International Journal of Community Medicine and Public Health
Mahajan H et al. Int J Community Med Public Health. 2017 Nov;4(11):4089-4095
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20174660

Original Research Article

Immunization coverage in an urban resettlement colony of district Gautam-Budh Nagar, Uttar Pradesh, India using WHO 30×7 cluster sampling technique

Harsh Mahajan, Shalini Srivastava*, S. Nagesh

Department of Community Medicine, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh, India

Received: 16 September 2017
Accepted: 04 October 2017

***Correspondence:**
Dr. Shalini Srivastava,
E-mail: shalini.srivastava@sharda.ac.in

ABSTRACT

Background: Immunization is one of the most cost-effective interventions to prevent the suffering that comes from avoidable sickness, disability and death. In India, though immunization coverage has improved over the past few years, the country still accounts for the largest number of children who are not immunized i.e. 7.4 million. So, this study was taken up to assess the immunization coverage among children in District Gautam-Budh Nagar of Uttar Pradesh and to decipher the causes behind the partial immunization/non- immunization.
Methods: A cross-sectional study was conducted during June-August 2015 in an urban resettlement colony of District Gautam-Budh Nagar in Uttar Pradesh among 210 children aged 12-23 months selected using WHO 30X7 cluster sampling technique.
Results: A total of 210 children were covered, of which 72.9% children were fully immunized, 19.0% children were partially immunized, whereas, 8.1% children did not receive even a single dose of any vaccine, thus constituting a total of 27.1% children with partial/no immunization. On bi-variate analysis, significant association was observed between immunization status among children and caste (p=0.047), mother's education (p=0.01), father's education (p=0.000) and socio-economic status (p=0.003). On multi-variate analysis, however, only father's educational status was found to be significantly associated. The major reasons for partial/non-immunization among children were Ignorance (80.7%) followed by unavailability of vaccines (7.0%).
Conclusions: Immunization coverage found in the present study is still way short of the target of universal coverage. Therefore, health planners and policy makers in our country should develop a comprehensive strategy to achieve universal immunization coverage.

Keywords: Immunization, Coverage evaluation, WHO 30×7 cluster sampling technique

INTRODUCTION

Globally, three million children die each year of vaccine-preventable diseases with a disproportionate number of these children residing in developing countries.[1] A recent estimate suggests that approximately 34 million children worldwide are not completely immunized with almost 98 per cent of them from the developing countries.[2] Immunization is one of the greatest gifts given by medical fraternity to mankind. Vaccines are most powerful, safe and cost-effective measures for prevention/control of a number of diseases. In May 1974, the World Health Organization (WHO) launched the Expanded Program on Immunization (EPI) globally, with focus on prevention of six vaccine-preventable diseases by the year 2000. In India, EPI was launched in 1978 and it was re-designated as the Universal Immunization Program (UIP) in 1985, with a goal to cover at least 85%

of infants. This goal of UIP has been revised to achieve universal coverage under the Multi-year Strategic plan for UIP 2013-17.[3] In India, currently under the UIP, vaccines for seven vaccine preventable diseases (tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, hepatitis-B and measles) are available free of cost to all.

The National Family Health Surveys (NFHS) conducted in India over the years have shown a progressive improvement in the vaccination coverage among the children. NFHS-1 (1992-93) reported a vaccination coverage of 35.4%, which rose to 42.0% in NFHS-2 (1998-99) and to 43.5% in NFHS-3 (2005-06).[4-6] The latest NFHS-4 conducted in 2015-06 has reported a vaccination coverage of 62.0%.[7] The UNICEF coverage evaluation survey (2009) reported the immunization coverage to be 61.0%.[8] Nevertheless, these figures are way short of the target of 85% coverage.

Considering the current immunization scenario, it is the need of the hour to decipher factors which influence routine immunization, as this will help the planners to implement the immunization programme in a better way to achieve universal coverage. Therefore, the rationale of the present study was to assess the immunization coverage among children 12-23 months of age residing in an urban resettlement colony of District Gautam-Budh Nagar, Uttar Pradesh and also to decipher the factors associated with poor immunization coverage.

