

# ETIOLOGY AND PRESENTATION OF ACUTE BACTERIAL MENINGITIS IN CHILDREN AT AL-THAWRAH HOSPITAL, SANA'A, YEMEN

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**Background:** This study was carried out to determine the etiology and management outcome of acute bacterial meningitis among children presenting at Al-Thawrah hospital, Sana'a, Yemen. **Methods:** This study was carried out from 1-1/2001 to 23-8-2002. It initially included 77 children of all ages (newborn to 12 years), who attended pediatric emergency with fever, convulsions and altered sensorium. Full medical history, clinical examination and lab investigations were used to diagnose acute bacterial meningitis, and to summarize etiology, presentation and management outcome. **Results:** Over this 20 months period only 63 (81.81%) out of 77 suspected children were diagnosed as acute bacterial meningitis (ABM). The most affected age group was 4 months and 3 years. Based on CSF exam; there were 23 with positive findings of CSF analysis (turbid, decrease glucose <40mg.dl, increase protein >80mg.dl and leucocytes neutrophils >5cells.cu.mm), 21 cases were confirmed with CSF culture, while the remaining 19 cases showed normal CSF pictures. The fatality rate was 14.28%. The predominant organism in CSF culture was Klebsiella (33.33%) followed by Haemophilus influenza (23.80%), streptococcal pneumonia (14.28%) then 2 cases each; E-coli, Pseudomonas (9.52%) while with one cases each of tubercles meningitis and staphylococcus aureus. **Conclusion:** Proper knowledge of etiology and presentation of ABM along with timely vaccination can help reduce mortality and morbidity associated with this deadly disease.

**Key words:** Acute bacterial meningitis, Etiology, Febrile convulsion, CSF culture

## INTRODUCTION

Acute Bacterial Meningitis (ABM) is one of the most severe infectious diseases in the childhood. The global burden of the disease is high. Apart from epidemic, at least 1.2 million cases of meningitis are estimated to occur every year with 135000 deaths.<sup>1</sup> It is caused by a variety of microorganisms but, beyond the neonate period, the most important ones are streptococcus pneumonia and Haemophilus influenza.<sup>2-4</sup> Acute bacterial meningitis is seen more in children than adults.<sup>1</sup> Haemophilus influenza, N.meningitides, S.pneumoniae are the most common cause of bacterial meningitis in children.<sup>2</sup>

ABM is an important disease of early childhood with high fatality and risk of neurological handicaps.<sup>3</sup> The prevalence of these organisms varies from place to place, by age and season.<sup>4</sup> The specific pathogen causing bacterial meningitis varies around the World.<sup>2,5,6</sup> There is predominance of gram negative organisms as the etiological agents of bacterial meningitis.<sup>7</sup>

Various factors that determine the outcome of the disease are age, early diagnosis, early treatment, duration of treatment and type of microorganism.<sup>8</sup>

The exact etiological diagnosis is often not possible because of poor culture facilities.<sup>9,10</sup> But similar studies showed that, the common causative organisms responsible for bacterial meningitis beyond neonatal period were H.influenzae type B, S. pneumonia and N.meningitides were found in different regions of Saudia Arabia and abroad.<sup>11,12</sup> Ceftrixone was used as drug of choice in many centers in treating bacterial meningitis, especially with H.influenzae type B infection.<sup>13,14,15</sup> As well as it has excellent penetration into the CSF with a ratio of achievable

CSF concentration to minimum inhibitory concentration levels in the range of 100:1.<sup>16</sup> The management of ABM include, a suitable combination of antibiotics, dexamethasone for first few days (reduces meningeal inflammation and improves the clinical outcome,<sup>19,20</sup>) and importantly, intensive care thereby especially for shock and raised intracranial pressure.<sup>8,17,18</sup>

CSF latex agglutination test (LAT) is of great promise. Various authors have suggested it to be simple with superior sensitivity and specificity and unaffected by previous antibiotics thereby.<sup>21-23</sup> This is particularly important for N.meningitides which is known to be not detected by in smear, CSF and blood culture, and even in antigen detection tests.<sup>24</sup> About 76% of ABM in children admitted to hospital had received antibiotics, had similar observation by Murphy.<sup>25</sup> A high percentage of ampicilline-resistant (23%) and chloramphenicol-resistant (11%) and similar findings have been observed by other workers<sup>26,27</sup> and the incidence of these antibiotics resistant was higher than those reported by other workers.<sup>10,28</sup>

CT scan is an important diagnostic tool to detect the intracranial complications, which was also suggested by Lancy et al.<sup>29</sup> The mortality rate among these children with ABM have been reported in industrialized countries such as the USA 2.6%.<sup>30</sup> High rates have been reported in some developing countries and countries in the Middle East such as Turkey 38%,<sup>31</sup> Saudia Arabia 14.7%,<sup>32</sup> Sudan 28.6%<sup>33</sup> and India 21.8%.<sup>34</sup>

This current study was carried out to determine etiology and management outcome of acute bacterial meningitis in Yemeni children, with a goal of help in reduction of morbidity and mortality associated with this disease.

