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Studies on the Cerebral Spinal Fluid (CSF) Of Children with Bacterial Meningitis in Tobruk Provence

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Abstract

Bacterial meningitis continues to be an important cause of morbidity and mortality among children in developing countries. This study strengthened hospital- base data of Bacterial meningitis among children admitted to Tobruk medical center (Tobruk Libya). Cerebrospinal fluid (CSF) samples were collected from children admitted to the hospital who suspected to have bacterial meningitis .Laboratory determination were performed and clinical information were recorded during a period of 24 months of the study, which began in January 2014 to the end of December 2015, CSF samples were collected from 233 children < 15 years of age with suspected meningitis. Bacterial meningitis confirmed in 72(31% cases). *Haemophilus influenzae* type b (21 cases), *Streptococcus pneumoniae* (17 cases), and *Escherichia coli*(9cases) represented 65% of confirmed cases. Unusually *Neisseria meningitidis* confirmed only in(3 cases). These data reveal the important of bacterial meningitis as a cause of hospital admission. Most recorded bacterial meningitis cases could have been prevented by pneumococcal and *Haemophillus influenzae* type b conjugated vaccines. Clear cerebrospinal fluid (CSF) samples were 15%, whereas turbid specimens constitute 79% of total specimens while, blood stained specimens were 6% . There was elevation in white blood cell level above normal in all cases of confirmed bacterial meningitis (50-6000 cell/ml³) with ratio (608.3cell/ml³). Total protein concentration reaches 600mg/dl while the level of sugar reduced to 5mg/dl.

Key words: CSF; Bacterial Meningitis; Haemophilus influnzae type b; Total protein concentration; glucose level; WBC Level

Introduction

Bacterial meningitis is a serious illness-affecting child more frequently than adult. It is known that presentation of meningitis is sometimes very acute with rapid progressive over few hours and in these cases, meningitis is almost always due to pyogenic bacteria. (Wood, 1981). Meningitis is an inflammation of the meningitis that may result in response to several causes, most commonly bacteria and viruses (Maria Karanika *et al*., 2009). Bacterial meningitis is potentially life – threatening condition if left untreated (WHO). Bacterial meningitis is a major cause of morbidity and mortality in children (Chao *et al.*, 2008). Bacterial meningitis is significant problem in many countries all over the world, especially in developing countries (Matthijs *et al*., 2010). In African countries where there are a high rate of immunodeficiency virus (HIV) infection, also bacterial meningitis associated with high mortality rates . (Mathijs et al 2010).

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In the life threatening infection such as bacterial meningitis, rapid diagnosis is very important as early commencement of appropriate chemotherapy is closely related to outcome of the disease (Kingsburg and Wanger 1990). Predictive factors that have shown to be important in the diagnosis of bacterial meningitis include cerebral spinal fluid (CSF) and peripheral blood white cell count (WCC) (Nigrovic *et al*., 2008). This disease become least common in resent time, however the mortality rates still very high. Although there is development in the industry of vaccines and antibiotics still there is a high incidence of bacterial meningitis. Bacteriological, biochemical, cytological and serological studies were conducted to highlight the incidence of bacterial meningitis in the area of this study and to recognize the etiological agents of this disease.

Material and Methods

233 suspected meningitis cases (aged 1day-14years) were admitted to pediatric department Tobruk medical center from the 3rd January 2014 to the end of December 2015.

CSF samples were collected as primary diagnosis using lumber puncture by specialist. The primary diagnosis was based on typical feature and cerebrospinal fluid (CSF) examination.CSF was tested for cytology by using chamber slide method. Biochemistry of CSF such as estimation of total protein and glucose level using conveninsion method which described by (Roca *et al*., 2006) . Gram stain and CSF culture were performed routinely for each by using standard method (Bohr *et al*., 1983).

Serological test was used latex agglutination test for detection bacterial antigens in CSF.

Results and Discussion

233 cases were admitted to Tobruk medical center during the period 3 rd January 2014 to the end of December 2015.

According to clinical feature 72 cases were diagnosed as bacterial meningitis. The cases were grouped into 6 groups as shown in (Table-1) , according to CSF culture, gram stain and serological test .

