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Clinical and Etiological profile of Pediatric Bacterial Meningitis in a Tertiary care center

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Abstract
Background: *Bacterial meningitis constitutes one of the major causes of mortality and morbidity in Pediatric population. The prevalence of common pathogens has reduced in developing countries with implementation of successful vaccination against the pathogens. Laboratory surveillance of pathogens is crucial in formulating the empirical treatment guidelines in suspected cases of Bacterial meningitis. We conducted this study to determine the clinical profile and bacterial pathogen pattern in such cases in a tertiary center.*
Methods: *A Single blinded Prospective study was conducted over one and half year duration and all suspected cases of acute bacterial meningitis were included in the study. Clinical features were recorded.CSF culture was done and biochemical analysis & cell counts of CSF were performed. Results were analyzed using SPSS 11.2 software version.*
Results: *Among 150 children, 83 were male child, 67 were female children. Fever was the predominant complaint followed by altered sensorium, convulsion, and neck rigidity. Few cases were admitted with cranial nerve involvement, cerebellar signs, motor and sensory system involvement. Among the infants fever, refusal of feeds, bulging fontanel were common presentation. In our study, nearly 47 cases among 150 cases of suspected bacterial meningitis had positive growth in culture. Among culture positive cases Gram negative organisms were predominant than gram positive organisms. CONS was the single most common isolate in the study followed by others like GNB, Enterococci, Escherichia coli, S. aureus, and Klebsiella pneumonia.*
Conclusions: *There is an overwhelming need to formulate locally suitable antibiotic policies in the management of cases of Pediatric bacterial meningitis. As the clinical manifestations are sometimes not clear, a high index of suspicion, laboratory evaluation of CSF and rational use of empirical antibiotics greatly reduce the morbidity and mortality of such cases.*
Keywords: *Acute bacterial meningitis, Clinical Profile, Cerebro spinal fluid, Etiological profile*

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I. Introduction

Incidence of meningitis is more frequent nowadays in childhood, where signs and symptoms are usually nonspecific. Meningitis is a particularly dangerous infection because of the very delicate nature of the brain. Brain cells are some of the only cells in the body that, once killed, will not revitalize themselves. Therefore, if enough brain tissue is damaged by an infection, serious lifelong handicaps will remain.[1]. Early diagnosis and timely treatment are imperative aspect of the management of children with meningitis.

Identification of the causative agent remains the gold standard for the diagnosis. Unfortunately the positivity rate of gram staining and cultures remain low between 25- 40% as against the rate of 80-85% from the developing world.

Several times, patients are submitted to lumbar puncture, but technical difficulty in obtaining enough material or a delay in getting CSF culture report usually get in the way of deciding on suitable antibiotic therapy.[2,3]

The use of quick cerebrospinal fluid (CSF) tests by means of urine reagent strips has been described in few studies, in which sensitivity and specificity reached respectively 97% and 100%.[4] But these tests merely state whether meningitis is present or not and do not throw light on the most probable organism responsible for

the current infection. This could result in starting an antibiotic therapy totally inappropriate in some of the instances hence resulting in serious neurological sequelae and possibly death in some of the affected children.

Here we have done a clinical and etiological profile of pyogenic meningitis in a tertiary Care centre and tried to identify the most common presentation of such children and the most common organisms responsible for Pyogenic meningitis in our setup.

II. Methodology

A Single blinded Prospective study was conducted over one and half year duration, from April 2017 - September 2018 at Dept of pediatrics, Madurai Medical College Hospital. 150 samples from children suspected to have meningitis constituted study material. All patients underwent a lumbar puncture following thorough clinical evaluation and fundus examination.

Each CSF sample was divided into two parts which were utilized for routine CSF analysis of glucose, protein and leukocyte and CSF culture & Sensitivity. Neuroimaging was carried out whenever clinically warranted. Data were analyzed using SPSS 11.2 software version.

