

Epidemiology Of Pyomeningitis In Hospitalized Children

Pramod Kumar Berwal¹, Niranjan Nagaraj², Anusha Srinivas³, Pratyusha Jevaji⁴, Ayush Berwal³, Gotam Swami⁵

¹Professor and HOD, ²3rd year PG student, ³Junior resident, ⁴Senior resident, ⁵2nd year PG student, Department of Paediatrics, SP Medical College, Bikaner, Rajasthan, India

Abstract

Background: Pyogenic meningitis is one of the formidable illnesses of childhood and continues to be a major challenge to the physicians. The aim of the present study is to describe the etiology, clinical spectrum, outcome and epidemiology of pyomeningitis. **Methods:** This was a prospective study conducted over a one year period in the pediatric Hospital, tertiary care Institute in North West part of Rajasthan (Bikaner). As per the inclusion criteria pyomeningitis cases were included. CSF analysis was done. All the collected data was tabulated and statically analyzed by using SPSS software. **Results:** Prevalence of pyomeningitis is comprised of 2.5%. Streptococcal pneumonia was commonest pathogens. The recovered organisms were sensitive to 3rd generation Cephalosporins, Amikacin Vancomycin, Meropenam. The mortality was higher in children who documented thick or purulent C.S.F, cell counts more than 1000, markedly elevated C.S.F. proteins (200 mg %) and sugar less than 20 mg%. **Conclusion:** Pyomeningitis can be lifethreatening because of the inflammation's proximity to the brain and spinal cord. Early diagnosis and prompt treatment modality is necessary to prevent adverse neurological sequelae

Key words: Pyomeningitis, Epidemiology, Antibiotics, Gram's stain, Bikaner

INTRODUCTION

Pyogenic meningitis is an acute emergency in pediatric practice with high morbidity and mortality despite the advances in antibiotic therapy. Pyogenic meningitis is one of the formidable illnesses of childhood and continues to be a major challenge to the physicians. Children still die or suffer permanent neurological sequel as a result of bacterial meningitis. Prompt diagnosis and aggressive management are the goals but early signs of meningitis are subtle and non-specific and therefore may be recognized only in retrospect.

Different workers have observed the incidence of Pyogenic meningitis to be 1-2% of the total cases admitted to hospital.^[1] Mortality as observed by different workers varies from 5-50%. Crippling sequelae are common in those who survive and varies from 74 - 69%.^[1,2] The offending organisms changing from time to time and place to place have been reported from India and other parts of world at different times. Culture and sensitivity studies are essential for application of appropriate antibiotic therapy. The definitive diagnosis of Pyogenic meningitis depends up on the positive C.S.F. culture, which is not only time consuming out the facilities for culture not available everywhere, especially at district hospitals and in the periphery. Hence there is a need of a method for detection of evidence of infection in cerebrospinal fluid and blood, which is not only reliable but also quick, inexpensive and easy to perform even at smaller places. No studies have been carried out in North West

part of Rajasthan (Bikaner) and to describe its Epidemiology, clinical characteristics and outcome.

MATERIALS AND METHODS

This was a prospective study conducted over a one year period in the pediatric Hospital, tertiary care Institute in North West part of Rajasthan (Bikaner). The Institute Ethics Committee approved the study protocol. All infants and children from 1 day to 12 years of age with diagnosed case of Pyogenic meningitis were eligible for inclusion. Diagnosis of Pyogenic Meningitis was based on the following criteria: Turbid or purulent C.S.F; Identification of bacteria on gram's staining or culture; Elevation of C.S.F. proteins above 50mg/dl and lowering of blood sugar below 30mg/dl with predominant polymorphonuclear pleocytosis; Positive latex particle Agglutination Test. Exclusion criterion includes: Refusal by parents/relatives for written consent. Other investigations as per need of the case were also being done. Continuous monitoring of case using hospital stay was done and course of illness was noted. The proforma filled for each case and data collected included age, sex, duration of illness, treatment prior to admission with reference to administration of antibiotics and detailed history, tabulated and statically analyzed by using SPSS software.

RESULTS

Prevalence of pyomeningitis is comprised of 2.5%. Maximum cases belonged to urban area and socioeconomic class 3. The diseases were common in children living under poor environmental conditions, definite seasonal variation with preponderance of the cases of pyomeningitis during a period from February to May. Of the various predisposing factors encountered in 32% cases, respiratory infections were the commonest. Fever, vomiting convulsions and irritability were present in all age groups while altered sensorium, refusal to feed and excessive cry were commoner in infants and younger children. The commonly

Address for correspondence*

Dr. Niranjan N

3rd year PG student,
Department of Paediatrics,
SP Medical college,
Bikaner, Rajasthan, India

