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Prevalence and Physiological analysis of Acute Bacterial Meningitis infections at care center in Babylon province

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Abstract

This study was done on the 142 patients suffering from meningitis infection depending on the physician's diagnosis from January 2009 to June 2009. Most specimens was collected in Babylon maternity and children hospital because the age group in this study was (<1-10 years). Blood and CSF specimens were collected, microbiological and biochemical tests were carried.

obtained results showed that the most common bacterial causing meningitis was *Streptococcus pneumoniae* (23.94%) followed by *Staphylococcus aureus* (16.197%), *Neisseria meningitides* (14.084%), *Escherichia coli* (14.084%), *Haemophilus influenzae* type b (Hib) (11.97%), *Pseudomonas aeruginosa* (6.338%), *Staphylococcus* spp. (3.521%) and *Acinetobacter* spp (1.408%), while Negative Culture formed (8.45%).

Physiological analysis of cerebrospinal fluid in acute bacterial meningitis showed that protein (mg/dl)>500, glucose <40 mg%, CSF/blood glucose <0.4, CRP > 24 mg/L, PMN (%)>80 and white blood cell (cells/mm3) different than normal values indicated of bacterial acute meningitis.

Corresponding factors associated with acute bacterial meningitis like sinusitis, cirrhosis, pneumonia, chronic otitis media, diabetes mellitus and malignancy was reported.

Age and sex distribution of meningitis causes revealed that the main age group of infection was (<1-5 years) and there is no significant differences between male and female infections.

Keywords: Meningitis, Bacteria, *Haemophilus influenza*, *Streptococcus pneumoniae*, *N. meningitides*

1. Introduction

Acute bacterial meningitis is one of the most severe infectious diseases, causing neurologic sequelae and accounting for an estimated 171,000 deaths worldwide per year [1, 2]. A systematic review of 36 studies from the world's developing nations estimated that there are 126 000 cases of neonatal meningitis annually, with over 50 000 deaths [3]. In these countries the major neonatal pathogens are Gram negative bacilli, such as *Escherichia coli* and *Klebsiella* species. A further recent review of almost 30 000 children and adults in *50* studies from 25 African countries found *Streptococcus pneumoniae* and *Haemophilus* influenzae type b to be the commonest causes of bacterial meningitis, with *Neisseria meningitidis* ranked third [4].

Neisseria meningitides is a leading cause of bacterial meningitis and septicemia in children and adolescents in the United States, with attack rates highest among children younger than 2 years of age [5].

The lack of field-based routine laboratory surveillance capacity may contribute to a failure to appreciate the contribution of such agents as *Haemophilus influenzae* and *Streptococcus pneumoniae*, in addition to meningococcal meningitis, to the overall burden of meningitis [6].

2. Materials and Methods:

Culture from proven or likely significant meningitis infections were collected CSF and Blood specimens in Babylon Maternity and Children Hospital from January 2009 to June 2009. A maximum of 142 isolates each of *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Neisseria meningitides*, *Escherichia coli*, *Haemophilus influenzae* type b (Hib), *Pseudomonas aeruginosa*, *Staphylococcus* spp. *Acinetobacter* spp. and Negative

Identification of isolates; the isolates were confirmed the identity and purity of every strain. S. pneumoniae isolates were confirmed by inhibition by optochin we used Chocolate agar and Blood agar for isolation so is used for *Neisseria meningitidis*. *Haemophilus* strains were identified by X and V factor requirement and reaction to polyvalent antiserum (Difco Laboratories, USA), and strains were confirmed as *H. influenzae* by determination of the requirement for both the X and V factors. Others gram negative bacteria diagnosis using specific media and biochemical tests for isolation and differentiation.

Hematological pending was used to determine the Physiological analysis of Cerebrospinal fluid bacterial meningitis. The demographical information submitted for each strain included patient age and gender, specimen collection date and specimen source.

3. Results and Discussion

In this study from 142 meningitis cases the most common bacterial causing meningitis was *Streptococcus pneumoniae* (23.94%) followed by *Staphylococcus aureus* (16.197%), Neisseria meningitides (14.084%), *Escherichia coli* (14.084%), *Haemophilus influenzae* type b (Hib) (11.97%), *Pseudomonas aeruginosa* (6.338%), *Staphylococcus* spp. (3.521%) and *Acinetobacter* spp (1.408%), while Negative Culture formed (8.45%) as shown in table (1). These results are strongly agreed with Isabelle study that found *Streptococcus pneumoniae*, *Haemophilus influenzae* type b (Hib) and *Neisseria meningitides* was the main causes of meningitis 34%, 27%, 23% respectively [6]. We found that *S. pneumoniae* caused the majority of cases of adult meningitis and the majority of deaths due to meningitis and that it had an incidence similar to that of *N. meningitidis*. Although *S. pneumoniae* causes a high proportion of meningitis in Africa [7, 8].

