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Original Research Article

Seropositivity of measles antibody- IgM in symptomatic pediatric patients with assessment of vaccination status in a tertiary care hospital

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ABSTRACT

Background: Measles is a febrile contagious viral illness caused by member virus of paramyxoviridae, commonly affecting paediatric population. It is a vaccine preventable disease. In spite of national immunisation programme in India, measles outbreaks are often encountered specially in pediatric population. This study aimed to assess the IgM seropositivity in acute cases of measles along with assessment of measles vaccination status.
Methods: This study was conducted in a department of microbiology of Government Medical College, Surat from March, 2022 to March, 2023 in which pediatric patients with febrile suspected of measles were included. Serum samples were received and recording of clinical history and vaccination profile were done. The samples were investigated for measles IgM antibodies using enzyme-linked immunosorbent assay (ELISA).
Results: Out of 90 pediatric febrile patients with suspected measles, 44 (49%) were found to be IgM measles positive. Among 44 IgM positive cases, 44% children were previously vaccinated and 45% children were not vaccinated. Information on vaccination status were not available for 11% children. Majority (43%) of IgM seropositive children were of age less than 2 years.
Conclusions: In spite of ongoing national immunisation programme throughout the country, vaccination coverage is still not satisfactory and even if vaccinated, significant number of children are still getting infected with measles. Hence, studies are needed to identify the lacunae of ongoing programme and find out possible causes of lower vaccination protection.

Keywords: IgM, Immunisation, Measles

INTRODUCTION

Measles is a highly contagious febrile disease caused by measles virus which is a member of the paramyxoviridae family and morbillivirus genus and prominently causing disease in children population.[1] It causes fever with morbilliform rash and often causes complications like severe pneumonia, encephalitis and even leading to death.[2] The word "measles'' was referred to by the Latin word morbilli ("little disease", derived from morbus). History of measles cases dates back to several centuries before in the 11th-12th centuries. Several epidemics were reported in various parts of the globe dating back to sixteenth and seventeenth centuries, and was widespread throughout the world creating a pandemic during the time of Renaissance in the 20th century. Measles cases back in India also belong to similar historical timelines.[3]

Measles being a contagious febrile exanthem, spreads rapidly upon exposure. Clinical symptoms of measles high-grade fever, cough, coryza, conjunctivitis and appearance of maculopapular rash.[10] Measles also result in complications of various systems. Relatively common complications of measles include pneumonia, persistent diarrhea otitis media, febrile convulsion, keratitis etc. Severe complications can also occur like subacute sclerosing panencephalitis (SSPE) myocarditis, pericarditis, encephalitis etc and manifest depending

upon patient profile with more propensity in malnourished and immunocompromised patients.[11]

Measles was common in all parts of the world and caused an estimated 135 million cases and more than 6 million deaths globally each year. Despite the availability of a safe and affordable vaccine, a projected 136 000 measles deaths occurred worldwide in 2022, with children under the age of five consisting both vaccinated and unvaccinated population.[4] Measles is highly contagious airborne diseases and spread via aerosolised infected respiratory droplets or secretions and also via contact and fomites.[5] Measles along with Pneumococcal and rotavirus diarrhea are the main vaccine-preventable causes of pediatric death.[5,6] According to WHO in 2022, 74% of children all over the world received both doses of the measles vaccine, and about 83% of the world's children received one dose of measles vaccine within one year of birth.[4] India has vaccinated over 348 million children between 2017 and March 2023 through nationwide measles-rubella vaccination campaign after which measles cases dropped by 62% between 2017 and 2021.[12] In spite of that resurgence of measles in various parts of the world, including countries where the disease was previously under control.[7] Factors contributing to this resurgence include vaccine hesitancy, gaps in vaccination coverage, and increased international travel, which facilitates the spread of the virus across borders.[7] Vaccine hesitancy, fuelled by misinformation about vaccine safety and efficacy, remains a significant barrier to achieving high immunization rates.[8] Socio-economic factors, healthcare access disparities, and logistical challenges in vaccine delivery exacerbate this issue.[9] Understanding the epidemiology of measles and the factors associated with measles outbreaks is critical for public health planning and response. Serological studies, which measure the presence of measles-specific antibodies in the blood, provide valuable insights into population immunity and the effectiveness of vaccination programs. The presence of measles-specific IgM antibodies indicates a recent infection or a primary immune response to the virus, making IgM seropositivity a useful marker for identifying recent measles cases.[13]

