ORIGINAL ARTICLE
MENINGOCOCCAEMIA IN CHILDREN—AN UNDER RECOGNIZED PUBLIC HEALTH PROBLEM IN PAKISTAN

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Background: Meningococcaemia is a serious bacterial disease caused by *Neisseria meningitidis* resulting in septicaemia and meningitis in previously well individuals and is associated with serious consequences including mortality. As the data from our region is scarce, the study was conducted with an aim to highlight the disease manifestations and outcomes so that appropriate interventions are devised. **Methods:** A descriptive study was conducted in Paediatrics A Unit from 1st March 2020 to 30th September 2021 after approval of institutional review board. Children admitted with features of meningococcaemia in the form of fever and typical petechial purpuric rash were included in the study. **Results:** A total of 46 patients with meningococcaemia were included in the study. Of these, 24 (52.2%) were male. Majority of the patients 22 (47.8%) were in the age group of 1 year to five years, Major complications were meningitis in 39 (84.8%), septic shock in 26 (56.5%) and purpura fulminans in 12 (26.1%) patients. Mortality was documented in 6 (13%) patients. Outcome was associated with age. (p= 0.039). There was a significant difference in outcome in patients with prolonged PT/APTT (p=0.031), purpura fulminans (p=0.000) and septic shock (p=0.021). **Conclusion:** Meningococcaemia is prevalent in our region in paediatric population. The disease has a fulminant course with a myriad of complications and potentially fatal outcomes especially in children under one year of age.

Keywords: meningitis; septic shock; mortality

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INTRODUCTION

Meningococcaemia is a serious bacterial disease caused by *Neisseria meningitidis* resulting in septicaemia and meningitis in previously well individuals and associated with serious manifestations and mortality.[1,2] The causative organism is a gram negative diplococcus having 13 serotypes with six types (A, B, C, W-135, X, and Y) responsible for the devastating disease manifestations like intracranial infection, sepsis and shock.[2] The organism only infects humans and is spread by droplets from respiratory or throat secretions.

The disease is rapidly progressing with cough or flu like symptoms being the initial presentation leading to septicaemia, meningitis and shock culminating in death in untreated cases (death reported in up to 50%) or severe disability with sequelae in the form of CNS insult, amputations and hearing impairment (10–20%)[3,4] One of the important factors related to disease onset and its potential carriage is the age. The disease is highly prevalent in paediatric population especially in children below 5 years of age. In developed countries the disease has also been reported in adolescents and younger adults. Other factors implicated in disease carriage include overcrowding, poor socioeconomic settings, and recurrent infections of respiratory tract.[5,6]

Global estimates suggest that nearly 1.2 million people suffer from meningococcal disease each year.[7] Mortality from the disease has been estimated to range from 4.1–20%.[8] The disease prevalence in the Asia Pacific region is not properly estimated owing to the absence of epidemiological data from this region.[9] Data from our region is limited and incomplete. One study reports an incidence of 1/100000 from Bangladesh in paediatric patients. Overall incidence from China is reported to be 0.1 cases/100000 persons per year.[10] The disease predominantly is reported to inflict children in this region with nearly 75% of total cases from Philippines documented in children aged 0–14 years.[11]

For optimizing and devising strategies for eradication of meningococcal disease, it is imperative to have a fair knowledge of its exact incidence.[12]The data on this potentially fatal disease is scarce in our region. The present study was conducted with an aim to highlight the endemicity as well as the disease manifestations and outcomes of meningococcaemia in paediatric patients of our region. This will help in formulating strategies for timely diagnosis and eradication of the disease from our area.

MATERIAL AND METHODS

The descriptive study was conducted in the department of Paediatrics from 1st March 2020 to 30th September 2021

after approval of institutional review board. Informed consent was obtained from the parents. All children admitted in paediatric unit with features of meningococcaemia in the form of fever and typical petechial purpuric rash were included in the study. Patients with petechiae and purpura secondary to haematological disorders like immune thrombocytopenic purpura, aplastic anaemia and acute leukaemia were excluded from the study. Patient characteristics including age, gender, weight, vaccination status, presenting complaints, duration of illness, duration of hospital stay, complications, laboratory parameters and outcome were documented on a predesigned *pro forma*. Data was entered and analyzed using SPSS 26.0. Mean and standard deviation was calculated for Quantitative like age, weight, Haemoglobin level (Hb), Total Leukocyte Count (TLC), platelet counts, D Dimers and duration of hospital stay were described as mean ± standard deviation. Frequencies and percentages were calculated for categorical variables. Chi square test was used for significance testing. p value $\leq$0.05 was considered significant.

RESULTS

A total of 46 patients with meningococcaemia were included in the study. Of these, 24 (52.2%) were male. Mean age of the participants was 37.5±35.3. (Table-1). The major presenting features were fever in 46 (100%), rash in 46 (100%), fits in 9 (19.6%), headache in 12 (26.1%), drowsiness in 19(41.3%), vomiting in 19 (41.3%) and joint pains in 8 (17.4%). A total of 26 (56.5%) patients required inotropic support. Major complications were meningitis in 39 (84.8%), septic shock in 26 (56.5%), purpura fulminans in 12 (26.1%), gangrene in 5 (10.9 %), and arthritis in 7 (15.2%) patients.