III. Results

At the beginning, 164 patients were included in the study. Among the 164 CSF samples, 14 were lost due to reagent strip misreading and unanalyzed hemorrhagic CSF. Therefore, 150 CSF samples were analyzed in the age ranged between one month and 12 years. Among 150 children, 35children were between 1Months to 3Yrs, 54 children were between 3Yrs To 6Yrs, 37 children were between 6Yrs To 9Yrs, 24 children were between 9Yrs To 12Yrs.In this study incidence of meningitis was more in the age group of 3y to 6y which contributes 36% of cases. Among 150 children 83 were male child (55%), 67 were female children (45%).

Table-1: Age wise distribution of Bacterial meningitis

Parameter		No of Patients	%
Age	1Month To 3Yrs	35	23
	3Yrs To 6Yrs	54	36
	6Yrs To 9Yrs	37	25
	9Yrs To 12Yrs	24	16

Table-2: Sex wise distribution of Bacterial meningitis:

Parameter		Frequency	Percent
Sex	Male	83	55
	Female	67	45
	Total	150	100.0

Figure-1: Sex wise distribution of Bacterial meningitis:

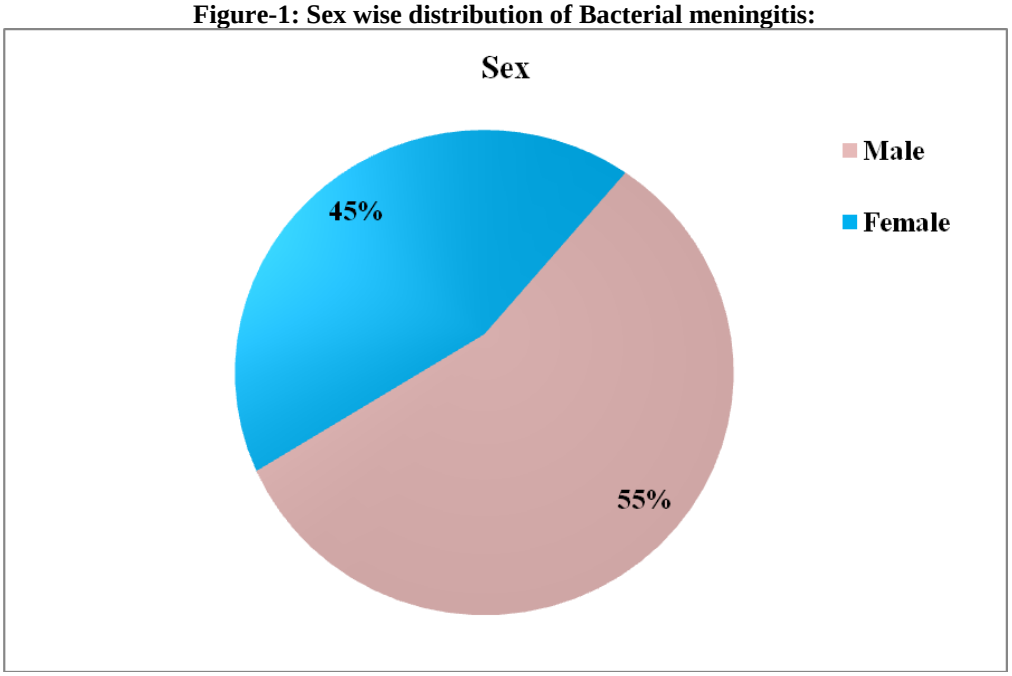
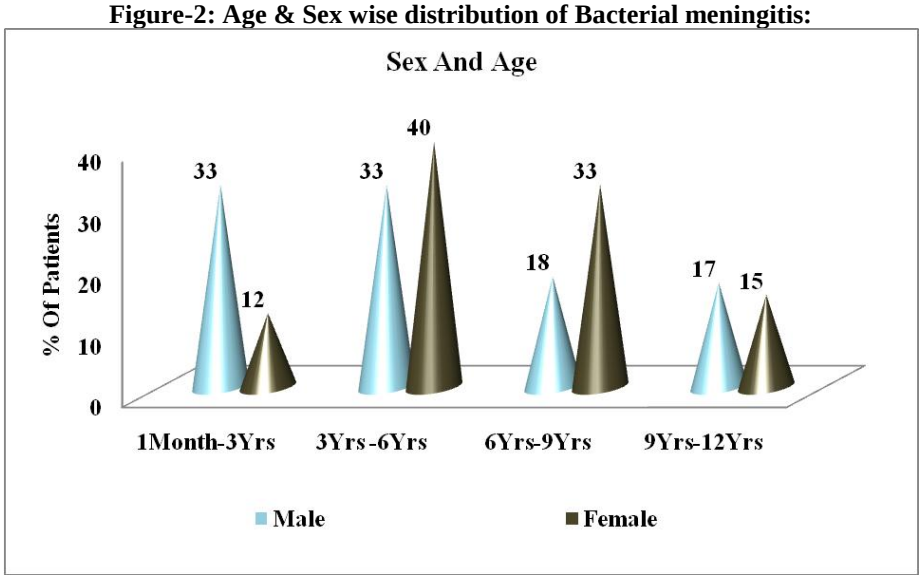