METHODS

Study design and setting

The study was a cross-sectional survey conducted from June 2015 to August 2015. The study was conducted in Bhangel area of district Gautam-Budh Nagar, Uttar Pradesh (i.e., urban field practice area of the Department of Community Medicine of the University). The Bhangel area is an urban resettlement colony consisting of a population of approximately 10,000 residing in 2,313 households. Majority of the population residing in Bhangel is migrating labour population.

Sample size estimation

The target population in the community under study were children in the age group of 12–23 months. To estimate the sample size, the desired confidence interval was taken to be 95% (z=1.96). The desired level of precision of the estimates was ±10% (d=0.1). Considering the complete immunization coverage in India as per the NFHS-3 report available at the time of conduct of study to be 43.5% (p=0.44) and taking design effect (DE) as two, the following sample size formula was used.[6,9]

$$n = [DE \times z^2_{1-\alpha/2} \times p \times (1-p)]/d^2$$

Using this formula, the total sample size came out to be 189, and considering the 10% nonresponse rate, sample size of 208 was reached which was rounded off to 210.

Using the WHO 30-cluster sampling technique, the size of the cluster came out to be 210/30=7.

Sampling technique

The 30-cluster sampling technique advocated by the WHO was used to assess coverage of immunization due for respective age in 12–23 months children.[10] The 30-cluster sampling technique is a two-stage random sampling technique (i.e., selection of clusters and identification of children in the selected clusters). The first step involved listing of all the clusters (i.e., lanes in Bhangel area and, of them, a total of 30 lanes were chosen randomly). In each selected lane, the first household to be visited was chosen randomly. All the eligible children of 12–23 months of age in that household were part of the study frame, but only one child from each household was selected randomly using lottery method. After the first household was visited, the interviewer moved to the next household using the right hand approach, and the same process was repeated. If any household was found to be locked or any mother refused to participate in the study, or if any household did not have eligible child, the interviewer skipped that household and moved to the next household. This process was continued until a total of seven children were covered in each lane, and, in this way, all the 30 selected lanes were covered, thus making a total sample size of 210 (30×7).

Inclusion and exclusion criteria

All children aged between 12-23 months living in the community for more than 6 months were included in the study. The children who were visiting from another community, children aged younger than 12 months, and severely ill children were excluded from the study.

The mothers of the study subjects were explained the purpose of the study, and their informed verbal consent was taken before starting their interviews. The study questionnaire comprised two parts. The first part of the questionnaire included the socio-demographic profile of the study subjects such as age, sex, religion, caste, maternal and paternal education, occupation and monthly family income. The second part of the questionnaire included information regarding the various vaccines received by the child till one year of age which was collected based on the documentary evidence in the form of immunization card/recall of mothers. The following definitions were used to categorize the child's immunization status.[11]

Complete immunisation (fully immunized)

Children who have received BCG, measles, and three doses of DPT, hepatitis, and OPV each (excluding OPV-0).

Partial/incomplete immunization

Children who have received at least one of the above-mentioned vaccines.

Unimmunised children

Children who have not received any vaccine.

Ethical consideration

Ethical approval to conduct this study was obtained from the Institutional Ethics Committee. Informed consent was obtained from the respondent verbally before being interviewed, and confidentiality was maintained.

Statistical analysis

Data was analyzed by using the statistical software Epi InfoTM 6(CDC, Atlanta, Georgia, USA). Results were expressed in percentages. Bivariate analysis using chi-square test was applied to find out the association between variables. Multivariate analysis using ordinal regression model was also done for all the variables. $p<0.05$ was considered to be significant. Individual vaccine coverage, dropout rates for various vaccines and reasons for partial/non-immunization have been analyzed.[12]

RESULTS

Of the 210 study subjects, 59.0% were males and 41.0% were female subjects. According to religion, 85.7% were Hindus and the remaining 14.3% were Muslims. Of the total study subjects, 91.9% belonged to general category and 8.1% belonged to SC/OBC. With respect to the parents' educational status, majority of the mothers were educated upto high school (51.9%) whereas, majority of the fathers (48.1%) were educated above high school. Regarding the socio-economic status, majority of the families (53.3%) belonged to lower middle class according to the Kuppuswamy socio-economic scale (Table 1).

Table 1: Association of different socio-demographic variables with immunization status among children using bivariate analysis.

