ejpmr, 2017,4(6), 727-738

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

EPIDEMIOLOGICAL STUDY OF MENINGITIS CASES IN EMBABA FEVER HOSPITAL

Mohammed Khairy Al Nagar MD[1], Heba Mohammed Abdella MD[1], Amal Tohamy Abdel Moez MD[1], Mohammed Hamdy*

[1]Tropical Department Faculty of Medicine-Ain Shams University Cairo, Egypt.
[2]Embaba Fever Hospital Cairo, Egypt.

***Corresponding Author: Mohammed Hamdy**
Embaba Fever Hospital Cairo, Egypt.

Article Received on 20/04/2017 **Article Revised on 10/05/2017** **Article Accepted on 01/06/2017**

ABSTRACT

Objectives and background: Meningitis can be life- threatening because of the inflammation's proximity to the brain and spinal cord; therefore the condition is classified as a medical emergency. Aim of this work is to Study the demographic, clinicoetiological and laboratory characteristics of acute meningitis in patients attending Embaba fever hospital. **Patients and methods:** We studied the data of 300 patients suspected to have meningitis and admitted to Embaba fever hospital over a period of one year from November 2015 to October 2016. Clinical assessment: including full medical history and complete clinical examination for all systems espicially nervous system. Cerebrospinal fluid analysis (CSF): Physical examination, Microscopic examination, Chemical examination, Bacteriological examination done for all patients studied. **Results:** Meningitis is more common in male 61.3% more than female38.7%, and rural area more than urban (57.3% vs 42.7%). The highest incidence in Spring and Summer**.** S.pneumoniae has been the most frequent isolated organism causing bacterial meningitis56.7%. **Conclusion:** We found that the most affected age category was patients below 2 years. The most prevalent organism was strept. pneumoniae followed by Staph. Aureus, then MRSA. Complications were reported in 31% of the studied patients.

KEYWORDS: Meningitis clinicoetiological especially Aureus, then MRSA.

INTRODUCTION

Meningitis is inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges. The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs *(Ginsberg, 2004).* Most cases are due to infection with viruses *(Attia et al., 1999).* Bacteria, fungi, and parasites are the next most common causes *(Ginsberg, 2004).*

Meningitis can be life- threatening because of the inflammation's proximity to the brain and spinal cord; therefore the condition is classified as a medical emergency (*Sáez-Llorens and McCracken, 2003; Tunkel et al., 2004).*

The most common symptoms of meningitis are headache and neck stiffness associated with fever, confusion or altered consciousness, vomiting, and an inability to tolerate light (photophobia) *(Van de Beek et al., 2006).* The classic triad of diagnostic signs consists of nuchal rigidity, sudden high fever and altered mental status; In infants up to 6 months of age, bulging of the fontanelle may be present *(Theilen et al., 2008).*

Meningitis can lead to serious long-term consequences such as deafness, epilepsy, hydrocephalus and cognitive deficits, especially if not treated quickly (*Sáez-Llorens and McCracken, 2003*; *van de Beek et al., 2006)*.

Cerebrospinal fluid (CSF) analysis is the cornerstone and diagnostic test of choice for suspected meningitis. Measure the opening pressure and send the fluid for cell count (and differential count), chemistry (ie, CSF glucose and protein), and microbiology (ie, Gram stain and cultures) *(Razonable, 2007).* However lumbar puncture is often delayed or deferred owing to concern about the risk of cerebral herniation, this risk is thought to be over emphasized *(Scarborough and Thwaites, 2008).*

Epidemiology is a good measure of understanding the significance of bacterial meningitis. Apart from actual epidemics, 1 million cases are observed every year out of which 170000 are life-threatening *(Biaukula et al., 2012).*

AIM OF THE WORK

This study aims at

Study the demographic, clinicoetiological and laboratory characteristics of acute meningitis in patients attending Embaba fever hospital.

Patients and Methods

Type of study: Cross section study.

Study setting and time

Study included patients with suspected meningitis in Embaba fever hospital over a period of one year from November 2015 to October 2016.

Patients selection

All patients attending Embaba fever hospital with symptoms suggestive for meningitis were included in the study.

METHODS

I-Clinical assessment: including full medical history and complete clinical examination for all systems including nervous system with special stress on.

