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RESEARCH ARTICLE

BACTERIAL MENINGITIS IN CHILDREN UNDER 12 YEARS OF AGE.

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Abstract

Background:- Bacterial meningitis in children is an infection with the greatest burden in low-income and under developed countries and it is a life- threatening infection disease with high mortality and disability rate. Treatment of this life-threatening disease should not be delayed, so that rapid antibiotic therapy should be immediately started. streptococcus pneumonia and Neisseria are the leading causative organisms.

Objectives:- This study is aimed to evaluate the predominate causative agents of bacterial meningitis in children. It is also to determine the susceptibility of the isolates to the commonly used antimicrobials.

Methods:- One-hundred and eighty Children in Central Child Hospital Baghdad City were the sources of the cerebrospinal fluids collected aseptically from each chilled. Each CSF sample was subjected to well Known microbiological methods for final identification. All isolates were tested for susceptibility for the commonly used antimicrobial through application of the disk diffusion method as described by kirby-Bauer.

Results:- Out of 180 CSF samples from children it was possible to obtain 62(34.5%) well diagnosed bacterial isolates during the period June 20-15-June 2016. The bacterial isolates were distributed as Haemophilus influenza which ranks the highest 18(29%) followed by streptococcus pneumonia 16(25.9%). The results of the susceptibility of isolates to the commonly used antimicrobial revealed that H. influenza are highly resistant (88.9%) to Tetracycline and moderately sensitive (50%) to the drugs Ciprofoxacin and Cephalecin. Streptococcus pneumonia showed high resistance (87.5%) to the drugs Gentamycin and Catrimaxazole. Multidrug resistant is documented in this study: Eschericia coli showed complete (100%) sensitivity to chloramphenicol.

Conclusion: it can be concluded that H. influenza and streptococcus pneumonia are the predominant causative agents of bacterial meningitis in children and that chloramphenicol is the drug of choice for treating bacterial meningitis in children caused by E. coli. Ampicillin is the drug of choice in the treatment of meningitis caused by Klebs. Pneumonia.

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No recommended drugs for H. influenza and S. pneumonia since the multidrug resistance of these two bacteria have been noticed.

Introduction:-

Bacterial meningitis in children is a life-threatening disease resulting in sever mortality and disability. [1,2]
Meningitis usually follows invasion of the blood stream by organisms that colonize mucosal surfaces.[3,4]
Pathogens are acquired mainly during birth by contact and aspiration of intestinal and genital secretion from mothers.[5,6,7]

In infants and children meningitis usually develop after encapsulated bacteria that have colonized the nasopharynx are disseminated in the blood.[8] Meningitis can also develop by direct extension of infection from paranasal sinuses or from middle ear through mastoid to the meningese.[8,9] A wide range of bacteria causes purulent meningitis including group B streptococci, E. coli, klebsiella, salmonella, Hamophilis influenza, n. meningitis, and st. pneumonia distributed according to age starting from newborn stage up to children up to5 years and adults are effected by s. pneumonia and N. meningitides, ps, aeraginosa and E. coli,[10,11,12] Bacterial Meningitis can be caused by the most common etiological agents like H. influenzae, S. pneumonia and N. meningitidis which are associated with 90 percent of causes of meningitis.[10,11]

Patients and Methods:-

Patients:- One hundred and eighty children attending the central child hospital at Baghdad city were the sources of CSF samples from cases of suspected meningitis as diagnosed by physician during the period June 2015 June 2016. The ages of children were 1-12 years and they were grouped into I which included 1-2 years, 3-5 years, 6-8 years, 9-12 years.

Methods:- Out of 180 CSF sample it was possible to obtain 62 (34.51) positive samples. Specimens were collected aseptically and transported to the laboratories very soon.

Specimen processing:- Each CSF specimen is subjected to well known microbiological methods for final identification.

Antibiotic sensitivity test:- Susceptibility profile of each isolate were determined by using disk diffusion method as described by Kirby- Bauer[13] and the results of the effect of each drug on certain isolate whether sensitive or resistant is determined according to comparison with the size of zone inhibition with that of an international standard values as in table (1) as applied by Kirby- Bauer disk diffusion method.[13]

Interpretation of zone inhibition by using Kirby & Bauer method (Disk diffusion method)

(Table 1)

Anti microbial agent	Code	Disk Potency Mcg/DISC	Diameter of zone inhibition		
			Resistance	Intermediate	Sensitive
1. Ampicilln	AM	10	≤11	12-13	≥20
2. Cefataxime	CTX	30	≤14	15-22	≥23
3. Cephalexin	KF	30	≤14	15-17	≥18
4. Chloamphenicol	C	30	≤12	13-17	≥18
5. Ciprofloxacin	CIP	10	≤15	16-20	≥21
6. Clindamycin	CN	2	≤12	13-17	≥18
7. Tobramycin	TM	10	≤13	13-14	≥15
8. Erythromycin	E	15	≤13	14-17	≥18
9. Ampiclox	ANP	30	≤14	15-16	≥17
10. Gentamycin	GN	10	≤12	13-14	≥15
11. Nalidixic acid	NAL	30	≤13	14-18	≥19
12. Penicillin G	PG	6	≤20	21-28	≥29
13. Rifampicin	RA	5	≤16	17-19	≥20
14. Co-Trimoxazole	SXT	25	≤18	19-23	≥24-32
15. Amoxicillin	AMN	10	≤90	-	≥29
16. Amikacn	AN	30	≤14	15-16	≥17

