

Clinical Profile, Complications and Outcomes of Measles among Children: An Observational Study from a Tertiary Care Hospital, South Gujarat, India

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ABSTRACT

Introduction: Measles is re-emerging as an infectious disease in children and hence the prevalence has been increasing worldwide. According to the World Health Organisation (WHO), in the year 2018, more than 140,000 deaths occurred globally due to measles and its complications; most common in children <5 years of age.

Aim: To evaluate the clinical profile of measles and its complications leading to death in children for better immunisation coverage and prevention of the disease.

Materials and Methods: This was a prospective, observational study carried out in the Department of Paediatrics, New Civil Hospital (tertiary care hospital), Surat, Gujarat, India. Patient data was collected from January 2021 to December 2021 and data was analysed from January 2022 to June 2022. Study was done on all children with history of fever with rash and laboratory confirmed positive patients for measles Immunoglobulin M (IgM) antibody titre. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 27.0.

Results: During the study period only, 42 children with fever and rash had laboratory confirmed measles IgM positive antibody titre. Out of total, 42.86% of the study participants belonged to 1-4 years age group and 50% were unvaccinated. Males were more affected than female. Majority (81%) of cases occurred during late winter and spring seasons and most (78.57%) of the patients belonged to urban slum areas. Most common presenting complaint observed was maculopapular rash in all the children. Majority (95.24%) of the children were in eruptive stage of the disease. A total of 31 patients out of 42 developed complications due to measles and the most common complication was pneumonia which occurred in 38.71% children. All the patients recovered completely and were discharged from the hospital.

Conclusion: There was decreasing trend of measles in young children. It can be due to recent immunisation campaigns and better coverage. Half of the patients in study were unvaccinated which indicates, there's still work left to be done to immunisation scheme for better coverage.

Keywords: Antibodies, Fever, Immunisation, Infection, Rubella, Vaccination

INTRODUCTION

Measles, or rubella, is an infectious disease which occurs predominantly in children and is caused by measles morbillivirus. It is a highly contagious disease which is transmitted by one person to other by respiratory droplets when they cough or sneeze [1]. In the last few years, cases of measles have surged worldwide and the disease has re-emerged despite the continuing vaccination campaign. According to the World Health Organisation (WHO), in the year 2018, more than 140,000 deaths occurred globally due to measles; most common in children under five years of age [2]. This occurred despite the availability of a safe and effective measles vaccine. The symptoms of measles usually occur seven to ten days after exposure and commonly include high-grade fever up to 104°F, cough, malaise, coryza or conjunctivitis. This is followed by a typical rash 3-5 days later [3]. The rash is red in colour and maculopapular which starts on face and later on spreads to the neck and rest of the body. Sometimes, two to three days after fever, tiny white spots known as Koplik spots appear inside the mouth [3].

Complications in measles are common. Measles virus infection results in a state of immunosuppression ranging from weeks to months. It has been shown in various studies to result in bacterial superinfections such as otitis media and bacterial pneumonia [4,5]. The other complications of measles include diarrhoea, laryngotracheobronchitis or croup, pneumonia, otitis

media, encephalitis or rarely subacute sclerosing panencephalitis and corneal ulceration [6]. So, it is important to prevent measles using the vaccine available which is safe as well as cost-effective. In India, as per WHO guidelines, two doses of measles vaccine are recommended which is given as either Measles-Rubella (MR) vaccine or Measles-Mumps-Rubella (MMR) vaccine under the Universal Immunisation Programme (UIP) at the age of 9-12 months and second dose at the age of 16-24 months [7]. Thus, with the re-emergence of this highly infective disease, it is important to study the clinical pattern and outcomes of measles in children in this region of south Gujarat. Since, there are migrants and overcrowding is very much prevalent, it is high-risk factor to develop measles. Hence, this study was planned with an aim to provide an insight into the clinical signs and symptoms, outcomes and complications in the children suffering from measles in the hospital setting.

MATERIALS AND METHODS

This was a prospective, observational study carried out in the Department of Paediatrics, New Civil Hospital (tertiary care hospital), Gujarat, India. Patient data was collected from January 2021 to December 2021 and data analysis was done from January 2022 to June 2022. The study was commenced after obtaining the required permissions from the Institutional Ethics Committee (Reg no. GMCS/STU/ETHICS/approval/168/19). As the study population included children, the consent for the study was obtained from the parents/guardians of the child.

Inclusion criteria: All children ≤ 12 years of age, with history of fever with rash and laboratory confirmed positive patients for measles IgM antibody titre and children whose parents or guardians provided written informed consent were included in the study.

Exclusion criteria: Clinically diagnosed cases of fever with rash who were negative for measles IgM antibody titre, children suffering from other disorders for which they are taking concomitant medications and children of the guardians who did not provide informed consent were excluded from the study.