1- History of symptoms of meningitis as. Fever, vomiting, headache, disturbance in the conscious level, hallucinations and convulsions. Past history with stress on past history of meningitis, and past history of head trauma. Family history with stress on family history of similar attack of meningitis.
2- Examination for meningeal irritation signs as:
1- Neck rigidity.
2- [kerning's sign]: flexing the patient's hip 90 degree then extending the patient's knee causes pain.
3- [Brudhzinski's sign]: Flexing the patient's neck causes flexion of the patient's hips and knee.
4- Motor system examination for weakness, hyperreflexia, hypertonia, spasticity. Examination by inspection, tone, power and movement, and reflexes.
5- Sensory system examination for: Touch, pressure, pain, temperature, joint position sense, and vibration.
6- Cranial nerve examination: Olfactory, Optic, Oculomotor, Trochlear, Trigeminal, Abducent, Facial, acoustic, glossopharyngeal, vagus, spinal accessory, hypoglossal.
7- Examination of the patient's ability to open the mouth, if the patient can open the mouth it suggestive meningitis, but if the patient can't open the mouth (lock jaw) it suggestive Tetanus.

II-Routine laboratory study

1- Complete blood picture.
2- ESR.
3- C reactive protein (CRP mean positive if >6, and negative if <6).
4- Liver function tests: liver enzymes, total proteins, serum albumin and serum bilirubin.
5- Kidney function tests: serum creatinine and urea.
6- Blood glucose (random).
7- Cerebrospinal fluid analysis (CSF):

Done on the first spinal tap including.

1-Physical examination

Volume
Color
Aspect: Clear
Turbid

2-Microscopic examination

A-Cell count: on cell counter.

Manual

Sample mixed well without centrifugation then 380 Ml acetic acid+20 Ml of the sample on haemocytometer then- counted as WBCs then –Multiply count x50.

B-Cell types: Sample centrifuged then-discard supernatant and film (thick film and thin film) from deposit then stained with Leishman's stain and count the film by oil lens.

3-Chemical examination

1- Protein.
2- Sugar.
3- LDH.

4- Bacteriological examination

Wet preparation: A drop examined without centrifugation on 10 or 40 eye lens for presence or absence of inflammatory cells, RBCs, parasite and fungus.

The sample centrifuged, part from deposit taken then stained by GRAM'S stain and Z.N then cultured on blood agar, Macconky and Chocolate agar. Sensitivity test done after confirmation of type of the organism.

Inclusion criteria and exclusion criteria

Over the study period, 300 patients included in the study were selected according to the following inclusion and exclusion criteria.

Inclusion criteria

Patients presented for the first time to Embaba fever hospital with clinical picture and CSF analysis suggestive of acute meningitis.

Exclusion criteria

Patients with the following conditions were excluded:

1- Clinical picture suggestive of cerebro-vascular disease.
2- Brain tumors or other neurological insults.
3- Other causes of fever.
4- Other causes of coma.

Treatment, hospital stay and outcome

- The clinical examination was done on admission over the period of hospital stay and after four weeks

for follow up after discharge to evaluate the effect of treatment and the outcome of the disease.
- Outcome as repeated convulsions, motor system affection as motor hypotonia, sensory system affection, cranial nerve affection or died.
- The duration of hospital stay were recorded.

7-Ethical considerations

The objective of the study was explained to all patients who met the pre-designed inclusion criteria and they were asked to sign a written informed consent form. Approval of all the conserned authorities were obtained.

Statistical Methods

Statistical methods

IBM SPSS statistics (V. 24.0, IBM Corp., USA, 2016) was used for data analysis. Date were expressed as Median and Percentiles for quantitative non-parametric measures in addition to both number and percentage for categorized data.

The following tests were done

1. Comparison between two independent groups for non-parametric data using Wilcoxon Rank Sum test.
2. Chi-square test to study the association between each 2 variables or comparison between 2 independent groups as regards the categorized data.

The probability of error at 0.05 was considered sig., while at 0.01 and 0.001 are highly sig.

RESULTS

This study was conducted in the period between November 2015 to October 2016, included patients attending Embaba fever hospital with acute meningitis.

Table (1): Demographic data of the studied patients.

		N (300)	
Age (years)	**Min.**	**Max.**	**Median**
	0.08	77	10.5
		no	%
Gender	Male	184	61.3%
	Female	116	38.7%
Marital status	Married	60	20.0%
	Not married	240	80.0%
Residence	Urban	128	42.7%
	Rural	172	57.3%
Occupation	No data	242	80.7%
	driver	2	0.7%
	electrical	2	0.7%
	farmer	3	1.0%
	housewife	9	3.0%
	officer	1	0.3%
	police officer	1	0.3%
	student	27	9.0%
	worker	13	4.3%
	total	300	100.0%

Table (1): Shows that male represented 61.3% of the studied groups while female were represented 38.7% of them. Patients from rural areas were more than patients from urban areas (57.3% vs 42.7%).

The most occupational group affected by meningitis was the students 9.0% followed by manual workers 4.3%.

Table (2): Symptoms of the studied patients.

