

CLINICAL AND DEMOGRAPHIC PROFILE OF CHILDREN HOSPITALIZED WITH MEASLES INFECTION IN PESHAWAR, PAKISTAN

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ABSTRACT

OBJECTIVE: To record the clinical and demographic characteristics of measles in patients hospitalized with measles infection in Peshawar, Pakistan.

METHODS: A retrospective review of medical records from December 2016 to January 2017 was conducted at Northwest General Hospital and Research Centre, Peshawar. A total of 182 measles patients' data was retrieved and recorded in predesigned format which included information on demographics, clinical features, complications and outcome. Both descriptive and inferential statistics were used for data analysis.

RESULTS: Out of 182 patients, 118(64.8%) were males. The mean age was 24.1 ± 2.5 months. The average length of hospital stay was 3.09 ± 2.58 days. The most common complication was pneumonia 99 (54.4%), followed by diarrhea 54 (29.7%) and encephalitis 11 (6.0%). The patients were categorized in to two age groups, pre-vaccination group (≤ 9 months age) and post-vaccination group (> 9 months age). Significant number of cases 54 (30%) were seen in age group ≤ 9 months. Only 45 (35%) cases in age group > 9 months received the scheduled measles vaccination. Multivariate regression analysis revealed that presence of Koplik spots [AOR=0.251, CI: 0.074-0.853, $p=0.027$], high lymphocyte count [AOR=0.205, CI: 0.092-0.453, $p<0.001$] and being unvaccinated in general [AOR= 2.546, CI: 1.185-5.469, $p=0.017$] were found to be significantly associated with age group > 9 months. Majority of patients were from the Peshawar ($n=95$) followed by Kohat ($n=10$),

CONCLUSION: Pneumonia was the commonest complication followed by diarrhea. Vaccination history was very poor and significant number of patients were seen in age group < 9 months of age.

KEY WORDS: Measles (MeSH); Vaccination (MeSH); Pneumonia (MeSH), Diarrhea (MeSH).

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INTRODUCTION

Measles is a highly contagious viral illness, usually transmitted through respiratory droplets and affecting predominantly the early age group (< 5 years). The incubation period is estimated to last 10 to 14 days. The prodromal phase is characterized by onset of fever accompanied by cough, coryza, and/or conjunctivitis. The fever is followed by the

characteristic maculopapular rash, generally 3 to 5 days later. The individuals are infectious mostly during the period (7 days before and 7 days after the rash appears).^{1,2} Measles affects the immune system, especially in the very young age group, leading to complications like pneumonia, diarrhea and encephalitis, that can lead to death.³

Despite the availability of a safe and cost-effective vaccine, measles is still a

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leading cause of mortality among young children, with greatest in the regions having poor access to primary health care.⁴⁻⁶ In 2011, it contributed 158000 deaths throughout the world, while in 2014 total recorded deaths were 0.11million or 314 deaths every day.⁷ According to the World Health Organization(WHO) figures, measles related deaths have been decreased by 79.0% from 2000 to 2014.⁸ Measles elimination was made a component of Millennium Development Goal 4 (MDG- 4). Being a member of Eastern Mediterranean Region (EMR) Pakistan made a commitment in 1997 to eliminate measles by 2010.⁹ The goal set by EMR office was to reduce measles incidence to One per million and mortality by 90% by 2010.¹⁰

Despite being part of the WHO's new Global Measles and Rubella Strategic Plan 2012-2020, Pakistan still experiences a high number of outbreaks and deaths due to measles.¹¹ In 2012, 14 000 cases were reported, resulting in 306 deaths.¹² WHO reported 94 measles outbreaks in the first three weeks of January 2013, with Punjab recording 25 and Baluchistan 33 outbreaks. Simultaneously, 1211 measles cases were reported in Sindh, 290 in Khyber Pakhtunkhwa and 483 in Baluchistan. It claimed lives of 103 children throughout the country from January 1 to January 19.¹³

According to the Expanded Program for Immunization (EPI) schedule for Pakistan; Measles immunization is

TABLE I: CLINICAL CHARACTERISTICS OF THE PATIENTS (n= 182)