Pneumococci contribute disproportionately to the burden of meningitis because of the substantially worse outcome associated with pneumococcal disease, compared with that associated with meningococcal disease [7]; moreover, pneumococci are the predominant cause of bacterial pneumonia in the developing world. Our data, if confirmed in other locations, suggest that prevention and treatment may need to focus as much on pneumococcus as on meningococcus. Vaccine recommendations will need to consider that serotype.

Cerebrospinal fluid samples collected from by lumbar puncture procedure by specialist. The CSF parameters are shown in Table 2. CSF protein elevated in 83.8% of cases, Glucose <40 mg% was formed 87.3%, CSF/blood glucose <0.4 in 84.5% of all cases, CRP > 24 mg/L was over then 71.8%, PMN (%)>80 was 83.8%. These finding are agreed with Bodin study who found that all these parameters are changes according to bacterial activity [9].

Also other studies revealed that CRP was elevated during neonatal infection [10]. Meningococcal meningitis is endemic in India. There has been a sudden surge of cases of meningococcal meningitis in 2005 in Delhi, so this Present study was undertaken to find out changing trends in physiological parameters [11]. Corresponding factors in acute bacterial meningitis showed below in table 3. It revealed 68.3% from all meningitis cases, these results are correlated with Marc study which found that 59% of meningitis related to physiological and were related to anatomical problems [12].

Other authors report a case of fatal tuberculous meningoencephalitis following chronic bilateral otitis media in a child [13]. Previous studies, as in ours, older age, Sinusitis, Cirrhosis, Diabetes mellitus, and shock on the first day correlate with a poor outcome in patients with meningitis. Other risk factors for death were observed in some studies, notably, diabetes mellitus, seizures, bacteremia, gram-negative bacilli meningitis, CSF WBC more than 5,000 cells/mm3 [14, 15].

Table 4 shows the most important clinical features of meningitis infection. Other study found the same clinical

features including, Fever was observed mosy cases, and all but one were in a state of disturbed consciousness. Hydrocephalus was seen in many patients. Seizure occurred in 10, nine of whom had generalized seizures and one, a focal seizure. The other clinical manifestations included cranial nerve involvement, and neck stiffness is recorded [16].

Other study found the same finding including Fever, Vomiting, Headache, Convulsions with nearly agreed percents [17]. Table 5 clear the relation between age and gender distribution and frequency of meningitis causes isolated from patients. Higher percent of meningitis infection was between (<1-5 years). Bacterial meningitis remains a major cause of morbidity, mortality and neurodisability in childhood, particularly in the developing world where effective vaccines against the usual pathogens responsible for the disease are not in routine use. Nigerian study found that the main age group of infection ranged between 2 months and 12 years [18].

Other study agreed with this results of cases of pneumococcal meningitis and N. meningitidis meningitis, 71% occurred among persons below12 years of age [6]. Streptococcus pneumoniae showed a remarkable sensitivity, Gentamycin, Kanamycin, Lincomycin, Nitrofurantoin, Norfloxacin, Oxacillin, Ofloxacin, Oxytetracyclin, Rifampim, while *Haemophilus influenzae* have sensitivity to Ofloxacin. *Staphylococcus aureus* sensitive to Norfloxacin and Nitrofurantoin (6). These results were agreed with [19,20].

E. coli isolates showed sensitivity with Nitrofurantoin, Ofloxacin, Norfloxacin and *Pseudomonas aeruginosa* shows sensitivity with Norfloxacin, Ofloxacin, Piperacillin, it is nearly compatible with Indian, Taiwan, Spain, and Senegal isolates [21,22].

In this study *E. coli*, *Pseudomonas aeruginosa*, isolates are resistant against many antibiotics. Whereas, this drug exhibited low resistance rate in the major part of the world, despite of it's being used for many years [23]. This is probably due to the fact that this antibiotic has been widely used in treating meningitis over the past decade in this region [24].

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Table1: Percentage of Etiological agents causes meningitis.

