Original Article

Complications of Measles in Malnourished Children, a Descriptive Cross-Sectional Study at a Tertiary Care Hospital Rawalpindi

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Abstract

Objective: To determine the frequency of common complications of measles in malnourished children.

Materials and Methods: This study was conducted in the Department of Paediatrics at Benazir Bhutto Hospital, Rawalpindi from January 2018 to December 2018. Through a Descriptive Cross-Sectional Study Design, a total of 110 cases of measles with malnutrition presented to the Paediatrics Department were selected and observations were recorded.

Results: The mean age was 2.7 years (SD±1.2) of which 61% (n=67) were male and 39% (n =43) were female patients. 35.5% (n=39) presented with grade I, 24.5% (n=27) in grade II and 40% (n= 44) in grade III malnutrition. On follow-up, pneumonia was observed in 39.1%, diarrhea in 36.4%, otitis media in 10%, and encephalitis in 8.1% of children. The most frequent complications were observed in grade II and grade III malnourished children and children of younger age groups.

Conclusion: Measles and malnutrition are still calamities in our population as once together, the complications of each other are more prevalent, and preventive projects must be designed with full efficacy against both these conditions.

Keywords: Measles, malnutrition, pneumonia, diarrhea, otitis media, encephalitis.

Introduction

Measles is a highly contagious cause of febrile illness typically seen in young children.[1] It is transmitted primarily by means of respiratory droplets and small particle aerosols and can remain viable in the air for up to 2 hours, Exposed people who are not immune have up to a 90% chance of contracting the disease, and each person with measles may go on to infect 9 to 18 others in a susceptible

Population[2] ts incidence is equal in both genders and commonly occurs in winter and spring. The incidence in children varies from 58% in epidemics to 10-15% in endemic. In 2010, there were 139,300 deaths globally with more than 95% in low-income countries with weak health infrastructure. Measles tends to be very severe in malnourished children carrying mortality up to 400 times, higher than in well-nourished children having measles.[3]

Measles is caused by an RNA virus in the family Paramyxoviridae and genus Morbillivirus. The route of entry for the virus is respiratory tract epithelium or conjunctivae following contact with droplets or aerosols containing the virus. The patient remains infectious from 3 days before to 4-6 days after the onset of rash. Measles has 3 stages: incubation period, prodromal stage (fever, cough, coryza, conjunctivitis), and maculopapular rash stage. Common measles complications in developed countries e.g. the USA are diarrhea (11.5%), otitis media (14%), and pneumonia (8.6%) with encephalitis and death.

Severe malnutrition in children results in sub-optimal immunity and higher morbidity and mortality with measles infection. Other risk factors for increased measles complications are patient age<5 years, crowding where children are exposed to larger inoculums doses after household exposure, low serum retinol levels (a form of vitamin A), and immuno-compromised patients.[4]

Malnutrition is a silent emergency.[5] Half of all child deaths can be prevented each year if undernutrition and associated micronutrient deficiency could be eliminated. In 2011, there were 258 million (240-274) children underweight.[6] In Pakistan, 31.2% of children less than five years are underweight.[7] It is estimated that feeding children an adequate diet would prevent 250,000 deaths/ year caused by measles.[8] Measles complications are more frequent among malnourished children and contribute to a major proportion of childhood mortality.[9] The purpose of this study was to determine measles complications in malnourished children in district Rawalpindi.

Materials and Methods

We conducted this cross-sectional study in the Paediatrics unit of Benazir Bhutto Hospital, Rawalpindi from January 2018 to December 2018. All children meeting the inclusion criteria which include malnourished children with measles, age group 1 to 5 years of either gender were included in the study through OPD and admission. Exclusion criteria were well-nourished children with measles and age groups less than 1 year and more than 5 years. Clinical measles was diagnosed in a patient with fever (> 3 days), maculopapular rash and cough, coryza, or conjunctivitis. Malnutrition was defined according to Modified Gomez Classification as the weight for age <80% and graded as

- GRADE I: Children with 71%-80% of expected weight for age
- GRADE II: Children with 61%-70% of expected weight for age
- GRADE III: Children with <60% of expected weight for age

Pneumonia was defined according to IMNCI (rapid breathing, sub-costal recessions), auscultatory findings of crepitation/bronchial breathing, and with or without radiological findings. Diarrhea as three or more loose/watery stools in 24 hours. Otitis Media is a history of acute ear pain, irritability, ear rubbing, and otoscopic evidence of middle ear effusion. Encephalitis as lethargy, irritability, headache, fits, dis- orientation, or other neurological deficits. Investigations like chest X-Ray, CSF R/E, CBC, electrolytes, etc. are done where needed.