Characteristics		N (%)
Fever	Low grade	49(26.9%)
	High grade	133(73.1%)
Cough	Present	139(76.4%)
	Absent	43(23.6%)
Rash	Present	166(91.2%)
	Absent	16(8.8%)
Eyes	Normal	167(91.8%)
	Inflamed	15(8.2%)
Kopliks spot	Present	17(9.3%)
	Absent	165(90.7%)
Hemoglobin (g/dl)	≤ 10g/dl(Anemia)	47(25.8%)
	> 10g/dl	135(74.2%)
Leucocyte count	Normal(≤ 11x10 ³)	123(67.6%)
	Increased(> 11x10 ³)	59(32.4%)
Neutrophil count	Normal	150(82.4%)
	Increased	32(17.6%)
Lymphocyte count	Normal	105(57.7%)
	Increased	77(42.3%)
X-Ray Chest	Normal	86(47.3%)
	Suggestive of pneumonia	96(52.7%)
Vaccination status	Unvaccinated	83(45.6%)
	Vaccinated	99(54.4%)
Measles vaccination	Unvaccinated	137(75.3%)
	Vaccinated	45(24.7%)
Pneumonia	Present	99(54.4%)
	Absent	83(45.6%)
Diarrhea	Present	54(29.7%)
	Absent	128(70.3%)
Convulsions	Present	14(7.7%)
	Absent	168(92.3%)
Encephalitis	Present	11(6.0%)
	Absent	171(94.0%)
Other complications	Pharyngitis	11(6.0%)
	Pneumothorax	3(1.6%)
	Sinusitis	1(0.5%)
	Sepsis	1(0.5%)
Length of hospital stay	≤ 7 days	172(94.5%)
	> 7 days	10(5.5%)
Outcome	Discharged	181(99.5%)
	Died	1(0.5%)

recommended at 9 months of age with the booster dose at 12 to 15 months of age. WHO recommended that, there should be more than 90% coverage of both doses of measles vaccine.³

Vaccination is the only hope towards measles elimination. But unfortunately Pakistan records very low vaccination

coverage, being 75%(initial dose) and 53%(booster dose) in 2011 while in the same year nearly 0.9 million children did not receive their first dose of measles vaccination, resulting in multiple outbreaks in country. For the year 2014, Pakistan showed overall vaccination coverage of 63%, with suspected measles cases approximately

2555 and laboratory confirmed cases 1362.¹⁵ According to the study done in Karachi between 2014-16, the measles vaccination coverage was very low, being 34.9% at 9-month age declining to 22.7% at 15-month age.¹⁶ Keeping in view the burden of measles cases, we conducted this study to record the clinical and demographic characteristics of measles in patients hospitalized with measles infection in Peshawar, Pakistan.

METHODS

A retrospective review of medical records from January 2016 to December 2017 was conducted at Northwest General Hospital and Research Centre, Peshawar, Pakistan. This is a private sector hospital covering vast areas in and around Peshawar and neighboring Afghanistan. Mode of payment ranges from fee-for-service, corporate coverage and the newly launched government scheme of Sehat Insaf Card.

The data was extracted from both patient file and electronic medical record, containing measles cases using a structured format. Patients aged 0-12 years were included in the study. Those with congenital disorders, immunodeficiency disorders and having malignant disorders were excluded. Information on demographics like, age, gender, locality etc., clinical features, immunization status, laboratory investigations, complications and clinical outcome was noted or recorded. Measles cases were divided in two age groups, pre-vaccination group (≤9 months) and post-vaccination group (>9 months). The data was analyzed by SPSS version 20 for Windows. Frequency and percentages were calculated for categorical data and mean (standard deviation [SD]) for numerical data. For comparison chi-square or Fisher's exact test where appropriate was used. P value <0.05 was considered significant for all statistical tests. A logistic regression analysis was used to calculate the adjusted odds ratios (AOR) and their 95% confidence intervals. Variables having P-value of <0.25 at univariate analysis were entered into multivariate analysis.