Figure-2: Age & Sex wise distribution of Bacterial meningitis:



Among the 150 cases, fever was the predominant complaint and following that altered sensorium, convulsion, neck rigidity, were other common presentations. Few cases were admitted with cranial nerve involvement. Very few cases were admitted with cerebellar signs, motor and sensory system involvement. Among the infants, fever, refusal of feeds, bulging fontanel were common presentations. Very few cases admitted with altered sensorium and fever, were not having classical laboratory picture suggestive of meningitis.

Table-3: Presenting Complaints of meningitis:

Parameter		No of Patients 150	%
Presenting Manifestation in General	Fever	150	100
	Projectile Vomiting	70	47
	Convulsion	109	77
	Headache	84	56
	Photophobia	20	13
	Refusal of Feeds	54	36

Figure-3: Presenting Manifestations of Bacterial meningitis:

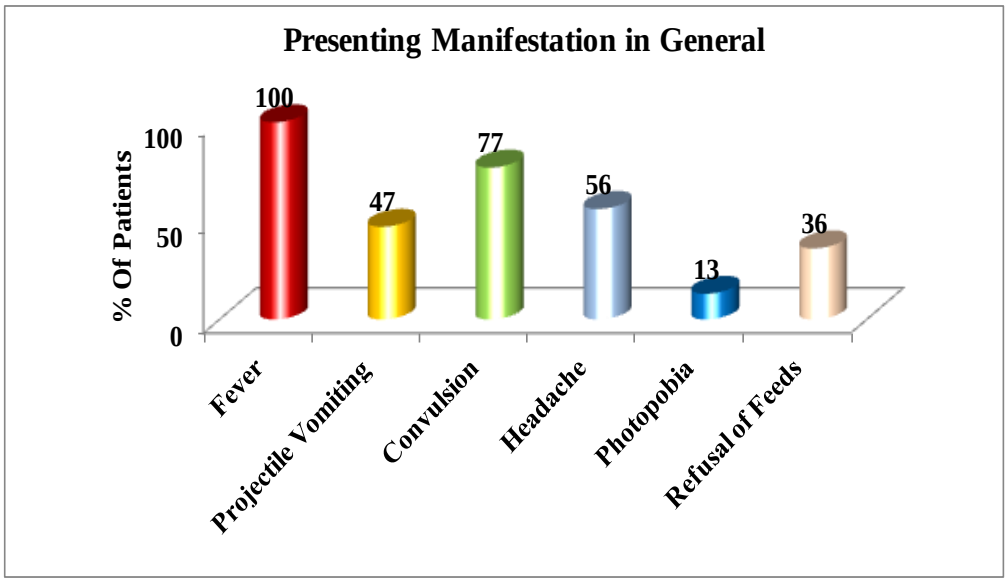
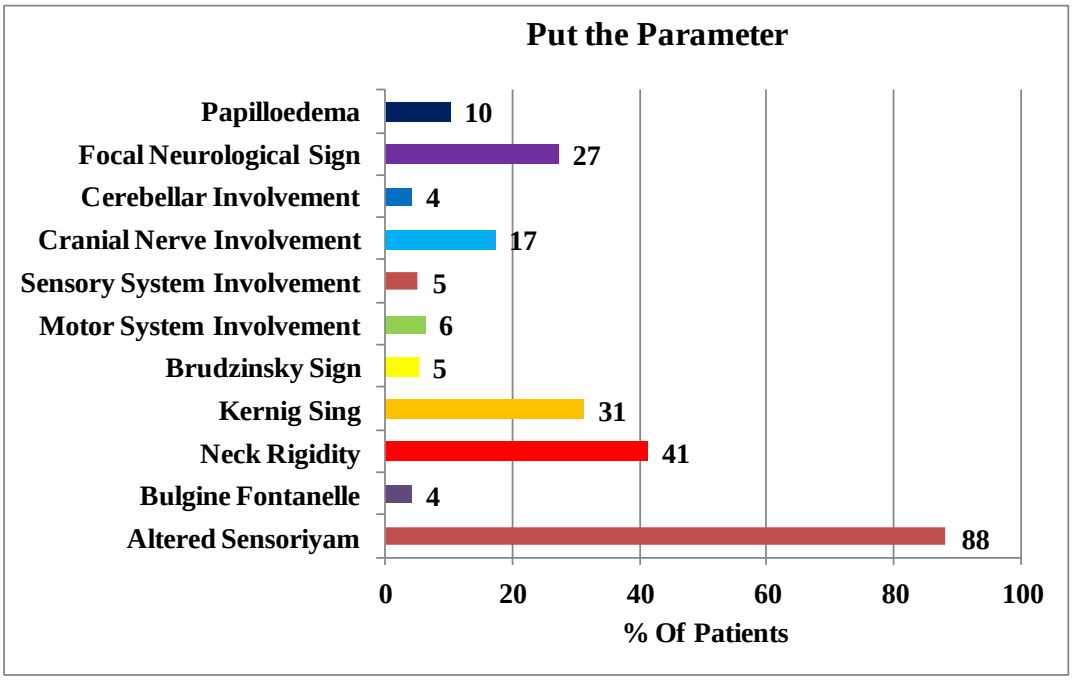


Figure-4: Presenting signs of Meningitis:



BASED ON CSF CELL, SUGAR& PROTEIN VALUES:

The cytological and biochemical analysis of CSF revealed that among the cases of suspected bacterial meningitis lab cytological analysis showed 90 cases had cells more than 10. Among the cases of suspected bacterial meningitis lab cytological analysis showed 60 cases had cells less than 10

Among the cases of suspected bacterial meningitis lab biochemistry showed 103 cases had protein value more than 50mgs/dl which was considered as positive cases based on protein value. Among the cases of suspected bacterial meningitis lab biochemistry analysis showed 47 cases had protein value below 50.

Among the cases of suspected bacterial meningitis lab biochemistry analysis showed 90 cases had sugar value below 50mg/dl which was considered as positive cases based on sugar value. Among the cases of suspected bacterial meningitis lab biochemistry analysis showed 60 cases were sugar values more than 50 which considered as negative cases.

Table-4: CSF values of Cells, Protein and sugar in Bacterial Meningitis cases:

	Parameter	Quantum	Frequency	Percent	
	CSF cell count	> 10 cells/mm3	90	60%	
		> 10 cells/mm3	60	40%	
Male		Male	Male	60%	55
				40%	
Male		Male	Male	68.6%	55
				31.4%	

