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CASE REPORT

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A rare presentation of measles and post-measles complications in a neonate: case report

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Abstract

Background Measles is a common infection in children. Measles infection in children less than 6 months of age is very rare since maternal antibodies play a major role in the prevention of the disease.

Case presentation Here we present a rare case of a 34-day-old infant, who had a history of fever with a rash on the 18th day of life and significant history of measles contact with mother and elder brother. The patient presented to us with septic shock and multiorgan involvement in the form of pneumonia, acute gastroenteritis with severe dehydration, mucopurulent conjunctivitis, and post-measles encephalitis. The patient had a strong measles contact and epidemiological linkage to the measles epicenter, Govandi (a locality in the Mumbai region of western India), so measles IgM antibody was obtained which were significantly raised.

The patient was successfully revived from this critical presentation with early and appropriate resuscitation, timely ionotropic support, and the use of empirical broad-spectrum antibiotics. The patient required intensive unit care for four days and was started on feeds and discharged after 12 days of hospital stay. On follow-up, the patient is doing well and gaining weight.

Conclusion Uncommon presentation and the epidemiology of the disease should alert the clinician of having a high index of suspicion. Early intervention and prompt treatment can help reduce morbidity and mortality.

Keywords Neonatal measles, Measles epidemic, Congenital measles, Post-measles complications

Background

Measles (*morbilli*, English measles, rubeola) is a highly contagious, vaccine-preventable viral disease affecting the pediatric population. Measles is transmitted by droplets, aerosols dispersed in the air from the infected individual while they cough, speak, breathe, or sneeze, etc [1]. The patient when infected can transmit measles for 6 days before and 4 days after the onset of the rash [2, 3]. Though measles vaccination has resulted in a substantial decrease in incidence, it has significant morbidity and mortality in developing countries [4]. Deaths secondary to severe measles infection and post-measles complications have been well focussed upon to decrease under-5 mortality by providing a measles-containing vaccine (MCV) and thus a part of the millennium development goal since 1990 [5]. Measles has been made a notifiable disease since 1975, hence any case showing signs and symptoms of the illness, regardless of the vaccination status needed to be notified to health care surveillance within 24 h [3]. Malnutrition and young age at infection are the two important risk factors associated with mortality and it's estimated that 4% of under 5 deaths in Indian children is attributed to measles and its complications

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[6]. Around 30% of reported cases of measles follow one or more complications [7].

Here we present a 34-day-old infant with post-measles complications of diarrhea, pneumonia, and encephalitis with measles infection on the 18th day of life from Mumbai, a city in western India.

Case presentation

A 34-day-old infant presented with high-grade fever, cough, cold and loose stools for two days and respiratory distress for one day. The patient had a history of refusal to feed, lethargy, and decreased urine output. On inquiry, the patient had a history of fever with rash, coryza, and watery eye discharge on day 18 of life. On perinatal record review, peripartum and early neonatal period history were unremarkable. The patient was born by full-term vaginal delivery at 38 weeks of gestation with a birth weight of 2.8 kg and was exclusively breastfed with adequate weight gain.

Contact tracing for the infection revealed that the mother developed febrile illness on postnatal day 14 with a rash starting from behind the ear and face with progression to involve the neck, trunk, and extremities in a centripetal direction. The elder sibling, a 6 years old boy child also developed signs and symptoms of measles concurrently during maternal infection. Both the maternal and siblings' measles infection resolved spontaneously after 5–6 days of illness without any medical intervention. No post-exposure prophylaxis was given to either siblings or any of the family members. However, after the admission of the index patient to our hospital, both of them were administered two consecutive doses of two lakh IU of vitamin A. Both mother and the elder sibling were not immunized as per inquiry.

The patient belonged to a geographically significant area of Mumbai, Govandi -which had an outbreak of measles during the same period. The patient belongs to lower socioeconomic status with poor sanitation facilities and overcrowding at home.

On examination, the patient was febrile and lethargic, the patient was tachypnoeic with a respiratory rate of 72 cycles/min with thread/poorly felt peripheral pulses, tachycardia with a heart rate of 196 beats/min, and delayed capillary refill time of 5 s. These were also associated with pallor and peripheral cyanosis with saturations of 75% on room air and 96% on humidified oxygen therapy. The patient had depressed, anterior fontanelle which was pulsatile, with dry oral mucosa and absent tear film. Skin turgor was delayed. On detailed examination, the patient had subcostal and intercostal retractions with decreased air entry and fine crackles in the bilateral inframammary and infra-axillary region. Random blood glucose was 96 mg/dl and blood pressure was below the 5th centile for age. The patient also had mucopurulent conjunctivitis with post-inflammatory hyperpigmentation over the body.