Manifestations	**cas**	
	no	**%**
Fever	300	100%
Vomiting	146	48.7%
Headach	108	36.0%
Convulsions	136	45.3%
Coma	60	20.0%
Involuntary movement	8	2.7%
Incoordination	3	1.0%
Weakness	7	2.3%

Stool incontinence	1	0.3%
Urine incontinence	1	0.3%
Speech disorders	4	1.3%
Hallucination	25	8.3%
Cough	106	35.3%
Hemoptysis	0	0
Dyspnea	29	9.7%
Chest pain	0	0
Cyanosis	0	0
Diarrhea	11	3.7%
Jaundice	0	0
Hematemasis	0	0

Table (2) shows that the most prominant symptom was fever in 100% of patients (duration of fever days ranged from one to 45 days with median 3 days) followed by vomiting in 48.7% of patients then convulsions in 45.3%. The least was speech disorders in 1.3% and incoordination in 1%.

Table (3): Neurological examination of the studied patients.

		no	**%**
Neck rigidity		115	38.3%
Kerning'S Sign		64	21.3%
Brudhzinski'S sign		59	19.7%
Signs of lateralization		0	0
Motor Affection		25	8.3%
Sensory Affection		2	0.7%
Cranial nerve affection		5	1.7%
Pupils	RRR	299	99.7%
	Pin point pupil	0	0

Table (3) shows that the most prevalent neurological finding was neck rigidity in 38.3% of patients followed by Kerning's sign in 21.3% and Brudhzinski's sign in 19.7%. No patients had signs of lateralization.

Table (4): Laboratory results of the studied patients.

		Median	**Min.**	**Max.**
ESR	**ESR**	**25**	**5**	**150**
CBC	RBCs	4.5	2.6	6.3
	Hb	11.4	6.6	16.8
	Plt	277000	24600	901000
	TLC	12000	1900	29200
	Neut	49.5	0	96
	Lymph	11	0	88
Renal function	Na	137	113	170
	K	4	2.3	9
	Calcium total	8.9	1.1	16
	Urea	25	8	191
	Creatinine	0.6	0.2	9.4
S. glucose	Glucose	112	35	429
Liver function	SGOT	32	10	1081
	SGPT	25	9	880
	ALP	121.5	30	970
	T.Bil	0.4	0.2	7.7
	TP	6.8	3.4	9
	Alb	3.7	2.4	4.9
Urine analysis	Pus.cells	15	2	100
	RBCs	7.5	2	100

Table (4) shows that TLC of the studied patients ranged from $1.9x10^3$ /ml to $29.2x10^3$ /ml with median$12x10^3$/ml.Serum Urea ranged from 8mg/dl to 191mg/dl with median 25mg/dl and serum Creatinine

ranged from 0.2mg/dl to 9.4 mg/dl with median 0.6mg/dl. SGPT ranged from 9u/l to 880u/l with median 25u/l and SGOT ranged from 10u/l to 1081u/l with median 32u/l. Total serum bilirubin ranged from 0.2mg/dl to 7.7mg/dl with median 0.4mg/dl. Three patients (1%) were positive for HIV.

Three patients (1%) had elevated serum Brucella agglutination titter. CRP was positive in 204 patients (76.7%), it was negative in 62 patients (23.3%).

Table (5): Physical findings of the CSF in the patients.

CSF		no	%
Aspect	Clear	200	66.7%
	Hazy	4	1.3%
	Turbid	90	30%
	bloody	6	2%
Color	Colorless	207	69%
	Whitish	27	9%
	yellow	32	10.7%
	reddish	34	11.3%

Table (18) shows that 66.7% of patients had clear CSF while it was turbid in 30% of them. 69% of patients had colorless CSF.

Table (6): Cytological and chemical findings of the CSF analysis in the patients:

Test	Min.	Max.	Median
WBCs (cell/cmm)	2	11000	100
Polymorph %	0	100%	50%
Lymphocytes %	0	100%	42%
Protein	15	1200	101.5
Glucose	0	233	59
CSF/serum glucose ratio	0	2.06	0.4956

Table (6) shows that WBCs in CSF ranged from2 to 11000 with median 100. Median of polymorphneutrophils in CSF was 50% while median of lymphocytes was 42%. Protein in CSF ranged from 15 to 1200 with median 101.5 while glucose in CSF ranged from zero to 233 with median 59.

