 (3.1)	13 (26.0)	0 (0)	143 (46.9)	08 (2.6)
	Lower Middle	24 (9.4)	43 (16.8)	02 (4.0)	02 (4.3)	26 (8.5)	45 (14.9)
	Lower	101 (39.6)	04 (1.6)	35 (70.0)	0 (0)	136 (44.6)	04 (1.3)

	P-Value	**<0.0001***		**<0.0001***		**<0.0001***	
Birth order of child	One	117 (45.9)	109 (42.6)	07 (14.0)	15 (31.9)	124 (40.7)	124 (40.9)
	Two	86 (33.7)	128 (50.0)	41 (82.0)	26 (55.3)	127 (41.6)	154 (50.8)
	Three	52 (20.4)	19 (7.4)	02 (4.0)	06 (12.8)	54 (17.7)	25 (8.3)
	P-Value	**0.0001***		**0.01***		**0.001***	

*statistically significant. Table 3 shows the reasons for vaccine hesitancy and delay in immunization. In both rural and urban areas, household problems were the main reason for vaccine hesitancy. It was observed that 43.3% in rural and 22.8% in urban have delayed vaccination.

Table 3: Reasons for Vaccine hesitancy

Reasons for Vaccine hesitancy		**Urban (N=303) N (%)**		**Rural (N=305) N (%)**		**Total (N=608) N (%)**		**P- Value**
Household problems		27	43.55	88	40	115	18.91	**<0.0001***
Unawareness		22	35.48	03	1.36	25	4.11	
Forgotten date		05	8.06	22	10	27	4.44	
Lack of caregiver		04	6.45	01	0.45	05	0.82	
Caregiver sickness		03	4.84	27	12.27	30	4.93	
Reluctant		0	0	0	0	0	0.00	
Child sickness		0	0	0	0	0	0.00	
Pregnant mother		0	0	27	12.27	27	4.44	
Discouragement by family		0	0	21	9.55	21	3.45	
Lack of trust		0	0	01	0.45	01	0.16	
Fear of vaccination		0	0	0	0	0	0.00	
Other specific reasons		01	1.61	30	13.64	31	5.10	
Delay in immunization	Yes	69	22.8	132	43.3	201	33	**<0.0001***
	No	234	77.2	173	56.7	407	67	

*statistically significant. Table 4 depicts the distribution of caregivers according to knowledge, attitude and practices regarding immunization. This difference was found to be statistically significant.

Table 4: distribution of caregivers according to knowledge, attitude and practices regarding immunization

Variables		**Urban (N=303)**		**Rural (N = 305)**		**Total (N=608)**		**P-Value**
		n	**%**	**N**	**%**	**N**	**%**	
Knowledge of caregiver	Inadequate or No knowledge	35	11.55	67	21.97	102	16.78	
	Moderate	182	60.07	235	77.05	417	68.59	
	Adequate	86	28.38	03	0.98	89	14.64	**<0.0001***
Attitude of caregiver	Inadequate or None	275	90.76	261	85.57	536	88.16	
	Moderate	03	0.99	01	0.33	04	0.66	**<0.047***
	Adequate	25	8.25	43	14.1	68	11.18	
Practices of caregiver	Inadequate or None	74	24.42	37	12.13	111	18.26	
	Moderate	207	68.32	157	51.48	364	59.87	**<0.0001***
	Adequate	22	7.26	111	36.39	133	21.88	

*statistically significant

Discussion

In the present study, the highest percentage of study participants in both urban, as well as rural area belonged to the 1-12 months of age group (35.7% and 61.7%) respectively. A similar study conducted in Nigeria had a proportion of female children to be 51%. [5] Sanjay Pandey et al. conducted a similar study in Bhojpur Bihar, where this proportion was 58.1% of males and 41.9% of females.[6] In the present study it was found that while the vaccine coverage at birth was extremely low, maximum coverage was seen for the age group 16-24 months where 160 (26.3%) of the children had received their age-appropriate vaccine. Vaccine coverage for 5 years was 24.4% in Urban and 12.5% in rural. This difference was found to be statistically significant. ($p < 0.01$). As per the study conducted by Sanjay Pandey et al. in Bhojpur, Bihar, the coverage was highest for BCG (98.1%) and lowest for measles (77.5%). [6]

According to the study of Young Eun Kim in Nagaland individual immunization coverage was 81% for BCG, between 66% and 71% for DTP3, OPV3, and measles. [7] In a study in the Rural area of Gambia individual vaccination coverage was

about 88.5% for BCG, 71% for OPV 3, 82.5% for Penta 3, and 72% and 71% for Measles-Rubella and yellow fever, respectively.[8] In the present study, it was seen that a total of 47 (48.5%), of participants, gave the reason for the delay as domestic work followed by instantaneous non-availability of health staff at the time of the patient's visit to the centre which was the reason given by 16.5% of the participants. This difference was found to be statistically significant between the urban and rural populations ($p< 0.01$).

According to a Nigerian study the barriers were single mothers and low-income families.[9] Children in the middle and richer wealth quintile households were 43–57% more likely to have full immunization coverage compared to children in the poorest wealth quintile households.[10] In Nigerian settings the contributory factors of complete immunization detected by a study by Paul Eze et al. were children of single mothers and low-income families. [11] As per the study of Sanjay Pandey et al. in Bhojpur, Bihar major reasons for partial and non-immunization were the non-availability of vaccines (76.2%) and children being outside their place of residence (15%).[6] In the present study, it can be seen that the majority of the parents preferred Government facilities for immunization. On statistical analysis, this difference was not found to be statistically significant. Similar studies in 59 low-performing blocks of Bihar reported that most of the immunization (95.56%) took place in Government set up and only 3.5% of immunization was conducted in a private setup.[12] In the district of Srinagar of Kashmir 91.42% of immunization of children was done at government health facilities while only 8.5% was in private.[13]

In the present study, it can be seen here that 43.3% of rural and 22.8% of urban have delayed vaccination. Valerie Yelverton et al. did a cross-sectional study in Tanzania to know the immunization delay. Median vaccination delays lasted up to 35 days; among rural children, median delays exceeded 35 days for the 3rd doses of polio, pentavalent, and pneumococcal vaccines. [14]

Limitations of the study:

As the study was conducted in limited areas, results may not be extrapolated to urban or rural areas of other states. At many centers, the older version of the MCP card is still being used which does not have a slot for newer vaccines therefore the data sometimes had to be cross-verified from the ANM register.

Conclusion:

This study was one among the few studies regarding vaccination coverage and assessment of determinants of incomplete immunization and quality of immunization services conducted in central India with a comparison between Urban and Rural areas and also with previous studies.

The importance of parental education in improving child health and the socioeconomic status of the family were found to be significant determinants of incomplete immunization. Coverage of optional vaccines was found to be very low in comparison with routine vaccines. From this study, policymakers and social workers could target young pregnant women to increase female education. These findings emphasize the need for regular monitoring and evaluation of immunization coverage to achieve the benefits of vaccination in all strata of society.

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