ORIGINAL ARTICLE

Bacterial Meningitis in Children in a Tertiary Care Hospital in South Punjab: A Retrospective Analysis of Clinical and Laboratory Features

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ABSTRACT

Background: In children, meningitis is still in the ten common causes of death in many countries. Bacterial meningitis has high incidence of mortality in childhood. Both clinical evaluation and the use of laboratory investigations are important tools in finding cause of bacterial meningitis .

Objective: The purpose of the research is to study the demographic features, yield of gram staining, the incidence and etiology of bacterial meningitis in children of ≥ 2 months to ≤14 years during a 1 year period, from October 2013 to September 2014, in Department of Pediatrics, Nishtar Hospital Multan & in Pathology Department Nishtar Medical College Multan.

Methods: Diagnosis of bacterial meningitis was mainly based on criteria published by the World Health Organization (WHO) .Children having history of intake of antibiotic in the last 5 days which can cross the blood brain barrier and children with tuberculosis meningitis were excluded. The patients were evaluated according to their sex, age, clinical features and pathogenic microorganisms. Patients were divided in three age groups. CSF was collected by lumbar puncture in ward and biochemistry, microscopy , gram staining and bacteriological culture was performed in pathology department .Statistical analysis of data was done by using Microsoft Excel, and SPSS 16.

Results: A total of 130 patients (2.53% of the total admissions) were included in the study. Male patients were 76(58.5%) and 54 (41.5%) patients were female. Out of 130, 54(41.5%) patients were in the age group of ≥2 months-1 year, 40(30.8%) in the group of 1-5 years and 36(27.7%) in group of 5-14 years. 72.3% children were below 5 years in our study . Gram staining was positive in 74(56.9%) cases and negative in 56(43.1%). The most common clinical symptoms was fever and headache and the least was vomiting .The CSF cultures were positive in 60(46.2%) cases and negative in 70(53.8%).The three most common pathogens reported are Streptococcuspneumonia 26 (20%),Neisseriaemeningitidis 20 (15.4%) and Hemophilusinfluenzae b , 12 (9.2%).

Conclusion: Bacterial meningitis is still a very common serious infection in children below 5 years .The most common pathogen involved in the etiology of bacterial meningitis was Streptococcus pneumoniae**.** The yield of gram staining and culture though comparable with the national studies but lower than reported internationally.

Keywords: Children; Bacterial Meningitis

INTRODUCTION

Meningitis is inflammation of the protective membranes surrounding brain and spinal cord. The inflammation may be caused by infection with viruses, bacteria or other microorganisms. Bacterial meningitis is a serious cause of illness, disability and death in children, therefore the condition is classified as a medical emergency. Bacterial meningitis has high incidence of mortality in childhood [1].In children, meningitis is still in the top ten leading causes of death in many countries [2]. The World Health Organization reported that 1.2 million cases of bacterial meningitis emerge worldwide annually and 135000 deaths occur due to this disease. Neisseria meningitidis, Haemophilusinfluenzae type b (Hib) and Streptococcus pneumoniae are the main pathogens responsible for more than 80% of all cases but other bacteria may cause bacterial meningitis.

There is much interest over worldwide in the prevention and management of bacterial meningitis. The use of Hib vaccine in many parts of the world has reduced incidence of meningitis due

to Haemophilusinfluenzae type b (Hib)[3] up to 98% .

The retrospective study was planned in a tertiary care hospital during a one year period for analysis of the epidemiological patterns of acute bacterial meningitis, so that management policies can be made and implemented properly on the basis of local data.

MATERIAL METHOD

Nishtar Hospital Multan is a tertiary care hospital with 1800 beds located in the South Punjab, Pakistan. . We retrospectively studied the children admitted with suspected bacterial meningitis to the paediatric department at Nishtar Hospital Multan during a one year period from October 2013 to September 2014.A case of bacterial meningitis was labelled as probable when a child >2months to <14 years of age presented with symptoms of meningitis (i.e., fever, headache stiff neck, bulging fontanelle, or mental status changes) with a turbid ("cloudy") CSF, or a CSF with an elevated protein (>100 mg/dl), decreased glucose (<40 mg/dl), or leukocytosis (>100WBC/mm3) with >80% neutrophils. A case of bacterial meningitis was confirmed when a child >2months to <14 years old presented with symptoms of meningitis (i.e., fever, headache stiff neck, bulging fontanelle, , or mental status changes) and identified by bacterial culture of the CSF. [4].The cases with negative bacterial culture were considered bacterial meningitis of "unknown etiology"[5] on the basis of thecyto-chemical analysis of the CSF and clinical assessment.