As the patient was in septic shock, immediate IV access was obtained and blood cultures were collected and started on broad-spectrum IV antibiotics cefotaxime (200 mg/kg/day) and amikacin (15 mg/kg/dose). The patient required 2 boluses of 10 cc/kg with normal saline. On reassessment, the patient had tachycardia with poor thready pulses and blood pressure below the 5th centile, and hence was stated as fluid refractory shock and started on noradrenaline at 0.05mcg/kg/min and required titration up to 0.1 mcg/kg/min. ventilation support to the child was started with continuous positive airway pressure ventilation.

Chest X-ray showed bilateral consolidation (Fig. 1). The laboratory investigations are mentioned in Table 1.

On the second day of admission, the patient had 2 episodes of convulsions in the form of cycling movements of the bilateral lower limb and frothing from the mouth for which, the child required loading (40 mg/kg/dose) and maintenance (20 mg/kg/day) doses of injectable Levetiracetam. Transcranial ultrasound screening was within normal limits. The results of the metabolic work-up and CSF analysis are mentioned in Table 1. No further episodes of seizures were witnessed during the hospital stay.

Considering a history of fever with a rash on the 18th day of life and familial contact history of measles, measles IgM antibodies were sent, which were significantly

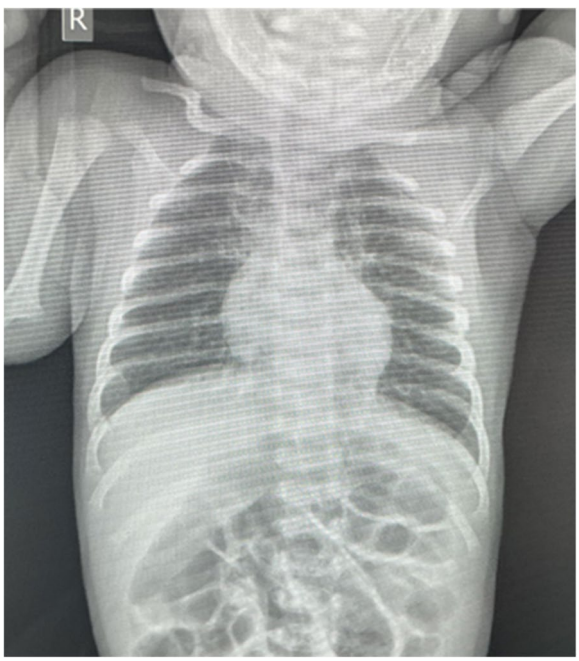

Fig. 1 Bilateral consolidation

Table 1 Laboratory investigations of the index case report

Parameter (units)	Observed value (Normal range)
Hemoglobin (g/dl)	11.7 (11.1–13.7)
Total leucocyte count (cells/mm^3)	16,790 (7.34–12.32)
Platelet count (lakhs/mm^3)	3.07 (184–430)
Blood urea nitrogen (mg/dl)	56 (6–17)
Serum creatinine (mg/dl)	1.17 (0.1–0.36)
Serum sodium (mmol/l)	136 (132–140)
Serum potassium (mmol/l)	5.7 (3.5–5.8)
Total protein/albumin (g/dl)	4.2/2.1 (4.5–6/3.5–5)
AST/ALT (IU/L)	269/231 (20–67/9–35)
ALP (IU/L)	256 (104–455)
Serum calcium (mg/dl)	
Total	9.4 (8.5–11)
Ionic	4.81 (3.7–5.9)
Serum phosphate (mg/dl)	5.9 (4.8–8.4)
Serum magnesium (mg/dl)	2.8 (1.97–3.07)
Cerebrospinal fluid analysis	
Sugar	114
Protein	55
Color	Clear
Cells	6 cells (PMNs)
Culture	No growth
Random blood sugar (concomitant)	156
ABG	
pH	7.191
PaO2	126.7
PCO2	37.4
HCO3	14.6
BE	12

raised (1.47 unit/ml; > 1.1 unit/ml suggestive of active infection). Thus, a diagnosis of post-natal measles was established. The genotype of the measles outbreak was determined and found to be D8 Strain. However, due to financial constraints, the genotype of the index patient could not be done.

The patient was given an age-appropriate dose of 50,000 IU of vitamin A, injectable antibiotics (cefotaxime and amikacin) for 10 days, tobramycin eye drops for purulent conjunctivitis, and anti-inflammatory medications. The child was discharged on a maintenance dose of Levetiracetam on the 12th day of admission. The child is currently on follow-up while the anticonvulsant was tapered and stopped after 3 months.

Discussion

Measles infection in the neonatal period can either be due to congenital infection via vertical transmission from the mother (congenital measles) or postnatally acquired infection (post-natal measles). Most of the evidence about congenital measles dates back 40 years due to the implementation of effective vaccination programs and measles elimination strategies. The higher mortality rate associated with congenital measles was related to preterm deliveries, perinatal infections, and neonatal pneumonia [8].

