

## Measles Epidemic in Pakistan: In Search of Solutions

The recent outbreak of measles in different areas of Pakistan has raised questions over its immunization program once again. The number of cases of measles in 2012 was reported to be 14,000 with 210 patients dying of it.<sup>[1]</sup> Unfortunately, due to a lack of proper surveillance infrastructure, the demographic statistics, including ages of the patients affected by measles in the current epidemic in Pakistan are unknown. This comes off as a major limitation to the accurate discussion of the current epidemic and its possible solutions. Being one of the only three countries of the world where polio is still endemic, Pakistan's immunization program is already a topic of much interest.<sup>[2]</sup> Measles is a highly contagious disease, mostly found in children, which was highly prevalent in the world until the introduction of its vaccine.<sup>[3]</sup> Epidemics of measles have become relatively uncommon since the introduction of its vaccine in the immunization program of World Health Organization (WHO). Statistics collected by the WHO showed that 84% of the children in the world received at least a single dose of measles vaccine.<sup>[4]</sup> In Pakistan, the measles vaccine is administered in two doses: At 9 months and 2 years of age.<sup>[5]</sup>

Failure of the Pakistani immunization program to control epidemics of measles may be attributed to corrupt practices, refusal of vaccination by the parents, influx of unvaccinated refugees, ongoing war in the Northern areas, political insurgency, security issues, inadequate awareness of health-care professionals regarding vaccination schedule, poor training regarding vaccine administration, and failure of the vaccine itself. Even though, attempts are being made to deal with each of these factors individually, efforts to evaluate and deal with the failure of the vaccine itself have not been seen. The fact that refusal of vaccination by the parents and inadequate permeation of the vaccination program to the public have major contributions in promoting measles epidemics is clear. However, there is some evidence that the rate of failure of the vaccine in Pakistan may be higher than is acceptable.

A study conducted in Karachi, the largest Pakistani city struck by the measles epidemic, showed the coverage of measles immunization program to be around 90% while that of the supplementary drive to be 3% of children from 1 to 5 years of age.<sup>[6]</sup> This is slightly more than the world average of 84%.<sup>[4]</sup> Further analysis in the study showed that 78% of the children

had received single measles vaccine while 12% of them had received both vaccines. However, the measles antibodies, which signify immunity against measles, were found in only 55% of the children. This shows that there is a large difference between the number of children who are vaccinated (90%) and the number of children who are actually immune to measles (55%). 58% of children who received a single measles vaccine showed measles antibodies while 64% of children who received both measles vaccines showed these antibodies. Even though, this study used recall by the parents as an indicator of whether the child had received the vaccine, but this is not as it may seem, an unreliable indicator. Studies evaluating the recall of parents regarding their children's vaccination have shown it to be a reliable measure.<sup>[7]</sup>

High rates of failure of measles vaccination have also been documented in other studies. In a study conducted in the Lasbela district of Pakistan, a vaccination failure rate of greater than 50% was found.<sup>[8]</sup> Even though, this study still demonstrated twice the risk of contracting measles in the unvaccinated children as compared to the vaccinated children, but in spite of this, the vaccination failure rate is extremely high. Such failure of the vaccine can be a result of problems at any stage from manufacturing to the actual administration of the vaccine. It is possible that incorrect administration of the vaccine by the untrained workers may lead to a decrease in the efficacy of the vaccine. However, further investigations are needed to confirm this.

There is also a possibility that the measles vaccine is being administered at the wrong time. Timing of any vaccine is decided on the basis of the duration of protection provided by the mother's antibodies to the child and the age of onset of susceptibility to the disease. It has been shown that mothers' antibodies provide protection to the child from measles for only the first 2.61 months after birth, after which the child is susceptible to developing measles.<sup>[9]</sup> Since, the first dose of measles vaccine is administered at 9 months of age, this would leave a few months in the life of the child where he is completely susceptible to contracting measles.

Considering that the coverage of measles vaccination program in Pakistan is greater than the world average, it seems likely that there are additional factors that are contributing to the inability to control the epidemics of measles. The factors discussed in this article suggest that even if full population coverage for the measles vaccine is achieved, Pakistan may still continue to be affected by measles epidemics. There is a need to assess the chain of handling the vaccine from manufacturing to the administration. Trials should be conducted to assess whether any additional benefit would be gained from administering the measles vaccine earlier in the childhood.

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While discussing the epidemic of measles, it is also noteworthy to discuss that the diagnostic criteria used for the diagnosis and surveillance of measles also needs improvement. Even though, a clinical suspicion is a good indicator of measles, it is strongly affected by the physician's experience and may easily be confused with other diseases causing rash and fever.<sup>[10]</sup> Laboratory diagnosis using serum Immunoglobulin M antibodies have a reported sensitivity of (83-89%) and specificity (95-100%) with imprecise positive and negative predictive values. In addition, the sample needs to be taken at appropriate timings after the appearance of rash in order to give reliable results.<sup>[11]</sup> Other techniques, such as reverse transcription polymerase chain reaction may be more sensitive, but are not available for field diagnoses. These limitations of the diagnosis of measles contribute a certain degree of uncertainty to the available statistics regarding the incidence of measles. In addition to ensuring that all diagnoses of measles are made according to the defined WHO standards, it is also the need of time to develop better, yet cheaper, diagnostic criteria for measles.

If measles is to be eradicated from Pakistan, the multifactorial determinants of the measles epidemic need to be understood and a multidimensional approach should be used to deal with each of the determinants. The answer would lie in the integrated enhancement of the provision of vaccination services to the public, augmentation of knowledge and awareness of the parents, motivating physicians to become advocates for the immunization programs, and involving all influential personnel and key stakeholders. Further research is needed to find out the root cause of the failure of vaccination in Pakistan and come up with the optimal time of administration of the measles vaccine. In addition, a highly efficient surveillance mechanism should be set up so more information on the population affected by measles can be obtained.

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