Variables	Unimmunized (n=17)	Partially immunized (n=40)	Fully immunized (n=153)	Total (n=210)	P value[c]
Sex					
Male	12 (9.7)[a]	26 (21.0)	86 (69.4)	124 (59.0)[b]	0.36
Female	5 (5.8)	14 (16.3)	67 (77.9)	86 (41.0)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	
Religion					
Hindu	14 (7.8)	35 (19.4)	131 (72.8)	180 (85.7)	0.87
Muslim	03 (10.0)	05 (16.7)	22 (73.3)	30 (14.3)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	
Caste					
General	13 (6.7)	38 (19.7)	142 (73.6)	193 (91.9)	0.047
SC/OBC	04 (23.5)	02 (11.8)	11 (64.7)	17 (8.1)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	
Mother's education					
Primary school	09 (16.4)	14 (25.5)	32 (58.4)	55 (26.2)	0.01
High school	08 (7.3)	16 (14.7)	85 (78.0)	109 (51.9)	
Above high school	0	10 (21.7)	36 (78.3)	46 (21.9)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	
Father's education					
Primary school	09 (37.5)	05 (20.8)	10 (41.7)	24 (11.4)	0.000
High school	08 (9.4)	09 (10.6)	68 (80.0)	85 (40.5)	
Above high school	0	26 (25.7)	75 (74.3)	101 (48.1)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	
Socio-economic class[d]					
Upper middle (II)	0	05 (14.7)	29 (85.3)	34 (16.2)	0.003
Lower middle (III)	05 (4.5)	25 (22.3)	82 (73.2)	112 (53.3)	
Upper lower (IV)	12 (18.8)	10 (15.6)	42 (65.6)	64 (30.5)	
Total	17 (8.1)	40 (19.0)	153 (72.9)	210 (100)	

[a] Figures in parenthesis are row percentages; [b]Figures in parenthesis of total column are column percentages;[c] $p<0.05$ is significant; [d]Kuppuswamy scale was used to assess the socio-economic status of the families. None of the families belonged to Upper (I) and Lower (V) socio-economic classes.

Table 2: Multi\variate analysis of the socio-demographic predictors of immunization status among children.

Variable	P value*
Sex	
Male	0.11
Female	
Religion	
Hindu	0.87
Muslim	
Caste	
General	0.11
SC/OBC	
Mother's education	
Primary school	0.13
High school	0.66
Above high school	Reference
Father's education	
Primary school	0.005
High school	0.30
Above high school	Reference
Socio-economic status	
Upper middle	0.21
Lower middle	0.91
Upper lower	Reference

*p<0.05 is significant.

Table 3: Gender-wise distribution of vaccines coverage among children.

Vaccines	Males (n=124) (%)	Females (n=86) (%)	Total (n=210) (%)	P value*
BCG	112 (90.3)	81 (94.1)	193 (91.9)	0.31
DPT 1	106 (85.5)	75 (87.2)	181 (86.2)	0.72
DPT 2	100 (80.6)	73 (84.9)	173 (82.4)	0.43
DPT 3	90 (72.6)	68 (79.1)	158 (75.2)	0.28
OPV 1	106 (85.5)	79 (91.9)	185 (88.1)	0.16
OPV 2	104 (83.9)	79 (91.9)	183 (87.1)	0.09
OPV 3	95 (76.6)	72 (83.7)	167 (79.5)	0.21
Hepatitis B 1	94 (75.8)	68 (79.1)	162 (77.1)	0.58
Hepatitis B 2	88 (71.0)	68 (79.1)	156 (74.3)	0.19
Hepatitis B 3	81 (65.3)	68 (79.1)	149 (71.0)	0.03
Measles	92 (74.2)	69 (80.2)	161 (76.7)	0.31

*p<0.05 is significant.

Table 4: Gender-wise distribution of dropout rates of different vaccines.

Vaccines	Males (%)	Females (%)	Total (%)	P value*
DPT (1 to 3)	15.1	9.3	12.7	0.25
OPV (1 to 3)	10.4	8.9	9.7	0.73
Hepatitis B (1 to 3)	13.8	0	8.0	0.004
BCG to measles	17.9	14.8	16.6	0.57
DPT 1 to measles	13.2	8.0	11.0	0.27

*p<0.05 is significant.