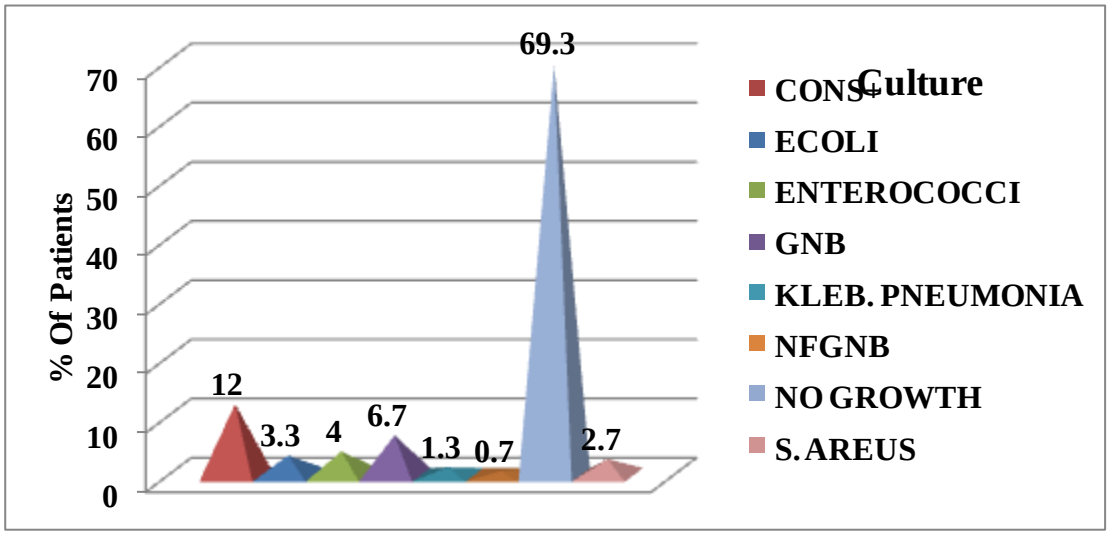
BASED ON CULTURE:

Culture growth is Gold standard test for diagnosing meningitis. In our study 46 cases [30.7%] among 150 cases of suspected bacterial meningitis had positive growth in culture and 104 samples did not grow any organism [69.3%]. Out of 46 culture positive CSF specimens, gram stain positivity was seen in 65.21% (30 cases) and gram stain negativity was seen in 34.79% (16 cases). Coagulase negative Staphylococcus aureus [CONS] was the most common organism in this study [12%], followed by group negative bacilli [6.7%], Enterococci [4%], E.coli [3.3%], Staph. Aureus [2.7%] & Klebsiella [1.3%].

Table-Six: Etiological agent of Bacterial meningitis in culture positive cases:

Parameter		Frequency	Percent
Culture Positive	CONS+	18	12.0
	GNB	10	6.7
	ENTEROCOCCI	6	4.0
	ECOLI	5	3.3
	S. AREUS	4	2.7
	KLEB. PNEUMONIA	2	1.3
	NFGNB	1	0.7

Figure-Five: Etiological Profile of Bacterial meningitis:



IV. Discussion

Bacterial meningitis is an inflammation of the meninges and the underlying subarachnoid CSF. Acute bacterial meningitis is a medical emergency requiring immediate management. The choice of antibiotic depends on the isolate prevalent in the region, its antimicrobial susceptibility pattern and the age of the patient. [5] Laboratory investigations of CSF specimens are extremely important in diagnosing and management of patients.

In our study, the incidence of bacterial meningitis was more in males than females and the male to female ratio was 55:45. This finding is in par with findings of studies of Singh AK et al, Manjiyil IJ et al.[6]

The most common age group observed in the study was 3-6 years[36%] which corresponds with the findings of previous studies.[7,8]

In the clinical presentation of Bacterial meningitis cases, fever [100%] was the most common symptom followed by headache, vomiting, and photophobia. Episodes of seizures were seen in 77% of cases, which is supported by many studies which reported more incidences of seizures in children when compared to adults. Findings of Sudharshan Reddy RC et al, Bareja et al reported a high incidence of seizures[>38%] in children.[8,9] Altered mental status, neck stiffness and neurological signs like Kernings sign and Brudzniski's sign were observed and found similar with other studies.[10] Laboratory parameters were on par with many studies with neutrophilic pleocytosis in all cases of ABM, raised protein and reduced glucose levels.