Etiological agents causes meningitis	No.	%
Streptococcus pneumoniae	34	23.943
Staphylococcus aureus	23	16.197
Neisseria meningitidis	20	14.084
Escherichia coli	20	14.084
Haemophilus influenzae type b (Hib)	17	11.97
Pseudomonas aeruginosa	9	6.338
Staphylococcus spp.	5	3.521
Acinetobacter spp	2	1.408
Negative Culture	12	8.450
Total	142	100

Table2: Physiological analysis of Cerebrospinal fluid in acute bacterial meningitis

Etiological agents causes meningitis	No.	Cerebrospinal fluid analysis in acute bacterial meningitis					
		Protein (mg/dl)>50 0	Glucose <40 mg%	CSF/blood glucose <0.4	CRP > 24 mg/L	PMN (%)>80	White blood cell (cells/mm3)
Streptococcus pneumoniae	34	28	30	26	26	30	27
Staphylococcus aureus	23	20	22	22	19	21	20
Neisseria meningitidis	20	18	18	20	16	18	20
Escherichia coli	20	16	20	19	18	20	14
Haemophilus influenzae type b (Hib)	17	15	11	16	13	15	14
Pseudomonas aeruginosa	9	9	5	9	3	4	7
Staphylococcus spp.	5	5	2	4	4	3	4
Acinetobacter spp	2	2	1	1	1	1	2
Negative Culture	12	6	2	3	2	7	4
Total	142	119 (83.8%)	124 (87.3%)	120 (84.5%)	102 (71.8%)	119 (83.8)	112 (78.8)

Table 3: Corresponding factors in acute bacterial meningitis

Factors	Meningitis 142 episodes	%
Sinusitis	15	10.5
Cirrhosis	20	14
Pneumonia	11	7.7
Chronic Otitis media	25	17.6
Diabetes mellitus	22	15.5
Malignancy	4	2.8
Total	97	68.3

Table 4: Clinical finding of bacterial meningitis.

Factors	Meningitis 142 episodes	%
Seizure	52	36.6
Neck stiffness	63	44.4
Fever	102	71.8
Vomiting	86	60.6
Shock	55	38.7

Table 5: Age and gender distribution and frequency of meningitis causes isolated from patients.

Age Groups (Years)	*Negative Culture*		*Acinetobacter spp*		*Staphylococcus spp.*		*Pseudomonas aeruginosa*		*Haemophilus influenzae type b*		*Escherichia coli*		*Neisseria meningitidis*		*Staphylococcus aureus*		*Streptococcus pneumoniae*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<1	3	5	1	1	1	0	0	1	0	5	0	6	3	5	5	4	8	6
(1-3)		2	0	0	0	0	3	0	7	0	3	1	1	2	1	4	5	6
(4-5)	0	0	0	0	0	2	0	2	0	1	0	1	3	1		2	0	1
(6-7)	1	0	0	0	0	0	1	0	0	1	2	3	0	2	2	1	1	3
(8-9)	0	0	0	0	1	0		1	2	0	0	1	0	1	0	1	1	2
(10-11)	0	1	0	0	1	0	1	0	0	1	2	1	0	2	0	2	0	1
Total	12		2		5		9		17		20		20		22		34	

Table 6: Antimicrobial sensitivity and spectrum for 13 selected antimicrobial agents tested against most frequently occurring meningitis infection pathogens.

Microorganism	Antimicrobial agent / % sensitive strains												
	E	CN	K	L	ME	F	NOR	OFX	OX	T	P	PRL	RA
Streptococcus pneumoniae	R	s	s	s	R	s	s	s	s	s	R	R	s
Staphylococcus aureus	R	R	R	R	R	s	s	R	R	s	R	R	R
Haemophilus influenzae	R	R	R	R	R	R	R	s	R	R	R	R	R
Staphylococcus spp.	R	R	R	R	R	s	s	R	R	R	R	R	R
Escherichia coli	R	R	R	R	R	s	s	s	R	R	R	R	R
Pseudomonas aeruginosa	R	R	R	R	R	R	s	s	R	R	R	s	R
Neisseria meningitidis	R	s	s	R	R	R	s	R	R	R	s	R	R
Acinetobacter spp	R	s	s	R	R	s	s	R	s	R	s	s	R

E \Erythromycin, CN\Gentamycin, K\Kanamycin, L\Lincomycin, ME\Methicillin, F\Nitrofurantoin, NOR\Norfloxacin, OFX \Ofloxacin, OX\Oxacillin, T\Oxytetracyclin, P\Penicillin G, PRL \Piperacillin, RA\Rifampim.