ORIGINAL ARTICLE

Frequency of Hearing Loss in Children after Acute Bacterial Meningitis

MUHAMMAD SARFRAZ[1], ZAHID JAMIL[2], NAEEM ZAFAR[3], SYED MUHAMMAD JAVID IQBAL[4], DR. MUHAMMAD NAEEM ASHRAF[5], LAIBA ZAHID[6]
[1]*Associate Professor, Department of Pediatrics, Shalamar Medical and Dental College, Lahore*
[2]*Senior Registrar, The Children's Hospital and The Institute of Child Health, Lahore*
[3]*Assistant Professor, Department of Pediatrics, University of Lahore*
[4]*Associate Professor, Department of Pediatrics, Allama Iqbal Medical College, Lahore*
[5]*Associate Professor, Department of Pathology, Al-Aleem Medical College, Lahore*
[6]*Lecturer, Department of Health Professional Technologist, University of Lahore, Lahore*
Correspondence to: Dr. Muhammad Sarfraz, Email: muhammad.Sarfraz@live.com, Cell: 0321-4468466

ABSTRACT

Aim: To determine the frequency of hearing loss among children of age group 3 month-12 years, presenting with acute bacterial meningitis.
Study Design: Cross sectional analytical study.
Place and Duration of Study: Department of Paediatrics Medicine, Children Hospital Lahore, Pakistan from September, 2019 to June, 2020.
Results: Majority of the patients 121 (40.33%) were between 5-12 years with mean age was 8.54±2.65 years. There were 178 (59.33%) males and 122 (40.67%) were females. Frequency of hearing loss among children of age group 3 months to 12 years was recorded in 60 (20%) while 240 (80%) had no findings of the morbidity.
Conclusion: The frequency of hearing loss is higher among children with acute bacterial meningitis. So, it is recommended that every patient who present with acute bacterial meningitis, should be sort out for hearing loss. However, it is also required that every setup should have their surveillance in order to know the frequency of the problem.
Keywords: Hearing loss, acute bacterial meningitis, children, frequency

INTRODUCTION

Meningitis is a provocative ailment of the leptomeninges, the tissues encompassing the mind and spinal line. The meninges comprise of three sections: the pia, arachnoid, and dura mater. Meningitis reflects aggravation of the arachnoid mater and the cerebrospinal liquid (CSF) in both the subarachnoid space and in the cerebral ventricles.[1]

The death pace of untreated bacterial meningitis approaches 100 percent. Indeed, even with ideal treatment, dreariness and mortality may happen. Neurologic sequelae are basic among survivors.[1] It is a health related crisis, if untreated, its mortality approaches 100%, and even with ebb and flow anti-toxins and progressed pediatric escalated care, the death pace of the malady is roughly 5–10% while the long haul grimness basically comprising of continuing neurologic sequelae is 15-20%.[2,3]

It is caused by bacteria, viruses, fungi, parasites, and drugs[4]. Bacterial meningitis is commonly caused by Streptococcus pneumoniae, Neisseria, meningitis, and Haemophilus influenzae[4]. Meningococcal meningitis caused by Neisseria meningitidis, a Gram-negative diplococcus, found in the nasopharynx of humans, is the most common type observed during outbreaks[5]. Serotypes A and C of Neisseria meningitidis are commonly associated with outbreaks[6]. Serotype A has been responsible for most outbreaks in Africa, but with widespread vaccination against this serotype, outbreaks have significantly reduced[7].

Received on 23-07-2020
Accepted on 13-11-2020

Complications such as hearing loss, visual loss, disseminated intravascular coagulopathy, encephalitis, seizures, cerebral palsy, and learning disabilities can arise as a result of meningitis[8-10]. Bacterial meningitis is one of the most common causes of acquired hearing loss[10]. This is much so in developing countries where weak health systems and poor health indices make the burden of preventable deafness high[11]. Streptococcus pneumoniae which is the most common organism causing meningitis has been observed to be associated with a high prevalence of post meningitic hearing loss, followed by Neisseria meningitidis[12]. The exact mechanism by which meningitis causes hearing loss is not fully understood, but suppuration of the labyrinth, cochlear neuroepithelial damage, and vascular insult have been postulated as possible mechanisms[13].

MATERIAL & METHODS

This cross sectional analytical study was carried out at Department of Paediatrics Medicine, The Children's Hospital Lahore, Pakistan from the period September, 2019 to June, 2020. And comprised 300 cases of acute bacterial meningitis. Children of age group three months to 12 years, male and female both genders and recent history of meningitis were included. Children age younger than 3 month, recurrent meningitis, concurrent serious medical condition and hearing impairment due to other reason were excluded. Bio data of patient including name, age, sex, address was noted and extent of hearing loss was assessed by audiologist were recorded. The data was entered and analyzed through SPSS-20.

