MEASLES, MUMPS AND HEARING LOSS IN DEVELOPING COUNTRIES

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Studies among deaf children in developing countries have implicated infectious and communicable diseases such as measles and mumps as notable aetiological factors.[1,2,3] This article describes the clinical features of these two conditions and the associated risks to hearing in early childhood. It also highlights necessary steps to address the disease burden in this region.

Measles

Measles is a highly infectious viral sickness which presents as an acute illness with high fever, running nose, characteristic Koplik's spots on the buccal mucosa and a distinctive generalised maculo-papular rash – large flat, red to brown spots that flow into one another and completely cover the skin (Figures 1A &1B).

Fig. 1 A: Severely ill 6 1/2 month-old infant, not yet due for measles vaccination, on the 2nd day of the eruptive stage with conjunctivitis, oral inflammation, aspiration pneumonitis, and generalised maculo-papular rash.

Photo: Bolajoko Olusanya

It occurs worldwide but its incidence has reduced significantly in developed countries since the introduction of an effective vaccine in 1968.

Measles is transmitted by droplet infection from the respiratory tract. It is predominantly a disease of infants and young children and occurs mostly after the age of 6 months. It also affects pre-school children but is rare in infants less than 6 months old because of protective maternal antibodies. In some developing countries, measles is endemic and occurs all year-round, but may show periodicity in late winter/early spring and during cold hammattan/rainy seasons in communities where poor housing conditions or overcrowding is widespread.

Where malnutrition is common, mortality from measles may be as high as 25%. Measles accounts for about 745,000 deaths annually, representing 50-60% of an estimated 1.6 million deaths attributable to vaccine-preventable diseases in childhood worldwide.[4] Globally, measles is the leading cause of vaccine-preventable child deaths. About 98% of the death toll from measles occurs in developing countries. In fact, Africa alone accounts for about 500,000 measles deaths per year.

Clinical features

Measles infection is characterised by four distinctive stages of illness:

1. The first stage is the incubation period (IP) of 8-14 days, during which there are no visible clinical signs of the disease.
2. The IP is followed by a prodromal period (PP) of 3-5 days, characterised by a severe constitutional upset, high fever, running nose, conjunctivitis, a harsh dry cough and irritability. Small greyish white lesions, which appear on the buccal mucosa during this stage, known as Koplik's spots, are the most characteristic sign of the disease.
3. The eruptive stage (ES) is the third stage of the disease characterised by the eruption of maculo-papular rash, which starts from the back of the ears, becoming a generalised rash within 2 days (Figures 1A & 1B).

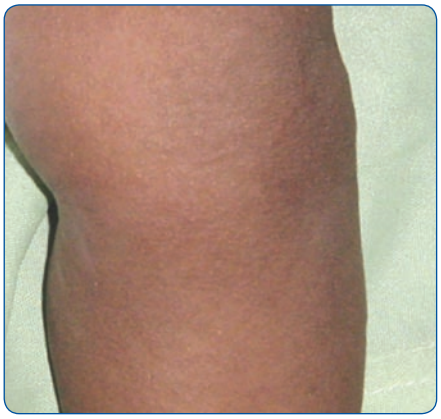

Fig. 1B: Close-up view of the confluent maculo-papular rash on the lower limb of the child in Figure 1A.

Photo: Bolajoko Olusanya

4. The fourth stage is the recovery phase (RP) characterised by the fading of the rash. This phase occurs by the third day of the eruption when the maculo-papular rash is replaced with brownish staining (Figure 2), and sometimes in severe cases, especially in malnourished children, a fine desquamation with extensive ulceration may occur (Figure 3).