Results:-

In this study 180 CSF samples from children, their ages were 1-12 years it was possible to obtain 62(34.51) well diagnosed bacterial isolates. Table 2 shows the distribution of the isolates according to gender in which males constitutes 35(56.51) while females are 27(43.61), accordingly H. influenza constitutes 18(29%) isolates from which 10(28.6%) isolates in males while it is 8(44.5%) isolates in females.

S. pneumonia ranks the second in distribution which is 16(25.8%) isolates from which 13(37.21) bacterial isolates among males which is the highest among males. Escherichia coli and klebs pneumonia each showed equal number in distribution i.e 10(16.2%) isolates for each and according to gender based distribution E. coli showed 6 isolates (17.2%) among males while kleb pneumonia showed 8(29.7%) isolates among females it is seen from this table that S. pneumonia followed by H. influenza showed significant percentage among males. In females H. influenza and klebsilla pneumonia showed the lightest incidence among females.

No ps aeroginosa have been found in females and no citrobacters is present in males. This could be due to low no. of isolates.

Table 3 which shows the distribution of the isolates according to the age groups it can be seen that the age group 3-5 years represent the highest no. i.e 30(48.39%) of the isolates from which 8 isolates (26.7%) are from S. pneumonia and klebs pneumonia respectively. The highest of the isolates in the age group 1-2 years is that of H. influenza which 7 isolates (38.9%). No Ps. aeroginosa have been found in this group of age.

Citrobacter spp are not found in the last 3 age groups H. influenza which constitutes the highest no. of isolates 18(29) have been found in all age groupes and highest no. of isolates 7(38.9) is among the age group 1-2 year i.e in infants.

Table 2:- Distribution of the isolated bacteria from CSF of children and their No based on Gender

Bacteria	NO	%	Males	Females	Total
H. influenza	18	29	10	8	18
St pneumonia	16	25.8	13	3	16
E. coli	10	16.2	6	4	10
Kleb. pneumonia	10	16.2	2	8	10
Ps. aeraginosa	4	6.4	4	-	4
C. trobacter spp	4	6.4	-	4	4
Total	62	100	35	27	62

Table 3:- Age dependant distribution of the bacteria isolated from CSF of children

Bacterial isolates							
Age in years	**H. influenza (8**	**St. pneumonia 16**	**E. coli 10**	**Kleb. Pneumonia 10**	**Ps. aeroginosa**	**Utrabaoter app 4**	**Total**
1 to 2 years	7	1	1	1	-	4	14
3-5 years	5	8	5	8	4	-	30
6-9 years	3	6	2	1	-	-	12
10-12 years	3	1	2	-	-	-	6
							62

Table 4:- Distribution of the sensitivity of the bacteria isolates from CSF of children to the commonly used antimicrobials

Bacterial isolates						
Antimicrobial	**H. influenza 18**	**St pneumonia 16**	**E. Coli 10**	**Kleb. pneumonia 10**	**Ps. aeroginosa 4**	**Citrobacter spp. 4**
Chloramphefenicol	**33.5**	**37.5**	**100**	**40**	**0**	**0**
Amikacin	**27.8**	**38.9**	**70**	**70**	**50**	**0**
Gentamycin	**44.5**	**12.5**	**70**	**20**	**80**	**25**

Ceftriaxone	**38.9**	**18.75**	**30**	**20**	**0**	**0**
Ceftazidin	**38.9**	**18.75**	**30**	**20**	**0**	**0**
Tetracyclin	**11.1**	**62.5**	**20**	**0**	**0**	**0**
Cotrimaxazole	**44.5**	**12.5**	**70**	**30**	**0**	**0**
Ciprofloxacin	**50**	**25**	**70**	**30**	**60**	**25**
Cephalexin	**50**	**25**	**30**	**20**	**0**	**0**
Ampicillen	**33.5**	**50**	**50**	**100**	**50**	**25**

Table 5:- Distribution of the resistance of the bacterial isolates from CSF of children to the commonly used antimicrobials

Bacterial isolates						
Antimicrobial	**H. influenza 18**	**St pneumonia 16**	**E. Coli 10**	**Kleb. pneumonia 10**	**Ps. aeroginosa 4**	**Citrobacter 4**
Chloramphefenicol	**66.5**	**62.5**	**0**	**60**	**100**	**100**
Amikacin	**72.2**	**61.1**	**30**	**30**	**50**	**100**
Gentamycin	**55.5**	**87.5**	**30**	**80**	**20**	**75**
Ceftriaxone	**61.1**	**81.25**	**70**	**80**	**100**	**100**
Ceftazidin	**61.1**	**81.25**	**70**	**80**	**100**	**100**
Tetracyclin	**88.9**	**37.5**	**80**	**100**	**100**	**100**
Cotrimaxazole	**55.5**	**87.5**	**80**	**70**	**100**	**100**
Ciprofloxacin	**50**	**75**	**30**	**70**	**40**	**75**
Cephalexin	**50**	**75**	**70**	**80**	**100**	**0**
Ampicillen	**66.5**	**50**	**50**	**0**	**50**	**75**

