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**Original Research Article**

# Evaluation of measles immunization coverage in rural area of central India using WHO EPI 30 cluster survey method

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## ABSTRACT

**Background:** Measles is one of the most infectious diseases known to humankind and an important cause of death and disability among children worldwide. In 2010, the World Health Assembly set milestones towards global measles eradication, to be reached by 2015. One of the milestones is to Increase in routine coverage with the first dose of measles-containing vaccine (MCV1) for children aged 1 year to ≥90% nationally and ≥80% in every district.
**Methods:** A community based cross sectional study was carried out in rural area of Bhopal district, central India from September 2014 to November 2014. The WHO EPI 30-cluster survey methodology was used as sampling method. A pre designed and pre tested questionnaire was used to collect information on immunization coverage. Data was entered into Microsoft Excel and was analyzed by using EPI Info version 7.
**Results:** The mean age of study subjects was 17.7 months with SD of 3.64. Out of total 210 subjects 57.2% were boys and 42.8 % were girls. Our study findings suggest that 92% of the children were vaccinated for MCV1 vaccine and 8 % were not received MCV1 vaccine. The association of place of delivery with MCV1 vaccination status was found statistically significant (P <0.001).
**Conclusions:** We found high measles vaccination coverage in the field practice area as compared to other surveys. Main reasons found behind noncompliance were unawareness about Universal Immunization programme, lack of information about Measles and its complications, away from home on the session day, long distance of session site from home.

**Keywords:** Measles, MCV1, Immunization coverage, Rural, Cluster survey

## INTRODUCTION

Measles is one of the most infectious diseases known to humankind and an important cause of death and disability among children worldwide. The disease is characterized by the presence of fever, cough, and coryza, followed by the appearance of a typical rash. The disease is generally transmitted by the airborne route, with a large proportion of cases being self-limiting; nevertheless, multiple deaths have been reported because of disease associated complications. Children unvaccinated against the disease are at risk of severe health complications such as pneumonia, diarrhoea, encephalitis, blindness and death.[1] In India there were 15768 cases of measles occurred with 56 deaths during the year 2013.[2] The measles vaccine has been in use for 50 years. It is safe, effective and inexpensive. WHO recommends immunization for all susceptible children and adults for whom measles vaccination is not contraindicated.[1] Measles vaccination resulted in a 75% drop in measles deaths between 2000 and 2013 worldwide.[3]

Estimates of measles-related deaths have been considered a crucial indicator to evaluate the progress of any nation towards measles elimination. The global estimates for the year 2013 suggest that close to 0.14 million deaths were attributed to measles, accounting for nearly 16 deaths each hour. Study findings have indicated that more than 50% of the global measles associated deaths were reported in India alone. Furthermore, the higher case fatality ratio was reported among under-five children and children from the backward class. In order to reduce the incidence of measles and associated deaths, the Government of India has adopted various strategies. These strategies include achieving high coverage with the first dose of the measles vaccine (i.e. first-dose coverage for the measles vaccine must be 90% at the national level and 80% for each district); intensive surveillance activities supported by adequate laboratory support (outbreak and case-based surveillance assisted by laboratories to ensure serological/ virological categorization); appropriate case management (including administration of vitamin A); and implementation of catch-up measles vaccination campaigns for children aged 9 months to 10 years in states with 80% evaluated coverage with the first dose of measles vaccine.[4]

As per Coverage Evaluation Survey (2009) measles vaccination coverage in India is 74.1%.[5] As per Annual health Survey 2012-2013 it is 85.5 % in MP and 87.4 % in Bhopal district.[6] Under Global measles and rubella strategic plan 2012-2020 one of the milestone was to increase in routine coverage with the first dose of MCV1 to ≥90% nationally and ≥80% in every district, which is to be reached by 2015.[7] In order to find out the progress towards this mile stone a study has been done on MCV1 vaccine coverage in Bhopal district by using WHO EPI 30 cluster technique.[8]

### *Objectives*

- To find out the measles vaccination coverage in Bhopal district by using WHO thirty cluster method.
- To find out the various factors associated with non-immunization of measles vaccine.

