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An Evaluation of Immunization Coverage among 12-23 months' children in an Urban Area of Central India: A Community Based Cross Sectional Study

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ABSTRACT

Background: Infectious diseases are major cause of morbidity and mortality in children. About 25% of the under-5 mortalities are due to vaccine preventable diseases. In Maharashtra according to the NFHS-5 (2019-20) 73.5% of children between age group 12-23 months were fully immunized. In urban area proportion of children fully immunized in age group between 12-23 months is 71.7% according to NFHS-5. Immunization against childhood disease is one of the most cost-effective public health interventions for child survival. Achieving and maintaining high level of immunization among children is necessary for the control and elimination of the major preventable diseases of childhood. **Objective:** To evaluate immunization coverage among 12-23 months' children in urban area. **Material and Methods:** A cross-sectional study will be carried out for the assessment of immunization coverage in the field practice area of the urban health training centre using WHO 30×7 clusters sampling method. A total of seven children aged 12-23 months will be interviewed from each cluster on pretested, predesigned schedule, thus giving us the sample size of 210. **Statistical analysis used:** A predesigned, pretested, semi-structured questionnaire was used to collect data of the study. Descriptive statistics and associations were analyzed. **Results:** A total of 210 children aged 12-23 months were included in the study. It was found that 140 (66.67%) of the children were found to be fully immunized. While 63 (30%) and 7 (3.33%) were partially and non-immunized respectively. There is statistically significant association between education of mothers, family income and immunization status of children. Most common reason for partial and non-immunization of children was found to be obstacles and ill child. **Conclusions:** Creating awareness of immunization among caretakers and ensure vaccine availability would be a strong step towards achieving the goals.

Key-words: Cluster sampling, Immunization coverage, Urban area.

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Introduction

Immunization has one of the most significant and cost-effective public health interventions, through which a number of serious childhood diseases have been successfully prevented.

There is evidence of inequalities in immunization in India, despite the fact that childhood immunization has been an important part of maternal and child health services since the 1940s.[1] Globally, vaccine preventable diseases account for nearly 20% of all deaths occurring annually among children under five years of age, and immunization has a vital role to play in achieving the goals specified in the Millennium Declaration.[2]

It is estimated that at least 27 million children and 40 million pregnant women worldwide do not receive the basic package of immunization (as defined by the WHO and UNICEF), and 2 to 3 million children die from vaccine preventable diseases every year.[3] The Center for Disease Control (CDC) has placed vaccination as one of top ten achievements in the field of public health in the twentieth century.[4]

We now have vaccines to prevent more than 20 life-threatening diseases, helping people of all ages live longer, healthier lives. Immunization currently prevents 3.5 million to 5 million deaths every year from diseases like diphtheria, tetanus, pertussis, influenza and measles.[5]

Globally in 2023, there were 14.5 million children missing out on any vaccination – so-called zero-dose children. The proportion of children receiving a first dose of measles vaccine was 83% in 2023, well below the 2019 level of 86%.[6]

In Maharashtra according to the NFHS-5 (2019-20) 73.5% of children between age group 12-23 months were fully immunized. In urban area proportion of children fully immunized in age group between 12-23 months is 71.7% according to NFHS-5.[7]

Immunization coverage in India is still far from the target of achieving the 100% vaccination despite the long-standing commitment of Government and Non-Government organizations, there are still pockets of low immunization coverage areas. Immunization is also presented as the key strategy to achieve the Millennium Development Goals (MDGs) specially to reduce the under-5 mortality rate (U5MR), infant mortality rate (IMR) and proportion of child immunized against measle.[3]

There is increased accessibility of health care services in both urban and rural areas – still, the utilization of health care services is low by the different segments of the society. Children of urban poor have high vulnerability to illnesses, as outbreak of vaccine preventable diseases are more common in urban slums, owing to high population density and migratory population.[8]

Immunization against childhood disease is one of the most cost-effective public health interventions for child survival. Achieving and maintaining high level of immunization among children is necessary for the control and elimination of the major preventable diseases of childhood.[9]

Material and Methods

A cross-sectional study will be carried out for the assessment of immunization coverage in the field practice area of the urban health training center using WHO 30×7 clusters sampling method. A total of seven children aged 12-23 months will be interviewed from each cluster on pretested, predesigned schedule, thus giving us the sample size of 210.

- ***Study design***- Cross sectional study
- ***Study setting***- field practice area of the urban health training center of central India
- ***Study subjects***- children aged 12-23 months
- ***Study period***- 3 month
- ***Sampling method***- 30×7 clusters sampling method
- The data was collected from field practice area of urban health training center by visiting house to house.

A predesigned, pretested, semi-structured questionnaire was used to collect data of the study. Descriptive statistics and associations were analysed. The p-value of < 0.05 was considered statistically significant.

