

Original Research Article

An evaluation of primary immunization coverage among 12-23 months children in an urban area of western Maharashtra: a community based cross sectional study

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ABSTRACT

Background: Infectious diseases are major cause of morbidity and mortality in children. One of the most cost effective and easy methods for the child survival is immunization. Objective was to determine the immunization coverage and find out the various factors and its reasons for partial or non-immunization of child.

Methods: A cross-sectional study was 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 during March 2021 to October 2022. A total of seven children aged 12-23 months were interviewed from each cluster on pretested, predesigned schedule, thus giving us the sample size of 210. Chi square test was applied for statistical analysis.

Results: A total of 210 children aged 12-23 months were included in the study. It was found that 158 (75.24%) of the children were found to be fully immunized. While 49 (23.34%) and 3 (1.42%) nonimmunized respectively. Most common reason for partial and non-immunization of children was found to be obstacles and lack of motivation on the part of parents. There is only statistically significant association between education of mothers and immunization status of children.

Conclusions: Increasing the knowledge and understanding of the caretakers of the young children abouts the essentiality and benefits of routine immunization would be a strong step forward in achieving the goals.

Keywords: Cluster sampling, Immunization, Immunization coverage, Urban area

INTRODUCTION

Immunization programme among the most cost-effective ways to reduce childhood morbidity and mortality. It also reduces the risk for those individuals who have escaped vaccination or those who have not developed satisfactory protection.¹ A recent estimate suggests that approximately 34 million children are not completely immunized with almost 98 % of them residing in developing countries.² In May 1974, The World Health Organization (WHO) officially launched a global immunization programme known as expanded programme of immunization EPI to protect all the children of the world against six vaccine preventable diseases by the year 2000.³ Immunization programme in 1985, there has been considerable

reduction in vaccine preventable diseases.⁴ The factors which have contributed in the success of the program are good disease surveillance, no pathogen variations, potent vaccines, adequate development and procurement of vaccines, appropriate and acceptable choice of technologies, universal vaccination, adequate logistics, cost benefit analyses, and resource mobilization.⁵ In 2005, some of the initiatives undertaken by the government under NRHM so strengthen the immunization by mobilization of children and pregnant Women by ASHA workers to increased coverage.⁶ As per coverage evaluation survey (2009), 91% of vaccination in India was provided through public sector while the private sector accounted for 9%.⁶ Despite all the efforts put by the governmental and nongovernmental institutes

for 100% immunization coverage, there are still pockets of low coverage areas. Urban Slums constitute one of the high-risk areas for the vaccine preventable diseases.⁷ About one-quarter or 25% of the under-5 mortality is due to vaccine preventable diseases.⁸ In India, immunization services offered free in public health facilities, but despite rapid increases, the immunizations rate remains low in some areas.⁹ Globally over 70% of infants who do not receive three doses of vaccine against diphtheria, tetanus and peruses, live in Africa and Asia (more than third live in India alone).¹⁰ Due to suboptimal immunization coverage in UIP, this program me has achieved only partial Success in reducing the burden of VPD's.¹¹ World Health Assembly endorsed the global vaccine action plan in 2012 to extend immunization to all children across the globe GVAP's key targets include achieving and sustaining 90% national pentavalent coverage and greater than equal to 80% pentavalent coverage in every district by 2015.¹² Currently the world including India is facing COVID-19 pandemic. All government are trying hard to control this pandemic health services department all over the country at each level is trying to control COVID-19. Due to this other health important care services may be affected, and immunization services is one of them. In Maharashtra according to the NFHS-4 (2015-16) and NFHS-5 (2019-20), 56.2% and 73.5% of children between age group 12-23 months were fully immunized respectively.^{13,14} In urban area proportion of children fully immunized in age group between 12-23 months is 71.7% according to NFHS-5.¹⁵ The present study was planned to find out immunization coverage and the reasons for partial or non-immunization of children in urban area and various factors affecting the immunization coverage.

METHODS

A community based descriptive cross-sectional study was conducted during March 2021 to October 2022 in an urban area of UHTC under the department of community medicine under a tertiary care center, catering population of approximately 30295. The sampling size of 210 was determined according to the WHO 30×7 cluster sampling method. 30 clusters from the study area were identified and from each cluster 7 children were taken into the study. Children of 12-23 months age group residing in the study area for ≥2 years.