Table (7): Results of CSF- bacterial culture in the studied patients:

CSFculture	Growth of bacteria		No growth of bacteria	
	N	%	N	%
	30	10%	270	90%
CSF culture	Cases (n=30)			
	no	%		
Strept. pneumoniae	17	56.7%		
Staph.aureus	5	16.8%		
MRSA	3	10%		
Neisseria meningitides	1	3.3%		
Actinobacteria	1	3.3%		
E.Coli	1	3.3%		
Klebsilla	1	3.3%		
Strept.pyogens	1	3.3%		
Total	30	100.0%		

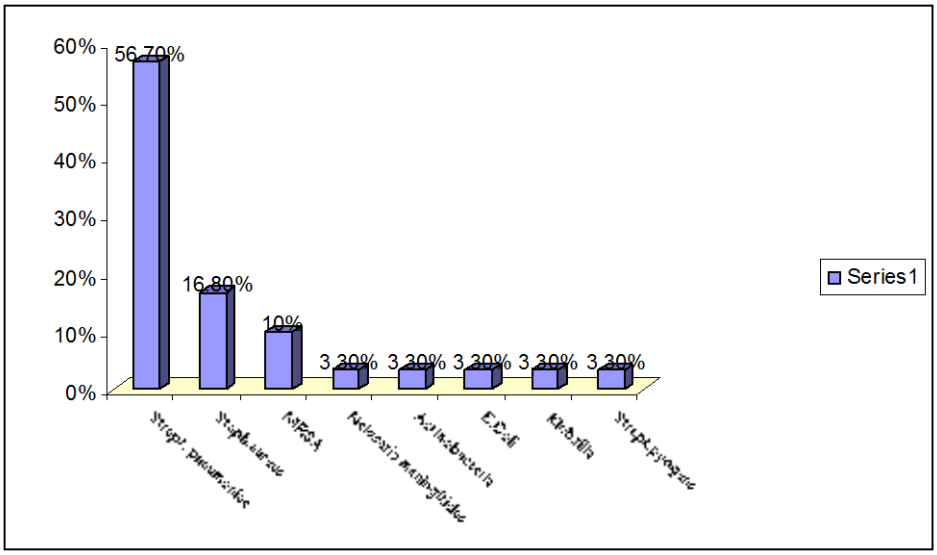

Figure (1): Results of CSF- bacterial culture in the studied patients

Table (7) CSF –bacterial culture shows no growth in 90% of cases. Bacterial growth in CSF culture was positive in only10% of cases. The most prevalent organism was strept. pneumoniae presented in 56.7% followed by Staph. Aureus presented in 16.8%, then MRSA presented in 10%, the least was Neisseria meningitides presented in 3.3%, Actinobacteria presented in 3.3%, E.Coli presented in 3.3%, Klebsilla presented in 3.3% and Strept. Pyogens presented in 3.3%.

Table (8): Duration of hospital stay of the studied patients

Number of days	median	Min	max
	14	**1**	**60**

Table (8) Shows that duration of hospital stay ranged from one day up to 60 days with median 14**.**

Table (9): Results of outcome of the studied patients

		No	**%**
Normal		207	69%
Complicated [n=93 (31%)]			
Complicated-Alive		41	13.6%
Died	At hospital	47	15.7%
	After discharge	5	1.7%
After discharge (N = 5)			
2nd week	**3rd week**		**4th week**
2(0.7%)	1(0.3%)		2(0.7%)

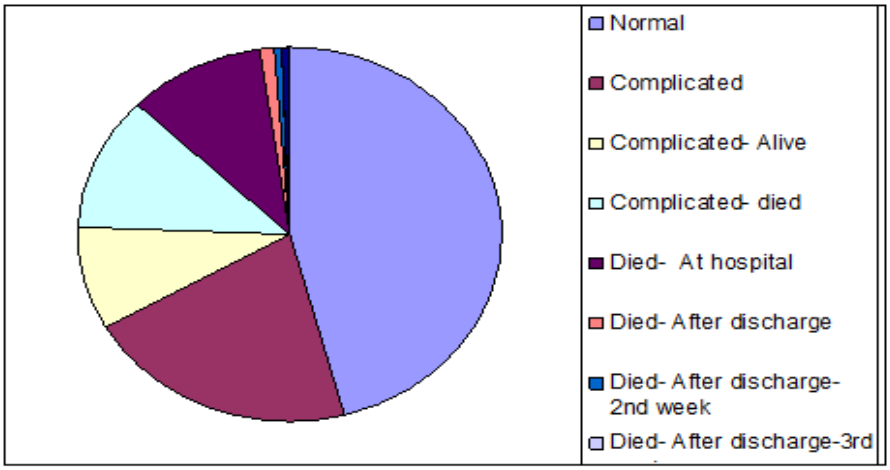

Figure (2): Results of outcome of the studied patients

Table (9) shows that 300 patients were admitted with meningitis of them 69% were discharged without complications, 31% of the patients were complicated. 13.6% of them were discharged alive with complications while 17.3% died either at hospital 47 patients (15.7%) or after discharge five patients (1.7%) tow patients (0.7%) died in the 2nd week, one patient (0.3%) died at the 3rd week and tow patients (0.7%) died at the 4th week.