In the present study, CONS was the commonest isolate (12%) in all age groups as described by many studies in India. Most studies globally and in India reported a high incidence of pneumococcal meningitis earlier but slowly the trend is changing with the introduction of Pneumococcal vaccines.[11] CONS is slowly emerging as a major etiological agent in Pyogenic meningitis and this could be explained as a result prior antibiotic use & pre existing immunodeficiency.

CONS have long been regarded as non-pathogenic but their important role as pathogens and their increasing incidence have been recognized and studied in recent years. CONS are by far the most common cause of bacteremia related to indwelling devices (Garcia et al., 2004). Other important infections due to CONS include central nervous system shunt infections, native or prosthetic valve endocarditis, urinary tract infections, catheter associated peritonitis, cerebrospinal fluid shunt infections in neonates, especially when they are premature and endophthalmitis. They are also common opportunistic pathogens in patients who are immunocompromised (Archer and Climo, 2005).[12]

Because of their low virulence, CONS may not evoke sufficient inflammatory response and thus a number of patients with coagulase negative staphylococcal bloodstream infection may not have typical clinical manifestations and laboratory indices of infection. (Souvenir et al., 1998).[13]

CONS are frequently isolated from blood and CSF cultures and are emerging as an important pathogen. Most of the patients (95.7%) in whom CONS were isolated were of paediatric age group. CONS was isolated in 4.5% of cases in study by Gohel et al., (2014) and among 4% cases by van der Heijden et al. (2011). Reported isolation of CONS was 20.16% (Arora and Devi, 2007); 33% (Akpaka et al., 2006); 42% (Karlowsky et al., 2004) and 16.5% (Roy et al., 2002). [14,15,16,17]

Among the gram-negative pathogens, E.coli and Klebsiella form the top two common organisms. These gram negative organisms most commonly cause CNS infections in very young age group and which is what seen in this study too.

In this study the overall culture positivity from suspected cases of ABM was 30.07% (46/150) which was low when compared with findings in studies of Modi S et al, (65.07%) and Farag HM et al (65.16%).[18,19]

However culture positivity of CSF in a study of Madhumitha P et al, was <26% and Kahn F et al were <34%. The reasons for low CSF culture positivity may be attributed to delay in transport and processing of specimens in the laboratory, autolysis of enzymes in CSF, lack of appropriate media for culture and prior antibiotic treatment.[20,21]

V. Conclusion

There is an overwhelming need to formulate appropriate policies in the management of cases of Pediatric bacterial meningitis. As the clinical manifestations are sometimes not clear, a high index of suspicion, laboratory evaluation of CSF and rational use of empirical antibiotics greatly reduce the morbidity and mortality of such cases.

We conclude that Pediatric Bacterial meningitis is now commonly caused not by bacteria like Pneumococci or Meningococci but lately there is a shift in the form of low virulence organisms like CONS, Group Negative Bacteria and Enterococci which slowly emerge as the common etiological agents. Further studies are required to confirm this changing pattern to form a suitable empirical antibiotic policy against these low virulence organisms.

VI. Limitations & Recommendation

Antibiotic susceptibility studies were not done as testing this would necessitate costly antibiotic susceptibility testing discs. If done so, would have shed more light on choosing the appropriate empirical antibiotics specific for our geographical area.

A lot of samples did not show any growth. This could have been due to receiving of any antibiotics outside before coming to our institution by these patients. If CSF collection was done before such patients received any antibiotics, the number of positive culture would have gone up and a clearer picture would have emerged.

Bibliography

[1]. Tunkel AR, Scheld WM. Acute meningitis. In: Mandell GL, Bennett JE, Dolin R. Principles and Practice of Infectious Diseases. 5th ed. Philadelphia: Churchill Livingstone; 2000. p. 959-96.

[2]. Feigin RD, Pearlmon E. Bacterial meningitis beyond the neonatal period. In: Feigin RD, Cherry JD. Textbook of Pediatric Infectious Diseases. 4th ed. Philadelphia: WB Saunders; 1998. p. 400-29

[3]. Quagliarello VJ, Scheld WM. Treatment of bacterial meningitis. N Engl J Med 1997;336(10):708-16.