RESULTS

One hundred and twenty one (40.33%) patients between 5-12 years, 87 (29%) between 0.3-12.0 months and 92 (30.6%) between 2-5 years with mean age was 8.54±2.65 years. There were 178 (59.4%) males and 122(40.6%) females. The hearing loss among children of age group 3 months to 12 years was recorded in 60(20%) while 240(80%) had no findings of the morbidity (Table 1)

When the hearing loss with regards to type of hearing impairment was done, out of 60 cases of hearing loss 5 (8.4%) had unilateral and 55 (91.6) had bilateral hearing loss (Table 2). When hearing loss was compared with age, it shows 19(31.6) between 0.3-12.0 months, 23(38.4) between 2-5 years while 19 (30%) between 6-12 years (Table 3). When hearing loss was stratified with gender, 35 (58.4) were males and 25 (41.6) were females (Table 4).

Table 1: Demographic information of the children

Variable	No.	%
Age		
3 – 12 (months)	87	29.0
2 – 5 years	92	30..7
6 – 12 years	121	40.3
Gender		
Male	178	59.4
Female	122	40.6
Hearing loss		
Yes	60	20.0
No	240	80.0

Table 2: Stratification for hearing loss with regards to type of hearing impairment (n=60)

Type of hearing loss	No.	%
Unilateral	5	8.33
Bilateral	55	91.67

Table 3: Stratification for hearing loss with regards to age of the children (n=60)

Age	No.	%
3-12 months	19	31.6
2-5 years	23	38.4
6-12 years	18	30.0

Table 4: Stratification for hearing loss with regards to gender of the children (n=60)

Gender	No.	%
Male	35	58.4
Female	25	41.6

DISCUSSION

Hearing impairment is one of the commonly found disorder in children following meningitis. Hearing loss is the most common complication in children with acute bacterial meningitis accounted 10 to 40%[14-15]. The present study was conducted aimed to examine the frequency of hearing loss in children after acute bacterial meningitis. In this regard 300 patients of bacterial meningitis were analyzed to examine the frequency of hearing loss. In this study male patients were high in numbers 59.4% as compared to females 40.6% and majority of patients 40.3% were ages 6 to 12 years followed by 30.7% with ages 2 to 5 years and the mean age was 8.54±2.65 years. These results were similar to many of previous studies in which males were predominant 55% to 68% and the most common age group was 5 to 10 years[16-17].

In present study the frequency of hearing loss was 20% while 80% patients had no hearing impairment. A study conducted by Yikawee et al[18] reported hearing impairment in 38.9% patients. A study conducted in low-income country reported that the prevalence of hearing impairment in meningitis children was 31.3%[19].

Another study regarding prevalence of hearing loss in adult with meningitis reported the frequency of hearing loss was 33.9%[20]. They also observed that mild hearing loss accounted for 37%, moderate hearing loss 30%, whereas severe hearing loss accounted for 22% of cases[20].

Douglas et al., while attempting to demonstrate if a causative agent of meningitis was more likely to cause profound hearing loss, observed an 11.4% of profound hearing loss among patients infected with Neisseria meningitidis and an 85.7% of profound hearing loss among those who had Streptococcus pneumoniae[21]. In a 5-year retrospective review of 343 patients who had pneumococcal meningitis, 54% of the 240 who had audiometry had hearing loss[4].

In this study when the hearing loss with regards to type of hearing impairment was done, out of 60 cases of hearing loss 5(8.4%) had unilateral and 55(91.6%) had bilateral hearing loss. When hearing loss was compared with age, it shows 19(31.6%) between 0.3-12.0 months, 23(38.4%) between 2-5 years while 19(30%) between 6-12 years, when hearing loss was stratified with gender, 35(58.4) were males and 25(41.6%) were females. A study conducted by Zeeshan et al[22] reported the prevalence of hearing loss in children with acute bacterial meningitis was 22%, in which male patients were high in numbers as compared to females and the most common age group was 2 to 5 years. A study conducted by Francis M et al[23] reported that out of 622 children with known hearing outcome, 201(32%) had hearing impairment, while 421(68%) had normal hearing. 8 children had a history of bacterial meningitis, and 6(75%) of these had hearing impairment. They also reported that Children under the age of 5 were 2.7 times (95% confidence interval = 1.3-5.5; P = .008) more likely to be diagnosed with sensorineural hearing loss compared with children aged 5 years or older. By contrast, children aged 5 years or older were 9.6 times (95% confidence interval = 2.2-41.0; P = .002) more likely to be diagnosed with conductive hearing loss compared with children younger than 5 years.

CONCLUSION

We concluded from this study that the frequency of hearing loss is higher among children with acute bacterial meningitis. So, it is recommended that every patient who present with acute bacterial meningitis, should be sort out for hearing loss.