Of the total children, 72.9% were fully immunized. A total of 19.0% children were partially immunized, whereas, 8.1% children did not receive even a single dose of any vaccine, thus constituting a total of 27.1% children with partial/no immunization (Table 1).

Table 1 shows the bivariate analysis showing association of different variables with immunization status among children. Among the male subjects, 69.4% were fully immunized, whereas 77.9% female subjects received complete immunization (p=0.36). With respect to

religion, 72.8% of the Hindus and 73.3% of the Muslims were fully immunized (p=0.87). On the basis of caste, 73.6% of children belonging to general category were fully immunized which was significantly higher (p=0.047) than the children belonging to SC/OBC category (64.7%). With respect to mother's education, the fully immunized children were significantly more (p=0.01) in the category whose mother's literacy status was high school (78.0%) and above high school (78.3%) than those in whom the mother's educational status was upto primary school (58.4%). Significant association was also observed between immunization status of children and father's educational status (p=0.000). More number of children was found to be fully immunized in the category whose father's educational status was high school (80.0%) and above high school (74.3%) than those in whom the father's educational status was up to primary school (41.7%). Significant association was also found between socio-economic class and immunization status of the children (p=0.003) as the number of fully immunized children were higher in the upper middle class (85.3%) and lower middle class families (73.2%) than the families belonging to upper lower socio-economic class (65.6%).

Table 2 shows the multivariate analysis using ordinal regression model on the socio-demographic predictors of immunization status among children. Only the father's educational status was observed to be significantly associated with immunization status among children.

Regarding individual vaccine coverage in children, the coverage was highest for BCG (91.9%) and lowest for Hepatitis B3 vaccine (71.0%). The coverage rate for all the vaccines was slightly higher among females as compared to males though it was found to be statistically insignificant for all the vaccines except Hepatitis B3 vaccine (p=0.03) (Table 3). A consistent decline in coverage rate from the first to the third dose was observed for DPT, OPV and Hepatitis B vaccines. Dropout rates for DPT, OPV and Hepatitis B vaccines from the first to the third dose were 12.7%, 9.7% and 8.0%, respectively. The dropout rates from BCG and DPT1 to the measles vaccine were 16.6% and 11.0% respectively. The dropout rates were higher for males as compared to females for all the vaccines (Table 4).

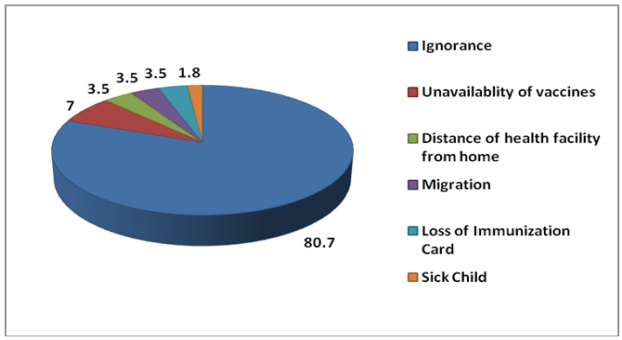

Figure 1: Reasons for non-immunization among children (%).

Figure 1 shows reasons for partial immunization/non-immunization among children. The major reasons for partial immunization/non-immunization among children were ignorance (80.7%) followed by unavailability of vaccines (7.0%).

Table 5: Awareness and practices regarding immunization amongst mothers.

	No. (%)
Awareness whether immunization prevents disease	
Not aware	136 (64.8)
Immunization prevents one disease	46 (21.9)
Immunization prevents two diseases	26 (12.4)
Immunization prevents three diseases	02 (1.0)
Place of immunnization	
Did not get the child immunized	17 (8.1)
Govt. centres and hospitals	98 (46.7)
Private clinics and nursing homes	95 (45.2)
Immunization card	
Present	147 (70.0)
Absent	63 (30.0)

Table 5 shows the awareness and practices among mothers regarding immunization. Majority of the mothers (64.8%) were not aware that immunization prevents diseases. Regarding the place of immunization, 46.7% children received immunization from government centres and hospitals whereas, 45.2% children received immunization from the private health sector. While 70.0% of the respondents had immunization cards, the rest of them did not have the immunization cards with them at that time, with most of them citing misplacement and non-issuance as the reasons.