[Email: getniranjan806@yahoo.com](mailto:getniranjan806@yahoo.com) Tel. No.: 08769674617

observed signs were altered sensorium, signs of meningeal irritation and altered reflexes. Bulging anterior fontanels and excessive cry and hypertonia were predominantly found in infants. Microorganisms could be identified in C.S.F cases by Gram's staining, 40 of them being gram positive organisms. The culture of C.S.F. revealed microorganisms in 26% cases. Streptococcal pneumonia were commonest pathogens while Staphylococcus aureus, N.Meningitis, Streptococcal Pyogens, H.Influenzae, E.Coli, Pseudomonas and B. Proteus were present in decreasing order of frequency. The recovered organisms were sensitive to 3rd generation Cephalosporins, Amikacin Vancomycin, Meropenam. The factor associated with poor outcome was younger age, long duration of illness prior to hospitalization, deep coma, any associated illness and severe malnutrition. The mortality was higher in children who documented thick or purulent C.S.F, cell counts more than 1000, markedly elevated C.S.F. proteins (200 mg%) and sugar less than 20 mg%.

Table 1: Bacterial organisms seen on Gram's Staining

Organisms	No.of cases	Percentage
Gram positive	40	57.14
Strepto. Pneumococci	18	25.71
Streptococcus	8	11.42
Staphylococcus	14	20
Gram Negative	30	42.86
N.Meningococci	15	21.42
Others(H.Influenzae, E.Coli, Pseudomonas, B.proteus)	15	21.42

Table 2: CSF Findings in Pyogenic Meningitis

Features	No. of cases	Percentage
TENSION		
Raised	62	62
Normal	24	24
Low	14	14
Colour(appearance)		
Clear	12	12
Opalescent	28	28
Purulent	46	46
Thick pus	14	14
Leucocyte count		
>1000	34	34
501-1000	22	22
101-500	39	39
10-100	05	05
Proteins		
>200	49	49
101-200	35	35
50-100	16	16
<50	0	0
Sugar		
<10	2	2
11-20	17	17
21-30	56	56
31-40	17	17
>40	8	8

DISCUSSION

Acute bacterial meningitis continues to be a major public health problem. Mortality in the acute stage is the high and the survivors are often left with crippling neurodevelopmental sequelae despite the advent of recent antibiotics. Prognosis is largely determined by early diagnosis and prompt institution of specific antimicrobial therapy the etiological agents responsible for pyogenic meningitis change from place to place at different times. Therefore it is necessary to carryout clinical and bacteriological studies at different times, at different places to know the prevalent causative organisms so that the antibiotic therapy can be rationalized. During this study period 1.04% of cases were brought for various meningitides (including T.B.M.). Amongst the admitted cases prevalence of meningitis was higher as much as 2.5% cases had Pyomeningitis and other 3.5% had tubercular meningitis and aseptic meningitis. Other workers have also accounted meningitis in 1-2% cases. Paul et al 2% cases.^[3]

Our study shows meningitis is much more common less than six years of age. Even in these children it is still commoner under one year, as many as 37% children were below one year. The higher incidence of disease under one year of age found in this study was also observed by various other workers. Paul et al.^[3] this high incidence in children under one year is explained as being due to lack of development of specific antibody against different etiological agents Heggerty et al.^[4] This may also be due to higher nasopharyngeal carrier rate and relative commonness of upper respiratory infection and pyoderma under one year of age. Our study reveals that pyomeningitis was relatively more in male children. The higher vulnerability of males may be protected by virtue of her possession of two X-chromosomes in the females might be possessing the gene, in which reside the capacity to form and immunoglobins having bactericidal properties Washburn et al.^[5] it may partly be due to the greater attention paid to male children by most of the parents. Udani ET al.^[6] Have reported that majority of the cases in their study were belonging to low socioeconomic status. In contrast to this, we have observed higher incidence in middle and upper class, could possibly be because of the fact that there is more awareness of the treatment by middle and upper class. There was no significant difference in the nutritional status of pyomeningitis the disease may be more frequent in the areas known for overcrowding congestion and bad drainage as such environment facilitates perpetuation and rapid spread of the infection. In the present study the disease occurred with equal frequency in the children irrespective of educational status of family.

A definite seasonal variation was noted with marked predominance of the incidence in spring and summer season 61% of the total cases were encountered between Februarys to May. In the month of April alone one fifth of the total cases were observed. Similarly, Talukdar ET al,^[7] also observed maximum incidence in winter spring and early summer seasons, as many as 83% of the total cases encountered from January to April and in December. The higher frequency of respiratory infection could be possibly being contributory factors for a higher incidence of disease in winter and spring. While diarrheal disorders in summer could be contributory to increase incidence in that season. Majority of the cases in this study had 1-3 days history of illness prior to hospitalization. Other workers have also observed the similar observation. udani et a.^[6] In this study among detected causes respiratory infection was the commonest source of infection in 20% cases as also observed by srivastava et al.^[1] Other predisposing factors were gastrointestinal infections in 8% cases

ear discharge in 2% cases, head injury and shunt infection 1% in each.

