Elimination of measles from India: Challenges ahead and the way forward

Despite the safe and effective measles vaccine being available and despite efforts put in by various stakeholders over the past few decades, measles continues to kill 360 children every day worldwide.\[1\] The idea of controlling and eliminating measles (which was killing over 65000 children annually) was mooted in the 1980s, soon after the eradication of smallpox.\[2,3\] However, the World Health Organization (WHO) accorded a higher priority to eradication of poliomyelitis than that of measles. Measles elimination came to the fore again in the year 2000 when the number of polio cases dwindled enormously and “world without polio” appeared to be just around the corner.\[4\] Since 2000, the WHO has been setting targets to decrease measles-related morbidity and mortality. Although, these set targets were not achieved due to gaps in immunization; the measles elimination and control programs saved millions of lives by preventing life-threatening complications and sequels (such as bronchopneumonia, severe acute malnutrition, military tuberculosis, keratomalacia, and subacute sclerosing panencephalitis) in several more children through enhanced immunization coverage.\[4,7\] The world has now pledged to eliminate measles in five of the six WHO regions by 2020.\[6,8,9\]

Elimination of measles from a region or country entails the cessation of indigenous transmission of measles that has been sustained for at least 36 months after the last reported indigenous measles case in the presence of a high-quality epidemiological surveillance (that is sensitive and specific enough to detect imported and import-related cases) which is supported by a laboratory network.\[10\] Since human beings are the only hosts for the measles virus, measles can be eliminated by attaining and maintaining high population immunity (>95%). This can only be achieved by reaching 95% coverage with a measles-containing vaccine (MCV) in a country or a region.\[10\] Various strategies such as strengthening of routine immunization services to allow for all infants to receive all vaccines (including MCV1) at appropriate ages, providing a second opportunity of receiving a MCV to children who may have missed the first dose (by offering a MCV2) and organizing supplemental immunization activities (SIA) to increase the population immunity at a faster pace are being employed to achieve this high MCV coverage. It is also essential to have a sensitive epidemiological surveillance system that is backed by a laboratory network in place. The surveillance system helps rapid detection of acute cases so that postoutbreak actions (e.g., vaccination) can be initiated promptly\[11\] and the outbreak is controlled expeditiously. It tracks the progress toward elimination by observing changes such as reduced frequency, magnitude and spread of outbreaks and loss of seasonality of the outbreaks.\[12\] It provides early warning signals of increasing incidence in a community and helps identify groups (based on geographical, demographic, ethnoreligious, and other characteristics) that are more susceptible to develop measles; thereby prompting appropriate corrective measures. The laboratory network ensures that definitive diagnosis is reached\[9\] and real incidence is known. The molecular studies provide clues about transmission and help determine if the indigenous transmission has ceased to allow verification of elimination.\[12\]

At this stage, it would be worthwhile looking at the measles picture in India, challenges faced and possible solutions. Although India initiated the Expanded Program of Immunization in 1978, measles vaccine was introduced in the national immunization program only in the year 1985, as a single dose for infants aged 9 months or above. The MCV1 coverage that was just 56% in 2000 climbed to 87% in 2015.\[13\] The National Family Health Survey-4 (2015–2016) has assessed it to be 81.1%.\[14\] This is low compared to the 95% coverage level required for elimination. In addition, the coverage is unevenly distributed with several large and populous states (provinces) such as Madhya Pradesh, Rajasthan, and Assam having MCV1 coverage that does not exceed 80%.\[15\] India was one of the last countries to introduce MCV2 in the national immunization schedule\[13\] and initially, this was implemented only in a few states. It was introduced in 21 provinces with good immunization coverage through routine immunization services and was offered to children aged 16–24 months. In 14 states, MCV2 was provided to 134 million children (age: 9 months – 10 years) through SIA.\[16\] Although not measles-centric, the Government of India’s recent initiative “Mission Indradhanush” launched on December 25, 2014, has concentrated on providing infant immunization in districts with poor vaccination coverage.\[17\]

The data clearly suggest that although India has taken several initiatives to protect its children and has made significant progress in decreasing measles incidence and related mortality...
and morbidity. Although these efforts have helped protect millions of children from measles, India still accounts for a significant proportion (estimated to be over 36%) of measles-related deaths in children. India achieved an estimated 51% reduction in mortality (2000–2015) as compared to that achieved in African (85% reduction), Western Pacific (80% reduction), European (79% reduction) regions and in South-East Asian region excluding India (91% reduction).6-8,18,19 However, the pace of this progress will have to be greatly enhanced, if our country has to eliminate measles by 2020. Furthermore, due to the sheer number of children in India, our efforts are of great consequence to the world’s progress toward measles elimination.

We will try to summarize some of the ways India can scale up its progress toward measles elimination:

**Achieving High (at least 95%) Population Immunity against Measles**

Universal implementation of the recently introduced MCV2 will give children one more opportunity to get vaccinated. The efforts for informing, educating and motivating communities and parents have to be much greater than that employed for polio eradication as measles vaccine will not be given at the doorstep, and it will be administered as an injection, which is considered as unpleasant. Hence, the government and voluntary organizations will be required to run a sustained media campaign regarding the essentiality of the measles vaccine. Such campaigns will have to be further scaled up when SIAs are being planned. Children over the age of 24 months should be routinely checked for missed vaccinations.20 It would be advisable to recommend multiple “checkpoints” (say, at school-entry, at high-school entry) wherein the child’s documented vaccination status against measles can be ascertained and parents of nonvaccinated children offered focused motivation to vaccinate.

