International Journal of Community Medicine and Public Health
Kambale S et al. Int J Community Med Public Health. 2026 Dec;13(12):xxx-xxx
https://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20264251

Original Research Article

Assessment of progress of measles and rubella elimination strategies in the selected high-risk areas of Chikkamagaluru district in Karnataka: a cross-sectional study

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Received: 15 October 2026
Revised: 06 November 2026
Accepted: 12 November 2026

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ABSTRACT

Background: Measles and rubella (MR) vaccination coverage and MR surveillance was affected by the impact of Covid 19 pandemic mainly in the year 2020 and 2021. Strategic plan for measles and rubella elimination and sustenance in the world health organization (WHO) south East Asia region 2024-2028 aims at achieving and sustaining the Measles and rubella elimination. The objective: is to assess vaccination coverage of Measles and Rubella (MR) vaccine, pentavalent vaccine, fractional-IPV among the children from 1 to 5 years of age and to assess the critical gaps to achieve measles rubella elimination in the high-risk areas.
Methods: A cross-sectional study was conducted among children age group 1 to 5 years in the selected high-risk areas in Chikkamagaluru district for measles rubella (MR) elimination gap assessment. The data was collected by house-to-house visit using pre-tested semi-structured questionnaire. Study was conducted for a period of three months. Cluster sampling technique was used. The sample size was 180 children. Inferential statistics were used for data analysis.
Results: Coverage of 1st dose of MR vaccine was 98.8% whereas the coverage of 2nd dose of MR vaccine was 94.6 %. Coverage of 3rd dose of fractional IPV was 47.8%. The main reason for missing 3rd dose of fractional IPV was unavailability of fIPV (74.5%).
Conclusions: The vaccination coverage of 2nd dose of MR vaccine was 94.6 %. Planning level assessment found to be satisfactory.

Keywords: Measles and rubella vaccine, Elimination, Coverage, Assessment, Children

INTRODUCTION

Strategic plan for measles and rubella elimination and sustenance in the World Health Organization (WHO) south East Asia region 2024-2028 aims at achieving and sustaining the measles and rubella elimination.[1] According to the Road map to measles and rubella elimination in India, the Strategic objectives are to achieve at least 95% vaccination coverage, sensitive case based MR surveillance, zero dropout rates and zero incidences of measles and rubella in India.[1]

Measles and rubella (MR) vaccination coverage and MR surveillance was affected by the impact of Covid 19 pandemic.[2] Karnataka is ambitious to achieve the goal of MR elimination. As per Health management and information system (HMIS), the first dose coverage of MR vaccine given at 9 months is 95% and second dose

coverage of 93% with district variance. To achieve and maintain non-measles non-rubella (NMNR) discard rate, above the recommended benchmark across state incessant review and timely evidence-based interventions in improving antigen coverage and towards sustaining the surveillance sensitivity.[3] Despite timely and focused measures, several blocks continue to report high load of measles and rubella cases which is of primary concern. The vaccination coverage of MR-2 vaccine was decreased to 86% in the year 2021 and improved to 94% in the year 2023.[3]

The first cause for the child fatality before the vaccination era was measles. The WHO's five strategic plans for measles-rubella elimination include 95 % two-dose vaccination coverage and sensitive case-based surveillance.[4] By the year 2030, end preventable deaths of newborn babies and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births.[5]

In Indonesia, the suspected cases of Measles and rubella are identified within one surveillance system based on the clinical symptoms.[6] Measles and rubella were eliminated by using second-dose schedule in Sri Lanka, Maldives, Bhutan, Timor-Leste and North Korea.[7] Assessing the health and economic impact of disease on a given population is the first step towards prioritization and adoption of appropriate vaccination policies and disease control strategies. Karnataka state reported measles cases and rubella cases in the recent years.[8] So, this study was conducted for assessment of MR vaccination coverage and critical gaps in MR elimination strategy

METHODS

A community based cross sectional survey was conducted among the children in selected high-risk area of Chikkamagaluru district. This study was done for the duration of three months from May 2024 to August 2024.