Post-natal measles infections in less than < 6 months are rare due to the presence of maternally acquired protective antibodies. An unimmunized mother hence poses a significant threat to the neonate. Other risk factors include prematurity, low birth weight, lack of breastfeeding, household crowding, exposure to smoke, and epidemiological outbreaks [8].

Clinical manifestations include non-specific symptoms like fever, cough, and respiratory symptoms which are non-specific and overlap with most viral infections, thus making an early diagnosis challenging. The characteristic morbilliform rash which appears within a few days provides a strong suspicion towards the measles diagnosis [1].

Post-measles complications like pneumonia, diarrhea, otitis media, blindness, post-infectious encephalitis (SSPE), and others, are secondary to damage of epithelial surfaces of different organ systems and immunosuppression [9–11]. Pneumonia, croup, and encephalitis are common causes of mortality, and encephalitis is the most common cause of long-term sequelae [12].

There is insufficient data regarding the incidence and mortality of children less than 6 months affected with measles. Based on the data from the last outbreak in 2009, from cape town south Africa, it was estimated that the median age of children requiring inpatient management was 8.9 months and mortality was 3% (18/552) among total inpatient admissions which had huge number amounting to 72% (13/18) belonging to children less than 1 year. A major cause of death was pneumonia in 61% (11/18) and multiorgan dysfunction syndrome (MODS) was 22% (4/18) [13]. Similar conclusions were also drawn from a single-center observational study admitted from January 2016 to December 2019 in the Philippines which showed the risk of mortality was 3.2% with 41% of death occurring in children less than 9 months [14]. This study also showed no mortality among children who have been vaccinated with the measles vaccine previously [14].

The index patient in our case report is an "epidemiologically linked measles" case that had not been confirmed by a laboratory but was geographically and temporally related, with dates of rash onset occurring 7–21 days apart from a laboratory-confirmed case or another epidemiologically linked measles case. Suspected cases during the measles outbreak/epidemic as in the present scenario should undergo serological diagnostic tests such as measles RNA-PCR or ELISA [15]. However, the index case

in our report was diagnosed by the measles IgM ELISA method since the patient was in the convalescent phase of the illness.

In such outbreaks, the measures that need to be implemented include interrupting measles virus transmission, reducing measles morbidity, mortality, complications, and sequelae, and identifying root causes so that immunity gaps and/or system weaknesses can be addressed to reduce the risk of future outbreaks. As soon as an outbreak is suspected, preparations need to be made quickly for rapid Outbreak Response Immunization (ORI) strategies and implementation. Clinical case management includes immediate administration of Vitamin A to children to reduce morbidity and mortality. Though WHO does not recommend administering prophylactic antibiotics, early empiric antibiotics should be considered for suspected secondary bacterial infections [15]. To reduce the disease burden of measles, the Global Immunization and Vision Strategy (GIVS) of the World Health Organization (WHO) and the United Nations Children's Fund have adopted various strategies to reduce measles-related mortality, which comprises high vaccination coverage of measles with the first dose of measles-containing vaccine (MCV), sensitive laboratory supported surveillance, appropriate measles case management and providing a second dose of measles vaccines [16].

Hence, in any measles-suspected infant under 6 months of age with an epidemiologically significant history, isolation, early diagnosis, hospitalization, and supportive management play an important role in preventing morbidity and mortality.

Conclusion

Measles and its complications are rare in less than 6 months of age since maternal antibodies play a major role in preventing measles. In the present case report, the patient lacked protective maternal antibodies as she was unimmunized, thereby presenting with multisystem complications and sepsis-like features. The uncommon presentation and the epidemiology of the disease should alert a high index of suspicion to initiate appropriate treatment measures so that morbidity and mortality can be circumvented.

Abbreviations

MCV	Measles-containing vaccine
CBC	Complete blood count
AST	Aspartate transaminase
ALT	Alanine transaminase
BUN	Blood urea nitrogen
MODS	Multiorgan dysfunction syndrome
ORI	Outbreak Response Immunization
GIVS	Global Immunization And Vision Strategy
WHO	World Health Organization
ORI	Outbreak Response Immunization

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Authors' contributions

Preparation of the first draft: SRS, SS. Collection of data: SRS, SS, VS. Interpretation of data: SS, SRS, VS, ASK. Literature search: SRS, VS. Conceptualization: SS, SRS, VS. Intellectual inputs for improvement of the manuscript: SS, SRS, VS, ASK. Approval of the final draft: SS, SRS, VS, ASK

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed patient consent has been taken and it shall be provided on request.

Competing interests

The authors declare that they have no competing interests.

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