

Profile of childhood meningitis in a hospital in South West Saudi Arabia

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ABSTRACT

Objective: To study the pattern of meningitis in children admitted to King Faisal Military Hospital, Aseer region, Kingdom of Saudi Arabia, during the period 1987 to 2000. Particular emphasis was on *Hemophilus influenzae* meningitis.

Methods: All the patients between the age of one month and 13 years of age, who were diagnosed with meningitis during that period, using the International Classification of Disease 9 coding system, were included in this study.

Results: A total of 43 cases of meningitis based on the cerebrospinal fluid results were found. The majority (74%) of these cases were less than 2 years of age. Twenty-four patients had a positive cerebrospinal fluid culture. Fifteen of them (62.5%) were due to *Hemophilus influenzae*. The

others were due to *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and group B *Streptococcus*. The remaining 19 patients had cerebrospinal fluid findings consistent with bacterial meningitis

Conclusion: Meningitis due to *Hemophilus influenzae*, constitutes a large percentage of childhood meningitis in the Kingdom of Saudi Arabia. This increase is highly attributed to the lack of vaccination against this organism. We recommend introducing this vaccine as a part of the routine vaccination schedule for all children.

Keywords: Meningitis, *hemophilus influenzae*, cost effective.

Saudi Med J 2002; Vol. 23 (7): 793-796

Hemophilus influenzae (HI) is one of the leading infectious agents in the pediatric age group. Meningitis due to this organism results in a significant morbidity and mortality.¹ In developed countries where vaccination against this organism has been implemented for many years, the incidence of serious infection has declined significantly.² We aimed at this review to study another area of the Kingdom of Saudi Arabia (KSA) and highlight the impact of meningitis on children's health with particular emphasis on HI as the leading cause of this illness, which can be prevented by using the readily available vaccine. As our vaccination schedule does not yet include HI vaccine, we still record a very high rate of meningitis, with devastating sequelae in our pediatric patients. There have been multiple reports

from different areas of the Kingdom addressing this problem.³⁻¹⁴ In spite of their recommendation, HI vaccine has not been implemented as one of the routine vaccinations of Saudi children.

Methods. This is a retrospective study performed at King Faisal Military Hospital, Aseer region, KSA. All charts of patients diagnosed to have meningitis using the International Classification of Disease (ICD) 9 between the years 1987 to 2000 were reviewed. All the cases were community based with no nosocomial infection encountered during the review. We aimed to review the pattern over 10 years, however some of the charts were difficult to retrieve so extra years were included to make the

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Received 5th November 2001. Accepted for publication in final form 20th March 2002.

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difference. Patients' ages were between one month to 13 years of age. Only patients who under went lumbar puncture (LP) were included in this study. Those patients with positive cerebrospinal fluid (CSF) culture, positive bacterial antigen or CSF parameter consistent with bacterial meningitis (high protein, low sugar and or increased white blood cell) were included in the review. Patients will be excluded from the study if LP was not carried out and or if CSF parameters were not consistent with bacterial meningitis.

Patient records were analyzed for demographic data, prior use of antibiotics and clinical findings at the time of presentation, culture results, sensitivity, drug therapy used, computerized tomography (CT) scan findings if carried out, complications as well as the follow up duration were recorded.

The kit used for latex agglutination is Wellcogen-Bacterial antigen kit for Murex Biotechnical Limited. It was coated with monoclonal antibodies to *Streptococcus pneumoniae* (*S.pneumoniae*), *H.influenzae* type b (Hib), *Nisseria meningitidis* and *Escherichia coli*. The CSF sample will be centrifuged and the deposit is inoculated onto blood agar, chocolate and MacConkey agars as well as thioglycolate broth. After 24 hours, the plates are examined for any growth of bacterial colonies. If there is no growth, a subculture is carried out from the thioglycolate broth onto blood, chocolate and MacConkey agars. Any bacterial colonies growing are picked up for identification and sensitivity testing. The antibiotic sensitivity is determined by the Kirby-Bauer method using Mastring-S rings from Mast Diagnostics.

Results. A total number of 43 patients with the diagnosis of meningitis according to our inclusion and exclusion criteria were included in this review. **Table 1** shows the demographic and clinical profile of the patients. The male:female ratio was 2:1. The mean age of patients was 2.64 years \pm 3.8 years with a range from one month to 13 years. Fever was documented in 38 (88.4%) patients. In the other 5, there was no history of fever; their symptoms included lethargy, vomiting and poor feeding however, fever was documented during the course of the admission. The mean duration of symptoms was 3.3 days \pm 2.6 days. Prior use of antibiotics was documented in 11 (25%) patients. Of the 43 cases, 42% were diagnosed in winter, 23.3% in summer, 18.4% in fall and 16.3% in spring. A 2nd focus other than central nervous system (CNS) was identified in 18 (42%) patients. Upper and lower respiratory tract infections were the most encountered sites. Anterior fontanel was bulging in 13 out of 30 patients less than 2 years of age (43%).

Bacteria was isolated and identified from the CSF culture in 24 (56%) patients. Fifteen of these cultures were positive for *HI* (62.5%) followed by

Table 1 - Demographic data and clinical presentation of 43 patients with meningitis.