The study was approved by the ethics

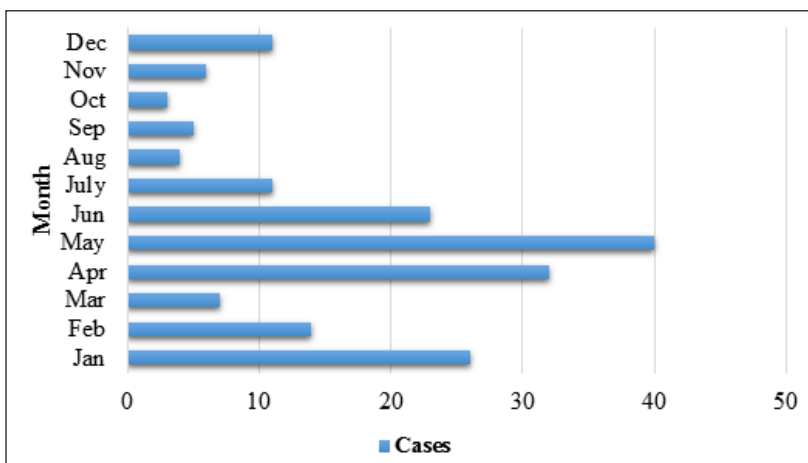


Figure 1: Month wise distribution of measles cases

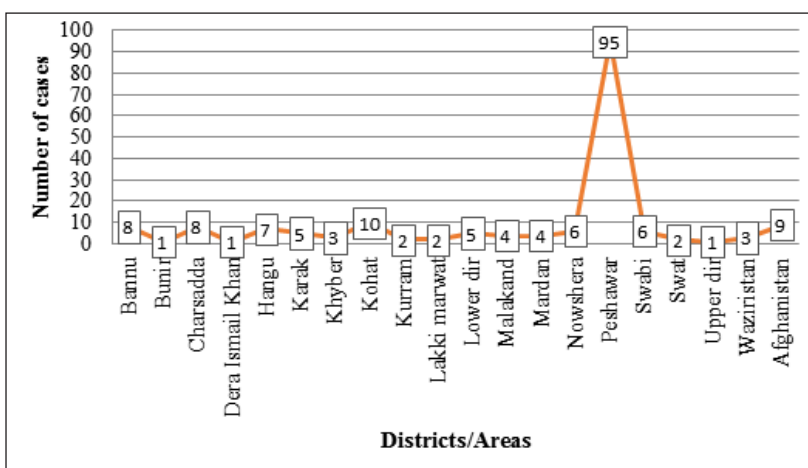


Figure 2: Area wise distribution of measles cases [including patients from Afghanistan (n=9)]

review committee of the Northwest General hospital and Research Centre [Ref No: NwGH/Res/approv/5].

RESULTS

Out of 182 patients included in the study, 118(64.8%) were males and 64(35.2%) were females. The mean (SD) age was 24.1±2.5 months and median age was 12 months.

Rash was observed in 166(91.2%) patients while koplik spots were present in 9.3% of the patients. The radiological investigations (Chest X-ray) were suggestive of pneumonia in 96(52.7%). Of the total patients 45.6% did not receive the age specific routine vaccination and 75.3% did not receive the measles vaccination. Overall,

pneumonia was the most common complication 99(54.4%) followed by diarrhea 29.7% and encephalitis 6.0%. The average length of their hospital stay was 3.09±2.58 days. Only one patient died during hospitalization which corresponds to overall mortality of 0.5%. The average hemoglobin and leukocyte count of the study sample was 11.43 ± 7.9 gm/dl and 9111.46±5043.67cells/mm³ (Table I).

Measles cases were observed in almost all the seasons of the year though the majority of cases were seen during the winter and a hot, dry spring season (March through May) (Figure 1). Majority of patients were from the district Peshawar followed by Kohat, moreover 9 patients were from

Afghanistan (Figure 2).

The patients were categorized into two age groups, pre-vaccination age group (≤9 months=54) and the post-vaccination age group (>9 months=128). Significant difference in lymphocyte count was observed between two age groups (p<0.001) and similarly Koplik spots was also found to be significant between the two groups (p=0.027), however no significant difference was found regarding the length of hospital stay and complications (Pneumonia, diarrhea, encephalitis) between the two groups (Table II). Both the groups had same clinical presentation (fever, cough and rash). More than half of the cases in pre-vaccination age group ≤9 months developed Pneumonia (almost 63%) as compared to post-vaccination age group >9 months (50%) however the difference was in-significant. Variables found to be significant (cut off value <0.25) at univariate analysis were entered into multivariate logistic regression analysis. Among the variables, three variables, presence of Koplik spots [AOR=0.251, CI; 0.074-0.853, p=0.027], high lymphocyte level [AOR=0.205, CI; 0.092-0.453, p<0.001] and being unvaccinated [AOR= 2.546, CI; 1.185-5.469, p=0.017] were found to be significantly associated with age group>9 months (Table III).