The patient's demographic characteristics were noted like name, age, gender, and address in a pre-designed proforma. They were called for follow-up after 14 days of measles rash if not grade III malnutrition which needed admission OR earlier if complications arise and evaluated for various measles complications i.e pneumonia, diarrhea, etc. Weights for age were properly recorded and malnutrition was graded according to the Modified Gomez classification.

Results

A total of 110 cases of measles presenting to OPD were included in the study and followed up for common complications. The mean age was 2.7 + 1.2 years. While distributing the cases of measles with regards to age (Table 1), we observed that 44 (40%) were in the age group 1-2 years, 30 (27.3%) were in the age group

2-3 years, 11 (10%) were in the age range 3-4 years while 25 patients (22.7%) were the age groups 4-5 years.

Table 1: Age-wise distribution of Sample

Age ranges [in years]	*No. of cases*	*Percentage*
1-2	44	40
>2-3	30	27.3
>3-4	11	10
>4-5	25	22.7
Mean + SD	2.7 + 1.2	

While distributing the sample with regard to gender, we observed that 67 (61%) were male and 43 (39%) were female babies (Figure 1).

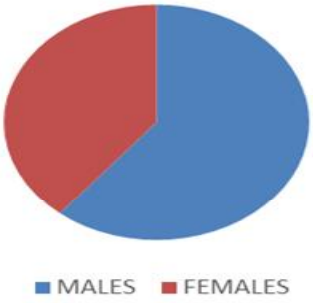

Figure 1: FREQ.

While distributing the sample with regards to baseline grade of malnutrition, we observed that 35.5% presented in grade I malnutrition, 24.5% presented in grade II malnutrition, and the majority 40% presented in grade III malnutrition Table 2.

Table 2: Grade of Malnutrition Wise Distribution of Sample

Grade of Malnutrition	*No. of Cases*	*Percentage*
Grade I	39	35.5
Grade II	27	24.5
Grade III	44	40
TOTAL	110	100

All the patients were followed up after giving them standard treatment and on follow up we observed that the maximum number of patients (93.6%) developed either one or a combination of complications. Of those, pneumonia was the most frequent and seen in 39.1% followed by diarrhea in 36.4%, however, acute otitis media was observed in only 10%, and encephalitis in 8.1% of children (Table 3).

Table 3: Common Complications

Complications	*No. of Cases*	*Percentage*
Pneumonia	43	39.1%
Diarrhea	40	36.4%
Acute otitis media	11	10%
Encephalitis	9	8.1%
No complication	7	6.4%
Total	110	100%

While distributing the common complications with regard to different age groups, we observed that younger age groups developed more frequent complications and the frequency of complications declined as the age progressed. Out of 44 patients in the age group 1-2 years, 45.4% developed pneumonia, 38.6% developed diarrhea while 9.1% developed acute otitis media and 6.8% developed encephalitis. Out of 30 patients in the age group 2-3 years, 40% developed pneumonia, 30% developed diarrhea while 16.6% developed acute otitis media and 13.3% developed encephalitis. Out of 11 patients in the age group 3-4 years, 27.8% developed pneumonia, 36.4% developed diarrhea while 9.1% developed acute otitis media and encephalitis. Out of 25 patients in the age group 4-5 years, 32% developed pneumonia, 40% developed diarrhea, and 4% developed acute otitis media and encephalitis (Table 4).

Table 4: Age Wise Stratification of Common Complications

Age	*Total No of cases*	*Pneumonia*	*Diarrhea*	*Acute Otitis Media*	*Encephalitis*
1-2	44	20 (45.4%)	17 (38.6%)	4 (9.1%)	3 (6.8%)
>2-3	30	12 (40%)	9 (30%)	5 (16.6%)	4 (13.3%)
>3-4	11	3 (27.8%)	4 (36.4%)	1 (9.1%)	1 (9.1%)
>4-5	25	8 (32%)	10 (40%)	1 (4%)	1 (4%)
TOTAL	110	43	40	11	9

While distributing the complications with regards to gender, not much difference was observed between male and female patients. Out of 67 male patients, 37.3% developed pneumonia, 29.8% developed diarrhea and 14.9% developed otitis media and 8.9% developed encephalitis. Out of 43 female patients, 41.9% developed pneumonia, 46.5% developed diarrhea and 2.3% developed otitis media, and 7% developed encephalitis (Table 5)