Table (10): Monthly distribution of the studied patients

month	November-15	December-15	January-16	February-16	March-16	April-16	May-16	June-16	July-16	August-16	September-16	October-16
cases	25	22	20	21	20	27	38	25	31	20	25	26
male	19	15	8	12	11	18	22	18	23	12	14	12
Female	6	7	12	9	9	9	16	7	8	8	11	14

Figure (3): Monthly distribution of the studied patients

Table (10) shows that the highest number of patients was presented in May 38 patients, then in July 31 patients, the least number of cases was seen in January, March and August. Usually number of male was higher than females except in January and October.

The patients were divided into three groups according to age category

1- G I: - Patients less than one year.
2- **G II**: - Patients from one to 20 years.
3- **G III**: - Patients above 20 years.

In the next tables comparisons were done between the 3 groups to find statistical significance where:
P1: P value between G I and G II**.**
P2: P value between G I and G III.
P3: P value between G II and G III
HS: Highly significance.
S: Significance.
NS: No significance.

Table (11): Symptoms between the studied patients groups:

Symptoms	G I (n=74)	G II (n=125)	G III (N=101)	P 1	P 2	P 3
Fever	74(100%)	125(100%)	101(100%)	NS(p>0.05)	NS(p>0.05)	NS(P>0.05)
Headache	0(0%)	45(36%)	62(61.4%)	HS(p<0.01)	HS(p<0.01)	HS(p<0.01)
Vomiting	35(47.3%)	73(58.4%)	38(37.6%)	NS(p>0.05)	NS(p>0.05)	HS(p<0.01)
Convulsions	69(39.2%)	50(40%)	17(16.8%)	HS(p<0.01)	HS(p<0.01)	HS(p<0.01)
Coma	10(13.5%)	19(15.2%)	31(30.7%)	NS(p>0.05)	HS(p<0.01)	HS(p<0.01)

Table (30) Shows that fever was constant finding in all patients studied with meningitis with no statistically significance difference between the three groups (p1, p2 and p3 >0.05).

The number of patients with headache in G II was significantly higher than G I (p1<0.01), the number of patients with headache in G III was significantly higher than G I (p2<0.01), and the number of patients with headache in G III was significantly higher than G II (p3<0.01).

There was no significantly difference in the number of patients with vomiting in G I and GII (p1>0.05), and there was no significantly difference in the number of patients with vomiting in G I and GIII (p2>0.05), while the number of patients with vomiting in G II was significantly higher than G III (p3<0.01).

The number of patients with convulsions in G I was significantly higher than G II (p1<0.01), and the number of patients with convulsions in G I was significantly higher than G III (p2<0.01), and also the number of patients with convulsions in G II was significantly higher than G III (p3<0.01).

There was no significantly difference in the number of patients with coma in G I and GII (p1>0.05), but the number of patients with coma in G III was significantly higher than G I (p2<0.01), and the number of patients with coma in G III was significantly higher than G II (p3<0.01).

Table (12): CSF- bacterial culture in the studied groups:

CSF culture	G I	G II	G III	P1	P2	P3
No growth	68 (91.9%)	116 (92.8%)	86 (85.1%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Growth	6 (8.1%)	9 (7.2%)	15 (14.9%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Actinobacteria	O (O %)	1 (0.8%)	O (0%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
E.Choli&chorynebacterium spp.	1 (1.4%)	0 (0%)	0 (0%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Klebsilla	1 (1.4%)	0 (0%)	0 (0%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
MRSA	0 (0%)	1 (0.8%)	2 (2%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Neisseria meningitidis	0 (0%)	1 (0.8%)	0 (0%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Staph. aureus	1 (1.4%)	1 (0.8%)	3 (3%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Strept. pneumonie	3 (4.1%)	5 (4%)	9 (8.9%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)

Table (12) Shows that there was no statistically significant difference in the CSF-bacterial culture between the three groups of the studied patients (p1, p2 and p3 > 0.05).

Table (13): Outcome in the studied patients groups.

Outcome	G I	G II	G III	P1	P2	P3
Normal	54 (73%)	92 (73.6%)	61 (60.4%)	NS(P>0.05)	NS(P>0.05)	NS(P>0.05)
Complicated	20 (27%)	33 (26.4%)	40 (39.6%)	NS(P>0.05)	NS(P>0.05)	S(P<0.05)
died	7 (9.5%)	18 (14.4%)	27 (26.7%)	NS(P>0.05)	HS(P<0.01)	S(P<0.05)

Table (13) Shows that there was no statistically significant difference in the patients discharged normal between the three groups of the studied patients (P1, P2 and P3 > 0.05). There was no statistically significant difference in the patients discharged with complications between G I and G II (P1>0.05), and also between G I and G III (P2>0.05), but the number of patients discharged with complications in G III was significantly higher than G II (P3 < 0.05).