## **MATERIAL AND METHODS**

This study was carried out from 01/01/2001 to 23/8/2002 at children unit of Al-Thawrah general teaching hospital that is one of the teaching hospital attached with Sana'a Medical College, Sana'a, Yemen. Seventy seven cases were initially admitted, out of whom 63 patients were clinically diagnosed as ABM. While 40 were who were confirmed were finally included.

The information obtained at the time of admission included patient age, weight, sex, presenting complaints, birth history, family history, developmental history, any history of trauma/wound, drugs, immunization and ear problems, exam findings and duration of illness. Investigations done were CSF exam, stain, culture, complete blood counts. Blood film for malaria, random blood sugar, chest x-ray, renal and liver function tests, serum electrolyte and trans-frontal ultrasound/CT scan of the head were carried out whenever required. Drugs used before admission, final diagnosis and the outcome were also recorded.

Bacteriological studies were carried out in the Department of Microbiology of the same hospital. Those children in whom CSF culture was negative (no organism was grew) but they were having signs of meningeal irritation/raised anterior fontanel were considered suspected cases of bacterial meningitis.

Data were analyzed manually to calculator using rates & percentages.

## **RESULTS**

Over a 20 months period, only 63 children (44 males, 19 females) with a presumptive diagnosis of acute bacterial meningitis were seen. The most affected group were those between 4 months to 3 years. The mean age at the presentation was 4.1±0.71 years.

The positive findings of CSF analysis (turbid, decrease glucose <40mg.dl, increase protein >80mg.dl and leucocytes neutrophils >5cells.cu.mm) were found in 23 (36.50%) cases. The findings of CSF analysis with respect to cell count, protein and glucose levels were suggestive of partially treated meningitis.

CSF culture detected 21 cases (33.33%) while the remaining 19 cases showed normal CSF pictures although they did have clinical signs of acute meningitis.

Fatality was 14.28%. The predominant organism in CSF culture was Klebsiella (33.33%), Haemophilus influenza (23.80%), streptococcal pneumonia (14.28%), 2 cases each of E-coli and Pseudomonas while with one cases each of tuberculus meningitis and staphylococcus aurus.

From those 21 with positive CSF culture (proved acute bacterial meningitis) major clinical presentation at pediatric emergency room were 7 patients with high fever, 7 cases were toxic look, 3 cases with altered consciousness, 2 cases looks ill and lethargic and 2 cases with neck rigidity.

Among 63 patients with ABM, only 6 CT scan were performed.

**Table 1: Cases showing positive CSF findings**

	Males	Females	Total
Turbid CSF	2	1	3
CSF glucose <40mg.dl	2	2	4
CSF protein >80 mg.dl.	7	4	11
CSF polymorph >05cells.cumm.	2	3	5
<b>Total</b>	<b>13</b>	<b>10</b>	<b>23</b>

*No neonate was seen in above group.*

**Table 2: Type of microorganism isolated:**

Age group	Male	Female	Type of organism	Total
0-3 months	1	2	2 with E-coli, 1strept.pneumoniae.	3
4mon-3 Yrs	10	3	5H.influenzae, 4Klebsiellae spp, 2strep.pneumonia, 1Pseudomonas, 1staph.aureus.	13
>3.1 Yrs	3	2	3Klebsiella pne, 1TBM, 1Pseudomonas.	5
<b>Total</b>	<b>14</b>	<b>7</b>	<b>21</b>	<b>21</b>

The outcome from the confirmed cases (organism isolated from CSF n=21) 12 (57.14%) cases improved, 3 (14.28%) left against medical advise, 3 (14.28%) expired (2 with H.influenzae and one with Pseudomonas), 2 cases got complications and one case absconded.

White blood cell count (WBC) showed; in those positive isolated micro-organism, there were 15 cases with raised WBC >11000cell.cu.mm (71.4%) and decrease WBC <5000 with only 6 cases (28.5%). Other WBC relation to those complicated cases n=2; one patient with increased & one patient with decrease WBC. The same WBC relation to those expired cases n=3 it showed one case with increase WBC >11000 and 2 cases with decreased WBC <5000 cells mm<sup>3</sup>.

The mean hospital stay was 2 weeks.

## DISCUSSION

From this study, it is evident that, the common causative organism responsible for bacterial meningitis beyond the neonatal period were H. Influenza type B and Klebsiellae spp.

