

# Evaluation of Efficacy of Ceftriaxone and Traditional Therapy of Ampicillin and Chloramphenicol in Treating Paediatric Patients with Bacterial Meningitis: A Comparative Study

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## ABSTRACT

**Introduction:** One of the medical emergencies in paediatric patients which manifests as meningeal inflammation in response to bacterial infections is bacterial meningitis. Among paediatric patients, a lot of variation exists in relation to various clinical manifestations of bacterial meningitis. These also show considerable variations in terms of age and duration of the pathology. Hence; we conducted the present study to comparatively evaluate the effectiveness of ceftriaxone and traditional therapy of ampicillin and chloramphenicol in treating paediatric patients with bacterial meningitis.

**Material and methods:** The present study was conducted in the department of paediatrics of the medical institute and included assessment of 40 paediatric patients that were suffering from meningitis. All the patients were divided randomly into two study groups with 20 patients in each group. First group included patients who were on Ceftriaxone therapy while the other group included patients who were on traditional therapy. All antibiotics were given intravenously. Ceftriaxone(50 mg/kg) was given every 12 h. In the traditional therapy group, those patients over 1 month of age initially received Ampicillin (200 to 400 mg/kg per day) and Chloramphenicol (75 mg/kg per day). Both drugs were given every 6h. Determination of complete blood count, prothrombin time, partial thromboplastin time, electrolytes, creatinine, urinalysis, bilirubin, serum glutamic pyruvic transaminase, and alkaline phosphatase was done before enrollment in the study, every 4days during therapy, and at the completion of the study. CSF bactericidal activity, CSF glucose and CSF proteins concentrations were determined. All the results were analyzed by SPSS software.

**Results:** Total of 40 paediatric patients were enrolled in the present study. The mean age of the patients was 6.8 years. Non-significant results were obtained while comparing the mean CSF findings in between patients under different treatment therapies at initial time of assessment. In patients undergoing Ceftriaxone therapy, the mean percentage of poly-morphonuclear (PMN) leukocytes were 81 while in patients undergoing traditional therapy was found to be 80 after 24 hours of therapy. Mean CSF glucose concentration and mean CSF protein concentrations in patients undergoing Ceftriaxone therapy were 35 and 292 mg/dl respectively after 24 hours of therapy. Non-significant results were obtained while comparing the mean CSF findings in between patients under different treatment therapies after 24 hours of assessment.

**Conclusion:** For treating paediatric patients with bacterial meningitis, ceftriaxone appears to be a safe and effective drug

**Keywords:** Ampicillin, Bacterial Meningitis, Ceftriaxone, Chloramphenicol

response to bacterial infection. If left untreated, it is associated with mortality rate of 100 percent. Even with high prevalence of high potential antibiotics, there still exists approximately five to ten percent of mortality rate of the disease.<sup>1</sup> Across the world, following the discharge from the hospitals, the amount of associated neurological sequelae risk approaches approximately 20 percent.<sup>2,3</sup> Among paediatric patients, a lot of variation exists in relation to various clinical manifestations of bacterial meningitis. These also show considerable variations in terms of age and duration of the pathology.<sup>4</sup> Knowledge of local resistance patterns of pathogens largely guides the choice of empirical antibiotics for this potential disease.<sup>5</sup> Hence; we conducted the present study to comparatively evaluate the effectiveness of ceftriaxone and traditional therapy of ampicillin and chloramphenicol in treating paediatric patients with bacterial meningitis.

## MATERIALS AND METHODS

The present study was conducted in the department of paediatrics of the medical institute and included assessment of 40 paediatric patients that were suffering from meningitis from February 2016 to December 2016. Ethical approval was taken from the institutional ethical committee and written consent was obtained from the parents/ guardians of the patients after explaining in detail the entire research protocol. Exclusion criteria for the present study included:

- Patients with history of any other systemic illness,
- Patients with any known drug allergy,
- Patients above 15 years of age

All the patients were divided randomly into two study group with 20 patients in each group. First group included patients who were on Ceftriaxone therapy while the other group included patients who were on traditional therapy. All antibiotics were given intravenously. Ceftriaxone(50 mg/kg) was given every 12 h. In the traditional therapy group, those patients over 1 month of age initially received ampicillin (200 to 400 mg/kg per day) and chloramphenicol(75 mg/kg per day). Both drugs were given every 6h. Determination of complete blood count, prothrombin time, partial thromboplastin time, electrolytes, creatinine,

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## INTRODUCTION

Bacterial meningitis is one of the commonest types of medical emergency characterised by inflammation of the meninges in

urinalysis, bilirubin, serum glutamic pyruvic transaminase, and alkaline phosphatase was done before enrollment in the study, every 4 days during therapy, and at the completion of the study. CSF bactericidal activity, CSF glucose and CSF protein concentrations were determined.

