

ORIGINAL ARTICLE

Frequency of Measles Related Complications in Hospitalized Children

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ABSTRACT

Background: Measles is a highly contagious viral infection, highly prevalent in children, clinically associated with complications of nervous, respiratory and digestive systems, with significant morbidity and mortality rate in the developing countries.**Objectives:** The study was aimed to determine the frequency of measles-related complications in hospitalized children.**Methods:** The study was conducted in tertiary care hospital of District Dera Ismail Khan, from February 2022 to November 2022, including 212 children affected with measles.**Results:** Most of the affected children ($p < 0.05$) were infants of age group less than 2 years (45.28%), and males (63.67%) were at higher risk ($p < 0.05$) as compared to the females (36.32%). Significantly higher proportion ($p < 0.05$) of rural kids were affected with measles (58.96%) than urban. Most of the affected children ($p < 0.05$) were not immunized (93.86%; 199/212), and the disease was significantly associated ($p < 0.05$) with the nutritional, socioeconomic, immunization status of the patients. Different complications like pneumonia (31.13%), gastroenteritis (19.33%), conjunctivitis (17.45%), otitis media (7.07%) and encephalitis (2.35%), while 22.64% (42/212) were also observed and six of the 212 patients died of the infection.**Conclusion:** A huge proportion of patients contracted the disease due to the absence of vaccination measures and the disease was associated fatal secondary complications. Therefore, the government must encourage immunization against this extremely contagious but preventable infection in the children.**Keywords:** Complications; Encephalitis; Immunization; Measles; Pneumonia.

INTRODUCTION

The measles is an extremely infectious viral exanthema, caused by Morbillivirus belonging to the family Paramyxoviridae. It is capsulated, single stranded RNA virus with 100-300nm diameter¹. Prior to the introduction of the measles vaccine, the disease caused millions of fatalities annually around the globe. In 2008, an estimated 164000 deaths were attributed to measles. The measles vaccine has significantly reduced morbidity and mortality associated with this highly contagious disease. However, there remain significant obstacles to measles control and eventual elimination².

An infection with measles can result in a variety of complications, including diarrhea, otitis media, pneumonia, CNS infections and sequel, blindness, and hearing losses. Measles-related morbidity and death is worse in poor nations due to malnutrition, huge populations, inaccessibility to health care, and lack of vaccination. The CNS is affected by the measles virus both during active infection and after the illness has become inactive. Primary measles encephalitis, subacute sclerosing pan-encephalitis, measles inclusion body encephalitis and acute post infectious measles encephalomyelitis are the CNS sequel. Neuropathogenesis, immune condition of the host, and clinical situations vary, but all entail brain-virus and immune interactions that result in severe morbidity and mortality, as described in the following section³.

The incidence of confirmed measles infections in Pakistan increased from 24.6 per million cases between 2000 and 2009 to 80.4 per million between 2010 and 2018. Approximately 30-40% of measles patients experience certain complications. Almost every organ in the body is destructed by measles due to damage to mucosal membranes and transitory and profound immunosuppression. This may persist for months following measles, causing complications and may prove fatal⁴. Non-immunization, overcrowding, malnutrition, immunological deficiency, vitamin A deficiency, infection at a young age, lack of healthcare facilities, severe consequences of measles viz pneumonia and encephalitis, are among the prominent risk factors. Although measles is ubiquitous in Pakistan, the country has seen two outbreaks in the last five years, in 2013 and 2017; numerous hospitalized children with complex measles had significant fatality rates⁵⁻⁶.

This hospital-based study was done to determine the frequency of measles-related complications in hospitalized children.

MATERIALS AND METHODS

This descriptive, cross-sectional study was conducted in tertiary care hospitals of District Dera Ismail Khan, Khyber Pakhtunkhwa province of Pakistan, from February 2022 to November 2022, and included 212 children affected with measles, who were hospitalized. The course and effects of measles virus infection in hospitalized patients were monitored by a retrospective cohort study. We studied clinical and para-clinical data from patients admitted to the Isolation ward of Pediatrics Department at DHQ teaching hospital Dera Ismail Khan for measles and associated complications.