The main complaint of our patients when attended at our hospital was fever and convulsions (47.6%) compared to children studied in Saudi Arabia (KSA)<sup>6</sup> in amongst whom 97% had high fever and 58.8% convulsions. Then the second major presented signs were nuchal rigidity (36.5%) compare to the same KSA study<sup>6</sup> were (47.1%) and to that done at Pune, India in 2001 (26%).<sup>17</sup>

Fourty Eight (76.19%) patients had received antibiotics before admission to this hospital, and this might have caused low bacteriological yield of CSF culture, A similar observation was reported by Murphy.<sup>25</sup>

The positive CSF culture obtained organism in our study in total were n=21 (33.33%) out of them, Klebsillae spp was the predominant one n=7 (33.33%) (That affect 4 cases in those 4 months-3years & 3 cases to those >3.1 years) then H.Infleunzae type b was n=5 (23.80%) which seen mainly beyond neonatal period, then streptococcal pneumonia n=3 (14.28%) mainly seen in those 4months-3years, then of 2 cases each E. coli (seen in neonatal period), Pseudomonas (9.52%) then one case each with tuberculosis meningitis and staph.aurous.

The other 14 cases of fever and convulsion were examined and investigated without any clinical signs/or lab finding suggestive of ABM, but did have the related clinical pictures and lab finding toward that illness. They were as 7 as febrile convulsions (9.09%), 4 cases with cerebral malaria (5.19%), 2 cases with acute gastroenteritis (2.59%), and one case with pertussis (1.29%).

Before admission to our hospital, 48 patients (76.19%) had received antibiotics, a similar observation was reported by Murphy.<sup>25</sup>

Complications were seen in 15 cases of our study, recurrent convulsions in 4, 1 got 7<sup>th</sup> cranial nerve palsy, 2 cerebral atrophy, 2 persisting coma, 1 hydrocephalus, 1 hemiparesis, 1 subdural effusion, 2 encephalitis and 1 decreased lower limbs tone.

Our complications among those with isolated organism in CSF were only 2 cases, along with other 13 cases from the remaining groups, all gives 23.80% and the fatality rates (3 patients among those positive isolated organism from CSF & 5 cases from other group, all gives n=8 (12.69%).

The Ampicilline & Chloramphenicol resistance in our study was 12.69% compare to those study in a rural Kenyan Hospital. In that study; 43.1% of CSF organisms isolated with streptococcal Pneumonia, 41.9% of H. Influenza, there complications were 23.5%, fatality 30.1% and their ampicilline and chloramphenicol resistant was 8%.

In the KSA study positive isolated organism in CSF culture among those with suspected ABM patients only 43%, the predominant organism obtained were H. Influenza 44.1% then strep.pneumoniae 29.4% and their complication were 46%, fatality 14.7% their ampicilline & chloromphinicol were 12%.<sup>6</sup>

Other similar study was done at Benghazi, Libya in 1998, in that; only 62.3% were CSF positive isolated organism (33.8% was H.Influenzae, 26% was strep. Pneumonia and 6.5% was Klebsiella spp), their fatality was 13%, and their ampicilline resistance was 33% and to chloromphnicol 11%.<sup>35</sup>

As regards WBC count it showed that in those with positive isolated micro-organism, there were 15 cases with raised WBC >11000 cell.cu.mm (71.4%) and decrease WBC <5000 with only 06 cases (28.5%). Other WBC relation to those complicated cases n=2; one patient with increased & one patient with decrease WBC. The same WBC relation to those expired cases n=3 it showed one case with increase WBC >11000 and 2 cases with decrease WBC <5000 cells.cu.mm.

In this above WBC relation, which mean that there were an early indicator sign to the major illnesses (ABM) as well as it may give an alarm to the prognosis (there were correlation between the increase/decrease WBC and the major illness with their outcome).

We did not isolate any N.Meningitidis in those CSF positive isolated organism, although, it is one of common organism causing ABM in children, it could be due to lack of this organism in the smear or in CSF. The development of new and very sensitive tests may throw light on this group.

In our study there were 12.69% of ampicilline & chloromphnicol resistant, that resistant was mainly due to the production of B-lactamase against ampicilline and transferase against chloromphnicol, a similar finding have been observed by other workers.<sup>26,27</sup>

In our study , we found that the majority of isolated organisms were highly sensitive to gentamycine, cefotaxime and ceftrixone.

No patient came back for post-treatment follow-up. Blood cultured was not done in our hospital.

## CONCLUSION

Proper knowledge of etiology and presentation of ABM along with timely vaccination can help reduce mortality and morbidity associated with this deadly disease.

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