## METHODS

A community based cross sectional study was carried out in the 14 villages under field practice area of rural health training centre of a medical college in Bhopal district. The study was carried out for three months from September to November 2014. The study team included Faculty, PG student and Medico Social worker from Department of Community Medicine. The total population covered was 11220 in 14 villages residing in area of 25 Sq KM. The study population was the people living in these 14 villages. The 14 villages included in the study were Naka Chavni, Sagonikalan, Jamuniyakalan, Tanda, Bilkhiria, Sankal, Chhavnipathar, Haripura, Arjunnagar, Aadampur chavni, Sehatganj, Padariya and Jhiriya kheda. The sampling frame included all 12-23 months old children living in these 14 villages. This particular age group was selected because if final primary immunization at 9 month of age then WHO recommends using children aged 12-23 months. The WHO EPI 30-cluster survey methodology was used as sampling method. It is a kind of two-stage sampling technique where 30 clusters from the district were identified in the first stage according to 'Probability Proportion to Size (PPS)', which ascertain that the probability of a particular sampling unit being selected in the sample is proportional to the population size of the sampling unit. In the second stage, the selection of the required number of children was done from each of the selected cluster provided a sample size of 30*7 = 210. The first household in each cluster was selected randomly, and the rest of them were selected from the contiguous households till the required number of children is attained. The sampling unit was 12-23 months old children but sampling was conducted on the household level. To find out 210 children in 12-23 months age group total 1938 household were visited. A pre designed and pre tested questionnaire was used to collect information by interviewing the mother or caretaker of study participants. Information collected includes various socio-demographic factors, measles immunization status and reasons for non-immunization of measles vaccine. As a proof of vaccination the Mother-child protection card and the recall method was used. The mother was considered as first respondent, in her absence father was taken. In case both were not available the elderly from the family who use to take care of the child and remained with him for most of the time or had taken the child for vaccination on at least one occasion was interviewed. If Immunization card or Mother-child protection card was available and measles vaccination entry was there the child considered as vaccinated. In case where card was not available or entry was missing, if respondent provided information regarding vaccination the child was considered vaccinated for measles. Data was analyzed by using EPI Info version 7. Chi-Square test was applied as test of significance.

### *Selection of clusters for the study*

A list of all villages under the field practice area of RHTC was obtained with their respected population. The population was arranged in cumulative frequency. A cluster interval of 374 was obtained by dividing the total population by 30. To obtain the first random number, a random number less than the cluster interval was generated by picking the last three digits of a currency note which was 191. The first cluster in area under RHTC having a cumulative frequency equal to or more than 191 was picked up as the first cluster and subsequent clusters were selected by adding the cluster interval (191), that is, (191+374 = 565). The village having a cumulative frequency equal to or more than 565 was the second cluster. Thus, in this manner, 30 clusters were selected. The first household was selected randomly and every next household was studied in a sequence, until a total of

seven eligible children in the age group of 12‑23 months were covered.

## RESULTS

In our study population there were total 1938 households with a population of 11220, the population consist of 51.37% Males and 48.62% females. There were 1304 children of 0-6 year age group. From this population we selected 210 children of 12 to 23 months age group through WHO 30 cluster technique (Table 1). The mean age of study subjects was 17.7 months with SD of 3.64. Out of total 210 subjects 57.2% were boys and 42.8% were girls. Our study findings suggest that 92% of the children were vaccinated for MCV1 vaccine and 8% were not received MCV1 vaccine. The association of place of delivery with MCV1 vaccination status was found statistically significant (P <0.001) (Table 2).

**Table 1: General information about study population.**

| | |
|---|---|
| **Total no. of household studied** | **1938** |
| **Total population covered** | 11220 |
| **Total numbers of clusters formed** | 30 |
| **Total Interview conducted** | 210 |
| **Mean age of the study subjects was** | 17.7 months with SD of 3.64 |

**Table 2: Characteristics of study population and factors associated with receipt of MCV1 vaccine.**

| Variable | Frequency | Vaccination for MCV1 (Card + History) | | p-value[1] |
|---|---|---|---|---|
| | | Vaccinated | Non vaccinated | |
| **Gender** | | | | $X^2$=2.26 Df=1 P value=0.133 |
| Male | 120 | 108 | 12 | |
| Female | 90 | 86 | 4 | |
| **Religion** | | | | $X^2$=0.44 Df=1 P value=0.516 |
| Hindu | 205 | 189 | 16 | |
| Muslim | 5 | 5 | 0 | |
| **Place of delivery** | | | | $X^2$=10.1 Df=1 P value=0.001 |
| Home | 69 | 58 | 11 | |
| Hospital | 141 | 136 | 5 | |
| **Home delivery attended by(n=69)** | | | | $X^2$=2.34 Df=1 P value=0.126 |
| TBA | 60 | 52 | 8 | |
| Family members | 9 | 6 | 3 | |
| **No. of children in family** | | | | $X^2$=0.105 Df=1 P value=0.992 |
| <- 2 | 131 | 121 | 10 | |
| >2 | 79 | 73 | 6 | |
| **Mother's Education** | | | | |
| Illiterate | 77 | 68 | 9 | $X^2$=4.07 Df=3 P value=0.254 |
| Primary | 98 | 94 | 4 | |
| Secondary | 31 | 28 | 3 | |
| Graduate | 4 | 4 | 0 | |
| **Father's Education** | | | | |
| Illiterate | 43 | 38 | 5 | |
| Primary | 111 | 102 | 9 | $X^2$=2.52 Df=3 P value=0.472 |
| Secondary | 47 | 45 | 2 | |
| Graduate | 9 | 9 | 0 | |
| **Mother's Occupation** | | | | $X^2$=1.67 Df=1 P value=0.196 |
| Housewife/unemployed | 170 | 159 | 11 | |
| Employed | 40 | 35 | 5 | |
| **Father's Occupation** | | | | |
| Unskilled labourer | 147 | 133 | 14 | $X^2$=3.04 Df=2 P value=0.218 |
| Semiskilled worker | 23 | 23 | 0 | |
| Skilled worker | 40 | 38 | 2 | |
| **Type of family** | | | | $X^2$=1.64 Df=1 P value=0.200 |
| Nuclear | 172 | 157 | 15 | |
| Joint | 38 | 37 | 1 | |