The pattern of the sensitivity of the bacterial isolates to the commonly used antimicrobial are presented in table 4 in which E. coli is completely (100%) sensitive to Chloramphefenicol and it is highly sensitive (70%) to the drugs Amikacin, Gentamycin and Cotrimoxazole. It is seen also that Klabs. Pneumonia is completely sensitive (100%) to Ampicillin and highly sensitive (70%) to Amikacin. It is seen from table 4 also that ps. Aeroginosa is highly sensitive (80%) to Gentamycine and moderately sensitive (60%) to Ciprofloxacin, while H. influenza showed intermediate (50%) to each of the drugs Ciprofloxacin and Cephalexin.

All of the other isolates in this table showed very low sensitivity i.e resistance to most of the antimicrobial in this study as pointed out in the tables. Table 5 in which the pattern of resistance of the isolates to the drugs used in this study reveals that H. influenza is highly resistant to (66%) Tetracycline S. pneumonia showed resistance (87.5%) to Gentamycin and Catrimaxozole respectively, also it is highly resistant (85.25%) to each of drugs Ceftriaxone and Ceftazidin. Klebs pneumonia showed complete (100%) resistance to tetracycline and highly resistance (80%) to each of the drugs Gentamycin, and ceftazidin. Each of the isolates Ps. aeroginosa and Citrobacter spp revealed complete resistance (100%) to most of the drugs used in this study and no conclusion can be taken concerning these isolate since they are few in number. In our study no N. meningitides isolate is detected based on our routine laboratory culturing.

Discussion:-

The data presented in this work demonstrate that H. influenza and S. pneumonia are the most important etiological pathogens of bacterial meningitis in children, this result is confirmed by other[6,8,9] who found that H. influenza account for most of the cases of meningitis. Our results in table 3 concerning age distribution H. influenza represent the highest 7(38.9%) among the isolates in the age group less than 2 years and of the isolates in this study showed highest distribution 30(48.4%) in the age group 3-5 years which confirmed by others who concluded that most of the bacterial meningitis in children are within the age lesser than 5 years(7). It is also documented by others[11,12] who found that H. influenza is one of the huge three causes of bacterial meningitis in kids under 5 years of age. The second leading cause which represent the Grams-Positive isolates are S. pneumonia which is in our study represents 16(25.9%) isolates in which 8(50%) Isolates are present among the age group 3-5 years which agrees with others[14,15] who found that S. pneumonia is the most common cause of meningitis in children.

Klebs pneumonia in our study showed similar rate in distribution to that of S. pneumonia which is 8(50%) in the group less than 5 year.

No significant role have been found for the isolates Ps. aeroginosa and citrobacter Spp in the age highest than 6 years and E. coli plays an intermediate role although it has been found that the highest percentage 5(50%) is within the age group of less than 5 years. The fluctuated distribution in certain age groups is of unknown explanation.

Our data demonstrate differences in age distribution between H. influenza and each of S. pneumonia, E. coli and Klebs. pneumonia.

The pattern of sensitivity and resistance of the bacterial isolates is presented in table 4 and table 5 in which H. influenza showed highe resistance (88.9%) to tetracycline and also resistant to all the drugs used in this study, followed by Str- pneumonia which is also resistant to the drugs Gentemycin (87.5%) and to each of the drugs ceftrioxone and cefazidin (81.25%) respectively. H. influenza represent Gram- Negative isolates while S. pneumonia are Grams-Positive isolates, this demonstrate that multidrug resistance is documented in this study. This result disagree with others[5] who founds that G+ve bacteria are sensitive to chloramphenicol and Gentamycin[16,17]. The only completely sensitive (100%) to chloramphenicol is that of E. coli isolates which is also disagree with those claimed that E coli is moderately sensitive to chloramphenicol it is moderately sensitive to the drugs Ampicillin (50%) and more sensitive to each of the drugs Amikacin, Gentamycin, Cotrimoxazole and ciprofloxacin (70%) respectively. This G- ve bacteria is highly resistant to the drugs Cefteiaxone and Ceftazidin and cepholexin (30%) respectively, so these drugs cannot be used for treating cases of bacterial meningitis in children caused by E. coli, klebs S. pneumonia is highly resistant to most of the drugs used in this study except for Ampicillin for which it is completely (100%) sensitive. The resistant pattern of Ps. aeroginosa and citrobacterv spp in table 5 reveals that both groups of isolates are completely resistant (100%) to most of the drugs used in this study including chloramphenicol which disagree with those[7,20]. Who claimed that G-ve bacteria are susceptible to chloramphenicol, this could be due to either the No. of the isolate are few in our study or that drug abuse are experienced in our area of the study.

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