The Professional Medical Journal
www.theprofesional.com

DOI: 10.29309/TPMJ/2020.27.10.3568

ORIGINAL PROF-0-3568

BACTERIAL MENINGITIS AND ITS ACUTE COMPLICATIONS.

Asif Ali Khuhro[1], Waqas Ali[2], Ameer Jamali[3], Fazal ur Rehman[4]

1. FCPS (Pediatrics Medicine)
   Assistant Professor Pediatrics Unit-II
   Children Hospital Chandka Medical College/ SMBBMU, Larkana.
2. FCPS (Pediatrics Medicine)
   Assistant Professor Pediatrics Medicine
   Ghurki Trust Teaching Hospital, Lahore.
3. MPH
   PGR Pediatrics Medicine
   The Baqai University and Medical College, Karachi.
4. MBBS, FCPS
   PGR Pediatric Medicine
   The Children's Hospital and
   The Institute of Child Health, Multan.

Correspondence Address:
Dr. Fazal ur Rehman
Pediatric Medicine
The Children's Hospital and
The Institute of Child Health, Multan.
fazal171@gmail.com

Article received on:
17/04/2019
Accepted for publication:
15/08/2019

ABSTRACT… Objectives: Bacterial meningitis is a major global issue. Despite medical advancement in childcare in the last couple of decades, bacterial meningitis is still causing significant mortality and morbidity. We planned this study to find out the frequency as well acute complications related to bacterial meningitis in our setting. **Study Design:** Observational descriptive study. **Setting:** Department of Pediatrics, Unit-II, Children Hospital Chandka Medical College / SMBBMU, Larkana. **Period:** 1st August 2018 to 31st March 2019. **Material & Methods:** A total of 78 children, aged 1 month to 10 years with bacterial meningitis were included. Acute complications were noted in all the children during their hospital stay along with mortality. A predesigned proforma was used to record all the study data. **Results:** Out of a total of 78 cases, 48 (61.5%) male and 30 (38.5%) female. There were 13 (16.7%) children between aged 1 to 3 months, 25 (32.1%) between 3 to 6 months, 27 (34.6%) between the age of 6 months and 5 years and 13 (16.7%) above the age of 5 years. Complications were noted in 33 (42.3%) cases, seizure following 4 days followed by subdural effusion and hydrocephalus were the commonest. Children having complications were compared with those who had none, hospitalization history prior to the admission turned out to be statistically significant ($p = 0.010$). Overall, mortality was noted in 3 (3.9%) children. **Conclusion:** Bacterial meningitis still remains a major disease related to significant morbidity and mortality. Most complications are seen in young children. Seizure and subdural effusion are noted to be the most frequent complications.

Key words: Bacterial Meningitis, Complications, Morbidity, Mortality, Seizures.

Article Citation: Khuhro AA, Ali W, Jamali A, Fazal ur Rehman. Bacterial meningitis and its acute complications. Professional Med J 2020; 27(10):2088-2092.
DOI: 10.29309/TPMJ/2020.27.10.4568

INTRODUCTION

Bacterial meningitis is a major global issue. Despite medical advancement in childcare in the last couple of decades, bacterial meningitis is still causing significant mortality and morbidity.[1,2] Bacterial meningitis is an infectious disease described by infection and inflammation of the meninges. If not treated, bacterial meningitis has been noted to be lethal in about 50% of the cases.[1] Following onset of symptoms, about 10 to 15% mortality is reported even if early diagnosis and treatment regarding bacterial meningitis is done. Those who survive, amongst them, around 20% are susceptible to everlasting sequelae that includes damage to the brain, hearing loss as well learning disabilities.[1,2] Streptococcus pneumonae and Haemophilus influenza type B (Hib) seem to be the major causative pathogens accountable for causing meningitis in the developing countries.[3,4] Major causes related to mortality along with the sequelae linked with bacterial meningitis are noted as intracranial complications developing at some stage during acute phase and then going to cause secondary damage to the brain.[5-7] Commonest acute complications linked with bacterial meningitis are raised intracranial pressure (ICP), seizures, hydrocephalus, subdural effusion, cranial nerve palsies as well as hemiplagia.[8-10]

In developing countries, lack of knowledge and awareness by parents and delay in the diagnosis of bacterial meningitis also contribute to burden of bacterial meningitis. Proper understanding of the disease spectrum as well and prompt detection of complications is said to improve the overall management of bacterial meningitis.[11] According to World Health Organization,[12] confirmed cases

of bacterial meningitis is described as laboratory confirmed growth (culturing) or identification (gram staining or by using antigen detection) a bacterial pathogen (Hib, pneumococcus or meningococcus) in the cerebrospinal fluid (CSF) or from the blood in a child presenting with clinical syndrome consistent with bacterial meningitis.