The various diagnostic methods used to diagnose measles include serological assays like IgM and IgG detection by ELISA methods, molecular tests by means of RT-PCR and viral isolation.[14] Epidemiological investigation include Genotypic sequencing of viral nucleoprotein to aid in identifying source of outbreak and determining transmission pathways

Although there are seroprevalence studies in different geographical regions of India and in different age groups, their number is very limited. Data on seroprevalence is also limited in the western region because their pattern varies locally. Analysis is also important to assess the vaccine efficacy locally. Hence, this present study aimed to evaluate and diagnose seropositivity of IgM antibodies against measles in pediatric patients and assess their vaccination status among positive patients in south Gujrat region of a tertiary care level.

METHODS

Study type

This was a retrospective study conducted in serology and immunology laboratory of Government medical college, Surat over one year from March 2022 to march 2023.

Inclusion criteria

All the samples received in microbiology from children with febrile illness for measles IgM testing were included in study.

Exclusion criteria

Samples of adult patients were excluded.

Study sample

Serum samples of pediatric patients with febrile illness with suspected measles, that were sent in department of microbiology for measles IgM ELISA testing were considered for study. Results of ELISA testing were entered in laboratory information system. Data of those children with confirmed measles were analysed with sociodemographic characteristics, vaccination status, contact with possible measles cases, clinical features, laboratory results and complications; these data were noted from relevant history taking from treating clinician. For study purpose data were retrieved from LIS system of the hospital. Approval from the institutional ethics committee was obtained for analysing the data.

Microbiological testing

All serum samples were received with details of patient, clinical history and were tested for measles immunoglobin M (IgM) antibodies by enzyme-linked immunosorbent assay (kit name- NOVALISA by Novatech), a qualitative immune-enzymatic determination of specific antibodies. The sensitivity and specificity of measles IgM antibody ELISA are 91.19-100% and 98.71-100% respectively (95% confidence interval). All assays were performed according to the manufacturers' procedures with quality controls. The intensity of colour/optical density (OD) was monitored at 450 nm. OD values are directly proportional to the amount of measles IgM antibodies present in the sample. Elisa runs were validated according to kit instructions and control provided. Cut-off was the mean absorbance value of the cut-off control determinations. Results were interpreted and expressed in terms of NTU (Novatech units) by multiplying sample absorbance value by ten and the dividing the obtained value by cutoff. A value off >11 NTU was taken as positive, 9-11 NTU as equivocal and <9 NTU as negative. Both positive and negative controls

were used to validate the test. The data acquired through LIS was entered into excel and analysed.

RESULTS

A total of 90 serum samples from pediatric patients with febrile illness suspected of measles were received by the Microbiology department for testing. Among these samples, 44 (49%) tested positive for measles IgM antibody by ELISA, while 46 (51%) tested negative. Regarding gender distribution, 55% of the patients were female and 45% were male. The majority of cases were observed in children under 2 years of age (43%), followed by the age group 2-5 years (32%), and 5-12 years (25%) (Figure 1). Among the measles IgM seropositive symptomatic cases, 45% were not immunized against measles. Only 43.8% of patients had received immunization, while the immunization status was unknown for 11.3% of the population (Figure 2). Clinical analysis revealed common symptoms including fever, rash, cough, Koplik's spots, and respiratory distress. Specifically, 8 patients presented with respiratory distress in addition to febrile rash illness, all of whom required ICU care with respiratory support (Figure 3).

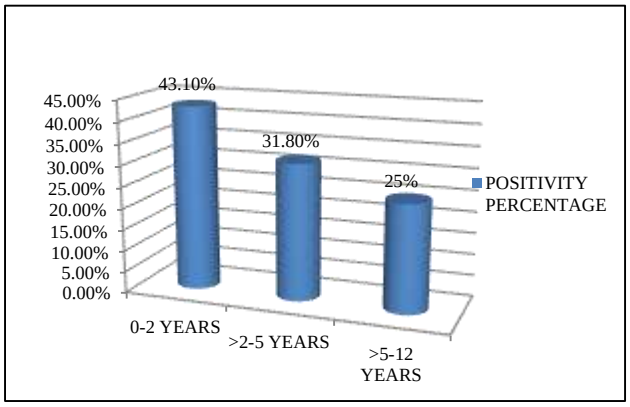

Figure 1: Age wise distribution of measles (Igm) seropositive cases.