DISCUSSION

Immunization against common childhood diseases has been an integral component of mother and child health services in India since the adoption of the primary health care approach in 1978. The Universal Immunization Programme (UIP) was introduced by the Government of India in 1985 to cover at least 85% of the infants against the six vaccine-preventable diseases (VPDs) by 1990. It was hoped that by the turn of 20th century, the coverage of children for vaccination against the six VPDs would reach 100 percent. In the present study, the vaccination coverage among children aged 12-23 months reflects that 72.9% of the children are fully immunized which is less than the desired goal of achieving universal coverage.[3] Similar level of coverage was documented in other studies by Kadri (70.3%) in urban slums of Ahmedabad and Sharma (80.9%) in urban slums of Mumbai.[11,13] However, the immunization coverage found in our study is appreciably higher than the NFHS-4 data for the urban areas of India (63.9%) and Uttar Pradesh (53.6%).[7,14] In the present study, the immunization coverage was found to be higher among females (77.9%) than males (69.4%)

but the difference was not found to be statistically significant. The study conducted by Kadri in the urban slums of Ahmedabad also showed no significant association between immunization coverage and gender, however, this study showed higher immunization coverage among males (76.0%) than females (63.5%).[13] In our study, on applying bivariate analysis, significant association was found between immunization status among children and caste, maternal education, paternal education and socio-economic status. A study conducted by Sharma in the urban slums of Mumbai also showed a significant association between immunization coverage among children and maternal education.[11] However, a study conducted by Angadi in the urban slums of Bijapur did not show any significant association between immunization status with maternal education and socio-economic status.[15]

Regarding the individual vaccine coverage, the coverage of BCG vaccine (91.9%) in our study was found to be exactly similar to the NFHS-4 data.[14] The coverage of three doses of OPV vaccine (79.5%) and three doses of Hepatitis B vaccine (71.0%) were found to be higher in our study than the NFHS-4 data (72.8% for OPV and 62.8% for Hepatitis B Vaccine). However, the coverage of three doses of DPT vaccine (78.4%) and Measles vaccine (81.1%) were found to be higher in NFHS-4 data than the present study (75.2% for DPT vaccine and 76.7% for measles vaccine). The individual vaccine coverage for all vaccines in the present study was found to be higher among the females than males but the difference was not found to be significant except Hepatitis B 3 vaccine. Contrary to this, a study conducted by Gupta in the rural area of Pune showed higher individual vaccine coverage among males than females.[16]

The dropout rate from BCG to measles vaccine was found to be slightly higher (16.6%) in our study than the study conducted by Kadri (13.9%) in the urban slums of Ahmedabad and that reported by Gupta in urban slums of Pune (11.1%).[13,16] The dropout rates in the present study were found to be higher among males than females for all the vaccines and the difference was significant for Hepatitis B vaccine. This finding is contrary to the studies conducted by Kadri in urban slums of Ahmedabad and by Gupta in urban slums of Pune in which dropout rates were reported to be higher among females than males.[13,16]

The major reasons for partial immunization/non-immunization among children were Ignorance among parents (80.7%) followed by unavailability of vaccines (7.0%). Similar finding was observed in the study conducted by Angadi in urban slums of Bijapur, in which the main reason for partial and non-immunization was found to be lack of information (67.3%).[15] Whereas, in a study conducted by Gupta in the urban slums of Pune, the main reasons for partial/non-immunization were inconvenient timing of immunization (36%) and sick child brought for immunization (20%).[16] In another study conducted by Sharma in the urban slums of Mumbai, the most common reasons for not immunizing the child as cited by respondents were illness of the child (29.5%) and unawareness of the need for immunization (8.1%).[11]

In our study, about two-third of the respondents (64.8%) were not aware that immunization prevents diseases. This lack of awareness among the parents has been the main reason for the low immunization coverage (72.9%) found in our study. Regarding the place of immunization, in our study, almost equal proportion of children got immunized in the government (46.7%) and private sector (45.2%). Contrary to this finding, the study conducted by Angadi in urban slums of Bijapur showed that a large proportion of the children (78.7%) had received their immunization from government establishments.[15] In our study, 70% of the respondents had immunization card. This finding is comparable to that observed in the study by Angadi in urban slums of Bijapur where 69.0% of the respondents had immunization card.[15]