Epidemiological surveillance system will identify vulnerable populations, and SIA would be required to enhance MCV-coverage for these groups. It was observed that SIA organized through 2013, faced certain challenges like a few schools not welcoming the campaign vaccinators, deficiencies in mobilizing parents and communities, and shortage of supplies.21 These should be anticipated and addressed through better planning (e.g., accurate forecasting of demand for vaccines, injection equipment, and supplies at various levels, building and maintaining infrastructure for cold-chain maintenance at sites and during transport).11 Enhanced communication with all the stakeholders (including school authorities, community representatives and parents) and better-quality management of logistical issues. Only through these coordinated actions, can we hope to increase the efficiency and reach of the SIAs from the current levels of 87%–92%.11 Communicating safety of the vaccine should also be a part of the motivational exercise. In today’s world dominated by social media, providing misinformation and spreading rumors are quite common and are easily accomplished.22 The administrators and other stakeholders should be alert to this possibility and should respond to such disruptive acts with alacrity. Investment in education about the need for MCV and advocacy programs is mandatory. Although, the anti-vaccine lobby is not as strong as in many Western countries, the possibility of ill-informed activists and organizations revisiting the supposed (and discredited) link between rubella vaccine and autism and starting such a “false information” campaign cannot be ruled out. Such campaigns can create doubts in the minds of uninformed parents and can discourage them from vaccinating their children. This issue is extremely pertinent since in India the measles-rubella (MR) vaccine is to be used as the MCV uniformly.

Although the healthcare needs of the needy and the under-privileged are largely satisfied by the public sector, private sector contributes significantly in providing healthcare to other sections of the society in India. Hence, coordination with general practitioners and pediatricians working in the private sector and their professional organizations (such as the Indian Medical Association and the Indian Academy of Pediatrics) is important. These organizations can appreciably help augment immunization coverage and advocate measles vaccine to families who may be considering measles as an inconsequential illness.

Implementation of immunization programs needs financial resources. It is estimated that India will require US$449 million for implementing SIA, routine immunization and MR surveillance over 2013–2020.11 Resources would also be required for imparting public education, promotional activities, strengthening health systems, improving surveillance and laboratory networks and conducting research to identify and overcome hurdles for achieving high vaccination coverage.6

Certain populations present difficulties in ensuring high vaccination coverage. Migrant populations are one such population and with inequality of economic activity and job opportunities. It is not uncommon for people from some areas to migrate from their native lands to other locations in search of farm- or factory-jobs. SIAs for migrant populations at appropriate locations and seasons will be helpful. Those populations which are shunning measles vaccination based on cultural or religious beliefs need to be tackled by providing the right information. As surveillance activities expand and get coordinated, new vulnerable groups will get identified, and strategies will have to be evolved and modulated to improve vaccination coverage in them.

Sustaining routine immunization program requires political commitment at all levels, financial resources, efficient program management and favorable economic, social, and legal environments.10 It is heartening to note that the recently unveiled National Health Plan 201721 emphasizes the importance of universal immunization and stresses on the continuation of efforts to take the past achievements forward. It promises to increase spending on health to increase from 1.15% of gross domestic product (GDP) to 2.5% of GDP over the next 8 years. It is hoped that such augmented internal resources along with financial support from international agencies and organizations will ensure that there would be no
shortage of resources for supporting immunization activities. Research should be an integral part of the program, as it can help devise effective strategies and innovative interventions for tackling vexed issues such as risk factors for outbreaks after SIA campaigns, transmission patterns, role of high-risk groups (including marginalized groups and migrants) in sustaining measles transmission, evaluation of different measles outbreak responses, and operational shortcomings in the program.[11]

**Develop and Sustain Case-based Surveillance Systems**

The importance of high quality sensitive case-based surveillance for providing early warning signs, identifying high-risk locations and populations, and determining progress toward elimination cannot be over-emphasized. Serological surveillance is another potentially important but under-utilized tool. It supplements the epidemiological data and helps indicate the problem areas (e.g., locations and communities not serviced by healthcare programs, individuals who refuse vaccination on religious or superstitious grounds), identify the susceptible age groups (e.g., older children and adolescents, when younger children are immunized) that should be prioritized for catch-up immunization campaigns and evaluate the contribution of campaigns in enhancing population immunity.[9,24,25] The Indian health-care set has managed acute flaccid paralysis surveillance efficiently, indicating that our motivated and trained health-care workforce can perform this job effectively. However, measles being a different disease, they will need to be trained in case detection and epidemiological investigations including retrospective case review and establishment of epidemiological linkages.

**Develop, Maintain and Strengthen an Accredited Measles Laboratory Network**

India has over 11 laboratories that are part of the WHO’s Measles Laboratory Network.[26] The National Institute of Virology, Pune is recognized as one of the WHO Reference Laboratories which undertakes measles virus sequencing.[26] Laboratory-based confirmation of measles has begun only in 2015.[11] In 2015, samples of only 7279 out of 61255 (amounting to 12%) patients suspected to have measles were received and tested in the laboratories.[11] In the 2012–2015 period, B3, D4, and D8 genotypes have been detected in measles outbreaks.[11] There is a need to expand the laboratory network in India with appropriate and adequate training for the personnel involved. Establishing laboratory networks faces shortage of human and financial resources.[17] Once India accelerates its case detection and case-based surveillance systems, more serological samples will now be referred for laboratory confirmation of measles and will improve the much-needed surveillance.

**Conclusion**

India has done well to reduce measles cases and measles-related deaths over the past decades. With a policy framework in place, with MCV2 having been introduced in the national immunization schedule, with the process of strengthening of case-based surveillance systems progressing and with the establishment of national, sub-national, and reference laboratories; the basic structure for achieving elimination of measles from the country seems to be readying. However, as the deadline for achieving elimination of measles is <4 years away, India will have to expand many of its programmatic components at a much quicker pace.

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