e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13(10); 73-76

Original Research Article

Microbiological Analysis of CSF in a Tertiary Health Care Setup

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Received: 12-07-2023 / Revised 21-00-2023 / Accepted 20-09-2023
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Conflict of interest: Nil

Abstract:

Introduction: Acute bacterial meningitis (ABM) is an infection of central nervous system (CNS), major health problem of developing countries. ABM is associated with significant mortality and morbidity, leads to around 25% deaths. With these, a study was taken to find various bacterial agents that cause ABM and also to find the antibacterial susceptibility testing to various antibiotics.

Methods: Study was conducted in the department of Microbiology, GSL Medical College. CSF samples were transported immediately to the microbiology laboratory. Samples were cultured on blood agar, chocolate agar and MacConkey agar, incubated at 37^0C; incubated plates were checked after 24 and 48 hours. Culture and antibacterial sensitivity for the isolates was carried by using Kibry bauer disc diffusion method.

Results: During the study period, total 222 CSF samples were collected, 34 (15.3%) were culture positive (CP); 58.8% were male and 41.2% were female. *Staphylococcus aureus* was the predominant {23.5% (8)} isolate followed by Klebsiella species (20.6%), *Escherichia coli* and other 14.7% each, Pseudomonas species 11.8%, *Streptococcus pneumoniae* (8.8%). In this study, all the isolates were sensitive to vancomycin, imipenem, linezolid, piptaz.

Conclusion: Meningitis is prevalent among male and staph.vaureus is the predominant isolate, no significant drug resistance was reported.

Keyword: Meningitis, Culture, Report, CSF.

Introduction

Acute bacterial meningitis (ABM) is an infection of central nervous system (CNS), major health problem of developing countries. [1] Meningitis is an inflammation of meninges and underlying cerebrospinal fluid (CSF). ABM is associated with significant mortality and morbidity, leads to around 25% deaths. [2] As per the WHO reports also, the mortality and morbidity of ABM is high. [3]

In addition to bacteria, viruses also cause meningitis, called viral meningitis (VM). As per the available reports, unlike ABM, VM is less severe and resolve spontaneously without any proper therapy. 3 Inspite of availability of various newer antibiotics, the mortality rate of ABM is reported to be high in developing countries such as India. [4,5]

Increased awareness as well as usage of vaccines is the prime technique to be followed for the prevention of these because prevention is always better than cure. [6, 7] Early diagnosis is the next alternative to be followed to escape from this mortality. [8]

Hence it is always essential to diagnose as well as differentiate ABM and VM. Various techniques such as gram staining, culture and sensitivity, PCR are available for the diagnosis of ABM. These techniques have their own advantages and disadvantages. With these, a study was taken to find various bacterial agents that cause ABM and also to find the antibacterial susceptibility testing to various antibiotics.

Methods

This was a prospective research. Study was conducted in the department of Microbiology, GSL Medical College; study was conducted from March 2021 to February 2022. Study protocol was approved by the institutional ethics committee. Informed written consent was taken from all the volunteers. Individual's of both gender, > 18 years, clinically diagnosed to be meningitis and who submitted the informed written consent were

included in this study. Individuals who did not submit the consent and non-competter members were not included in the study.

After recruiting the individuals in the research, detailed clinical history was collected and all the findings were noted in the study proforma. After this, CSF specimen were collected as per the protocol. Then the CSF samples were transported immediately to the microbiology laboratory for gram staining. Samples were cultured on blood agar, chocolate agar and MacConkey agar, incubated at 37^0C; incubated plates were checked after 24 and 48 hours. If growth is present it was identified by gram staining and using set of biochemical reactions such as catalase, oxidase, indole, IMViC, urease, citrate, TSI and so on. Simultaneously, antibacterial sensitivity for the isolates was carried by using Kibry bauer disc diffusion method. [9]

The data were analyzed using SPSS version 22. The data was presented in percentage.

Results:

During the study period, total 222 CSF samples were collected, among these 34 (15.3%) were culture positive for ABM. Gender wise, the culture positivity was 58.8%, 41.2%, respectively among the male and female. More culture positivity was detected in 11 – 20 years group (Table 1).

Table 1: Age wise culture result in the gender; n (%)

Age	Male	Female	Total
0 – 10	5 (14.7)	3 (8.8)	8 (23.5)
11 – 20	4 (11.8)	5 (14.7)	9 (26.5)
21 – 30	3 (8.8)	4 (11.8)	7 (20.6)
31 – 40	2 (5.9)	1 (2.9)	3 (8.8)
41 – 50	5 (14.7)	0	5 (14.7)
$\geq$ 51	1 (2.9)	1 (2.9)	2 (5.9)
Total	20 (58.8)	14 (41.2)	34 (100)

Pathogen wise, *Staphylococcus aureus* was the predominant {23.5% (8)} isolate followed by Klebsiella species (20.6%), *Escherichia coli* and other 14.7% each, Pseudomonas species 11.8%, *Streptococcus pneumoniae* (8.8%) (Table 2).