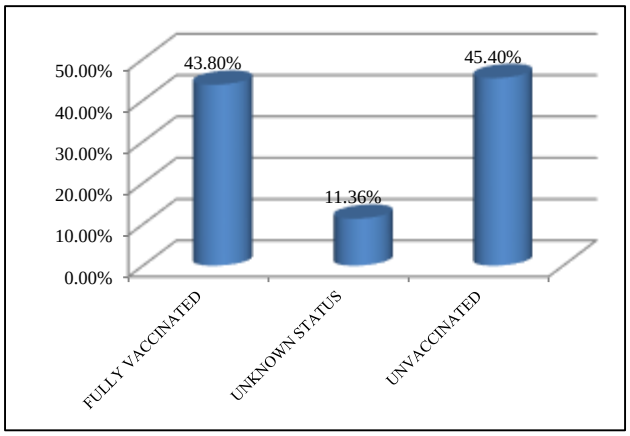

Figure 2: Proportion of immunisation.

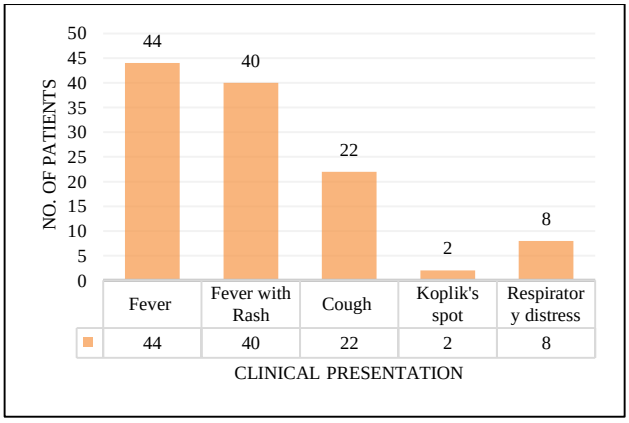

Figure 3: Clinical presentation and symptomatology.

DISCUSSION

In comparison to Adekola et al, who reported an anti-measles virus IgM seropositivity rate of 14.6% among symptomatic children, present study found a significantly higher seropositivity rate of 48.8%.[5] Ray et al reported an incidence of measles at 5.76%, with equal distribution between sexes and a higher prevalence among infants.[17] Present study findings show slight contrast, showing a higher prevalence of seropositive cases in less than 2 years age group and a slightly higher prevalence among girls (54.55%) compared to boys (45.45%). Mathew et al conducted a study assessing measles immunity and found a seropositivity rate of 94% overall (n=1690), compared to our study's 48.48% seropositivity rate.[16] In our study, immunized children exhibited the lowest seroprevalence, while non-vaccinated children had the highest seroprevalence. Of the eight patients requiring ICU care with respiratory support, six had not received any vaccines, and two had received only one dose of the measles vaccine. Vaccination against measles has been shown to protect children from severe infections, particularly in endemic regions, as demonstrated by studies in Nigeria, Egypt, and other locations. In our study, 45.45% of positive cases had not received measles immunization or had only received a single dose, indicating a susceptible population. Additionally, 43% of positive cases had received the full vaccination dose, suggesting potential vaccine failures.

This study has few limitations. The immunization history of patients was obtained from patient attendees or parents, which in some cases were not reliable due to unavailability of vaccination cards. Additionally, the current study did not include measles IgG ELISA testing, which would have provided insight into the seroprevalence of measles protective antibodies resulting from vaccination within the study population. Furthermore, the study was restricted to pediatric patients visiting a tertiary care hospital, which may not fully represent the broader community. Therefore, the data may not reflect the epidemiological situation of measles in the general population

CONCLUSION

Partially protected or unprotected individuals serve as reservoirs for the measles virus, potentially contributing to outbreaks. Therefore, implementing additional catch-up measles immunization campaigns may be necessary to prevent future outbreaks. Moreover, sero-surveillance for measles in western India, similar to other parts of the country, is crucial as the disease re-emerges with varied clinical presentations received full dose of vaccination, which might indicate towards vaccine failures. Partially protected as well as unprotected human beings serve as the reservoir of measles virus and this could be the reason for the outbreak. Hence, more implementation of one catch up measles immunization campaign might be required to prevent future outbreaks. Need of sero-surveillance for measles in western India is needed like other parts of India as it is re-emerging with varied clinical pictures.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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