Inclusion criteria

Children aged between 12-23 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 ≥2 years. Children whose parents willing to give consent for participating in the study.

Exclusion criteria

Those children who are seriously ill. Those children who advised by pediatrician not take immunization for any reasons, any other contraindications for immunization.

Sample size calculation

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. Thus, giving us the sample size of 210. 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. Information collected using a pretested semi structure questionnaire using door to door approach after explaining the purpose of informed consent. 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=30295/30=1009.83=1010. Cluster number 1. 0001 to 1010. Random number chosen from a currency note of RS. 100 which was 3AT 511001. The last four digits were less than sampling interval. Therefore, the random number was 1001. The first cluster was located in which the cumulative population equal or exceeds the random number was 1035 the first cluster located.

Data analysis

Information collected using the above mention method is converted into a computer-based Excel sheet. All data have been expressed in terms of numbers and percentages. Data analysis done using SPSS-21.0 statistical software. Data was represented in tabular and graphical format. Ethical permission was taken from the IEC.

Table 1: Definitions of immunization.

Immunization status	Definitions
Fully immunized¹⁶	Children who had received BCG and three doses of DPT(PENTA)/OPV and measles vaccine as scheduled in the first year of life were classified as fully immunized
Partially-immunized¹⁶	Those children who had missed any dose of six primary vaccines were labelled as partially immunized
Non-immunized¹⁶	Those children who had not received any vaccine, except OPV in PPI, up to 12 months of age were defined as non-immunized
Cluster¹⁷	A small group that is part of a population that is being surveyed; for the purposes of evaluating immunization coverage, a cluster is defined as seven or more children in the age range being evaluated

RESULTS

Table 2 shows that distributions of children according to their socio-demographic characteristics (N=210). Out of 210 children, 114 (54.29%) males were more than females 96 (45.71%). The 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.

Table 2: Distributions of children according to their socio-demographic characteristics (N=210).

Variables	Characteristics	Total N (%)
Gender of children	Male	114 (54.29)
	Female	96 (45.71)
Age in months	<18 months	132 (62.86)
	≥18 months	78 (37.14)
Religion	Hindu	98 (46.66)
	Muslim	57 (27.14)
	Buddha	41 (19.54)
	Others	14 (6.66)
Type of Family	Nuclear family	138 (65.72)
	Joint family	40 (19.05)
	Three generation family	32 (15.23)
Mother's education	Illiterate	24 (11.43)
	Primary	30 (14.28)
	Secondary	92 (43.81)
	College and above	64 (30.48)
Father's education	Illiterate	14 (6.66)
	Primary	16 (7.62)
	Secondary	91 (43.34)
	College and above	89 (42.38)
Occupation of mother	House wife (not working)	202 (96.19)
	Working	8 (3.81)
Socioeconomic status (Modified BG Prasad's classification)	Class-I	7 (3.33)
	Class-II	11 (5.23)
	Class-III	54 (25.72)
	Class-IV	11 (5.23)
	Class-V	114 (54.28)
Immunization card	Available	205 (97.62)
	Not available	5 (2.38)

The majority children from urban area 138 (65.72%) belonged to nuclear family. 24 (11.43%) children had

illiterate mothers from urban area. Mothers of children from urban area educated up to primary school, secondary school and college were 30 (14.28%), 92 (43.81%), and 64 (30.48%) respectively.

The children from urban area, according to Modified BG Prasad's classification 7 (3.33%) were belonging to class I, 11 (5.23%) was belonging to class II, 54 (25.72%) were belonging to class III, 11 (5.23%) were belonging to class IV and 114 (54.28%) were belonging to class V. Immunization card was available at 205 (97.62%) children from urban area.

Table 3: Reasons of partial or non-immunization of children in urban area.

Reasons of immunization failure	Urban area (N=52) (%)
Lack of information	14 (26.92)
Unaware of need of immunization 2nd dose	2 (4.28)
Unaware of need of immunization	6 (11.54)
Place of immunization unknown	3 (5.77)
Fear of side reactions	3 (5.77)
Lack of motivation	11 (21.15)
Postponed until another time	6 (11.54)
No faith in immunization	5 (9.62)
Obstacles	23 (44.23)
Child ill but not brought	16 (30.77)
Place of immunization too far	2 (3.85)
Mother too busy	5 (9.62)
Fear of COVID-19	4 (7.69)

Table 3 shows the reasons for immunization failure (partial or non-immunized) in urban area. 52 children from urban area were partially immunized. In urban area, 23 (44.23%) children had obstacles like illness, too far away the distance of the immunization session from their house, mother was too busy etc. 14 (26.92%) children's parents were having lack of information. 11 (21.15%) children's parents found unmotivated. Only 4 (7.7%) children's parents had fear of COVID-19. Whereas 14 (26.92%) were lack of information from urban area.