Marked reduction in infection has been seen due to Hib Vaccine and pneumococcal conjugate vaccine (PCV) as both these pathogens are considered to be the commonest reasons for bacterial meningitis around the world. It has been estimated that Hib and PCV vaccination can reduced the incidence of bacterial meningitis by 60% if properly adopted in early years of life.[13,14]

In a systemic review assessing global etiology related to bacterial meningitis,[2] it was observed that an obvious variation exist between the frequency as well as causes of bacterial meningitis in different geographies of the world. Findings of our study may assist prevention strategies ans well as treatment practices for the management of bacterial meningitis. So, we planned this study to find out the frequency as well acute complications related to bacterial meningitis in our setting.

MATERIAL & METHODS

This was an observational descriptive study, done at The Department of Pediatrics, Unit-II, Children Hospital Chandka Medical College / SMBBMU, Larkana, from 1st August 2018 to 31st March 2019. A total of 78 children, aged 1 months to 10 years, fulfilling the WHO definition for bacterial meningitis[12], were included in this study. Children with meningitis following head injury or meningocele/myelomeningocele were excluded from this study.

Demographic data along with duration and history of treatment at the time of admission was recorded. Ultrasonography as well as computed tomography (CT) scan of the head were done as and when required. Relevant laboratory findings were done. Patients aged 1 to 3 months were treated with cefotaxime or ceftraxone along with amikacin, more than 6 months old were given cefotaxime or ceftriaxone along with benzyl penicillin. Intravenous (IV) dexamethasone was administered at a dose of 0.15 mg per kg per doses 6 hourly for 2 days. Antibiotics were changed according to response or persistence of the infection as per CSF examination. Vancomycin or meropenem were adopted as 2nd line antibiotics. Acute complications were noted in all the children during their hospital stay along with mortality. A predesigned proforma was used to record all the study data. SPSS version 20 was used for the data handling and analysis. Relationship of acute complications with study variables was calculated. Chi square test was applied and p value less than 0.05 was taken as statistically significant.

RESULTS

Out of 78 cases, 48 (61.5%) male and 30 (38.5%) female. There were 13 (16.7%) children between aged 1 to 3 months, 25 (32.1%) between 3 to 6 months, 27 (34.6%) between the age of 6 months and 5 years and 13 (16.7%) above the age of 5 years. Mean age amongst all the children was 19.6 + 6.3 months.

Lumbar puncture was performed in all the cases on the 1st admission day. The total leukocyte count (TLC) ranged from 80 to 6500 per high power field (hpf) with a mean of 470 per hpf while mean neutrophil count was noted to be 64%. Mean CSF protein amongst all the children was noted to be 162 mg/dl whereas mean CSF glucose was noted to be 69 mg/dl. Subsequently looking at the clinical indications, 2nd and 3rd lumber puncture were done in 21 (26.9%) and 12 (15.4%) cases respectively.

Complications were noted in 33 (42.3%) cases during the hospital stay. In terms of commonest complications, seizure following after 4 day 15 (19.2%), subdural effusion 10 (12.8%) and hydrocephalus 9 (11.5%) were noted to be the commonest complications amongst the cases.

Thirteen (16.7%) children were noted to have > 1 complications. Duration of history prior to the admission for this study was noted to be 1 to 3 days in 26 (33.3%), 24 (30.8%) between 3 to 7 days and 28 (35.9%) > 7 days. It was noted that

29 (37.2%) children had not treatment before registering for this study. Cranial ultrasonography was performed in 68 (87.1%) cases, amongst which we noted that 15 (19.2%) were having one of the complications of meningitis as stated earlier. There were 52 (66.7%) children in which CT scan was performed, amongst which, 20 (25.6%) were found to have complications.

Children having complications were compared with those who had none, all the study variables turned out to be insignificant (p value > 0.05) except for duration of hospitalization history prior to the admission for this study (p = 0.010).

As per clinical indications, 35 (44.9%) children needed 2nd line antibiotics. Overall, mortality was noted in 3 (3.9%) children and all died on within 3 days of their hospital stay.