[4]. Beck PD, Rainier-Pope CR. The assessment of the value of a reagent strip in testing cerebrospinal fluid. S Afr Med J 1966;40:882-4.

[5]. Bonev V, Gledhill RF. Use of reagent strips to diagnose bacterial meningitis. Lancet 1997;349:287-8

[6]. Antimicrobial chemotherapy. In: Jawetz, Melnick, Adelberg's Medical Microbiology. 21st Ed. International Edition, Stanford, Connecticut, Prentice-Hall International Inc: 1998;145-76.

[7]. Singh AK, Kumar A, Gaur V, Jasuja K, Pandey J, Mishra R. Bacteriological profile of acute bacterial meningitis at a tertiary care hospital of North India. Int J Res Med Sci. 2016;4:4387-93.

[8]. Sudharshan RC, Reddy MP, Neelima A. Pattern and antibiogram of bacterial meningitis in children at a tertiary care hospital. J Scient Innov Res. 2013;2(6):1012-6.

[9]. Bareja R, Pottathil S, Shah RK, Grover PS, Singh VA. Trends in bacterial etiology amongst cases of meningitis. J Acad Indus Res. 2013;1(12):761-5.

[10]. Basri R, Zueter AR, Mohamed Z, Alam MK, Norsa'adah B, Hasan SA, et al. Burden of bacterial meningitis a retrospective review on laboratory parameters and factors associated with death in meningitis Kelantan Malaysia. Nagoya J Med Sci. 2015;77(1-2):59-68.

[11]. Panjarathinam R, Shah RK. Pyogenic meningitis in Ahmedabad. Ind J Ped. 1993;60(2):669-73.

[12]. Archer, G.L., Climo, M.W. 2005. Staphylococcus epidermidis and other coagulase negative Staphylococci. In: Mandel, G.L., Bennett, J.E., Dolin R. (Eds.), Principles and practice of infectious diseases. Philadelphia. Elsevier Churchill Livingston. Pp. 2352 62

[13]. Souvenir, D., Anderson, Jr. D.E., Palpant, S., Mroch, H., Askin, S., Anderson J et al. 1998. Blood cultures positive for coagulase-negative Staphylococci: antisepsis, pseudobacteremia, and therapy of patients. J. Clin. Microbiol., 36(7): 1923 1926

[14]. Gohel, K., Jojera, A., Soni, S., Gang, S., Sabnis, R., Desai, M. 2014. Bacteriological profile and drug resistance patterns of blood culture isolates in a tertiary care nephrourology teaching institute. Bio. Med. Res. Int., Article ID: 153747, Pp. 1 5.

[15]. Arora, U., Devi, P. 2007. Bacterial profile of blood stream infections and antibiotic resistance pattern of isolates. JK. Sci., 9(4): 186 190.
[16]. Akpaka, P.E., Christian, N., Bodonaik, N.C., Smikle, M.F. 2006. Epidemiology of coagulase-negative Staphylococci isolated from clinical blood specimens at the University hospital of the West Indies. West Indian Med. J., 55(3): 170 72.
[17]. Roy, I., Jain, A., Kumar, M., Agarwal, S.K. 2002. Bacteriology of neonatal septicemia in a tertiary care hospital of Northern India. Indian J. Med. Microbiol., 20: 156 159.
[18]. Modi S, Anand AK. Phenotypic Characterization and antibiogram of CSF isolates in acute bacterial meningitis. J Clin Diagost Res. 2013;7(12):2704-8.
[19]. Farag HFM, Fattah-Abdel MM, Youssri AM. Bacterial meningitis among children in Alexandria. Indian J Med Microbiol. 2005;23(2):95-101.
[20]. Madhumita P, Gupta N, Clinical and bacteriological spectrum of community acquired bacterial meningitis in adults at tertiary care hospital in Northen India. Int J Nutr Pharmacol Neurol Dis. 2011;1:194-200.
[21]. Khan F, Rizvi M, Fatima N, Shukla I, Malik A, Khatoon R. Bacterial meningitis in North India. Trends over a period of eight years. Neurol Asia. 2011; 16(1):47-56.

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