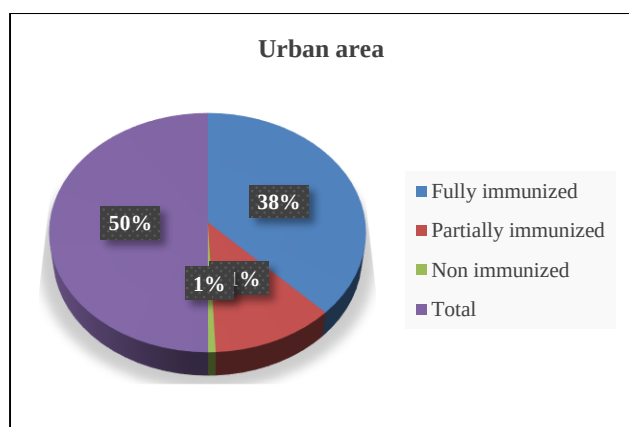


Figure 1: Pie chart-showing of immunization status of children in urban area.

Out of 210 children, fully immunized 158 (75.24%), partially immunized 49 (23.24%), non-immunized 3 (1.42%) from urban area.

Figure 2 is showing distribution of the children by mother's education in urban area.

Figure 3 is showing distribution of immunization status of children in urban area.

Table 4 shows that association between immunization status of children with variables.

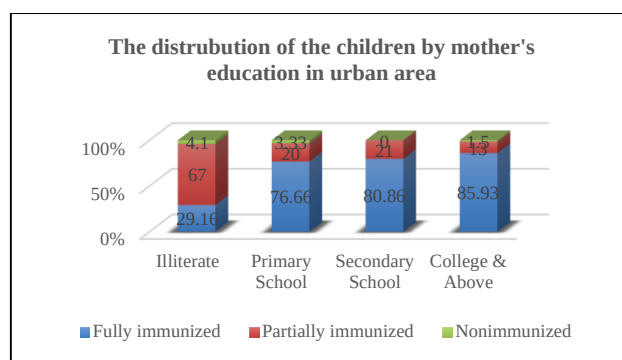


Figure 2: Distribution of the children by mother's education in urban area.

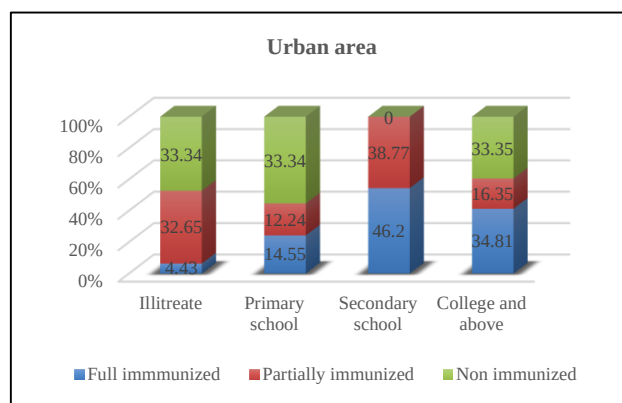


Figure 3: Distribution of immunization status of children in urban area.

Table 3: Association between immunization status with variables.