Pyogenic meningitis has a variable clinical profile. The salient clinical features are in conformity with the well-known classical pictures of bacterial meningitis. Fever, vomiting, convulsions, irritability were the main clinical symptoms in decreasing frequency in all age group while refusal of feeds excessive cry and altered sensorium were chiefly present in infants and younger children. Similar clinical symptomatology has been noticed by various workers shrivastava et al.^[1] A higher index of suspicion is therefore necessary for the diagnosis of pyogenic meningitis in infants and younger children as the neck rigidity, kerning sign and bulging anterior fontanelles may be absent, unexplained fever specially with convulsion, persisting, vomiting, alternating irritability and drowsiness, headache and refusal to feeds in infants should arouse suspicion. Complete examination and culture of cerebrospinal fluid is indicated in all such cases. During the disease course, many complications occurred; subdural effusion was the commonest complication, observed in 10% cases as also reported by achar et al.^[8] The examination of CSF revealed typical picture on cytochemical analysis in present study. Raised C.S.F. pressure in majority of cases (62%) was consistent with the observations of srivastava et al.^[1] Opalescent or purulent or thick pus fluid obtained in most of the cases (88%) in this study. The cellular response was varying from 100 more than 1000/cu.mm. in majority of the cases (95%). The cells were predominantly polymorphonuclear with a small number of mononuclear cells. C.S.F. protein levels were raised in all cases ranging from 50 to 500 mg% was usual in pyomeningitis cases, reported by various other workers - reddy et al.^[9] C.S.F. sugar level below 30 mg% observed in 75% cases in this study. The staining of C.S.F. by gram's staining method revealed microorganisms in 70% cases in this study. Penumococci, N. Meningitidis, Gram negative bacilli, Staphylococci and Streptococci were present in decreasing order of frequency. From the above observation it was concluded that Gram's staining of CSF was reliable, quick, inexpensive beside procedure which required no sophisticated laboratory technique, less affected by prior antimicrobial therapy than CSF culture organism could be demonstrated directly by stained smear of CSF. Thus it gave direct evidence of presence of infection in C.S.F. Appropriate antibiotics could be administered before the results were available on the basis of tentative diagnosis given by this method. This technique could be performed even at places where culture facilities were not available. By this technique cases of pyogenic meningitis could be differentiated from those of tubercular and viral meningitis. Latex particle agglutination test is quick, reliable and easily performed method. It was performed in this study for N. Meningitidis (Meningococci Acy W 135) antigen only and not for other antigens due to its lack of availability. Out of 60 tests done, it was positive in 15 (25%) cases only. The remaining was due to other antigens than the ones studied in this study. Out of 15 identified cases due to meningococcal, 8 cases presented with meningococemia as revealed by shock, hypotension, skin rashes and cold clammy extremities. The gram staining of C.S.F. revealed organisms in 83.33% of the untreated cases whereas C.S.F. culture in these patients documented organisms in 35% cases. In the present series, meningitis caused by gram positive strains occurred throughout the year but it was slightly more common in winter and spring seasons (December to March). Whereas meningitis caused by gram negative organisms was commoner in summer (April and May). 60% of the total gram negative meningitides

pathogen being M. meningitides. The higher incidence of Meningococcal meningitis during summer could be because of the favorable hot and humid climate facilitates the growth of these organisms, whereas the frequent respiratory infections during winter and spring due to gram positive organisms may possibly be responsible for gram positive meningitides in that season. Most of the organisms isolated from C.S.F. culture were Gram positive (57.7%) and remaining (42.3%) organisms were gram negative in this study. Pneumococci were the commonest organism isolated from 7 (26.92%) cases in the present study. Antibiotic sensitivity of C.S.F. culture for the isolated organisms was done in all the cases. Ceftriaxone was the most effective antibiotic in 84.61% cases. Followed by Cefotaxim and Meropenam in 69.23% cases and Vancomycin was effective in all the cases due to staphylococcus aureus. Amikacin was effective against gram negative bacilli. Pneumococci, the most common pathogen isolated were sensitive to Ceftriaxone (100%). Gram negative organism meningococci, H. influenza, E. coli and B. proteus were sensitive to ceftriaxone in all the cases. Amikacin was effective against pseudomonas, E.coli and B.proteus. In the present study 77% of the total cases survived. 97.4% of the cases survived, recovered completely while (2.6%) cases were left with sequelae.

CONCLUSION

Pyomeningitis can be life-threatening because of the inflammation's proximity to the brain and spinal cord. Early diagnosis and prompt treatment modality is necessary to prevent adverse neurological sequel.

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