Patients with clinical suspicion of meningitis according to WHO criteria in the age group between ≥2 months to ≤14 years were included in this study. Children, having age <2 months and >14 years, having TB meningitis, having meningitis due to head trauma or CSF shunt operation, suffering from any other pathology, having history of intake of antibiotics in the last 5 days were excluded. No consent was received in this study because the data did not relate to any individual. A total of three age groups of clinically suspected meningitis patients were selected i.e. age group ≥2 months to 1 year, age group 1 to 5 years and age group 5 to ≤14 years. Initial clinical assessment was done in ward by on duty medical officer and residents . Data regarding name, father name, sex, date of birth, postal address, dates of admission and discharge and clinical history (h/o preadmission antibiotic therapy ,vomiting, headache, fever, irritability, neck stiffness, bulging fontanelle, convulsions or coma on admission) were recorded on proforma of children between ≥2 months to ≤14 years, suspected of having bacterial meningitis. CSF was collected by lumbar puncture. All CSF samples were forwarded to pathology laboratory for biochemistry, microscopy and gram staining .CSF for culture was centrifuged for 15 minutes. The supernatant was removed. Sediment inoculated on 5% sheep blood agar was incubated at 37^0 C in incubator and inoculated chocolate agar plate was incubated at 37^0 C in a CO2 enriched atmosphere . We analyzed the clinical presentations and laboratory findings .

Statistical analysis: Statistical analysis of data was done by using Microsoft Excel, and SPSS 16.

RESULTS

During this study period, a total of 5144 patients were admitted to the department of pediatrics ,Nishtar Hospital, Multan. Total 154 patients suffering from clinically suspected meningitis were enrolled. Twenty four (16.67% of the total enrolled) patients left the hospital before the minimum observation period of 5 days and were not included. Remaining 130 (2.53 % of the total admissions) patients were included in final data.

Table #1 showed that out of 130 patients, 54 (41.5%) were in the age group >2 months to 1 year, 40 (30.8%) were in age group 1 to 5 years and 36 (27.7%) werein agegroup 5 to 14 years.:

Table # 1: Distribution of Patients According to Age

Age	No of patients	% age
≥2 months to 1 year	54	41.5
1 to 5 year	40	30.8
5 to 14 year	36	27.7

Table # 2 showed that out of 130 patients, 76 (58.5%) were males and 54 (41.5%) were females.

Table # 2: Distribution of Patients according to Gender

Gender	No of patients	% age
Male	76	58.5
Female	54	41.5
Total	130	100

Table # 3 showed that Gram staining results for 74 (56.9%) patients were positive and negative for 56 (43.1%) patients.

Table # 3: Distribution of Patients by Gram Staining

Gram staining	No of patients	%age
Positive	74	56.9
Negative	56	43.1
Total	130	100

Table # 4 showed that CSF culture was positive for 60 (46.2%) and negative for 70 (53.8%) patients.

Table # 4: Distribution of Patients by CSF Culture:

CSF culture	No of patients	% age
Positive	60	46.2
Negative	70	53.8
Total	130	100

Patients with clinical meningitis, or bacterial meningitis were admitted throughout the year with no seasonal effect. In the specified age group (n= 130) Streptococcus pneumoniae (20%), Neisseria meningitidis (15.4%) and Haemophilusinfluenzae type b (Hib) (9.2%) were the most common bacterial isolates.In 55.4% of all the cases of suspected bacterial meningitis, growth of bacteria was not present or contaminant as Staphylococcus epidermidis was isolated .The leading causal agent was Streptococcus pneumonia .

Table # 6 showed that most children in age group ≥2months-1 year had maximum % ages of irritability and bulging fontanelle on presentation. Convulsions and vomiting were seen maximum in children of age group 1-5 years. Important clinical signs in the older group (5-14) were fever, neck stiffness and headache.

Table # 5 showed the %age of organisms causing meningitis.