Study Procedure

After obtaining the required ethical clearance, the study was started in the Paediatric Department. All the children with complaints of fever, rash, cough, coryza and breathlessness who were admitted in Paediatric ward were suspected and investigated for measles. Measles IgM antibody titre test was performed with Elisa reader microlisa to confirm measles (Measles novalisa kit) as per kit instructions. The diagnosis of measles was confirmed by the attending physician based on the clinical and laboratory evidence. All 42 enrolled patients were given unique identification number to maintain the confidentiality throughout the study procedure.

The demographic details of the child such as age, gender were noted down in a preapproved and prevalidated patient data sheet. Immunisation status was also recorded. After the children were admitted and diagnosis of Measles was confirmed, they were followed-up daily until discharge for clinical and laboratory parameters. All the patients were closely monitored for complications like otitis media, pneumonia, diarrhoea, convulsions and encephalitis. Parents were also counselled about nutritional supplements, routine vaccination as per Indian Academy of Paediatrics (IAP) guidelines [5], and preventive measures against spread of infection to other children.

STATISTICAL ANALYSIS

All the data was collected and entered in the Microsoft excel 2016. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 27.0 wherever required. The descriptive data was expressed in mean and percentages.

RESULTS

In the present study, there were 14,886 paediatric admissions including 42 confirmed measles cases < 12 of age. Both males and females were affected more in the age group of 1-3 years with male to female ratio was 1.5:1. Male predominance was seen in all subgroups of measles infection. The most common age group affected was 1-6 years and less in older children [Table/Fig-1]. Most (78.57%) of the patients belonged to urban slum areas. Majority ($n=34$, 81%) of cases occurred during late winter and spring season from December to April (postwinter season) [Table/Fig-2]. In clinical features, rash was present in all the patients of measles. Fever (95.24%) and cough (76.19%) were most common presenting clinical features, while coryza (28.57%), diarrhoea (30.95%), conjunctivitis (19.05%) and convulsions (7.14%) were least common presentation [Table/Fig-3]. Among the general examination, rash was seen in all patients, pallor was seen in 66.66% of patients and cervical lymphadenopathy was seen in 9.52% of patients [Table/Fig-4]. A total of 21 (50%) patients were immunised with only one dose of measles vaccine and 47.62% patients were immunised with both doses and one patient was not vaccinated for measles. These doses of Measles vaccination was taken according to IAP guidelines [Table/Fig-5]. Two (4.76%) of the subjects had positive contact history with an active case of measles. The results of the immunisation coverage for measles showed half of the study participants vaccinated against measles (50%, $n=21$) while the other half was unvaccinated against measles.

[Table/Fig-6] gives the incidence of chief presenting complaints of measles in the study participants. The main presenting complaints

Age group	Males n (%)	Females n (%)
0-1 year	6 (14.29)	6 (14.29)
2-6 year	12 (28.57)	7 (16.67)
7-12 year	7 (16.67)	4 (9.52)
Total	25	17

[Table/Fig-1]: Age and sex distribution in the study group.

Month	n (%)
January	0
February	5 (11.9)
March	12 (28.58)
April	10 (23.81)
May	4 (9.52)
June	3 (7.14)
July	0
August	0
September	0
October	0
November	1 (2.38)
December	7 (16.67)
Total	42 (100)

[Table/Fig-2]: Season and month wise distribution of measles cases.

Clinical features	n (%)
Fever	40 (95.24)
Rash	42 (100)
Cough	32 (76.19)
Coryza	12 (28.57)
Diarrhoea	13 (30.95)
Conjunctivitis	8 (19.05)
Convulsion	3 (7.14)
Others	8 (19.05)

[Table/Fig-3]: Clinical features of measles cases.

Clinical findings	Yes n (%)	No n (%)
Rash	42 (100)	0
Koplik's spot	0	42 (100)
Lymphadenopathy	4 (9.52)	38 (90.48)
Pallor	28 (66.66)	14 (33.33)

[Table/Fig-4]: Findings of general examination of measles cases.