Table 2: Gender wise various pathogens isolated; n (%)

Pathogen	Male	Female	Total
Staph.aureus	5 (14.7)	3 (8.8)	8 (23.5)
Strep. Pneumoniae	2 (5.9)	1 (2.9)	3 (8.8)
Esch.coli	3 (8.8)	2 (5.9)	5 (14.7)
Klebsiella species	4 (11.8)	3 (8.8)	7 (20.6)
Pseudomonas species	2 (5.9)	2 (5.9)	4 (11.8)
Proteus species	1 (2.9)	1 (2.9)	2 (5.9)
Others	3 (8.8)	2 (5.9)	5 (14.7)
Total	20 (58.8)	14 (41.2)	34 (100)

In this study, all the isolates were sensitive to vancomycin, imipenem, linezolid, piptaz. Good sensitivity was reported to gentamycin, ciprofloxacin, teicoplanin, amikacin. No significant drug resistance was reported (Table 3).

Table 3: Antibiotic susceptibility pattern of various isolates

Pathogens	Antibiotic sensitivity (%)
S.aureus (n = 8)	100 – vancomycin, linezolid, gentamicin; 80 – doxycycline, cefoxitin, cotrimoxazole, ciprofloxacin, teicoplanin; 75 – clindamycin; 50 – erythromycin; 0 – penicillin.
Klebsiella (n =7)	100 – Imepenem, piptaz; 88 – gentamicin, amikacin, cotrimoxazole; 83 - ciprofloxacin; 50 – amoxiclav, cefotaxime, ceftazidime; 27 – cefoxitin; 11 – ampicillin.
E.coli (n=5)	100 – imipenem, piptaz, gentamicin, amikacin; 80 – ciprofloxacin, cotrimoxazole; 60 – amoxiclav, ceftazidime; 40 – cefotaxime; 20 – cefoxitin, ampicillin.
Pseudomonas (n=4)	100 – Imepenem, amikacin; 75 – piptaz, ciprofloxacin, aztreonam, gentamicin, netilmicin; 50 – tobramycin, levofloxacin; 25 – ceftazidime, cefepime.
Str.pneumoniae (n = 3)	100 – vancomycin, teicoplanin, linezolid, gentamicin, 66 – ciprofloxacin, ampicillin; 33 – amoxiclav, penicillin; 0 – erythromycin, tetracycline.
Proteus sp (n = 2)	100 – Imipenem, piptaz, gentamicin, amikacin, ciprofloxacin, cotrimoxazole, amoxiclav; 50 – ceftazidime, cefotaxime, cefoxitin; 0 – ampicillin

Discussion

As per the WHO report, the rate of morbidity and mortality are remain high because of ABM. [3] Literature reported that every year 1.2 million cases of meningitis are reported in this around 1.35 thousands are fatal. [3] In Indian subcontinent, meningitis is endemic and most of the meningitis cases are reported from Andhra Pradesh. [10]

In the current repot, total 222 CSF samples were collected and the culture positivity was 15.3% (34). Another Indian study on neonatal meningitis reported that out of 303 CSF samples, 67 were culture positive; culture positivity was reported to be 22%. [11] Jayaraman Y et al. reported that 257 cases were culture positive out of 3104 suspected cases of meningitis; culture positivity was 8.3%. [12] As per the Chauhan D et al., report, 5% (4) were culture positive out of 80 confirmed cases of meningitis [13] (CSF 3). The range of culture positivity in suspected cases of meningitis from India was 6 – 50%. [14, 15]

When gender was considered, meningitis suffering among the male was 1.7 times compared to female. Even the studies mentioned that the rate of meningitis was reported to be more among the male. [14-18] The reasons behind the male predominance was not reported in the literature.

When age of the patient was considered, 50% (17) culture positive meningitis cases diagnosed in $\leq$ 20 years age group. Mathew et al., reported that in Indian the prevalence of meningitis was reported to be high amomg children below 5 years and the death rate was 22%. [19] In this study, Stap.aureus was the predominant pathogen followed by Klebsiella, Esch.coli, Pseudomonas species and Strep. pneumoniae. In the prevalence of pathogens this study showed difference with the available reports. Gram negative bacilli are the predominant isolate in this study. Whereas Walaa Shawky Khater and Safia Hamed Elabd [1] reported that gram positive cocci was the predominant isolate and other studies also reported that GPC is the predominant isolate. [8]

In this study, the clinical features were recorded retrospectively from the records. Here, in 95% cases, fever was found to be the predominant clinical finding followed by vomiting, nausea (46%) and consciousness (42%). Similar finds were reported in the literature also. [20, 21]

In the meningitis cases drug resistance was reported in various studies. [16, 22, 23] Resistance was reported to chloramphenicol, penicillin and ampicillin. Whereas in this study no significant drug resistance was reported and the isolates showed good sensitivity to commonly used antibiotics.

Conclusion

Meningitis is prevalent among male and staph. aureus is the predominant isolate. No significant drug resistance was reported.

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