Sample size calculation

A study conducted by N. R. Ramesh Masthi in Karnataka reported that 87.6% of individuals were immunized with the Measles-Rubella vaccine. Taking this as a reference, at a 95% confidence level and an absolute precision of 5%, the estimated sample size was calculated to be 167. Assuming a 10% non-response rate, the final required sample size to conduct the study was 180.

The sample size was calculated using the formula:

$$n = (Z^2 \times p \times q) / d^2$$

Where: Z=1.96 (at 95% confidence level), p=0.876 (87.6%), q = 1−p =0.124 and d=0.05 (5% absolute precision)

Substituting the values:

$$n = (1.96 \times 1.96 \times 0.876 \times 0.124) / (0.05 \times 0.05)$$

$$n = 0.417 / 0.0025$$

$$n = 166.8 \approx 167$$

For considering the non-response rate the final sample calculated was 180 children

Sampling technique/method

Cluster sampling

Inclusion criteria: Children 1-to-5-year age group in the high-risk areas of Chikkamagaluru district were included in the study.

Exclusion criteria: Children with severe illness and children on medication for their health conditions were excluded from the study.

Method of data collection

This study was done in the in the high-risk areas of Chikkamagaluru district. Study place is primary health care centres in Chikkamagaluru district. In the high-risk areas, the total five primary health care centres (PHCs) were included in this study. The five PHCs are Amble, Kaimara, K. R. Pete, Mallanduru and UPHC-A Chikkamagaluru. The villages surveyed were Amble (under the PHC Amble), Channagondanahalli and Ramanahalli (under the PHC Kaimara), Malaluru, Mugalavalli (under the PHC K. R. Pete), Sweepers colony, Shantinagara (under the UPHC-A Chikkamagaluru).

The list of all children in the selected villages was prepared with the help of health workers. The villages were selected by using simple random sampling method. The informed written consent was obtained from the children's parents. The pretested semi-structured questionnaire was used for data collection by house-to-house visits. The demographic details of children and parents were noted. Immunization history was recorded in the study Performa. The source of health information like mother card, neonatal intensive care unit (NICU) discharge card and hospital discharge cards were also used for collection of immunization history.

Statistical analysis

Statistical analysis of the data will be performed using IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY). Demographic data and descriptive statistics will be presented using frequency, percentage, mean, and standard deviation. Association will be performed using chi square test. A p-value < 0.05 will be considered statistically significant.

RESULTS

A cross-sectional study was conducted among the 180 children in the selected high-risk areas of chikkamagaluru district. Among total 180 children, 104 (57.8%) were females and 76 (42.2%) were males. Mean age of children was 28.81+12.04 months. Majority of the children 78 (43.3%) belonged to class 3 socioeconomic status followed by 56 (31.1%) class 2, 26 (14.5%) class 4 and 20 (11.1%) belonged to class 1 SES according to Modified BG Prasad SES classification.

The vaccination coverage of 1st dose of MR vaccine was 98.8% whereas the coverage of 2nd dose of MR vaccine was 94.6 % (n=150). Coverage of all three doses pentavalent vaccine was 100% and Coverage of 1st and 2nd dose of fIPV was 100%. Coverage of 3rd dose of fractional IPV was 47.8%. The main reason for missing 3rd dose of fractional IPV was unavailability of fIPV (74.5%).

Among the total 180 children, 72 (40%) belonged to the 1 to 2 years of age group among which, 44 (61.1%) received the 3rd dose of fractional injectable polio vaccine (fIPV) in time whereas it was delayed vaccination in 28 (38.9%) children. Among the total 180 children, 108 (60%) belonged to the age group of 2 to 5 years, among which fIPV vaccination was delayed for 66 (61.2%) of the children. Reason for missing Fractional IPV-3 were Vaccine unavailability (74.5%), minor illness (8.4%) fear of after-effects of vaccination (6.4%), unaware of when and where to go for vaccines (6.4%) and unaware of missed dose of vaccine (4.3%) (Table 1).

