

LETTER TO THE EDITOR

Measles in India: Challenges & recent developments

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Measles is an infectious disease caused by Morbillivirus, with a secondary attack rate in excess of 80%, that usually affects children (1). However, multiple outbreaks of the disease have even been reported among adults in heterogeneous settings (urban areas, university campuses, disaster sites, during international travel, etc.) (2–5). The disease is characterized by the presence of fever, cough, and coryza, followed by the appearance of a typical rash (1, 6). 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 (1, 2, 6, 7).

Estimates of measles-related deaths have been considered a crucial indicator to evaluate the progress of any nation towards measles elimination (8). 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 (7). Study findings have indicated that more than 50% of the global measles-associated deaths were reported in India alone (9, 10). Another systematic review of studies in 12 Indian states published over four decades revealed that the median case fatality ratio was 1.63% (8). Furthermore, the higher case fatality ratio was reported among under-five children and children from the backward class (11).

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 $\geq 90\%$ at the national level and $\geq 80\%$ 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 (12, 13). Despite the presence of these effective strategies, the Indian District Level Health Survey–3 reported that only 30% of vaccinated infants received the measles vaccine at the recommended age of 9 months (14).

A critical evaluation of the current strategies and their implementation in the field suggests that poor coverage of measles or high case fatality rate can be attributed to

various existing shortcomings or barriers. These barriers include sociodemographic parameters (e.g. higher birth order, low family income, lower parental education, Muslim religion, poor knowledge of measles and the measles vaccine, limited public demand for and confidence in vaccines, etc.); challenges faced by difficult-to-reach areas; inadequate infrastructure, manpower, and communication; faults in vaccine storage, transport, and cold chains; defective surveillance activities for reporting of adverse events following immunization and for outbreak response; and issues with the biomedical waste disposal system (4, 12, 13). Because some of the states and union territories had poor measles coverage, they required a catch-up immunization campaign, in contrast to the states with better coverage where there was need to strengthen only routine immunization services (12). In addition, in most regions of the nation, the virologic surveillance data are often incomplete (to date the measles virus genotypes D4, D7, D8, and B3 have been isolated in India) (15–17).

In addition, the findings of cohort studies have indicated the significance of waning of immunity (i.e. protective level of antibodies) over a period of time after receiving the vaccine (18, 19). In fact, it has been shown that the levels of antibodies developed in response to the vaccine decline at a much faster rate than when naturally acquired (18). Further, the ability of maternal antibodies to respond to measles virus often interferes with seroconversion after vaccination (20). Hence, the age at which the measles vaccine should be administered is debatable among most developed nations, where measles-related morbidity/mortality is rare in infants; these nations prefer an older age (12–15 months) for vaccination, so that any interference from maternal antibodies can be neutralized (20, 21). However, this is not possible in low-resource settings, where a large number of measles-associated deaths occur in infancy itself, and hence the vaccine is administered at an age of less than 9 months (20, 21).

Until 2008, India was the only nation among the 193 member nations of the World Health Organization (WHO) to make provision for only a single dose of measles vaccine in their national immunization schedule, whereas all other nations opted for two doses of measles vaccine (22). In fact, in case-based measles surveillance in Pune, it was observed that, in approximately 40% of confirmed measles cases, the patient acquired the disease despite being immunized with one dose of measles vaccine; thus a

single dose of measles vaccine was insufficient to protect the general population (23). Eventually, in response to the recommendations made by the Indian National Technical Advisory Group on Immunization and the findings of other studies, the government of India introduced a recommendation for a second dose of measles in late 2010 for all children between 16 and 24 months of age (12, 24, 25). The program managers agreed to the second dose in the national immunization schedule because it can impart additional immunity to measles to children under age five and thus improve the mortality indicators in children (26).

Policy makers and professional bodies have acknowledged the presence of various challenges and hindering factors; they are working in a concerted manner to improve all components of the measles immunization program (infrastructure support, manpower and other resources, laboratory assistance such as virological surveillance, the importance of continued surveillance, etc.) (4, 14, 17, 24). However, a mechanism should be developed to obtain an accurate estimate of the vaccine coverage across the nation (12). This mechanism essentially requires continuous support, monitoring, and guidance from policy makers and concerned stakeholders to streamline the entire process. In addition, sensitizing health professionals to the need to conduct measles outbreak-based surveillance in all of the states and union territories of India can also assist in reducing the incidence of the disease (27). Further, crucial evidence can be obtained by undertaking case-based measles surveillance activities across all settings using the standardized guidelines proposed by the Government of India (23, 28).

On the basis of other corrective measures and the introduction of a second dose of measles vaccine, India is hoping to accomplish the goal of measles elimination by the year 2020, along with other member states of the South-East Asia Region of the WHO (26, 29). In fact, the different regions of India generally face a wide range of challenges, resulting in less than 80% coverage in 14 states (where the second dose was thus introduced through catch-up vaccination campaigns), whereas the remaining 21 states had better coverage, and hence the second dose was introduced only for children in the 16–24 months age group through routine campaigns (12). Although no recent estimate is available to confirm a significant decline in the incidence of measles following the introduction of the second dose of measles, on a global scale, a 74% reduction was observed in measles-related deaths between 2000 and 2007 (24, 26). Further, significant improvement in vaccination coverage, especially with the first dose of measles, has been observed in India (12). In addition, the Indian Academy of Pediatrics have advocated for the elimination of not only measles, but also of mumps and rubella, as effective measles-rubella or

measles-mumps-rubella vaccines are available at an affordable price (12, 30).

To conclude, in order to achieve the nation's goal of measles elimination and bring about a significant reduction in measles-related deaths, the need of the hour is to maintain a high level of immunization coverage for the measles vaccine and to strengthen all the integral components of the national immunization program.

Keypoints

1. Policy makers should take all possible measures to maintain a high level of measles coverage so that the disease can be eliminated in the near future.
2. Public health authorities and other agencies should enhance the public's understanding of different aspects of measles to increase acceptance of the vaccine.

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