| | | | | |
|---|---|---|---|---|
| **Vaccination card available** | | | | $X^2$=1.85 |
| Yes | 113 | 107 | 6 | Df=1 |
| No | 97 | 87 | 10 | P value=0.173 |
| **SES of family** | | | | |
| Lower class | 144 | 133 | 11 | $X^2$ =0.441 |
| Middle class | 61 | 56 | 5 | Df=2 |
| Upper class | 5 | 5 | 0 | P value=0.802 |

[1]Chi-square or Fisher exact test for categorical variables.

**Table 3: Reasons responsible for non-vaccination of MCV1 vaccine.**

| Reason | Frequency | Percentage |
|---|---|---|
| **Unawareness about immunization programme** | 3 | 15 |
| **No information about Measles and its complications** | 3 | 15 |
| **Vaccination site is too far from home** | 2 | 10 |
| **Child illness** | 2 | 10 |
| **Child was away from home** | 4 | 20 |
| **No one to accompany** | 1 | 5 |
| **Illness among other child due to immunization** | 1 | 5 |
| **Due to rumours regarding side effect of vaccination** | 1 | 5 |
| **Father's alcohol addiction** | 1 | 5 |
| **Not able to give any reason** | 2 | 10 |
| **Total[1]** | 20 | 100 |

[1]Two children have more than one reason

**Table 4: Comparison of MCV1 vaccine coverage as per present study with NFHS-3, DLHS-3 and AHS 2012-2013.**

| S No. | Survey type | MCV1 vaccine coverage |
|---|---|---|
| **1** | NFHS-3 (2005-2006) India | 58.8% |
| **2** | NFHS-3 (2005-2006) MP | 61.4% |
| **3** | DLHS-3 (2007-2008) Rural MP | 53.6% |
| **4** | DLHS-3(2007-2008) Rural Bhopal district | 56.5% |
| **5** | Annual Health Survey (2012-2013)-MP | 85.5% |
| **6** | Annual Health Survey (2012-2013) –Bhopal district | 87.4% |
| **7** | Present study | 92.4% |

The main reasons behind noncompliance to MCV1 vaccination as obtained by us were, unawareness about Universal Immunization Programme, no information about Measles disease and its complication, Away from home on the session day and distance of session site from home (Table 3).

We found a very high coverage of MCV1 vaccine (92%) in rural area of Bhopal district in comparison of AHS 2012-13 (87.7%), NFHS-3 MP data (61.4%) and DLHS - 3 rural Bhopal coverage(56.6%) (Table 4).

## DISCUSSION

In 2010 the World Health Assembly set 3 milestones towards global measles eradication, implemented through GMRS plan 2012-2020.[9] First one was to increase in routine coverage with the first dose of MCV1 for children aged 1 year to ≥90% nationally and ≥80% in every district. In the present study, the vaccination coverage reflects that 92 % of the children are vaccinated with MCV1 which is more than the milestone set by WHO-GMRS plan. MCV1 coverage was also found to be high (92 %) as compare to AHS 2012 (87.7%), NFHS-3 (61.4%) and DLHS -3 data of rural Bhopal district (56.6 %).[6,10,11] Sivasankaran et al in Tamilnadu also found high coverage (97.7%) of MCV1 vaccine similar to our study.[12] Kadri et al in Ahmedabad and Sharma et al in Mumbai found 71.7% and 87.6% MCV1 vaccination coverage respectively which was less than our study findings.[13,14] Studies done by Sharma et al in urban slums of Mumbai and Kumar et al in north India showed significant association between MCV1 vaccination status and place of delivery similar to our study findings.[14,15] Studies conducted by Kar et al in New Delhi and Nath et al in Lucknow showed that the major causes for incomplete immunization were illness of child, unawareness of UIP, and visit to native place, similar to our findings.[16,17] Studies by Mathew et al in New Delhi and Karinaganavar et al in Kerala, reported that distance of session site from home was the main reasons of non-immunization as we found in our study.[18,19]

## CONCLUSION

We found high measles vaccination coverage in the field practice area as compared to other surveys. The main reasons behind noncompliance to MCV1 vaccination as obtained by us were, unawareness about Universal Immunization Programme, no information about Measles disease and its complication, Away from home on the session day and distance of session site from home

### *Recommendations*

In order to achieve 100 % MCV1 immunization coverage vaccination facility should be provided to the population as near as possible. As people are still not aware about measles and its complications, health education regarding vaccine preventable diseases should be provided through ASHA in the rural areas. Health education to mothers should be given at every interface with health facility like ANC visits, PNC visits, immunization visits and in under-five clinics regarding vaccine preventable diseases.

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