Item	N (%)
Male	29 (67.4)
Female	14 (32.6)
Age \leq 2 years	32 (74.4)
Age $>$ 2 years	11 (25.6)
Fever	38 (88.4)
Lethargy/poor feeding	31 (72.1)
Vomiting	16 (37.2)
Convulsion	10 (23.3)
Second focus of infection	18 (41.9)
Bulging fontanel	13 (30)
Neck rigidity	17 (39.5)
Neurological deficient	9 (21)
N - number	

S.pneumoniae in 4 (16.6%) patients, *Klebsiella* and *Staphylococcus aureus* in 4 (16%), and group B *Streptococcus* in one patients (4%). Nineteen patients had negative CSF cultures, however the CSF parameters and clinical findings were consistent with bacterial meningitis. Latex agglutination test was positive in 7 out of 24 patients and was not documented in 19 patients. Blood culture was positive in 8 (18.6%) patients. The mean duration of antibiotics treatment was 13.2 \pm 5 days. The most commonly prescribed antibiotic was ceftriaxone followed by a combination of ampicillin and chloromphenicol. Four days course of dexamethsone was given to 5 cases with *HI* meningitis. Five cases (35.7%) of *HI* were found to be resistant to ampicillin, penicillin and co-trimoxazole.

The mean duration of hospital stay was 15.2 \pm 7.0 days. Follow-up was documented in charts of 20 patients (46%). This follow-up ranged from 3 months to 14 years. Long term sequelae were documented in 9 (21%) patients. Theses sequelae involved hearing, language, vision and hydrocephalus. Three of these 9 patients had moderate to severe cerebral palsy. Routine hearing test was not carried out on all patients. No death was documented in this review.

Discussion. Bacterial meningitis is an acute illness that can occur at any age, it is associated with high morbidity and mortality. This disease has a devastating outcome when complications occur. These complications range from subtle central

Table 2 - Causative organisms of childhood meningitis in cities of Kingdom of Saudi Arabia expressed in percentage of the total numbers.

Organism	Khamis ¹⁰ N=74	Tabuk ⁸ N=49	Riyadh ⁷ N=106	Al-Khobar ⁶ N=161	Madinah ⁵ N=97	*N. Guard ¹¹ N=70	Qatif ¹² N=50	Baha ¹³ N=71	**M. City N=43
<i>Streptococcus pneumoniae</i>	12.6	18.5	18.9	15.5	7.2	22.9	12	35.2	9.4
<i>Hemophilus influenzae</i>	18.9	57.2	57.7	27.3	21.7	65.7	16	50.7	33.8
<i>Klebsiella</i>	-	-	-	-	-	-	-	-	4.6
Group-B <i>Streptococcus</i>	-	-	6.6	1.3	3.1	4.3	-	7	2.3
<i>N meningitidis</i>	8.8	2	13.2	7.5	23.7	4.3	16	-	-
<i>Staphylococcal aureus</i>	-	-	-	3.7	-	2.8	-	-	4.6
<i>Escherichia coli</i>	2.5	-	0.9	3.1	4.2	-	-	-	-
Negative culture	56.9	22.4	-	34.9	35.1	-	46	-	40.8
Others	-	-	2.8	6.8	4.1	-	10	7	4.6

N - number, *N. Guard - National Guard, **M. City - Military City (Khamis Mushayat).

nervous system damage to severely handicapped children.^{1,14} There are reports from different parts of KSA which addressed bacterial meningitis in children (**Table 2**).

It is very clear from this study and others from KSA that the most frequently encountered organism is *HI*. This organism constituted 62.5% of the positive CSF cultures in our study. It also constituted a high percentage of meningitis from all reports from KSA.⁴⁻¹¹ Despite recommendation from previous authors to include the *HI* vaccine as part of the essential immunization program of the Saudi children, only Armed Forces Hospitals, National Guard and ARAMCO have implemented this recommendation. Bacterial meningitis caused by *HI* has almost disappeared from the United States of America, Canada and other countries that have implemented such a vaccine. The overall incidence of meningitis in these countries has therefore declined by more than (50%), and the age distribution of susceptibility has shifted, the disease now is more common in adults than in children.² Unfortunately such trend has not been documented in KSA. This is in part due to lack of adopting such policy.

The use of the Hib vaccine does not only prove reduction in meningitis rates but it also proved to be cost effective. The cost benefit ratio has been established in many parts of the world. Miller¹⁵ predicted that death related to Hib could be prevented. A report from Sweden predicts that the society will save 88 million Swedish Crown by introducing the vaccine.¹⁶ A report from France

demonstrated a net cost of 1.02 billion French Franc (FF) to the national health insurance system and 920 million FF for the patients' families.¹⁷ Midani¹⁸ demonstrated a net saving of 22.6 million US dollars per year due to the vaccine. No reports are available from KSA addressing the impact of this disease on our economy. We believe the same trend will be observed.

The resistance of *HI* to commonly used antibiotics was found in 5 patients (36%) in our study, this figure is much higher than the experience from Tabuk and Riyadh (7%, 12%).^{4,8} This is most probably the consequences of self-medication with over the counter drugs and the misuse of antimicrobials even by health provisionals. Despite the availability of modern intensive care management of infant and children with bacterial meningitis and the advent of potent antibiotics, case fatality rates and morbidity remain high.¹⁴ The major break through during the recent decade is the discovery of the vaccine against *HI*, which proved to reduce meningitis cases by up to 50%.²

During the revision of the manuscript, there was a memo distributed by the Ministry of Health indicating that vaccination against *HI* will be implemented as of January 2002.

In conclusion, a high index of suspicion of meningitis, the proper use of antibiotics mainly 3rd generation cephalosporines and the possible use of corticosteroids will help to minimize the damage that may occur. This should go in conjunction with the introduction of the vaccine.

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