Among the total 150 eligible children for MR vaccination, majority of them 62 (41.3%) belonged to the class III socio-economic status among them, 58 (93.5%) taken the 2nd dose of MR vaccine and 4 (6.5%) of the children were not vaccinated with the MR vaccine. Among the total 150 eligible children for MR vaccination, 19 (12.7) children were belonged to the class I socio-economic status among them, 18 (94.7) of the children taken 2nd dose of MR vaccine. In this study, 22 (14.6) belonged to class IV socio-economic status among them 20 (90.9) have received 2nd dose of MR vaccine (Table 2). Reasons for missing MR1/MR2 vaccine were unaware of missed dose of vaccine (40%), fear of after-effects of vaccination (20%), unaware of when and where to go for vaccines (20%) and minor illness (20%).

In our study, majority of the parents 63 % visited to the government hospitals for seeking health care for children developed fever with rash, whereas 29% of the parents met the local health workers for the care for the children fever with rash. Only 8% of the participants seek health care from the private hospital (Figure 1).

Health staff and ICDS staff were the major source of information [136 (75.5%)] to the parents regarding the MR vaccination to the children. social media and print media were the source of information regarding the MR vaccination to the 14 (7.8%) of the parents. only 12 1(6.7%) of the parents were got information from the private practitioners about the vaccination (Figure 2).

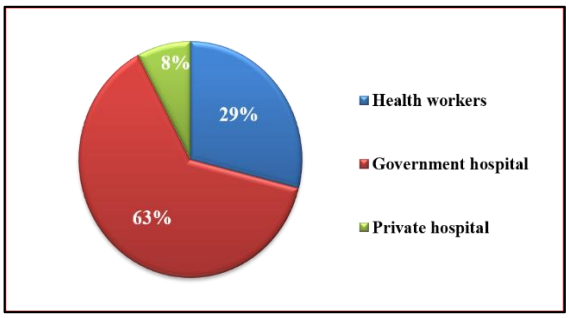


Figure 1: Health seeking behaviour of parents in case of child develop fever with rash (n=180).

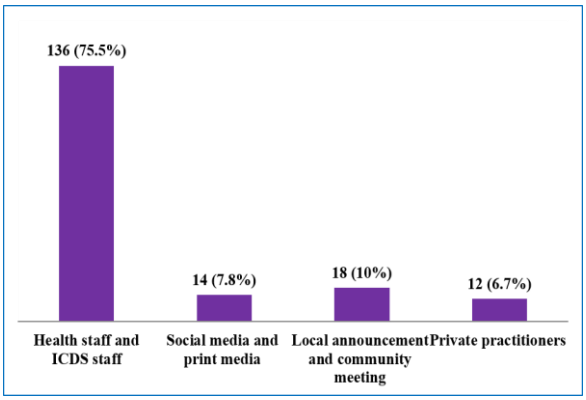


Figure 2: Source of information for parents about child's vaccination (n=180).

The interview was done among the 35 health workers to find out the reasons for delaying the MR vaccination to the children. Health workers told that the most common reason for delaying the vaccination was lack of awareness [16 (45.7%)] regarding the vaccination and 11 (31.4%) of the health workers said that fear of after effects of vaccination to the children. For delaying the vaccination, 3 (8.6%) of the health workers told that, the vaccination is not a priority as per the parents of the children (Figure 3).

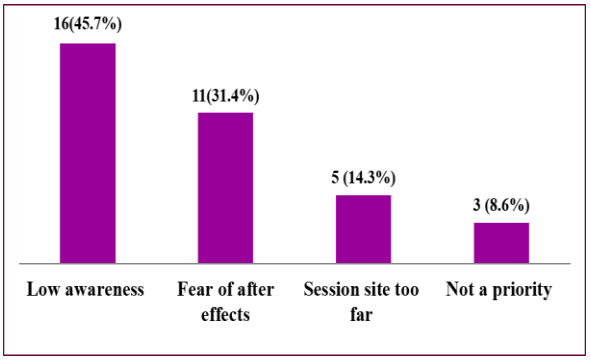


Figure 3: Reasons for children delaying vaccination according to health workers (n=35).