DISCUSSION

Our study confirms male preponderance, this finding is consistent with a study conducted in Bangladesh.¹⁷ Moreover same results have also been reported locally by Khan, et al.¹⁸ and Saleem, et al.¹⁹

The mean age of measles cases in present study was 24.13±2.5 months. A study conducted by Tariq, et al.²⁰ on measles patients in Rawalpindi reported mean age of 32 months. Another research conducted by Furrukh, et al.²¹ also reported mean age of 32 months.

One unanticipated result in our study is that 54 (30%) cases, who presented with measles, were ≤9 months of age while 70% children were >9 months of age. While other studies showed that

TABLE II: ASSOCIATIONS OF TWO AGE GROUPS WITH DEMOGRAPHICS AND CLINICAL CHARACTERISTICS (n=182)

Characteristics		Age Groups		p-value
		≤9 months (n=54) N(%)	>9 months (n=128) N(%)	
Sex	Male	36(67.7)	82(64.1)	0.737
	Female	18(33.3)	46(35.9)	
Fever	Low grade	15(27.8)	34(26.6)	0.866
	High grade	39(72.2)	94(73.4)	
Cough	Present	44(81.5)	95(74.2)	0.292
	Absent	10(18.5)	33(25.8)	
Rash	Present	47(87.0)	119(93.0)	0.197
	Absent	7(13.0)	9(7.0)	
Eyes	Normal	47(87.0)	120(93.8)	0.132
	Inflamed	7(13.0)	8(6.2)	
Koplik spots	Present	9(16.7)	8(6.2)	0.027
	Absent	45(83.3)	120(93.8)	
Neutrophil count	Normal	41(75.9)	109(85.2)	0.135
	High	13(24.1)	19(14.8)	
Lymphocyte count	Normal	20(37.0)	85(66.4)	<0.001
	High	34(63.0)	43(33.6)	
X-ray chest	Normal	21(38.9)	65(50.8)	0.142
	Suggestive of pneumonia	33(61.1)	63(49.2)	
Vaccination status	Unvaccinated	19(35.2)	64(50.0)	0.067
	Vaccinated	35(64.8)	64(50.0)	
Measles vaccination	Unvaccinated	54(100)	83(64.8)	<0.001
	Vaccinated	0(0.0)	45(35.2)	
Pneumonia	Present	34(63.0)	65(50.8)	0.132
	Absent	20(37.0)	63(49.2)	
Diarrhea	Present	16(29.6)	38(29.7)	0.994
	Absent	38(70.4)	90(70.3)	
Convulsions	Present	1(1.9)	13(10.2)	0.068
	Absent	53(98.1)	115(89.8)	
Encephalitis	Present	1(1.9)	10(7.8)	0.123
	Absent	53(98.1)	118(92.2)	
intensive care required	Yes	8(14.8)	13(10.2)	0.369
	No	46(85.2)	115(89.8)	
Outcome	Discharged	54(100)	127(99.2)	0.515
	Died	0(0.0)	1(0.8)	
Hemoglobin(g/dl)	≤10	15(27.8)	32(25.0)	0.696
	>10	39(72.2)	96(75.0)	
Leukocyte count	Normal	33(61.1)	90(70.3)	0.226
	High	21(38.9)	38(29.7)	
Length of hospital stay	≤7days	50(92.6)	122(95.3)	0.462
	>7days	4(7.4)	6(4.7)	

11.5% to 23.4% of children were less than 9 months of age.^{19,20} In a similar study by Akramuzzaman et al in Bangladesh found 23% of measles cases before 9 months of age and 19% between 9-11 months of hospitalized

children admitted with measles.²² This finding highlights the gap in herd immunity due to low immunization coverage. Poor maternal health and hence lack of proper breastfeeding has also been cited as the reason behind

increased incidence of measles cases in ≤9 months of age. Studies by Zahidie et al and Silfverdal et al described that >3 months of breast feeding can modify the outcome of measles in comparison to those who are not breastfed.^{23,24} Such high percentage of measles patients younger than 9 months implies need for further studies and proper investigations to find out incidence and prevalence of measles in infants from birth onwards.