There was no statistically significant difference in the number of patients that died between G I and G II (P1>0.05), but the number of patients discharged died in G III was significantly higher than G I (P2 < 0.01), and the number of patients discharged died in G III was significantly higher than G II (P3 < 0.05).

DISCUSSION

Meningitis is inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges. The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs *(Ginsberg, 2004).*

The delay in the diagnosis and the consequent delay in initiation of treatment can cause death in about 10% of cases with advanced disease and severe neurological sequelae as many as 80% of survivors *(Van den Bos et al., 2005).*

The present study: Included 300 patients with suspected acute meningitis admitted in Embaba fever hospital in the period from the 1st of November 2015 to 31 October 2016.

In the present study all ages were included, the most affected age category was the patients below 2 years, they represented 31% of the studied patients, agrees with *Thigpen et al., (2011)* who stated that, babies are at increased risk for bacterial meningitis compared to people in other age groups. However, people of any age can develop bacterial meningitis.

In the present study males were higher in number than females (61.3% males versus 38.7% females). This agrees with many other studies conducted in Egypt documenting that males are more exposed to infection than females and the male to female ratio ranged from as low as 1. 1: 1 to as high as 2.8: 1 *(Abro et al.,* 2008*).*

In the present study the higher number of cases was in Spring and Summer months and this agree with *Nicolos et al., (1986)* who found that the most number of cases occurring in the summer months.

As regareds the patients symptoms in the current study fever was noted in 100% of the patients, vomiting presented in 48.7% of patients, convulsions presented in 45.3% of patients, and headache presented in 36% of patients studied, *Van de Beek et al., (2006)* had reported that 95% of the adult patients had 2 out of the following symptoms: fever, headache, neck stiffness and altered mental status.

Thirty nine percent of patients in the age below one year in the present study had convulsions and 40% in the patients from one to 20 years had convulsions, but only 16.8% of patients above 20 years had convulsions. These results agree with *Francois et al., (2008)* who reported that seizures were more frequent among infants than in older age groups with a highly significant difference between them.

Headache is more frequent in adults more than other age groups. In the present study 61.4% of patients above the age category 20 years had headache while 36% of the age category from one to 20 years had headache. This was documented by *Francois et al. (2008)* who reported that headache was more prominent with adults than in younger age with statistically significant difference too. *Silva et al., (2010)* also noted the higher occurrence of seizures in younger age groups while headache was more prominent in older age groups, *Sunit et al. (2006)* suggested that the absence of headache in some patients with bacterial meningitis may be attributed to the fact that infants are unable to localize this complaint.

In this study neck rigidity was present in 38.3% of patients, Kerning's sign was present in 21.3% of patients and Brudhzinski's sign was present in 19.7% of patients .In contrast, aprospective study of 297 adults with suspected meningitis documented that: neck rigidity was present in 30% of patients, Kerning's sign was present in 5% of patients and Brudhzinski's sign was present in 5% of patients *(Thomas et al., 2002).*

In the present study, on examination of patients below one year (74 patients), we found that 16.2% of them presented with bulging anterior fontanel, this agrees with *Shacham et al.(2009)* who reported that infants with bulging fontanels and fever may not always have a diagnosis of meningitis. Careful clinical and laboratory assessment can help guide the decision to conduct lumbar puncture. If any question exists about the presence of meningitis, early examination of CSF is always warranted, but careful observation may be possible in healthy-appearing children with normal laboratory studies, as long as the child's immunization history is well documented.

In someone suspected of having meningitis, blood tests are performed for markers of inflammation *(Tunkel et al., 2004).* In the present study TLC had been done and it's median was$12x10^3$ cell/ml. Median of serum Creatinine was 0.6 mg/dl, median of SGOT was 32 IU/L, and median of serum blood glucose was 112 mg/dl. *Singhi et al., (2006) and Elbishry et al., (2010)* found that there was no difference in blood urea and liver enzymes between patients with acute meningitis.

In this study, we noted that CRP was positive in 76.6% of the studied patients, this agreed with *El- Kapany., (2011), Viallon et al., (2011), Ibrahim et al., (2011) and Alkholi et al., (2011)* who explained that as serum CRP is a reactive protein activated by acute inflammatory process or acute bacterial infection.