Every child of age less than 12 years, hospitalized due to measles and its sequel was included in this observational study. Children under 6 months of age were omitted because maternal antibodies were believed to protect them from measles⁷. Patients characterized with the clinical manifestations including broad maculopapular rash, cough, coryza, fever (101°F or more) and conjunctivitis were recognized as having measles based on clinical criteria. Pneumonia was diagnosed using the Integrated Management of Pediatric Illness (IMCI) criteria of increased respiratory rate or infiltrates on chest x-ray. While, the nervous system complications were clinically characterized by neurological dysfunction, lethargy, unconsciousness, convulsions etc. Similarly, all the systems of the patients were clinically examined for any kind of measles-related complications. In this instance, the vaccination status was also determined through patient's history.

Prior to including patients in the trial, informed consent was obtained.

Data pertaining to age, gender, nutritional and vaccination status, complications and outcome were entered into an MS Excel spreadsheet and analyzed using SPSS version 24 for Windows. For qualitative data, the results were expressed as frequencies and percentages, and for quantitative data, as the mean and standard deviation. It was established the baseline features of inpatients with and without a diagnosis of measles. Age, number of chronic conditions, sex, demographic and medical record was examined as associations with measles hospitalization. With the

measles diagnosis as the independent variable (yes/no) and the various sequel as the dependent variables (yes/no), were created.

RESULTS

The study included 212 children affected with measles and were admitted to the Isolation ward of Pediatrics Department at DHQ teaching hospital Dera Ismail Khan. Statistically significant difference was indicated in the age and sex groups of the patients in which most of the affected children ($p < 0.05$) were infants of age group less than 2 years (45.28%), and males (63.67%) were at higher risk ($p < 0.05$) as compared to the females (36.32%). Significantly higher proportion ($p < 0.05$) of rural kids were affected with measles (58.96%; 125/212) than urban (41.03%; 87/212) (Table 1).

The data was collected in the MS Excel sheets on pre-designed specimen Performa and it was seen that most of the affected children ($p < 0.05$) were not immunized against this exanthema (93.86%; 199/212), while, only 13 immunized children were infected. Nutritional status of the patients played significant role ($p < 0.05$) in the onset of infection and most of the patients were suffering from malnutrition (45.75%; 97/212), while, most of the affected children ($p < 0.05$) were from the lower socioeconomic class (46.22%) followed by the middle class (45.28%). While, investigation of the disease, it came to the notice that significantly high percentage of patients ($p < 0.05$) had history of contact with affected persons (69.33%). Significant patient population was admitted in the hospital ($p < 0.05$) during the course of less than 3 days and were discharged thereafter, followed by hospital stay for 4-7 days and more than 7 days, with the frequency of 58.01, 28.30 and 13.67%, respectively. Body rash was the major clinical manifestation which lasted for less than 5 days in most of the patients ($p < 0.05$), while few had rash over 5 days period, with the incidence of 69.33 and 30.66%, respectively (Table 2).

Table 1: Demographic characteristics of the patients admitted to hospitals

S. No	Demographic variables	Number of patients (n)	Frequency (%)
1	Age		
	<2 years	96	45.28
	2-5 years	78	36.79
	>5 years	38	17.92
2	Sex		
	Male	135	63.67
	Female	77	36.32
3	Location		
	Urban	87	41.03
	Rural	125	58.96

*indicated that the p-value was significant at $p < 0.05$

Table 2: Recorded history of the measles affected patients

S. No	Variables	Number of patients (n)	Frequency (%)
1	Vaccination status		
	Immunized	13	6.13
	Not immunized	199	93.86
2	Nutritional status		
	Well-nourished	35	16.50
	Moderate	80	37.73
	Malnutrition	97	45.75
3	Socio-economic status		
	Upper class	18	8.49
	Middle class	96	45.28
	Lower class	98	46.22
4	History of contact		
	Yes	147	69.33
	No	65	30.66
5	Stay at hospital (days)		
	<3 days	123	58.01
	4-7 days	60	28.30
	>7 days	29	13.67
6	Body rash		
	<5 days	166	78.30
	>5 days	46	21.69

A significantly high ratio of the patients ($p < 0.05$) suffered from different complications including pneumonia (31.13%), followed by gastroenteritis (19.33%), conjunctivitis (17.45%), otitis media (7.07%) and encephalitis (2.35%), while 22.64% (42/212) children recovered from the measles without any complication (Table 3). The degree of severity of the measles was analyzed based on the clinic-pathological manifestations whereby 46.22% were affected with mild severity followed by moderate and intense severity of 31.6 and 22.16%, respectively. The prognosis of the measles infection was also determined based on the rate of recovery and significantly highest patients ($p < 0.05$) were recovered from the malady (206/212), while, six of the patients were expired during the course of infection in the hospitals.