Variables	Category	Immunization status (N=210)			χ^2 =Chi-square test, DF=degree of freedom, P=test of significance
		FI* 158 (%)	PI* 49 (%)	NI* 3(%)	
Gender	Male	85 (74.56)	27 (23.68)	2 (1.76)	$\chi^2=0.21$, DF=1, $p>0.05$ Non-significant
	Female	73 (76.04)	22 (22.91)	1 (1.04)	
Religion	Hindu	77 (48.73)	20 (49.81)	1 (33.33)	$\chi^2=4.96$, DF=2, $p>0.05$ Non-significant
	Muslim	40 (25.31)	15 (3.61)	2 (66.66)	
	Buddha	29 (18.36)	12 (29.6)	0 (0)	
	Others	12 (7.59)	2 (4.08)	0 (0)	
Type of family	Nuclear family	100 (73)	36 (26)	2 (1)	$\chi^2=1.87$, DF=1, $p>0.05$ Non-significant
	Joint family	58 (81)	13 (18)	1 (1)	
Education of mother	Illiterate	7 (29.16)	16 (66.66)	1 (4.76)	$\chi^2=34.26$, DF=3, $p<0.01$ Statistically significant
	Primary school	23 (76.6)	6 (20)	1 (3.33)	
	Secondary school	73 (80.8)	19 (20.65)	0 (0)	
	College and above	55(85.93)	8(12.5)	1 (1.56)	
SES*	Class-II*	13 (73)	5 (27)	0 (0)	$\chi^2=6.17$, DF=3, $p>0.05$, Non-significant
	Class-III	43 (80)	11 (20)	0 (0)	
	Class-IV	88 (78)	24 (21)	2 (1)	
	Class-V	14 (58)	9 (37)	1 (5)	
Immunization card	Yes	156 (77)	46 (22)	3 (1)	Fisher's exact test=0.15, non-significant
	No	2 (40)	3 (60)	0 (0%)	
Occupation of mother	House wife (not working)	152 (75.24)	47 (23.26)	3 (1.48)	Fisher's exact test=1.0, non-significant
	Working	6 (75)	2 (25)	0 (0)	

FI*-fully immunized, PI*-partially immunized, NI*-non-immunized, class I* merged with class II by applying test, DF*=degree of freedom=1, P-test of significance, SES*-socioeconomic status.

Out of 210 children, 85 (74.56%), 27 (23.68%) and 2 (1.76%) males were fully immunized, partially immunized and nonimmunized from urban area while 73 (76.04%), 22 (22.91%) and 1 (1.04%) female were fully immunized, partially immunized and nonimmunized in urban area. 77 (48.73%), 20 (49.81%) 1 (33.33%) fully immunized, partially immunized and nonimmunized Hindu children were from urban area. In urban area 100 (73%), 36 (26%), 2 (1%) fully immunized, partially immunized, nonimmunized children belongs to nuclear family respectively. In urban area 7 (29.16%), 23 (76.6%), 73 (80.8%) and 55(85.93%) fully immunized children had mothers educated as illiterate, primary school, secondary school and college and above respectively. but in urban area 3 unimmunized children had mothers educated as illiterate, primary school and college and above. In urban area 13 (73%), 43 (80%), 88 (78%), and 14 (58%) fully immunized children belong to class II, class III, class IV and class V socioeconomic status respectively. In the urban area 156 (77%), 46 (22%), 3 (1%) fully immunized, partially immunized, nonimmunized children had immunization card and the mothers of 152 (75.24%), 47 (23.26%), 3 (1.48%) fully immunized, partially immunized, nonimmunized children respectively in urban area were not-working. There was only statistically significant association between education of mothers and immunization status of children ($p<0.01$). There was no significant association between gender, religion, type of family, education of mothers, socioeconomic status, immunization card, mother's occupation and immunization status of the children in urban area respectively ($p>0.05$).

DISCUSSION

Table 1 shows that, 114 (54.29%) males were from urban area and 96 (45.71%) females were from urban area respectively. Similar comparable results were found by Gupta et al a total of 198 children of 12-23 months of age, 100 (50.5%) were males and 98 (49.49%) were females from urban area.¹⁸ The children from urban area 98 (46.66%) were Hindu, 57 (27.14%) were Muslim, 41 (19.54%) were Buddhist and 14 (6.66%) were from other religions and the children from rural area 148 (70.48%) were Hindu, 44 (20.95%) were Muslim, 12 (5.72%) were Buddhist and 6 (2.85%) were from other religions. In urban area of Vijaykumar et al found Hindu 89 (79.5%) followed by Muslim 16 (14.3%), Christians 6 (5.4%), and Sikh 1 (0.89%) children.¹⁹ In the out patient department (OPD) of urban health training center (UHTC) of Era's Lucknow Medical College, district Lucknow, Gupta et al in his study found 152 (76.8%) of children belonged to nuclear families and 46 (23.2%) of children belonged to joint families.¹⁸ These findings were similar to the present study results. Manuja, et al at urban slums of Bangaluru found 144 (68.5%) children belonged to nuclear family, 44 (21%) belonged to joint family and 22 (10.47%) belonged to three generation family.²¹ Mothers of children from urban area educated up to primary school, secondary school and college were 30 (14.28%), 92 (43.81%), and 64