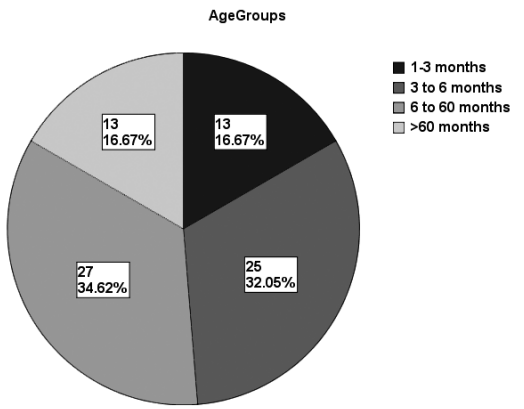

Figure-1. Distribution of age among children with bacterial meningitis

Complications	Number (%)
Seizure after 4 days	15 (19.2%)
Subdural Effusion	10 (12.8%)
Hydrocephalus	9 (11.5%)
Cranial Never Palsies	8 (10.3%)
Hemiplegia	6 (8.0%)
Others	3 (3.8%)

Table-I. Frequency of acute complications amongst children with bacterial meningitis

Variable	Complications		P Value
	Yes (n=33)	No (n=45)	
Age			
1 to 3 months	5 (15.2%)	8 (17.8%)	0.521
3 to 6 months	8 (24.2%)	17 (37.8%)	
6 to 60 months	13 (39.4%)	14 (31.1%)	
>60 months	7 (21.2%)	6 (13.3%)	
Gender			
Male	20 (60.6%)	28 (62.2%)	0.885
Female	13 (39.4%)	17 (37.8%)	
Duration of history of hospitalization (days)			
1 to 3	9 (27.3%)	17 (37.8%)	0.010
3 to 7	6 (18.2%)	18 (40.0%)	
>7	18 (54.5%)	10 (22.2%)	
CSF While Blood Cells			
100-500	28 (84.8%)	37 (82.2%)	0.950
500-1000	3 (9.1%)	5 (11.1%)	
>1000	2 (6.1%)	3 (6.7%)	
Treatment prior to hospitalization			
Oral	16 (48.5%)	13 (28.9%)	0.209
Injectable	7 (21.2%)	13 (28.9%)	
None	10 (30.3%)	19 (42.2%)	

Table-II. Acute complications with regards to study variables

DISCUSSION

Acute bacterial meningitis has been noted to be the cause of significant morbidity as well as mortality around the world. Resource limited countries have been seen to have a 10 times greater incidence in comparison to those countries that are well resourced.[15]

We noted that 62% children in our study were male. A study conducted by Naz S et al[11] noted that 80% of children with acute bacterial meningitis were males. Male predominance in this aspect could be due to overall male gender predominance in South Asia.

In the present study, we noted that 49% children were less than 6 months of age. Younger age has been documented to have a greater frequency of bacterial meningitis in other studies[11] as well including the work of Chinchankar[16] and colleagues from India where they found 78% cases having an age of less than 1 year. This same

Indian study also noted 39% of the children to have neurological complications during hospital stay. These findings were very similar to current work.

We noted that seizures after 4 days to be most frequent among our patients. A local study from Lahore also noted seizures to be the commonest (22%).[11] These results are quite comparable to some other local studies conducted by Rabbani MA et al[17] and Aurakzai AA et al.[18] Subdural effusion was the 2nd commonest form of complication in the current study. Naz S et al[11] found the similar findings where they saw subdural effusion to be 2nd commonest form of complication while others also noted subdural effusion to be the most common form in patients with bacterial meningitis.

Our study also found that there was a significant delay in actual start of proper treatment amongst those bacterial meningitis cases that developed complications. Delay in the start of proper treatment has been recorded as a predictor for mortality in some studies done in South Asia.[19,20] Our results could be because of late diagnosis by primary care physician and that might have lead to more frequent complications in children with late diagnosis.

In the present study, 45% children needed 2nd line antibiotic therapy according to hospital protocol. A study conducted in India[16] noted that 19% cases with acute bacterial meningitis needed 2nd line antibiotic treatment while a local data[11] showed that 38% children required 2nd line antibiotic therapy which again is align with the present work. Antibiotics are usually changed due to clinical indications and reasoning more frequently due to culture and CSF sensitivity results.

Mortality rate as high as 30% have been reported in some studies[15] whereas our findings were more aligned to another local study from Lahore[11] where they noted only 2% children with fatal outcomes. As far as limitations of this study are concerned, we only included those children who could go through lumbar puncture on the 1st admission day. We also noted the short term outcomes without recording the follow up of registered children. Studies with bigger sample sizes and involving multicenters will further verify the results of current study.

CONCLUSION

Bacterial meningitis still remains a major disease related to significant morbidity and mortality. Most complications are seen in young children. Seizure and subdural effusion are noted to be the most frequent complications. Timely referrals along with early diagnosis and effective management will reduce the overall burden of morbidity as well as mortality linked with bacterial meningitis.