Table 5: Gender Wise Stratification of Common Complications

Gender	*No of cases*	*Pneumonia*	*Diarrhea*	*Acute Otitis Media*	*Encephalitis*
Male	67	25 (37.3%)	20 (29.8%)	10 (14.9%)	6 (8.9%)
Female	43	18 (41.9%)	20 (46.5%)	1 (2.3%)	3 (7%)
TOTAL	110	43	40	11	9

While distributing the complication with regards to baseline grade of malnutrition, we observed that all of the cases in either grade II or grade III developed any type of complications in all cases. Out of 39 patients in grade I malnutrition, 51.3% developed pneumonia, 17.9% diarrhea and 7.7% otitis media, and 5.1% developed encephalitis. Out of 27 patients with grade II malnutrition, 37% developed pneumonia, 37% diarrhea and 18.5% otitis media and 7.4% developed encephalitis. Out of 44 patients with grade III malnutrition, 29.5% developed pneumonia, 52.3% diarrhea and 6.8% otitis media and 11.4% developed encephalitis (Table 6).

Table 6: Baseline Grade of Malnutrition Wise Stratification of Common Complications

Grade	*No of cases*	*Pneumonia*	*Diarrhea*	*Acute Otitis Media*	*Encephalitis*
Grade I	39	20 (51.3%)	7 (17.9%)	3 (7.7%)	2 (5.1%)
Grade II	27	10 (37%)	10 (37%)	5 (18.5%)	2 (7.4%)
Grade III	44	13 (29.5%)	23 (52.3%)	3 (6.8%)	5 (11.4%)
TOTAL	110	43	40	11	9

Discussion

The results of our study show that a large number of patients with measles developed complications. The majority of patients' ages were 12 months to 36 months, and this is similar to the studies from ethopia[10], west Bengal[11] and Pakistan.[12] 47% of patients were less than 24 months. This is similar to a study that reported 11.5%–40%[12-14] of cases in developing countries, whereas in contrast with the data from developed countries[15-16]. The males were affected more as compared to females as reported by Satpathy et al[11] and a higher rate of vaccination as compared to females, which is similar to those reported by Desai et al.14. Younger-aged children have a high risk of acute measles infection and its complications, with those 24 months and below even at a greater risk. This is similar to other reports[17-21] where the majority of the children were under two years old. However, the Ilorin report22 showed an upward shift involving mainly those of age 3-5years. Regarding gender differences, our study supports the previous data that measles is much more common in boys.[11]

In our study, 35.5% of patients presented with grade I malnutrition, 24.5% in grade II, and 40% in grade III malnutrition, and a high rate of malnutrition among measles children were also reported by Aurangzeb et al.[12] Malnourished children presented with more severe measles infections at a greater frequency due to their altered immune response.[23-25]

Pneumonia is a common complication of measles.[26-30] This was a common complication in our study, similar to studies from southeast Asia and Europe.[11-13,23,24]

Diarrhea is the second common complication in our study in contrast to Indian studies[10,11,14,31] where diarrhea was the most common complication.

Measles with its complications have a severe course even in prosperous countries[32] and can lead to death. A high incidence of complications has been reported in infants by Ariyasriwatana[34] and Khan.[23] This could be due to the fact that infants have poor resistance to infections and are at higher risk of dying.[35] Other workers have reported no difference in mortality in different age groups.[23]

The high rate of complications in our study and similar reported in other local studies may be due to a lack of complete vaccination coverage. As vaccination provides the only measure to control the high burden of measles in our population and lack of its coverage and efficacy is a big threat to increasing prevalence. Studies comparing the impact of the measles vaccine in one area with a control area with a similar mortality rate found 40-50% reduction in mortality.[11] This indicates the importance to improve vaccination coverage to protect the unvaccinated children and introducing a two-dose measles vaccination schedule. WHO and UNICEF have recommended that in addition to achieving high coverage with the first dose of measles vaccine, all children be offered a second opportunity for measles vaccination to improve immunity. This will hopefully present a second chance opportunity for measles immunization for children who did not receive the measles vaccine from the routine programs and for those who did not develop immunity to measles after the first dose. Close monitoring and prompt reporting of all cases of measles will help identify the areas with low vaccine

coverage and also help focus more on the high-risk populations within the community.

Conclusion

Pneumonia and diarrhea are the most common complications of measles in children with malnutrition with most higher frequency in cases with grade II and grade III malnutrition and younger age group

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