Inclusion Criteria:

- Children aged between 12 and 23 completed months at the time of study.
- Children in the age group of 12-23 months whose parents are residing in the study area for a period of not less than two years.
- Mothers/Guardians /Care takers who gave the consent for participation.

Exclusion Criteria:

- Children in the age group of 12-23 months whose parents are residing in the study area for less than two years.

- Parents who were not willing to participate.
- Serious ill child.

A total of 30 clusters from all 40 urban areas (slum and non-slum area) will be selected through 30×7 cluster sampling method as proposed by WHO. A total of 7 children from each cluster will be taken in study i.e., 30×7=210 children from urban areas were taken.

The area wise population and cumulative population of the study area will be noted. The sampling interval is calculated by dividing total cumulative population by 30. Then a random number ≤ sampling interval was drawn, and the first cluster was identified, thus by adding sampling interval to the random number next clusters were identified till the 30 clusters. All the decimals were rounded off to the nearest whole number. Selecting a random number which was less than or equal to sampling interval with equal number of digits. First cluster located in which cumulative population equals or exceeds the random number. Identifying the community in which cluster two was located by adding the sampling interval to the random number. Identify the area whose cumulative population equals or exceeds the calculating number. Once the 30 clusters identified, then select children within each cluster. Starting point in each cluster that is the start of first household was done by a random method. Seven children were selected from each cluster by moving in one direction till the desired number of children was completed. If a house found locked, then next house in the lane having child eligible for study was selected. If there was more than one eligible child available in the house, all of them were selected by random method. Immunization card was verified physically to validate information and confirm the date of vaccination. If the immunization card not available, the verification was done by BCG scar and interviewed the respondent during the home visit for every child.

Cluster identification in urban area

Sampling interval = total cumulative population/number of clusters. Sampling interval=67278/30= 2242.60= 2243. Cluster number 1.0001 to 2243. Random number chosen from a currency note of Rs 500 which was 5MH 762246. Therefore, the random number was 2246. The first cluster was located in which the cumulative population equal or exceeds the random number was 2246 the first cluster located.

Definition of immunization

- ***Full Immunization*** 10 - At birth - HepB, BCG, OPV & 3 doses of OPV, 3 doses of Rotavirus (where applicable), 3 doses of Pentavalent, 2 doses of fractional IPV, 3 doses of PCV (where applicable), MR vaccine -1st dose, JE 1st dose (where applicable)
- ***Partially-immunized*** -Those children who had missed any dose of above primary vaccines were labelled as partially immunized.
- ***Non-immunized***-Those children who had not received any vaccine, except OPV in PPI, up to 12 months of age were defined as non-immunized.

Results

Table-1: Association between immunization status with gender

Gender	Completely immunized		Partially/non immunized		Total		χ^2; df and P value
	No.	%	No.	%	No.	%	
Male	78	67.24	38	32.76	116	100.0	χ^2=0.039 Df=1; P=0.84
Female	62	65.96	32	34.04	94	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table 1 show that out of total 210 children's 116 were male and 94 were female.140 children's were completely immunized while 70 were partially/ non-immunized. There is no association between immunization status and gender.

Table -2: Association between immunization status with religion

Religion	Completely immunized		Partially/non immunized		Total		χ2, df & P-value
	No.	%	No.	%	No.	%	
Hindu	60	69.77	26	30.23	86	100.0	χ2= 1.541 Df=3 p= 0.6728
Muslim	32	61.54	20	38.46	52	100.0	
Buddha	36	69.23	16	30.77	52	100.0	
Other	12	60.0	8	40.0	20	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table-2 show that out of 210 study subjects 86, 52, 52 and 20 were Hindu, Muslim, Buddha and other by religion respectively.69.77 % Hindus children were completely immunized while 40% were others in partially immunized. There is no association between immunization status with religion.

Table- 3: Association between immunization status with mother education

Mother Education	Completely immunized		Partially/non immunized		Total		χ2, df & P-value
	No.	%	No.	%	No.	%	
Illiterate	7	26.92	19	73.08	26	100.0	χ2 = 21.5 Df=2 P=0.000
Primary	23	67.65	11	32.35	34	100.0	
Secondary and above	110	73.33	40	26.67	150	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table- 3 shows that out of 210 children's 26, 34 and 150 children's mother were illiterate, primary and secondary above educated respectively. There is significant association between mother education and immunization.

Table- 4: Association between immunization status with type of family

Types of Family	Completely immunized		Partially/non immunized		Total		χ2, df & P-value
	No.	%	No.	%	No.	%	
Nuclear	86	71.01	40	28.99	138	100.0	χ2 = 3.4 Df=1; P=0.06
Joint	42	58.33	30	41.67	72	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table-4 shows that 140 (66.67%) children's were completely immunized, while 70 (33.33%) children's were partially/none immunized. There is significant association between type of family and immunization status of children's.