Table # 5: Distribution according to type of Organisms causing Meningitis

Name of organism	Frequency	% age
S. Pneumonia	26	20
N. Meningitis	20	15.4
H. Influenza	12	9.2
no growth of bacteria / Contaminants	72	55.4
Total	130	100

Table # 6: Distribution according to the clinical signs and symptoms

Symptoms	2M-1Year (54)	1-5 Years (40)	5-14 years (36)
H/O Fever	81%(43)	86%(16)	90%(32)
Irritability	66%(36)	56%(22)	61%(22)
Bulging fontanelle	49%(26)	13%(5)	NA*
Neck stiffness	44%(24)	63%(25)	86%(31)
Headache	**	**	78%(28)
Convultions	42%(23)	47%(19)	46%(17)
Vomiting	34%(18)	44%(18)	33%(12)

Not applicable

DISCUSSION

Bacterial meningitis is a medical emergency . It is very important that empirical antibiotics should be started immediately after clinical suspicion of bacterial meningitis. Complications such as deafness, epilepsy due to meningitis can develop especially if not treated quickly. Accurate diagnosis and management are important to prevent mortality and long term morbidity. Diagnosis involves both clinical assessment and the use of laboratory investigations [6].

Laboratory confirmation of the etiology in acute bacterial meningitis is necessary for appropriate antibiotic therapy . In the hospital, meningitis is responsible for 2-5% of pediatric admissions. Most of the time, the diagnosis is based on clinical grounds i.e. clinical examination and CSF microscopy, biochemical examination and gram staining but the gram staining results are positive in a minority of the cases because majority of the children do receive antibiotics in one form or the other before reaching the hospital[7,8].

It was observed in our study that the incidence of bacterial meningitis was higher among children in age group 1 to 5 year which correlates with other studies in which prevalence was documented highest in children less than 5 year old. [9,10].Regarding the gender, slight male predominance was documented in our study as compared to significant predominance of male (63.2%) was observed over female (46.8%) [11]. In the present study male to female ratio 1.4:1

correlates to ratio reported in studies conducted in Greece (2.1:1 and 1.4:1 respectively) [12].

Several reports from many different countries reviewed the prevalence of bacterial causes of acute bacterial meningitis based on CSF cultures. CSF culture is the absolute standard and should always be obtained when possible [13]. According to the previous studies CSF culture result was 46.3% positive [8] and it was 57.1% positive in Akbani[14]. While in the same studies Gram stain smear was 62% and 63.4% positive respectively [8,15] and this value coincides with our research work.

Streptococcus pneumoniae was isolated predominantly throughout the study period in bacterial meningitis samples followed by Neisseria meningitidis which was the second most commonly isolated pathogen. This result correlates with the data collected from the National Meningococcal Reference Laboratory [16] and with previous reports from specific geographic areas of the world[17,18].The most isolated pathogens in bacterial meningitis found in other study[19] are S pneumoniae and Haemophilusinfluenzae type b (Hib) but it differs from our results where S pneumoniae and N meningitidis are more common pathogens.Neisseria meningitidiswas reported as a major pathogen in bacterial meningitis in children in other countries such as Scotland [20], Bulgaria [21] and Nigeria [22]. Prevalence of Haemophilusinfluenzae type b (9.2% in all ages) reported in the present study was found higher to data (5%) from developed countries [22] but comparable with findings reported in several other studies. [21,24,25].

A systematic review of 10 studies looking at clinical features of bacterial meningitis in thousands of patients showed 51% of cases of bacterial meningitis found to have neck stiffness and 36% had bulging fontanelle. In our study Bulging fontanelle was found 49% in age group >2months to 1 year which coincides with the other studies. [26].

Other bacteria can also be isolated in CSF samples of suspected bacterial meningitis patients mostly in children. Staphylococcusepidermidis was found in our study. It was also reported in various studies [9,27,28] as etiologic agent in bacterial meningitis cases.

CONCLUSIONS

Bacterial meningitis is still a very common serious infection in children below 5 years. S. pneumonia, N. meningitidis and H. influenza are most common etiological agents of bacterial meningitis in children. Streptococcus pneumoniae was predominantly isolated pathogen in patients enrolled for this study. Base line investigations and proper clinical approach are very important tools in the diagnosis and clinical management of Bacterial meningitis.

ACKNOWLEDGEMENTS

All authors had an equal role in the writing of this manuscript. Dr Riaz Hussain Malik conceived and planned the study, conducted analysis of research findings, and written the manuscript; Dr Asghar Javaid conducted the study, and reviewed the manuscript .We would like to thank all the, paediatric medical staff , nursing and laboratory staff of Nishtar Hospital who helped us for the one year complete patient record of these patients.

Limitations of Study

This study had several limitations. We were unable to do viral cultures on those patients in whom gram staining and cultures were negative as viral meningitis may at times presents exactly like bacterial meningitis. The main limitation of such investigations was the high cost and lack of facilities in the hospital.

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