Complications

Measles has been reported as a major aetiological factor for severe to profound bilateral hearing loss in deaf children. As it was known that mucous membranes all over the body were affected, the observed hearing loss was previously thought to be conductive and attributable to suppurative otitis media, chronic perforation and mastoiditis. For instance, none of the three children (Figures 1, 2 & 3) highlighted in this report, recorded normal otoacoustic emissions during the recovery phase when tested for hearing impairment. The involvement of the middle ear with extensive mucosal lesions, as demonstrated by these cases, was previously perceived as the main course of measles - related hearing loss, until the documented report of measles virus within the cochlea[5] besides the measles virus-associated otosclerosis,[6] thus providing the needed evidence in favour of the sensorineural component. This finding, therefore, explains the often-reported severe and sometimes progressive/delayed sensorineural hearing loss among deaf children.

Fig. 2: A 13 months old well-nourished boy who had measles vaccination at the age of 9 months. He is now recovering from measles infection. The generalised maculo-papular rash has been largely replaced by a yellowish stain in the upper limb.

Photo: Bolajoko Olusanya

Apart from the ear and hearing organ, measles infection affects respiratory, ophthalmic, gastrointestinal and the central nervous systems. Complications may occur anytime from the prodromal phase to the recovery stage of the disease. As a result, high fever or febrile convulsion, which may occur towards the end of the second stage or early in the eruptive stage, remains one of the most common complications (Table1). Similarly, severe gastro-enteritis may result from the extensive viral damage of the inner linings, at anytime from the eruptive stage. Severe oral inflammation, due to secondary infection, is more commonly seen in malnourished children towards the end of the eruptive stage.

Fig. 4: Measles immunisation

Preventive measures

WHO and UNICEF have emphasised primary prevention of measles in its global campaign against the prevailing childhood illnesses in the developing world, for several decades. Immunisation for measles is currently administered at the age of 9 months at the earliest, in developing countries. However, the cases presented in this present article highlight two major concerns. Firstly, children between the ages of 6 to 9 months are vulnerable to severe measles attack before vaccination (Figures 1A & 1B). Secondly, severe infections after vaccination cannot be ruled out completely (Figure 2).

Currently, there is only a single-dose vaccine for measles in many developing countries (Figure 4), unlike some other vaccine-preventable diseases such as diphtheria, polio, pertussis and tetanus. The need for a second dose of measles immunisation has been suggested and is currently advocated by WHO and UNICEF - to catch those who have not responded to, or have missed the first dose. In addition, national programmes on immunisation currently exclude mumps vaccination in several developing countries. The triple MMR vaccine against major causes of hearing loss in the region (i.e., measles, mumps and rubella) would easily provide a much better alternative to the current single vaccine for measles.

Good nutrition and breast-feeding should safeguard from middle ear complications, while early diagnosis and intervention remains the mainstay of management. The early recognition of clinical features would provide lead-time for instituting appropriate and effective support treatment. It will also often prevent avoidable complications such as febrile convulsions and corneal ulceration, early in the disease process.

Photos: Christian Blind Mission

Fig. 3: A 10 months old malnourished infant who missed measles vaccination at 9 months now in the protracted post-measles phase of the illness. The maculo-papular rash is now replaced with widespread desquamation of the skin and buccal ulceration. In addition, the child received treatment for bronchopneumonia, zinc deficiency and electrolyte imbalance.

Photo: Bolajoko Olusanya

Mumps

Mumps, also known as endemic parotitis is a milder disease, relative to measles. It is caused by infection with the mumps virus. A decline in the incidence of mumps has been reported since the introduction of Measles, Mumps, and Rubella (MMR) vaccine which is now administered routinely, mainly in developed countries.

Mumps tends to affect older children and is transmitted by droplet infection from the respiratory tract. The incubation period is about 18-22 days.

Clinical features

Mumps infection is a non-suppurative enlargement of the salivary glands, particularly the parotids. Symptoms are most pronounced during the first two days after the incubation period but subside slowly over the next five days. The clinical features are quite varied and range from inapparent infection in one-third of the cases. In several others, the first presentation may be the appearance of complications.

Complications

Mumps is frequently associated with sudden unilateral sensorineural hearing loss, which is often total, but bilateral involvement has also been reported. Although the incidence of mumps-related sensorineural hearing loss has been documented as 5/100,000,[7] its patho-

physiology has not been fully described. Other complications include aseptic meningitis, post-infectious encephalitis, as well as transient facial paralysis, without prior infection of the salivary glands.