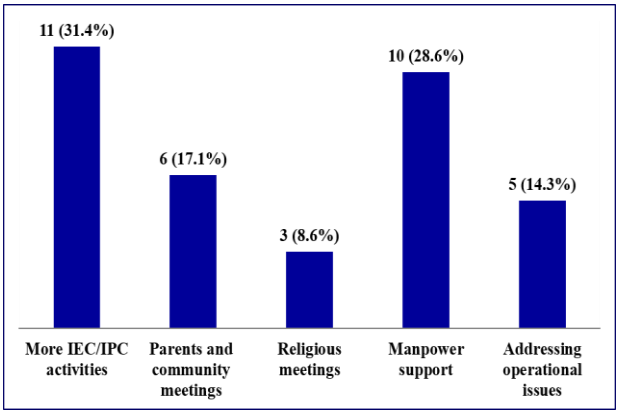


Figure 4: Suggestions given by health workers for improving vaccination services at field level (n=35).

Among the 35 health care workers, 11 (31.4%) of them told that, more information, education communication (IEC/IPC) activities are required to improve vaccination services at field level and 6 (17.1%) of the health care workers said that a greater number of parents and community meetings will help in improving the vaccination coverage at field level. Among 35 health care workers, 10 (28.6%) of them told that, increasing the number of health care workers (health man power support) will help in improving the vaccination coverage. Addressing the operational issues will improve the vaccination coverage according the 5 (14.3%) health care workers (Figure 4).

Assessment showed that all the health care workers had training on RI handbook, aware about RI monitoring formats, conducting convergence meeting with ICDS, urban local bodies (ULB), panchayat raj (PRI), RI micro plan was available, Head count survey done in last 6 months (Table 3). Total 5 PHC were assessed, all necessary registers such as surveillance tracking register, AEFI register, lab confirmed MR case reports, vaccine stock register and cold chain register were maintained.

Table 1: Vaccination coverage of 3rd dose of fractional-IPV.

Age group of children (years)	3rd dose of fractional injectable polio vaccine (fIPV)		Total (%)
	Received (%)	Delayed (%)	
1 to 2 years	44 (61.1)	28 (38.9)	72 (40)
2 to 5 years	42 (38.8)	66 (61.2)	108 (60)
Total	86 (47.8)	94 (52.2)	180

Table 2: Distribution of children according to 2nd dose of MR vaccination and socioeconomic status (Modified B. G. Prasad classification) (n=150).

Socioeconomic status (SES)	MR-2nd dose vaccination		Total (%)
	Yes (%)	No (%)	
I	18 (94.7)	1 (5.3)	19 (12.7)
II	46 (97.9)	1 (2.1)	47 (31.4)
III	58 (93.5)	4 (6.5)	62 (41.3)
IV	20 (90.9)	2 (9.1)	22 (14.6)
Total (%)	142 (94.6)	8 (5.4)	150

Table 3: Planning level assessment among health care workers (n=35).

Assessment among health care workers	Yes (%)	No (%)
Aware of case definitions of measles and rubella	32 (91.4)	3 (8.6)
Serology sample collection period	28 (80)	7 (20)
Importance of vitamin A administration	31 (88.6)	4 (11.4)

DISCUSSION

A cross-sectional study was conducted among the 180 children in the selected high-risk areas of chikkamagaluru district. Among total 180 children, 104 (57.8%) were females and 76 (42.2%) were males. Mean age of children was 28.81±12.04 months. Majority of the children 78 (43.3%) belonged to class 3 socioeconomic status according to Modified BG Prasad SES classification. In a study conducted by Kumar A et al among total children, 52.3% were boys and 47.7% were girls.[9]