A total of 40 (87%) patients were discharged and 6 (13%) patients expired. Outcome was assessed in relation to gender, age groups, complications, and laboratory parameters. The difference was statistically significant in patients with prolonged PT/APTT (p=0.031) (Table-2). The difference was not found to be statistically significant as regards gender (p=.0.909). The difference was also found to be statistically significant when outcome was assessed in relation to age groups (p=0.039). There was a significant difference in outcome in patients with purpura fulminans (p=0.000) and septic shock (p= 0.021). The outcome was also found to be significantly related to duration of hospital stay (p=0.017) as majority of the deaths were reported in first 24 hours indicating the fulminant nature of disease. (Table-3)

Table-1: Patient Characteristics (n=46)

Age in months		37.5000 ± 35.321	
Weight in kg		11.589 ± 5.650	
Duration of symptoms		2.065 ± 0.800	
Duration of hospital stay		5.826 ± 3.220	
Mean Haemoglobin(g/dl)		9.99 ± 1.95	
Mean Total leucocyte count (/cmm)		17663.04 ± 5869.55	
Mean Platelet count (/cmm)		146565.2174 ± 104923.81409	
Mean D dimers		3835.12 ± 2441.46	
		No. of patients	**Percentage**
Gender	Male	24	52.2
	Female	22	47.8
Age Groups	1month to 1 year	17	37
	>1year to 5 years	22	47.8
	>5 years	7	15.2
Vaccination status	Fully vaccinated	8	17.4
	Partially vaccinated	9	19.6
	Unvaccinated	29	63
Outcome	Discharged	40	87
	Expired	6	13
Duration of stay	Up to 5 days	18	39.1
	>5 days	28	60.9

Table-2: Laboratory Parameters in relation to outcome

Parameters		**Discharge**	**Expired**	***p* value**
Platelet Count	Low	24	3	0.643
	Normal	16	3	
D Dimers	Elevated	35	4	0.185
	Not done	5	2	
PT/APTT	Prolonged	20	3	0.000
	Normal	19	0	
	Not done	1	3	

Table-3: Patient characteristics in relation to outcome

		Discharged	Expired	*p* value
Gender	Male	21	3	0.909
	Female	19	3	
Age Groups	1 month to 1 year	12	5	0.039
	>1year to 5 years	21	1	
	>5 years	7	0	
Duration of stay	Up to 5 days	13	5	0.017
	>5 days	27	1	
Septic Shock	Present	20	6	0.021
	Absent	20	0	
Purpura Fulminans	Present	6	6	0.000
	Absent	34	0	
Meningitis	Present	33	6	0.266
	Absent	7	0	
Gangrene	Present	3	2	0.058
	Absent	37	4	
Arthritis	Present	7	0	0.266
	Absent	33	6	

DISCUSSION

Our study comprised almost equal number of male and female patients. Hence, no significant gender predilection for the disease was reported. In contrast, a meta-analysis evaluating gender differences in patients with meningococcal disease from ten countries reported higher incidence rates in male patients. The incidence rates were reported to be higher in younger patients especially in the 1–4 years age group.[13] Results from our study also documented that nearly half of the patients were in 1–5 years age group.

All patients with meningococcal disease presented with fever and rash in our study. Other features included seizures, vomiting, headache and joint pains in varying proportions. Other studies also reported fever, vomiting, rash and headaches as the initial manifestations of meningococcal disease frequently progressing to severe disease with shock and multi organ dysfunction.[14] A major proportion of our patients with meningococcaemia had meningitis. A previous study from Karachi also reported the presence of meningococcal meningitis in nearly 80% of the total enrolled patients.[15] Another study reported meningitis in nearly 80% of patients with meningococcal disease.[16] In contrast, Stein-Zamir *et al* reported meningitis in only 37% patients[17]. Nearly half of the patients presented with shock in our study and required inotropic support. In another study, septicaemia with shock has been documented in 20-30% patients and meningitis in 30–60% patients.[14] Arthritis was reported in 6–15% patients in this study[14]which is similar to results from our study.

A total of 13% patients in our study expired. Stein-Zamir *et al* reported mortality in 11.6%.[17] Low platelet counts, low WBC count and purpura fulminans have been reported to be associated with higher mortality.[14] Results from our study showed statistically significant correlation of mortality to presence of purpura fulminans and septic shock.

In a study from USA, higher mortality rates were documented among female patients with invasive meningococcal disease as compared to male patients.[18] However there was no significant difference in mortality among male and female patients in our study.

Majority of the patients were unvaccinated in our study. Although meningococcal vaccine is not part of EPI schedule in Pakistan, the lack of vaccination shows the gravity of situation of preventive health strategies in our area. The strengths of this study include rigorous data collection. Limitation is a small sample size.

CONCLUSION

Meningococcaemia is prevalent in our region in paediatric population. The disease has a fulminant course with a myriad of complications and potentially fatal outcomes especially in children under one year of age. There is a dire need of health education about importance of vaccination along with vaccination campaigns aimed at meningococcal eradication in the affected areas.

AUTHORS' CONTRIBUTION

SB: Write-up, literature search, data analysis and interpretation. SYHG: Literature search, proof reading. TSS: Conceptualization of study design. AUR: Proof reading. SJ, KM: Data collection.

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