## STATISTICAL ANALYSIS

All the results were analyzed by SPSS software. Chi-square test and student t test were used for the assessment of level of significance. P-value of less than 0.05 was taken as significant.

## RESULTS

Total of 40 paediatric patients were enrolled in the present study. The mean age of the patients was 6.8 years. Mean CSF findings of the patients at the initial time of assessment is shown in Table 1. In patients undergoing Ceftriaxone therapy, the mean percentage of poly-morphonuclear (PMN) leukocytes were 89 while in patients undergoing traditional therapy was found to be 84. Mean CSF glucose concentration and mean CSF protein concentrations in patients undergoing Ceftriaxone therapy were 26 and 230 mg/dl respectively. Mean CSF glucose concentration and mean CSF protein concentrations in patients undergoing traditional therapy were 27 and 201 mg/dl respectively. Non-significant results were obtained while comparing the mean CSF findings in between patients under different treatment therapies at initial time of assessment.

In patients undergoing Ceftriaxone therapy, the mean percentage of poly-morphonuclear (PMN) leukocytes were 81 while in patients undergoing traditional therapy was found to be 80 after 24 hours of therapy. Mean CSF glucose concentration and mean CSF protein concentrations in patients undergoing Ceftriaxone therapy were 35 and 292 mg/dl respectively after 24 hours of therapy. Mean CSF glucose concentration and mean CSF protein concentrations in patients undergoing traditional therapy were 37 and 220 mg/dl respectively. Non-significant results were obtained while comparing the mean CSF findings in between patients under different treatment therapies after 24 hours of assessment (Table 2, Graph 1).

## DISCUSSION

Among paediatric patients, instead of the fact that antibiotics have advanced to a much higher level in the recent time, acute bacterial meningitis remains a serious condition with causing mortality in significant amount of population along with potential neurological manifestations.<sup>5-7</sup> It has been shown that in meningitis cases, the amount of inflammation in the cerebrospinal fluid (CSF) is directly correlated with the pathophysiology of neurological injury. Also the use of systemic corticosteroids has been shown to attenuate the severity of neurological manifestations.<sup>10</sup> Hence; we conducted the present study to comparatively evaluate the effectiveness of ceftriaxone and traditional therapy of ampicillin and chloramphenicol in treating paediatric patients with bacterial meningitis.

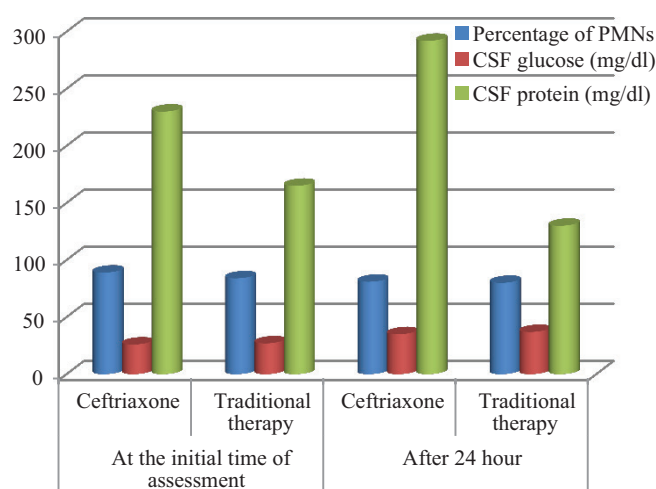
In the present study, we observed non-significant difference in relation to the CSF parameters in paediatric patients undergoing traditional therapy and ceftriaxone therapy (Table 1, Table 2). Ceftriaxone therapy and traditional therapy for bacterial meningitis have been compared by Congeni BL in 45 paediatric patients. Children within age group of 1 day to 15 years were evaluated by them and were randomly divided into two

Treatment therapy	Percentage of PMNs	CSF glucose (mg/dl)	CSF protein (mg/dl)
Ceftriaxone	89	26	230
Traditional therapy	84	27	201
P-value= 0.12 (Non Significant)			

**Table-1:** Mean CSF findings of the patients at the initial time of assessment

Treatment therapy	Percentage of PMNs	CSF glucose (mg/dl)	CSF protein (mg/dl)
Ceftriaxone	81	35	292
Traditional therapy	80	37	220
P-value= 0.12 (Non Significant)			