In the present study, there was difference in the aspect and color of CSF, there was 66.7% of patients had clear CSF and about 30% had turbid CSF, 69% had colorless CSF, 10.7% yellow CSF and (9%) whitish CSF. Cloudy CSF indicates higher levels of protein *(Tunkel et al., 2004).*

In the present study, we noted that the maximum number of CSF WBCS was 11000 cell/ml with median 100 cell/ml. This Agree with *Sáez-Liorens, (2003)* who reported that the increased CSF WBCs may be attributed to increased blood brain barrier permeability caused by direct effect of bacteria and by response of the immune system to the entrance of bacteria, with subsequent entrance of large numbers of WBCs into the CSF.

In the current study, we noted that the median of CSF protein was 101.5mg/dl (normal 15-60 mg/dl). The elevated CSF protein in bacterial meningitis may be attributed to the disruption and marked increased permeability of the blood brain barrier *(Swartz, 2004)*, caused by the bacteria and by the response of the immune system to the entrance of bacteria into the CNS *(Sáez-Liorens., 2003).*

The low CSF glucose is characteristic of pyogenic meningitis due to interference with normal carrier-facilitated diffusion of glucose and to increased utilization of glucose by host cells (*Swartz., 2004).* In the present study, we found that the maximum of CSF glucose was 233mg/dl and the minimum of CSF glucose was zero with Median 59mg/dl.

In the present study, the Median of CSF/serum glucose ratio between patients was (0.4956). This agreed with *Østergaard et al., (2009)* who reported that there was no difference in CSF/serum glucose ratio between patients with meningitis.

Afifi et al., (2007) stated that S. pneumoniae was described as the leading cause of bacterial meningitis in adults in Egypt. In the present study, we found that the three major pathogens accounting for 83.5% of bacterial meningitis were Strept. Pneumoniae (56.7%), Staph. aureus (16.8%), and MRSA (10%). S.pneumoniae has been the most frequent isolated organism causing bacterial meningitis.

In all age groups, as regard CSF culture, S.pneumoniae was the most common etiologic agent in bacterial meningitis. In contrast, *Silva et al., (2010)* founded in their study that the most common etiologic agent of bacterial meningitis in infants under the age of 1 year was H.influnzae.

Sixty nine percent of the studied patients were discharged normal without complication. This agrees with *Van de Beek et al. (2006)* who stated that 66% of all cases of meningitis emerge without disability.

Complications were reported in 31% of the studied patients. 13.6% discharged alive but with complication. Motor complication in the form of hypotonia was present in adults. Infant and children mainly complicated by repeated convulsions. This agree with *Sáez-Llorens et al. (2003)* who stated that, in children, there are several potential disabilities which may result from damage to the nervous system, including epilepsy.

Approximatly 17.3% of patients died in the current study. Patients died at hospital were 15.7%. Four weeks follow up after discharge we founded that five patients (1.7%) died after discharge, two patients (0.7%) died in the 2nd week, one patient (0.3%) died at 3rd week and two patients (0.7%) died at 4th week. This agrees with *Thigpen, et al. (2011)* who says that with almost 4100 cases of meningitis, 500 (12.2%) deaths occurring annually in the United States.

CONCLUSIONS

From the present study, we can conclude that

Meningitis is more common in male more than female, and rural area more than urban.

- Some clinical manifestations when present are more likely to suspect meningitis as fever with repeated convulsions especially in infant and children, and as fever with headache and vomiting more likely to suspect meningitis.
- Seasonal variation regarding meningitis cases was demonstrated in this study with the highest incidence in Spring and Summer.
- The three major pathogens accounting for (83.5%) of bacterial meningitis in Embaba fever hospital were Strept. Pneumoniae 56.7%, Staph. Aureus 16.8% and MRSA 10%. On which S.pneumoniae has been the most frequent isolated organism causing bacterial meningitis.As regard blood culture the three major pathogens accounting for (73.3%) were MRSA 40%, S.pneumoniae 20% and Staph. aureus 13.3%. MRSA has been the most frequent isolated organism.
- In infant less than one year and from one year to 20 years and also in more than 20 years as regard CSF culture S.pneumoniae was the most common etiologic agent in bacterial meningitis. A s regard blood culture in infant less than one year S.pneumoniae and MRSA were the most common etiologic agent, but patients from one year to 20 years and more patients more than 20 years MRSA was the most common etiologic agent.