In our study, the vaccination coverage of 1st dose of MR vaccine was 98.8% whereas the coverage of 2nd dose of MR vaccine was 94.6 % (n=150). Coverage of all three doses pentavalent vaccine was 100% and Coverage of 1st and 2nd dose of fIPV was 100%. Coverage of 3rd dose of fractional IPV was 47.8%. The main reason for missing 3rd dose of fractional IPV was unavailability of fIPV (74.5%). Kumar et al conducted a community based cross sectional study for a period of one month among parents of beneficiary children in 312 households of the study population.[9] Total 312 families were covered consisting 578 children. Coverage of MR vaccine was

97% as compared to the MR vaccination coverage was 98.8% in our study.

A study conducted by Ramesh et al found lower coverage of MR vaccination (87.6%) as compared to the results of our study (98.8% MR vaccination coverage).[10] In a study conducted by Newtonraj et al among the total 420 children, also found lower MR vaccination coverage (90.5%) as compare to the MR vaccination coverage (98.8%) in our study.[11] A study done by Bahl S et al showed that, the unexpected occurrence of COVID-19 pandemic impacted vaccine coverage and quality of surveillance, thereby delaying achievement of the goal and necessitating a revision of the target date of MR elimination.[12]

A study conducted by Uddin et al found that, the MR campaign achieved high coverage despite relatively low level (23%) of interpersonal communication with caregivers through registration process.[13] Child registration was associated with higher MR coverage. Children of parents with primary or secondary or higher education had higher coverage compared to children of parents with no formal education. Most caregivers told that, the MR campaign helped in vaccination for the children not previously vaccinated. Priyadharshini et al conducted a cross-sectional study showed the vaccine coverage among the 616 children surveyed was 80.2% as compared to vaccination coverage (98.8%) in our study.[14] A cross sectional study conducted by Joe et al among 147 children showed that, the coverage of measles vaccination by routine immunization and the MR campaign was 93.9% and 86.4% respectively.[15]

In our study, majority of the parents 63 % visited to the government hospitals for seeking health care for children developed fever with rash, whereas 29% of the parents met the local health workers for the care for the children fever with rash. Only 8% of the participants seek health care from the private hospital. Health staff and ICDS staff were the major source of information (75.5%) to the parents regarding the MR vaccination to the children. social media and print media were the source of information regarding the MR vaccination to the (7.8%) of the parents. only (6.7%) of the parents were got information from the private practitioners about the vaccination. A study done by Kumar et al showed that, the majority of the families (88%) had heard about the MR campaign.[9] They had received information mainly from the health workers (50%) and school authorities (43.3%). Around two thirds of them (66%) had received the MR campaign invitation card.

A study done by Newtonraj et al shown that, the most of the people came to know about the MR vaccination through auxiliary nurses and midwives, followed by school teachers.[11] The main reasons for not getting vaccinated were fear of an adverse event following vaccination or fear of injection. Reasons for not getting vaccinated were significantly associated with usage of smart phone by at least one of the parents, better literacy level among mothers and poor literacy level among fathers. Kumar et al conducted a study shown that, the 5% of children had minor side effects, fever (89%) was the most common side effect. among total children, 88.1% (275) of the families studied knew about the MR campaign while only 267 (85.6%) actually received the MR vaccine.[9] Among those who were not vaccinated 3% nearly half of them (44%) were not aware of ongoing MR campaign and 22% as per physician's advice.

In a study conducted by Ramesh et al shows 12.4% remained unimmunized, the reasons given being absence, ignorance or refusal because of rumours concerning side-effects.[10] In addition the spatial mapping is a useful tool for measurement of coverage of a vaccination campaign. There was no clustering of unimmunized subjects observed on spatial mapping. In our study, the reasons for missing MR1/MR2 vaccine were unaware of missed dose of vaccine (40%), fear of after-effects of vaccination (20%), unaware of when and where to go for vaccines (20%) and minor illness (20%). The reasons for missing Fractional IPV-3 were Vaccine unavailability of the vaccine (74.5%), minor illness (8.4%) fear of after-effects of vaccination (6.4%), unaware of when and where to go for vaccines (6.4%) and unaware of missed dose of vaccine (4.3%).