**Table-2:** Mean CSF findings of the patients after 24 hour



**Graph-1:** Mean CSF findings of the patients at the initial time and 24 hour of assessment

study groups depending upon the type of treatment protocol followed. One group of patients received the traditional therapy consisting of ampicillin and chloramphenicol or gentamicin while the other group comprised of paediatric patients that were given ceftriaxone therapy. Based on the type of etiologic agents, all the patients were divided broadly into two study groups; Haemophilus influenzae type b, Neisseria meningitidis, Streptococcus pneumoniae, and group B streptococcus. One day to two day time after admission of the patients, repeat spinal taps were done. In one patient treated with ceftriaxone therapy, gram staining showed the presence of organisms. In the patients of the traditional therapy group, five patients showed the presence of micro-organisms on gram staining. In the CSF, the ceftriaxone entered well and showed sixty times higher bactericidal activity in comparison to the traditional ampicillin therapy. One death was reported in each of the group due to infection caused by S. pneumoniae. From the results, they concluded that for treating paediatric bacterial meningitis cases, ceftriaxone appeared to be a safer therapy.<sup>11</sup> Duke et al assessed the paediatric meningitis cases and the difference in the mortality rate and neurological sequelae with chloramphenicol and ceftriaxone therapy. In the cases, in which they used ceftriaxone as the first line of treatment therapy, reduction in the mortality rate and neurological sequelae was seen in comparison to the other treatment group. They also

observed that in treating chloramphenicol resistant cases, third generation cephalosporin were equally effective.<sup>12</sup>

A randomized blind trial was conducted by Peltola et al who conducted a prospective study to compare adjuvant dexamethasone or glycerol with placebo in paediatric patients within the age group of two months to 16 years. They administered ceftriaxone to all the paediatric patients and randomized all the patients to received dexamethasone intravenously, glycerol through oral route, either both the agents or neither of the two agents. Death was taken as primary end point with severe neurological sequelae, or deafness, forming the initial two end points (composite end point). Among 654 analyzed patients; the main agents found were *H. influenzae* type b, pneumococci, and meningococci. Death or deafness was not affected significantly by any of the adjuvant therapy. In comparison to the placebo, a significant reduction in the severity of neurological sequelae was observed in cases on glycerol and dexamethasone plus glycerol. From the results, they concluded that severe neurological sequelae in paediatric patients with childhood meningitis is prevented by oral glycerol therap.<sup>13</sup>

## CONCLUSION

From the above results, the authors concluded that for treating paediatric patients with bacterial meningitis, ceftriaxone appears to be a safe and effective drug.

## REFERENCES

- Novelli VP, Peters M, Dobson S. Infectious diseases. In: Macnab AJ, Macrae DJ, Henning R, editors. Care of the Critically Ill Child. London, UK: Churchill Livingstone; 1999. pp. 281–298.
- 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. *The Lancet Infectious Diseases*. 2010;10:317–328.
- Saez-Llorens XM, GH XM. Acute bacterial meningitis beyond the neonatal period. In: Long S, editor. Long: Principles and Practice of Pediatric Infectious Diseases Revised Reprint. 3rd edition. Philadelphia, Pa, USA: Churchill Livingstone; 2008. pp. 284–291.
- Reefhuis J, Honein MA, Whitney CG, et al. Risk of bacterial meningitis in children with cochlear implants. *The New England Journal of Medicine*. 2003;349:435–445.
- Santolaya ME, O’Ryan ML, Valenzuela MT, et al. Immunogenicity and tolerability of a multicomponent meningococcal serogroup B (4CMenB) vaccine in healthy adolescents in Chile: a phase 2b/3 randomised, observer-blind, placebo-controlled study. *The Lancet*. 2012;379:617–624.
- Geiman BJ, Smith AL. Dexamethasone and bacterial meningitis. A meta-analysis of randomized controlled trials. *West J Med*. 1992;157:27–31.
- van de Beek D, de Gans J, McIntyre P, Prasad K. Corticosteroids in acute bacterial meningitis. *Cochrane Database Syst Rev*. 2003;(3):CD004305.
- Molyneux EM, Walsh AL, Forsyth H, et al. Dexamethasone treatment in childhood bacterial meningitis in Malawi: A randomised controlled trial. *Lancet*. 2002;360:211–8.
- Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Control Clin Trials*. 1996;17:1–12.
- DeLemos RA, Haggerty RJ. Corticosteroids as an adjunct to treatment in bacterial meningitis. A controlled clinical trial. *Pediatrics*. 1969;44:30–4.
- Congeni BL. Comparison of ceftriaxone and traditional therapy of bacterial meningitis. *Antimicrobial Agents and Chemotherapy*. 1984;25:40–44.
- Duke T, Michael A, Mokela D, Wal T, Reeder J. Chloramphenicol or ceftriaxone, or both, as treatment for meningitis in developing countries? *Archives of Disease in Childhood*. 2003;88:536–539.
- Peltola H1, Roine I, Fernández J, Zavala I, Ayala SG, Mata AG, Arbo A, Bologna R, Miño G, Goyo J, López E, de Andrade SD, Sarna S. Adjuvant glycerol and/or dexamethasone to improve the outcomes of childhood bacterial meningitis: a prospective, randomized, double-blind, placebo-controlled trial. *Clin Infect Dis*. 2007;45:1277–86.

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