REFERENCES

1. Abro AH, Abdou AS, Ali H, et al. (2008): "Cerebrospinal fluid analysis-acute bacterial versus viral meningitis" Pak. J. Med. Sci, 24(5): 645-650.
2. Afifi S, Wasfy MO, Azab MA, et al. (2007): Laboratory-based surveillance of patients with bacterial meningitis in Egypt (1998–2004). Eur J Clin Microbiol Infect Dis, 26(5): 331–40.
3. Alkholi UM, Abd Al-monem N, Abd El-Azim AA, et al. (2011): Serum Procalcitonin in Viral and Bacterial Meningitis. J Glob Infect Dis, 3(1): 14–18.
4. Attia J, Hatala R, Cook DJ, et al. (1999): "The rational clinical examination. Does this adult patient have acute meningitis? ". JAMA, 282(2): 175–181.
5. Biaukula VL et al. (2012): Meningitis in children in Fiji: etiology, epidemiology, and neurological sequelae. International Journal of Infectious Diseases, 16: e289–e295.
6. Elbishry M, Elwan S, Elshaer O, et al. (2010): Serum and cerebrospinal fluid cortisol levels in acute bacterial and aseptic meningitis in relation to clinical criteria and outcome. Thesis of Master Degree in Pediatrics, Faculty of Medicine, Banha University, 71-91.
7. El-Kapany RA (2011): Serum and CSF Cortisol Level in Patients with Meningitis. Egypt J Neurol Psychiat Neurosurg, 48(4): 391-397.
8. Francois Dubos, Bartoszkorczowski, et al. (2008): "Serum Procalcitonin Level and Other Biological Markers to Distinguish Between Bacterial and Aseptic Meningitis in Children" Arch. Pediatr. Adolesc. Med, 162(12): 1157- 1163.
9. Ginsberg L (2004): "Difficult and recurrent meningitis". Journal of Neurology, Neurosurgery, and Psychiatry, 75 Suppl, 1: i16–21.
10. Ibrahim kA, Abdel-Wahab AA and Ibrahim AS (2011): Serum procalcitonin in patients with acute meningitis: a comparison with blood leukocyte count and C-reactiveprotein. JPMA, 61: 346.
11. Østergaard C and Benfield T (2009): Macrophage migration inhibitory factor in cerebrospinal fluid from patients with central nervous system infection. Critical Care, 13: R101.
12. Razonable RR (2007): Meningitis. Article in eMedicine Specialties > Infectious Diseases > Medical Topics. Pediatric Cytomegalovirus Infection. http:// emedicine. medscape.com
13. Sáez-Llorens X and McCracken GH (2003): "Bacterial meningitis in children". Lancet, 361 (9375): 2139–2148.
14. Scarborough M and Thwaites GE (2008): The diagnosis and management of acute bacterial meningitis in resource-poor settings. Lancet Neurol, 7(7): 637-48.
15. Shacham S et al.(2009): Bulging fontanelle in febrile infants: Is lumbar puncture mandatory? Arch Dis Child, 2009 Sep; 94: 690.
16. Silva WA, et al. (2010): "Acute bacterial meningitis in north-eastern Brazil Revista da Sociedade Brazileira de Medicina Tropical", 43(4): 455-457.
17. Sunit C and Arun Bansal (2006): "Serum cortisol level in children with acute and aseptic meningitis". Pediatr. Crit. Care. Med, 7: 74-78.
18. Swartz MN (2004): "Bacterial meningitis--a view of the past 90 years". The New England Journal of Medicine, 351(18): 1826–1828.
19. Theilen U, Wilson L, Wilson G, et al. (2008): "Management of invasive meningococcal disease in children and young people: Summary of SIGN guidelines". BMJ (Clinical research ed.), 336(7657): 1367–1370.
20. Thigpen MC, Whitney CG, Messonnier NE, Zell ER, Lynfield R, Hadler JL, et al. (2011): Emerging infections programs Network. Bacterial meningitis in the United States, 1998-2007. N Engl J Mwd, 364: 2016-25.
21. Thomas KE, Hasbun R, Jekel J, et al. (2002): "The diagnostic accuracy of Kernig's sign, Brudzinski's sign, and nuchal rigidity in adults with suspected meningitis". Clinical Infectious Diseases, 35(1): 46–52.
22. Tunkel AR, Hartman BJ, Kaplan SL, et al. (2004): "Practice guidelines for the management of bacterial meningitis". Clinical Infectious Diseases, 39(9): 1267–1284.
23. Van De Beek D, De Gans J, Tunkel AR, et al. (2006): Community acquired bacterial meningitis in adults. N Engl J Med, 354(1): 44-53.
24. Van den Bos F, Terken M, Yoma L, et al. (2005): Bacterial meningitis and miliary tuberculosis in young children. Tropical Med and International Health, 9: 309-313.
25. Viallon A, Desseigne N, Marjollet O, et al. (2011): "Meningitis in adult patients with a negative direct cerebrospinal fluid examination: value of cytochemical markers for differential diagnosis". Critical care, 15(3): R 136.