REFERENCES

1. World Health Organization (WHO). **Meningococcal meningitis:** Fact sheet 2017 [updated December 2017; cited 2017 November 9]. http://www.who.int/mediacentre/factsheets/fs141/en/.

2. Oordt-Speets AM, Bolijn R, van Hoorn RC, Bhavsar A, Kyaw MH. **Global etiology of bacterial meningitis: A systematic review and meta-analysis.** PLoS ONE 13(6): e0198772.

3. Peltola H. **Burden of meningitis and other severe bacterial infections of children in Africa: Implications for prevention.** Clin Infect Dis 2001; 32(1): 64-75.

4. Peltola H. **Haemophilus influenza type b disease and vaccination in Latin America and the Caribbean.** Pediatr Infect Dis J 1997; 16(8): 780-87.

5. World Health Organization (WHO). **Number of suspected meningitis cases and deaths reported,** 2010 epidemiological season 2017 [cited 2017 November 9].

6. **Centers for disease control and prevention (CDC).** Bacterial Meningitis 2017 [updated January 25, 2017].

7. Hamborsky J, Kroger A, Wolfe C, editors. **Centers for disease control and prevention: Epidemiology and prevention of vaccine-preventable diseases.** 13th ed. Washington D.C.: Public Health Foundation; 2015.

8. Massenet D, Birguel J, Azowe F, Ebong C, Gake B, Lombart JP, et al. **Epidemiologic pattern of meningococcal meningitis in northern Cameroon in 2007±2010: Contribution of PCR-enhanced surveillance.** Pathogens and global health. 2013; 107(1):15-20.

9. Tegene B, Gebreselassie S, Fikrie N. **Bacterial meningitis: A five-year retrospective study among patients who had attended at University of Gondar Teaching Hospital, Northwest Ethiopia.** Biomedical Research and Therapy. 2015; 2(5).

10. Nuoh RD, Nyarko KM, Nortey P, Sackey SO, Lwanga NC, Ameme DK, et al. **Review of meningitis surveillance data, upper West Region, Ghana 2009-2013.** The Pan African medical journal. 2016; 25 (Suppl 1):9.

11. Naz S, Mushtaq A, Khan MZ, Bari A, Ahmad TM. **Spectrum of acute complications and mortality in bacterial meningitis.** Pak Paed J 2012; 36(3):132-6.

12. **The WHO AFRO Hib-Paediatric Bacterial Meningitis (Hib-PBM) Surveillance Network Manual,** Field Test Version, July 2001.

13. Kambire D, Soeters HM, Ouedraogo-Traore R, Medah I, Sangare L, Yameogo I, et al. **Nationwide Trends in Bacterial Meningitis before the Introduction of 13-Valent Pneumococcal Conjugate Vaccine-Burkina Faso, 2011-2013.** PloS one. 2016; 11(11):e0166384.

14. Saeed N, Al Ansari H, AlKhawaja S, Jawad JS, Nasser K, AlYousef E. **Trend of bacterial meningitis in Bahrain from 1990 to 2013 and effect of introduction of new vaccines.** Eastern Mediterranean health journal 2016; 22(3):175-82.

15. Choo KE, Ariffin WA, Ahmad T, Lim WL, Gururaj AK. **Pyogenic meningitis in hospitalized children in Kelantan, Malaysia.** Ann Trop Pediatr 1990; 10(1):89-98.

16. Chinchankar N, Mane M, Bhave S. **Diagnosis and Outcome of bacterial meningitis in early childhood.** Indian Pediatr 2002; 39(10): 914-21.

17. Rabbani MA, Khan AA, Ali SS, Baig SM, Khan MA, Wasay M. **Spectrum of complications and mortality of Bacterial Meningitis: An experience from a Developing Country.** J Pak Med Assoc 2003; 53(12):580-3.

18. Aurakzai AA, Imran M, Muhammad F, Zeb A. **Acute complications of meningococcal Meningitis in children.** JPMI 1993; 7(2):35-7.

19. Ogunlesi TA, Okeniyi JAO, Oyelami OA. **Pyogenic meningitis in Ilesa, Nigeria.** Indian Pediatr 2005; 42(10): 1019-23.

20. Khichi GQ, Channar MS, Mannan MA. **Mortality variables in pyogenic meningitis in paediatric age group.** J Coll Physicians Surg Pak 2003; 13(10): 573-76.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Asif Ali Khuhro	Methodology, Data collection.	
2	Waqas Ali	Methodology, Data analysis.	
3	Ameer Jamali	Literature review, Discussion.	
4	Fazal ur Rehman	Literature review, Drafting, Discussion.	