In our study, the interview was done among the health care workers found that, lacks of awareness regarding the vaccination and fear of after effects of vaccination to the children were the most common reason for delaying the MR vaccination. For delaying the vaccination, the health workers told that, the vaccination is not a priority as per the parents of the children. In the study conducted by Priyadharshini et al the Barriers reported among the unimmunized participants were rumours of adverse effects (47.5%), fear of adverse effects (53.3%), and no faith in immunization (18.9%).[14] Risk factors for vaccine refusal included female child, Children not attending school, Mothers with higher education. A study done by Joe et al showed that, the most common reason for not being vaccinated was lack of unawareness about the campaign and the location for vaccination which could have been curbed by health education.[15] While communication with field workers was significantly associated with both routine immunization and the MR campaign, religion and mother's educational status were associated with MR campaign.

In our study, 11 (31.4%) of the health care workers told that, the more information, education communication (IEC/IPC) activities are required and 6 (17.1%) of the health care workers said that a greater number of parents and community meetings will help in improving the vaccination coverage at field level. In our study, we found that, there is shortage of health man power at field level. Increasing the number of health care workers and addressing the operational issues will improve the vaccination coverage according the health care workers.

Priyadharshini et al conducted a study showed that, the factors that motivated acceptance of vaccine among the immunized participants were easy access to immunization (85%), support and motivation from school teachers (41.1%) and community level health workers (25.5%).[14] Study conducted by Verger et al showed that, the MR vaccination system's performance for MR vaccination is reduced by the vulnerable coordination functions between programs and other health workers.[16] The role of private sector was vital for the surveillance reporting the cases of Measles and rubella especially in the sub-district level. Verma et al done a study showed that, the second dose of MR vaccine administration was resulted in seroprotection against rubella and measles of all children.[17]

Assessment showed that all the health care workers had training on RI handbook, aware about RI monitoring formats, conducting convergence meeting with ICDS, urban local bodies (ULB), panchayat raj (PRI), RI micro plan was available, Head count survey done in last 6 months. Total 5 PHC were assessed, all necessary registers such as surveillance tracking register, AEFI register, lab confirmed MR case reports, vaccine stock register and cold chain register were maintained. Cross-sectional study conducted by Sylvia et al found that, there is no PHC used the system to make decisions regarding MR vaccination.[18]

The surveillance system contains structural weaknesses in networks and partnerships because of the minimal involvement by the private health facilities and community. Timeliness completeness, accessibility and flexibility were limited. Salsman et al conducted a study showed that, the community's measles-rubella CDC program is not included in PHC-trained health volunteers' training materials.[19] It shows weak dissemination and coordination partnership functions.

The limitation of this study is that, the detailed planning level assessment was not done and total five primary health care centres (PHCs) were included for the planning level assessment.

CONCLUSION

The vaccination coverage of 2nd dose of MR vaccine was 94.6 %. The vaccination coverage of 3rd dose of fractional IPV was 47.8%. Main reason for low coverage of fIPV-3 was unavailabity of vaccine. The main reasons for missing MR vaccination were low awareness, fear of after effects of vaccination and session site too far. Planning level assessment found to be satisfactory.

ACKNOWLEDGEMENTS

The authors sincerely thank all the mothers and children for their consent, cooperation for this research study in the high-risk areas of Chikkamagaluru district.

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

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Cite this article as: Kambale S, Kothalguthu S, Badiger S. Assessment of progress of measles and rubella elimination strategies in the selected high-risk areas of Chikkamagaluru district in Karnataka: a cross-sectional study. Int J Community Med Public Health 2026;13:xxx-xx.