Preventive measures

No preventive measure for mumps is currently available under the Expanded Programme of Immunization in developing countries, in contrast to the practice in most of the developed world where MMR vaccines are routinely administered. This illness and its complications will therefore persist in this region until an appropriate vaccine is introduced.

Conclusion

Measles and mumps are significant aetiological factors for permanent hearing loss in the developing world. Because of the limitations in the current primary prevention strategy for these conditions, early detection through a high index of suspicion and appropriate/timely intervention should be actively promoted - to reduce devastating and long-term complications particularly in 'endemic' communities.

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CONGENITAL RUBELLA SYNDROME: A VACCINE PREVENTABLE CAUSE OF DEAFNESS

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Congenital Rubella Syndrome and Vaccines

The World Health Organization (WHO) estimates that globally there are 100,000 new cases of congenital rubella syndrome (CRS) in infants each year.[1] Most of these CRS cases occur in countries where widespread introduction of rubella vaccine has not been implemented. Rubella vaccine is highly effective; a single dose of the most commonly used RA27/3 rubella vaccine strain leads to seroconversion in at least 95% of vaccinees and is thought to afford lifelong protection. All studies that have examined cost-effectiveness of rubella vaccination, including studies in developing countries have found a positive cost-benefit ratio.[2]

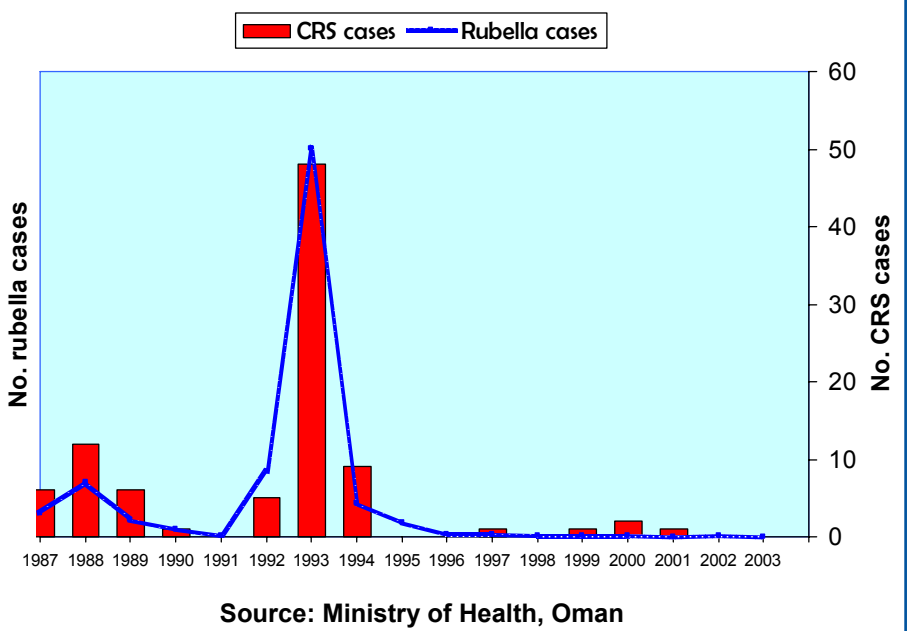
Rubella Vaccination

The WHO position paper on rubella vaccines recommends that all countries should assess their rubella situation and, if appropriate (see Box), make plans for the introduction of rubella vaccine.[1]

The primary purpose of rubella vaccination is to prevent CRS. There are two approaches:

1. Prevention of CRS by providing rubella vaccine to women of childbearing age; or
2. Prevention of both rubella and CRS through rubella immunisation of young children, as well as women of childbearing age.

Fig. 1: Annual incidence of congenital rubella syndrome (CRS) and rubella, Oman, 1987-2003



Source: Ministry of Health, Oman