REFERENCES

1. Ban HA. Causative organisms and risk factors in bacterial meningitis in Al-Elwia Childhood Hospital, Baghdad. Kindy Col Med J 2011;7:59-68.
2. Catherine I, Tacon L, Oliver F. Diagnosis and management of bacterial meningitis in the paediatric population. Emerg Med Int 2012;

3. de Jonge. Predicting sequelae and death after bacterial meningitis in childhood: A systematic review of prognostic studies. BMC Infectious Diseases 2010;10:232.
4. Gerber J, Nau R. Mechanisms of injury in bacterial meningitis. Curr Opin Neurol 2010;23:312-8.
5. Stephens DS. Biology and pathogenesis of the evolutionarily successful, obligate human bacterium Neisseria meningitidis. Vaccine 2009;27 Suppl 2:B71-7.
6. Peltola H, Roine I, Fernández J, et al. Hearing impairment in childhood bacterial meningitis is little relieved by dexamethasone or glycerol. Pediatrics. 2010;125(1):e1-8.
7. Chang Q, Tzeng YL, Stephens DS. Meningococcal disease: Changes in epidemiology and prevention. Clin Epidemiol 2012;4:237-45.
8. Daugla DM, Gami JP, Gamougam K, Naibei N, Mbainadji L, Narbé M, et al. Effect of a serogroup A meningococcal conjugate vaccine (PsA-TT) on serogroup A meningococcal meningitis and carriage in Chad: A community study [corrected]. Lancet 2014;383:40-7.
9. van de Beek D, Brouwer M, Hasbun R, Koedel U, Whitney CG, Wijdicks E. Community-acquired bacterial meningitis. Nat Rev Dis Primers 2016;2:16074.
10. World Health Organization. Rapidly Growing Outbreak of Meningococcal Disease in Niger. World Health Organization; 2015. Available from: http://www.who.int/mediacentre/news/situationassessments/meningitis-niger/en/. [Last accessed on 2019 Jul 29].
11. Collard JM, Issaka B, Zaneidou M, Hugonnet S, Nicolas P, Taha MK, *et al*. Epidemiological changes in meningococcal meningitis in Niger from 2008 to 2011 and the impact of vaccination. BMC Infect Dis 2013;13:576.
12. Edmond K, Clark A, Korczak VS, Sanderson C, Griffiths UK, Rudan I. Global and regional risk of disabling sequelae from bacterial meningitis: A systematic review and meta-analysis. Lancet Infect Dis 2010;10:317-28.
13. McGill F, Heyderman R, Panagiotou S, Tunkel A, Solomon T. Acute bacterial meningitis in adults. Lancet 2016;388:3036-47.
14. World Health Organization. 10 facts about deafness. www.who. int/features/factfiles/deafness/en/. Accessed May 23, 2017.
15. Nnadi C, Oladejo J, Yennan S, Ogunleye A, Agbai C, Bakare L, et al. Large outbreak of Neisseria meningitidis serogroup C – Nigeria, December 2016-June 2017. MMWR Morb Mortal Wkly Rep 2017;66:1352-6.
16. Bari A, Zeeshan F, Zafar A, Ejaz H, Iftikhar A, Rathore AW. Childhood Acute Bacterial Meningitis: Clinical Spectrum, Bacteriological Profile and Outcome. J Coll Physicians Surg Pak. 2016;26(10):822-826
17. Jawaid A, Bano S, Haque A. Frequency and outcome of meningitis in pediatric intensive care unit of Pakistan. J Coll Physicians Surg Pak. 2016;26(8):716-717.
18. Yikawe SS, Manya C, Solomon JH, Yaroko AA, Aliyu N, Inoh MI, Adamu AM. Meningitis and hearing loss during an outbreak of meningococcal meningitis. Indian J Otol 2020;26:38-42.
19. Edmond K, Clark A, Korczak VS, Sanderson C, Griffiths UK, Rudan I. Global and regional risk of disabling sequelae from bacterial meningitis: A systematic review and meta-analysis. Lancet Infect Dis 2010;10:317-28.
20. Heckenberg SG, Brouwer MC, van der Ende A, Hensen EF, van de Beek D. Hearing loss in adults surviving pneumococcal meningitis is associated with otitis and pneumococcal serotype. Clin Microbiol Infect 2012;18:849-55.
21. Douglas SA, Sanli H, Gibson WP. Meningitis resulting in hearing loss and labyrinthitis ossificans – does the causative organism matter? Cochlear Implants Int 2008;9:90-6.
22. Zeeshan F, Bari A, Dugal MN, Saeed F. Hearing impairment after acute bacterial meningitis in children. Pak J Med Sci 2018; 34(3):655-659.
23. Francis M. Banda, Kathleen M. Powis, Agnes B. Mokoka et al. Hearing Impairment Among Children Referred to a Public Audiology Clinic in Gaborone, Botswana. 2018. Global Pediatric Health Volume 5: 1–8.