Table- 5: Association between immunization status with family income

Family income per month	Completely immunized		Partially/non immunized		Total		$\chi 2$, df & P-value
	No.	%	No.	%	No.	%	
I	11	61.11	7	38.88	18	100.0	χ^2 = 14.95 Df=4; P=0.005
II	21	70.00	9	30.00	30	100.0	
III	32	55.17	26	44.83	58	100.0	
IV	62	81.58	14	18.42	76	100.0	
V	14	66.67	14	50.00	28	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table-5 shows that there is significant association between family income and immunization status of children's.

Table-6: Association between immunization status with availability of immunization card

Immunization Card available	Completely immunized		Partially/non immunized		Total		$\chi 2$, df & P-value
	No.	%	No.	%	No.	%	
Yes	108	51.43	50	9.53	158	100.0	χ^2 = 0.8179 Df=1; P=0.366
No	32	15.24	20	23.80	52	100.0	
Total	**140**	**66.67**	**70**	**33.33**	**210**	**100.0**	

Table-6 shows that there is no significant association between immunization card available and immunization status of children's.

Table-7 shows the reasons for immunization failure (partial or non-immunized) in urban area. 70 children from urban area were partially or non-immunized immunized. In urban area, 23 (32.86%) children's had obstacles like mother/father illness, death in family, child goes to relative's house for family function etc. 16 (22.86%) children's were ill. 14 (20 %) children's parents had lack of information about immunization site. Only 3 (4.29%) children's parents said that immunization facility is too far from their home & inconvenient timing of immunization.

Table- 7: Reasons of partial or non-immunization of children in urban area (N =70)

Reasons for delay in immunization*	Number of informants	%
Obstacles	23	32.86
Child ill	16	22.86
Lack of information	14	20.00
Lack of motivation	11	15.71
Family too busy at work	5	7.14
No faith in immunization	5	7.14
Fear of side effect	4	5.71
Unaware about follow up	4	5.71
Health facility too far	3	4.29
Inconvenient timing of immunization	3	4.29

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Discussion

Study done by Ahuja R et al [1] show that Out of the total children, 50.6% (226/447) were males and 49.4% (221/447) were females. Overall, 49.7% were fully immunized and 20.4% partially immunized. In this study shows that out of total children 55.24% (116/210) were males and 44.76% (94/210) were females. Overall, 66.67% fully immunized and 33.33% partially/ unimmunized.

Study done by Mane vs et al 11 observed that children from urban area 98 (46.66%) were Hindu, 57 (27.14%) Muslim, 41 (19.54%) was Buddhist and 14 (6.66%) were from other religions. In this study shows that 86 (40.95%) were Hindu, 52 (24.76%) Muslim, 52 (24.76%) was Buddhist and 20 (9.52%) were from other religions.

Study done by Baliga SS, et al[12] on Immunization coverage in urban areas of Belgaum city observed that the most common reasons for not immunizing the child were: mother was too busy (34.1%), family problem, including illness of the mother (31.7%), unaware of return for 2nd and 3rd dose (9.7%). Significant association was found between educational status of mother and socioeconomic status of family with immunization status of children. This study observed that most common reasons for not immunizing the child were obstacles (32.86%), child ill (22.86%) and lack of information about immunization (20%). This study also shows Significant association was found between educational status of mother and socioeconomic status of family with immunization status of children.

Bhonsla SK et al [13] observed that educational status of mothers, Occupation of mothers, Religion, Sex, Monthly Family Income and Caste were found to be significantly associated with immunization coverage. This study also shows Significant association was found between educational status of mother and socioeconomic status of family with immunization status of children. Singhal G et al[3] observed that the commonest reason among partial and non-immunized infant was sickness 22 (36.06%) of elder sibling as a result of the previous vaccination followed by 20 (32.07%) of the sickness of beneficiary at the time of vaccination.

Parmar R, et al[4] observed that fully immunized children were 77.7% (CI 69.4-86.1), whereas 2.9% (CI 0.0-6.1) children were not vaccinated at all. Non-awareness regarding subsequent doses of vaccines was most common reason for partial or non-vaccination.

Immunization hand book for medical officer 2017 [10] shows that Full immunization coverage was75%, Non-immunized coverage-3% and Partial immunization coverage 22%.

Conclusions

- In present study most (66.7%) of children were completely immunized.
- There was significant association between education status of mother and socioeconomic status of family with immunization status of children.
- In present study we observed that there were some pockets in slum areas where immunization to children was poor.

Recommendations

- Missed opportunity for immunization can be brought down by creating awareness periodically once in 2 or 3 months for immunization.
- Ensure vaccines are readily available and accessible particularly in slum areas and for families with financial constraints.
- Train community health workers to actively follow up with families who have missed immunization appointments.

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