(30.48%) respectively. In urban slums of Bhopal city, a study by Tiwari et al found 146 (48.66%), 22(7.33%), 126 (42%) and 6 (2%) children had mother's education as illiterate, primary school, secondary school and college and above respectively.²² 202 (96.19%) were housewife (not working) from urban area while 8 (3.81%) were working mothers from urban area respectively. Dr. Varsha Chaudhary, et al in her study conducted in an urban slums area of Bareilly city found mothers of 184 (87.62%) children were housewife (not-working) and mothers of 26 (12.38%) children were working.²³ The children from urban area, according to Modified BG Prasad's classification 7 (3.33%) were belonging to class I, 11 (5.23%) was belonging to class II, 54 (25.72%) were belonging to class III, 11 (5.23%) was belonging to class IV and 114 (54.28%) were belonging to class V. Vidyasagar et al in his study found 19 (17.3%) children were from class I, 23 (21%) from class II, 19 (17.3%) from class III, 25 (22.7%) from class IV and 24 (21.8%) from class V respectively in the urban area of Ranchi.²⁴ Tiwari et al in an urban slum area of Bhopal city, he found 113 (18.06%) children belonged to class III and 126 (55.48%) to class IV socioeconomic class.²² Immunization card was available at 205 (97.62%) children from urban area. Similar findings observed by Manuja et al at urban slums area of Bangaluru city.²¹ They found 188 (89.52%) children had immunization card and 22 (10.48%) children had not immunization card.

158 (75.24%) fully immunized, 49 (23.33%) partially immunized and 3 (1.42%) non immunized children were from urban area. Reason for poor immunization in urban area can be regular influx of migratory population especially in urban slums which is also a hurdle in achieving full immunization coverage. Study conducted by Gupta et al found immunization status of children in urban health training center of Era's Lucknow's Medical College found that 148 (74.7%) were fully immunized, 22 (11.1%) were partially immunized and 28 (14.1%) were not immunized.¹⁸ The coverage of fully immunized children is comparable with the present study. But the unimmunized children were more in the study by Pratibha and the partially immunized children are more in the current study. In the urban slums areas of Bangalore city Manuja et al found similar results of immunization status of children as 175(83.3%) children were fully immunized 35(16.7%) children were partially immunized.²¹ A study conducted by Ganguly et al in urban area of Raigarh block of Churu district in Rajasthan reported that full immunization coverage 88.7%, partial immunization coverage 10.3% and unimmunized children were only 1%.²⁵

According to National Family Health Survey-4 (2015-16) the proportion of fully immunized children were 62% and as per NFHS-5 (2019-2020) it was 81.7% and the coverage of fully immunized children at Maharashtra state level was 73.5% (71.7% in urban and 74.7% rural).¹³⁻¹⁵ As per District Level Household Survey (DLHS-4) (2012-13) the percentage of fully immunized

children was 66.2% (urban 65.3% and rural 67.0%), and unvaccinated children were 1.7% (urban 1.5% and rural 1.8%).²⁶ Similarly, the coverage in this study was higher when compared to District Level Household Survey (DLHS-4) (2012-13) where the percentage of fully immunized children was 66.2% (urban 65.3% and rural 66.7%), and unvaccinated children were 1.7% (urban 1.5% and rural 1.8%).²⁶ But in present study, it was found to be 78.03% in urban and 79.45% in rural area.

CONCLUSION

Children with educated mother were found to have better immunization coverage, as mother education increases then immunization status of children increases. 74.56%, 23.68% and 1.76% males were fully immunized, partially immunized and nonimmunized from urban area. While 76.04%, 22.91% and 1.04% female were fully immunized, partially immunized and nonimmunized in urban area. Availability of immunization card were also the major determinants of immunization. In urban area, 44.23% children had obstacles like illness, too far away the distance of the immunization session from their house, mother was too busy etc. 26.92% children's parents were having lack of information. 21.15% children's parents found unmotivated. Only 7.7% children's parents had fear of COVID-19. There is need to strengthen IEC skills of health workers to improve service provision and health education among mothers/guardians. Increasing awareness and reducing fear of side effects of immunization among parents through health education, counselling etc. can increase the percentage of immunized children. The need of the hour is to make it a "felt need" of the community. Increasing the knowledge and understanding of the caretakers of the young children about the essentiality and benefits of routine immunization would be a strong step forward in achieving this goal.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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