Immunisation status	n (%)
Both doses of Measles vaccination not taken	1 (2.38)
1 dose taken	21 (50)
2 doses taken	20 (47.62)
Total	42 (100)

[Table/Fig-5]: Immunisation status of measles cases.

observed in the study was the typical appearance of the maculopapular rash on the face and behind the ears in all the children (100%). The other presenting complaint was fever which was present in almost all cases ($n=40$, 95.42%). Only two children presented with an afebrile rash. The other common symptom was cough which occurred in 32 (76.19%) children. The other symptoms were coryza, diarrhoea, vomiting, abdominal pain, dyspnea and conjunctivitis. None of the patients had koplik spots or lymphadenopathy on examination. Majority ($n=40$, 95.42%) of the children were in eruptive stage of the disease. A total of 31 patients out of 42 developed complications due to measles [Table/Fig-7]. The most common complication was pneumonia which occurred in 12 (38.71%) children. The other common complications were laryngotracheobronchitis (16.12%) and

ophthalmic complications (12.9%) such as conjunctivitis. There was one case of orbital cellulitis. None of the cases were complicated by subacute sclerosing pan encephalitis. All the patients recovered completely, mean hospitalisation five days and were discharged from the hospital while, otitis media, gastroenteritis and encephalitis were less commonly seen complications in the present study.

Presenting complaints	n (%)
Maculopapular rash	42 (100)
Fever	40 (95.24)
Cough	32 (76.19)
Coryza	12 (28.57)
Conjunctivitis	8 (19.05)
Measles diagnosis	
Stage of measles	n (%)
Eruptive	40 (95.24)
Prodromal	2 (4.76)

[Table/Fig-6]: Presenting complaints and diagnosis of measles in study participants (N=42).

Complications	n (%)
Upper respiratory tract infection	3 (9.67)
Laryngotracheobronchitis	5 (16.12)
Pneumonia	12 (38.7)
Acute otitis media	3 (9.67)
Ophthalmic	4 (12.9)
Encephalitis	2 (6.45)
Subacute sclerosing panencephalitis	0
Gastroenteritis	2 (6.45)
Protein-energy malnutrition	26 (83.87)
Anaemia	28 (90.32)
Uncomplicated	14 (45.16)

[Table/Fig-7]: Complications in measles cases (N=31).

DISCUSSION

Measles is an extremely contagious disease which predominantly occurs in children. It is responsible for more than 100,000 deaths worldwide every year [8,9]. It is transmitted through airborne droplets of the infected patients by sneezing or coughing. The symptoms of measles typically involve high-grade fever, cough, coryza, fatigue followed by the appearance of a characteristic rash. There is no specific therapy for measles. It is usually treated by symptomatic therapy and fluid therapy in addition to vitamin A and antibiotics to prevent measles complications like pneumonia, diarrhoea and otitis media [10]. Rarely, central nervous system complications such as encephalitis and Subacute Sclerosing Panencephalitis (SSPE) may also develop. There is a safe and effective measles vaccine available which is covered under immunisation programme in two doses few months apart. The incidence of measles has been rising in the past few years and hence, it is important to understand the clinical pattern, complications and outcomes of the disease to plan for effective therapy and immunisation coverage. Thus, this study encompasses such aspects of the disease.

It was observed that measles was highest in 1-5 years age group followed by less than one-year-old children. This could be due to the time of immunisation with first dose of measles vaccine is usually around nine to sixteen months of age. Hence, the children are not protected from measles till then.

In the current study, most of the cases were observed in the late winter months of December and January and early spring months. This corroborates with the findings of other study done in China which observed the same seasonal variation pattern with measles [11]. This could be due to various climatic conditions which prevail

in these months. It has been shown in studies that measles virus becomes inactive after half an hour when exposed to sun [12], so, the transmission of measles is infrequent in summer months. Also, it survives best in the low humidity weather which is common in late winter and early spring months [12]. It was reported that half the patients were fully immunised against measles and half were not. Increasing the immunisation coverage has been shown to decrease the incidence [13,14].

The most common symptom reported was rash in the present study followed by fever. The rash was maculopapular in nature and red in colour. These symptoms were similar to the clinical features reported in a previous study by Lo Vecchio A et al., [15]. Majority of the children were treated with antibiotics and in approximately 67% of the children fluid therapy was also started in addition to the antibiotics. A systematic review published in Cochrane also advocates the use of antibiotics in children suffering from measles [16]. Though measles is a disease caused by a virus, antibiotics are added for treatment to prevent the bacterial superinfections due to compromised immune system which occurs as a complication of measles infection [17]. The most common complication reported in the study was pneumonia which occurred in 38% children. It has been reported to be bacterial superinfection or viral pneumonitis [18].

Limitation(s)

There were a few limitations in this study. Only the children admitted for measles were included, so the children who were treated on outpatient basis were missed during the study period. The sample size was small hence the generalisation of results for the entire population may be difficult.

CONCLUSION(S)

Measles is re-emerging as an infectious disease in children and hence the prevalence has been increasing worldwide. It is very common in children less than five years of age. With timely and appropriate treatment, all the children recovered completely without any sequelae. Knowing the clinical profile and prevalence of the disease, will help the policy makers to form key guidelines for the immunisation coverage of measles. Future studies analysing the effectiveness and preventive measures for measles could be planned.

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