In this study Pneumonia was the most common complication observed among the measles cases, followed by diarrhea and encephalitis, and very severe pneumonia with respiratory failure was the reason behind the single death in age group >9 months. Similar complications are observed by various studies.

Measles is endemic in this part of the world with periodic epidemics occurring every two to three years. Figure one depict the monthly hospital admissions. The disease is more common during the winter and spring seasons as supported by our study results. More than half of measles cases 95(52%) were reported from Peshawar District of Khyber Pakhtunkhwa. Since our study center was Peshawar, hence most cases were from Peshawar and its surrounding areas.

The Expanded Program on Immunization (EPI) was initiated in Pakistan in 1978 under the umbrella of World Health Organization with the aim of reducing the mortality due to vaccine preventable illnesses.²⁶ Measles immunization is a part of EPI, consisting of two doses, initial dose administered at 9 months of age and the booster dose at 12 to 15 months of age.¹⁴ Despite all the global support measles is still a major public health problem in Pakistan. In 2011 Pakistan recorded very low vaccination coverage, being 75%(initial dose) and 53%(booster dose).¹¹ Measles vaccination coverage serves as an indicator of the quality of immunization programs.²⁷

According to our study, only 35% of the cases in age group >9 months were vaccinated, either with a single or two doses however no documentary proof

TABLE III: MULTIVARIATE LOGISTIC REGRESSION ANALYSIS OF THE PATIENT'S CHARACTERISTICS ASSOCIATED WITH AGE GROUP >9 MONTHS

Characteristics	Age groups		Adjusted Odd Ratios (AOR)	95% CI	p-value
	≤9 months (n=54) N(%)	>9 months (n=128) N(%)			
Koplik spots					
Present	9(16.7)	8(6.2)	0.251	0.074-0.853	0.027
Absent	45(83.3)	120(93.8)	Reference		
Lymphocyte count					
Normal	20(37.0)	85(66.4)	Reference	0.092-0.453	<0.001
High	34(63.0)	43(33.6)	0.205		
Vaccination status					
Unvaccinated	19(35.2)	64(50.0)	2.546	1.185-5.469	0.017
Vaccinated	35(64.8)	64(50.0)	Reference		

of the vaccination status was available. Furrukh et al reported 61.1% of patients were not vaccinated against measles while in a study conducted at Khyber Teaching Hospital, Peshawar 25% of patients were not vaccinated.^{21,28}

The coverage for measles vaccination was even lower in a Nigerian study that showed higher proportion of unvaccinated children i.e. 77.9%.²⁹ This low coverage of measles vaccination in our study (35%) is quite high and alarming, in spite of our health care systems strenuous efforts and contributions in the field of EPI. Occurrence of measles in vaccinated children (35%) also raises questions about efficacy and effectiveness of vaccine. Whether the problem is with the vaccine, its method of administration, usage after being expired or the failure of maintenance of a proper cold chain; issues that need to be explored on urgent basis. Low immunization coverage is a composite in this part of the world, various studies have reported different contributing factors to this dilemma.^{19,30} Among them socioeconomic, cultural and poor health infrastructures are the major factors.

Some other factors associated with increased measles incidence in literature are budgetary constraints, mismanagement, poor primary health services, security situation, negligence/lack of awareness among parents, shortage in number of vaccinators, poor cold chain maintenance, floods and malnutrition.^{19,30}

CONCLUSION

Significant numbers of cases were seen in ≤ 9 months of age. The most common

complication was pneumonia, followed by diarrhea and encephalopathy in frequency. Measles vaccination coverage is very poor in current study population. Vaccination at early age should be initiated in epidemic or higher endemic situations.

LIMITATIONS

The worth mentioning limitations related to this study are its design and setting (single center and hospital based) and hence may not be representative of the whole community. Being a retrospective study, information on detail socio-demographic and contact history was not available and no documentary proof of measles vaccination was obtained, only the verbal response of parents as "yes" or "no" was relied upon.

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AUTHORS' CONTRIBUTIONS

Following authors have made substantial contributions to the manuscript as under:

FK & AJG: Concept, study design, critical revision, final approval.

FK & IA: Acquisition & analysis of data, drafting the manuscript, critical revision, final approval.

RZ & WA: Acquisition of data, critical revision, final approval.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest

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