A case of bacterial meningitis was considered definite, according to the definition of the pneumococcal vaccines accelerated Development and Introduction plane (Pneumo ADIP), Roca *et al* ., 2009, when either .

1- The culture of CSF samples had positive results.

2- The CSF was abnormal (purulent) and either the results of the SCF, gram stain were positive.

3- When the CSF samples were either abnormal or purulent and the latex agglutination result was positive for any of the antigens included.

The result of the present study showed that *Haemophilus influenzae* b was confirmed as being responsible for 21 (29%) cases which represent the higher ratio (table-1).The result was not in agreement with the result of Maria *et al*., 2009 which reported that *Neisseria meningitidis* was the higher bacterial agents and *H. influenzae* b was the second bacterial agents responsible for meningitis cases. However Paolo *et al.*, 2009 reported that incidence of *H. influnzae* b decreased during the period of their study (2001 – 2005) to 5% only.

H. influnzae b remains a major etiological agent of pediatric meningitis with higher rate of morbidity and mortality throughout the world (Mathijis *et al*., 2010).

Streptococcus pneumoniae came in second place with 17(23.5%) followed by *Escherichia coli* (12.5%) *staphylococcus aureus*(7%) and *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* 5.5% each . (Table-2). However *Neisseria meningitidis* confirmed only in 3 cases (4%). The result of this study was similar to results of Roca *et al*., 2009 for both H. *influenzae* b and *Streptococcus pneumoniae*, while it is different from their result for *E .coli* & *Neisseria meningitidis*. The incidence of specific bacterial meningitis agents that has been reported different from country to country , also there are differences in different parts of the country due to the differences in the laboratories conditions , supplies and expertise Maria *et al*., 2009; Minz *et al*., 2008; Cehyn *et al*., 2008).

Table-3 revealed the examination of CSF, and it is clear that there were elevation in the concentration of WBCs which ranged between 50-6000 cell/ml and the polymorphoneuclears were the most common with 70-95%. These result are agreed with those from many studies which have shown that there were elevation in number of WBCs in bacterial meningitis (Fracois *et al*.,2008; Maria *et al*., 2009; Roca *et al*.,2009).

The distribution of CSF specimens according to morphological characters are shown in (table- 4).The results of this study showed that clear CSF specimens were 11(15%) while the turbid specimens were 57(79%) specimens. However ,4(5.5%)were blood stained specimens .The appearance of turbid specimens or purulent are due to either the elevation of WBCs in the specimens (Austin 1985)or the presence of high number of bacteria in the CSF (Mahmood & AL-Saadi,1997).

The appearance of turbid specimens considered as primary diagnosis for meningitis (Gardner and Broven, 1980).

The appearance of clear specimens in some incidence is either when the number of WBCs are very low which happens in the beginning of the infection (Ponka *et al*.,1983) or the patients are already on antibiotics therapy (Klein,1994).The blood stained samples are as results of the presence of RBCs in the specimens due to the injuries of the blood vessels during the puncture wauyolke *et al*., 1995).

The examination of CSF sampling showed elevated concentration of total protein, and reduced concentration of sugar table-5. These results indicated to CSF finding were abnormal according to Werle & Overturf, 1981) who reported that if WBC, in excess (1000 cell/ml), glucose concentration (< 40ml/dl) and concentration of total protein >150 mg/dl were considered as parameters for bacterial meningitis.

Conclusion

Bacterial meningitis will continue to be significant cause of morbidity and mortality in children beyond the neonate period in many countries. Scientist continues to see changes in the epidemiology of new

vaccines. However, bacterial causative agents which continue to persisted due to their antibiotic resistance. There for, it is important to study their antibiotic resistance patterns.

The limitation to this study include that after 2011 most medical centers suffer from the lack of laboratory supplies and always there were changes in the number and type of antibiotic disk available in the laboratory. In addition many cases have been discharged to be treated outside the country this will make it difficult to get a comprehensive picture of bacterial meningitis incidence in the area of this study.