Table 3: Complications in the children affected with measles and hospitalized

S. No	Clinical complications	Number of patients (n)	Frequency (%)
1	Pneumonia	66	31.13
2	Otitis media	15	7.07
3	Gastroenteritis	41	19.33
4	Conjunctivitis	37	17.45
5	Encephalitis	5	2.35
6	No complications	48	22.64

DISCUSSION

Measles is a highly contagious viral infection and characterized with the significant cause of mortality and morbidity in children. With the high incidence of measles in the developing countries, we conducted this study to investigate the hospitalized patients with measles and their clinical outcome in District Dera Ismail Khan. As per our findings, out of 212 patients affected with measles, 45.28% were infants and 54.72% were the children of age more than 2 years. Mostly were non-immunized, male children of rural community, malnourished, having history of contact with the affected population. Most of the patients were recovered and their hospital stay was less than 3 days with characteristic body rash for less than 5 days. Six of the 212 children also died of the infection. Studies exposing the severity of measles in hospitalized youngsters provided substantial support for our findings. 33.66, 33, and 30.33 percent of infected children had mild, moderate, and severe measles infections, respectively⁸⁻⁹. In addition, it was observed that 32% had moderate infections and 24% had mild infections. Another study reported comparable findings regarding measles immunization in children¹⁰.

Long hospitalizations were linked with chronic lung disease (OR = 1.07), liver damage (OR = 1.66), a long duration since the last MMR vaccination (OR = 2.02), raised c-reactive protein (OR = 2.17), bilateral pulmonary condensations on X-ray (OR = 3.13), and elevated procalcitonin (OR = 3.49). The development of pneumonia was likewise connected with the same independent risk variables. It is essential to treat these risk factors in a patient with measles, especially in conjunction with an unknown vaccination status¹. The study demonstrating that a considerable number of measles patients suffer problems and require hospitalization further corroborated our findings. The majority of patients were between six months and four years old, and twenty percent of patients were between six months and eleven months old. Males have a higher incidence of measles than females, possibly due to their greater exposure to the virus^{7, 11}.

Our findings were strongly supported by a study reporting the most common complications as pneumonia (56.29%), diarrhea (17.22%), encephalitis (7.28%), febrile seizures (6.95%), croup (3.31%), otitis media (2.98%), severe stomatitis (2.34%), emphysema (1.32%), dysentery (0.99%), myocarditis (0.66%), and sixteen individuals died, with a mortality rate of 5.29 percent¹². Other studies also suggested that pneumonia was the common complication in measles affected children¹³⁻¹⁵ and diarrhea was reported to be the second complication¹⁶⁻¹⁷. Our findings were also corroborated with the study in which 81.8% of the 110 patients diagnosed with measles, complications were observed. The most

common consequence among patients was pneumonia with 53 cases (48.2%), followed by encephalitis with 16 cases (14.5%), severe watery diarrhoea with 14 cases (12.7%), otitis media with 4 cases (3.6%), and febrile convulsions with 3 cases (2.8%)¹⁸. Similar reports were seen that pneumonia, encephalitis and diarrhea were the prominent complications associated with the measles¹⁹⁻²⁰.

CONCLUSION

Our study revealed that a considerable number of children were admitted to tertiary care hospitals in our district with measles, and that a huge proportion of patients contracted the disease due to the absence of vaccination measures. The case fatality rate was 2.83 percent. The majority of clinical cases manifested with significant sequel including pneumonia, gastroenteritis, encephalopathy, otitis media, and conjunctivitis. Therefore, the government must encourage immunization against this extremely contagious infection, and children, particularly infants, with measles should be hospitalized promptly for treatment to prevent complications and reduce the rate of fatality.

Conflict of Interest: None

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