CONCLUSION

The findings in the present study reflect that even after almost three decades of implementation of the UIP, routine immunization has not achieved universal coverage. An unfortunate fact is that inspite of massive IEC activities by the government emphasizing the significance of immunization; a vast majority of population is still unaware of the importance of immunization and have only a superficial knowledge of the immunization schedule. This study gives a message for all policy makers and healthcare providers, in that, providing the resources for immunization alone is a job which is half done and that health education to the beneficiaries as well as health care providers is one of the vital components towards achievement of universal immunization coverage. National and state routine immunization monitoring systems also need to be geared up for effective 100 per cent immunization coverage.

ACKNOWLEDGEMENTS

The Authors are thankful to the Medical Social Workers of the Department of Community Medicine for their sincere efforts in data collection.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Bonu S, Rani M, Baker TD. The impact of the national polio immunization campaign on levels and equity in immunization coverage: Evidence from rural north India. Soc Sci Med. 2003;57(10):1807-19.

2. Das NP, Mishra VK, Saha PK. Does community access affect the use of health and family welfare services in rural India? National Family Health Survey Subject Reports No. 18. 2001, Mumbai: International Institute for Population Sciences.
3. Ministry of Health and Family Welfare (MOHFW), Government of India, 2013. Multi-Year Strategic plan 2013-17. Universal Immunization Programme. Reaching every child. New Delhi: MOHFW.
4. International Institute for Population Sciences (IIPS), 1995. National Family Health Survey. (MCH and Family Planning), India 1992-93, Bombay: IIPS.
5. International Institute for Population Sciences (IIPS) and ORC Macro. 2000. National Family Health Survey. (NFHS- 2), 1998- 99: India, Mumbai: IIPS.
6. International Institute for Population Sciences (IIPS) and Macro International. 2007. National Family Health Survey. (NFHS-3), 2005–06: India: Volume I. Mumbai: IIPS.
7. International Institute for Population Sciences (IIPS). National Family Health Survey. (NFHS-4), 2015–16-India Fact sheet: India: Mumbai: IIPS.
8. United Nations Children's Fund. Coverage Evaluation Survey Report. 2009– National Fact sheet.
9. UNICEF. Somaliland Immunization Coverage Survey—July 2008. New York, USA: UNICEF, 2008: 17.
10. Henderson RH, Sundaresan T. Cluster sampling to assess immunization coverage: A review of experience with a simplified sampling method. Bull World Health Organ. 1982;60(2):253–60.
11. Sharma B, Mahajan H, Velhal GD. Immunization Coverage: Role of Sociodemographic Variables. Advan Prevent Med. 2013;2013:607935.
12. Agarwal S, Bhanot A, Goindi G. Understanding and Addressing Childhood Immunization Coverage in Urban Slums. Indian Paediatr. 2005;42:653-63.
13. Kadri AM, Singh A, Jain S, Mahajan RG, Trivedi A. Study on immunization coverage in urban slums of Ahmedabad city. Health and Population: Perspectives and Issues 2010;33(1);50-4.
14. International Institute for Population Sciences (IIPS). National Family Health Survey. (NFHS-4), 2015–16-UP Fact sheet: India: Mumbai: IIPS.
15. Angadi MM, Jose AP, Udgiri R, Masali KA, Sorganvi V. A Study of Knowledge, Attitude and Practices on Immunization of Children in Urban Slums of Bijapur City, Karnataka, India. J Clin Diagnos Res. 2013;7(12):2803-6.
16. Gupta PK, Pore P, Patil U. Evaluation of immunization coverage in the rural area of Pune, Maharashtra, using the 30 cluster sampling technique. J Fam Med Primary Care. 2013;2:50-4.

Cite this article as: Mahajan H, Srivastava S, Nagesh S. Immunization coverage in an urban resettlement colony of district Gautam-Budh Nagar, Uttar Pradesh, India using WHO 30×7 cluster sampling technique. Int J Community Med Public Health 2017;4:4089-95.