The diagnostic criteria that have been exploited in this study are the laboratory predictors to an able a possible predetermination of the specific etiological agents of bacterial meningitis in suspected meningitis incidence. These predictors are merely but a representation of what could be possibly used as a tool to guide the clinicians for the appropriate antibiotic therapy. Further studies should be done to include clinical feature and laboratory predictors together with study of the resistance patterns of bacterial meningitis Causative agents to antibiotic and the predisposing factor of the disease such as age, sex and nutrient status to give clear picture of this disease in Tobruk Provence.

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Table 1: The sensitivity of different laboratory testing

Groups	No of cases	CSF finding	CSF culture	Gram stain	Latex agglutination test
Group I	39	Abnormal	+	+	+
Group II	9	Abnormal	+	-	+
Group III	12	Abnormal	-	-	+
Group IV	4	Abnormal	-	+	+
Group V	3	Abnormal	+	+	-
Group VI	5	Abnormal	+	-	-
	72		77.7%	63.8%	88.8%

Table 2: Bacterial cases of meningitis

microorganisms	No.	%
Haemophilus influenzae	21	29
Streptococcus pneumoniae	17	23.5
Escherichia coli	9	12.5
Streptococcus agalactia	3	4
Staphylococcus aureus	5	7
Neisseria meningitidis	3	4
Flavobacterium spp	2	3
Enterobacter cloacae	2	3
Pseudomonas aeruginosa	4	5.5
Klebsiella pneumoniae	4	5.5
Listeria menocytogenes	2	3
Total	72	100

Table 3: Range & Rate of white blood cells & Percentage of Polymorphonuclears (PMNS) in CSF specimens

Causative bacteria	Total No. of specimens	Range of WBC total cell/ml	Rate	%PMNS
Haemophilus influenzae	21	50 - 5650	2600	75 - 90
Streptococcus pneumoniae	17	150 - 6000	1900	70 - 85
Escherichia coli	9	1000 - 3500	1600	70 - 90
Streptococcus agalactia	3	500 - 1700	900	80 - 85
Staphylococcus aureus	5	400 - 600	480	90 - 95
Neisseria meningitidis	3	500 - 750	600	90 - 95
Enterobacter cloacae	2	700 - 800	750	70 - 75
Flavobacterium Spp	2	1000 - 3000	2000	80 - 85
Pseudomonas aeruginosa	4	1000 - 3500	1875	80 - 90
Klebsiella pneumouiae	4	150 - 4000	1900	70 - 90
Listeria menocytogenes	2	500 - 700	600	80 - 85

Table 4: Distribution of CSF specimens according to morphological characters

Causative bacteria	Total No. of specimens	Clear	Turbid	Blood stained
Haemophilus influnzae	21	5	16	0
Streptococcus pueumonia	17	4	11	2
Escherichia coli	9	1	8	0
Streptococcus agalactiae	3	1	2	0
Staphylococcus aureus	5	0	4	1
Niesseria meningitis	3	0	3	0
Enterobater coloaca	2	0	2	0
Flavobaterium spp	2	0	2	0
Pseudomonas aeruginosa	4	0	3	1
Klebsiella pneumoniae	4	0	4	0
Listeria menocytogenes	2	0	2	0
Total	72	11 (15%)	57(79%)	4(6%)

Table 5: The range and rate of protein and glucose level

Causative bacteria	Total No. of specimens	Protein level		Glucose level	
		Range	Rate	Range	Rate
Haemophilus influnzae	21	95 - 319	196	8 – 36	19
Streptococcus pueumonia	13	100 - 410	200	5 – 30	17
Escherichia coli	9	90 - 165	120	10 – 25	14
Streptococcus agalactiae	3	90 - 300	180	20 – 30	15
Staphylococcus aureus	5	95 - 310	180	15 – 23	19
Neisseria meningitidis	3	90 - 400	250	10 – 25	15
Enterobater cloacae	2	150 - 300	225	11 – 24	17.5
Flavobaterium spp	2	100 - 310	205	20 – 30	25
Pseudomonas aeruginosa	4	95 - 600	260	10 – 30	18
Klebsiella pneumouia	4	90 - 410	230	10 – 25	14
Listeria menocytogenes	2	90 - 310	200	5 – 25	15

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