Global Scientific JOURNALS

GSJ: Volume 9, Issue 6, June 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

Meningococcal disease in children in a pediatric hospital Benghazi-Libya

Mailud El-Amari*, Jamal Ammari**, Mohamed A. Ganim Ramadan*, Salah Mursi***, Walid M. Abdulhamid Ramadan**** Salah.M.Amari***, abdull kader Abaid***.

** Benghazi University Libya faculty of public health Lab. Medicine dep.*
***Benghazi University Libya faculty of medicine,. Community medicine dep.*
****Benghazi University Libya.Gamins high institute, medical science.*
*****Yildirim Beyazit University, Faculty of Medicine – Turkey.*

Corresponding author: Mohamed A. Ganim, mghanimdvm@yahoo.com

Abstract: Bacterial meningitis remains a very important disease worldwide. WHO estimates, approximately 171,000 people worldwide die from bacterial meningitis each year. The mortality of untreated bacterial meningitis approaches 100% and, even with optimum treatment, mortality might happen. unregulated use of antibiotics in the general community is common and clinicians may have limited access to more effective, broad-spectrum antimicrobial agents. The present study aimed to explore the magnitude of the disease and identify the type of bacteria that causes meningitis in children. Using data available from the children's hospital, Benghazi. Gram-negative bacteria were fo.und to be responsible for the highest contribution to bacterial meningitis in Infected Children, the highest infections rate of bacteria *K. pneumonia* (35.6%) next comes an *S. aureus* (17.8%). Due To the facts that overall aim of the study was to decrease the morbidity of bacterial meningitis through, control or limit infectious by increasing health awareness and improve healthy lifestyle, as well as continues surveillance to detect changes in the microbiology of organisms causing bacterial meningitis or their sensitivity in our community is essential.

Keywords: *Meningitis, Acute inflammation, Children hospital, Antimicrobial activity, Bacteria.*

INTRODUCTION

Meningitis is an acute inflammation of the protective membranes covering the brain and spinal cord, known collectively as the meninges. The most common symptoms are fever, headache, and neck stiffness. Other symptoms include confusion or altered consciousness, vomiting, and an inability to tolerate light or loud noises. Young children often exhibit only nonspecific symptoms, such as irritability, drowsiness, or poor feeding. If a rash is present, it may indicate a particular cause of meningitis; for instance, meningitis caused by meningococcal bacteria may be accompanied by a characteristic rash. McCracken G H (2003).

Bacterial meningitis remains a very important disease worldwide. From its original recognition in 1805 until the early 1900s, bacterial meningitis was virtually 100% fatal According to. Elsaid, M F.2006), World

health organization (WHO (2001.V). estimate, approximately 171,000 people worldwide die from bacterial meningitis each year. Even with antimicrobial treatment, fatality rates are as high as 5-10% in the developed world.

Acute bacterial meningitis is an important cause of morbidity and mortality in children. The three most common etiologic agents are *Haemopilus influenza* Type b (HIb), *streptococcus pneumonia*, and *Neisseria meningitis*, which account for 90% of reported cases of acute bacterial meningitis. Muangchana.*et al*, (2009)

The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs. 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 Tunkel *et al*, (2004).

Some forms of meningitis are preventable by immunization with the meningococcal, mumps, pneumococcal, and Hib vaccines. Giving antibiotics to people with significant exposure to certain types of meningitis may also be useful. The first treatment in acute meningitis consists of promptly giving antibiotics and sometimes antiviral drugs. Corticosteroids can also be used to prevent complications from excessive inflammation. Meningitis can lead to serious long-term consequences such as deafness, epilepsy, hydrocephalus, or cognitive deficits, especially if not treated quickly. Elsaid *et al*, (2006)

Suspected bacterial meningitis is a medical emergency; thus, immediate steps must be taken to establish a specific diagnosis, and empirical antimicrobial treatment must be started rapidly. Hopkins. et al, (2010) The mortality of untreated bacterial meningitis approaches 100% and, even with optimum treatment, mortality might happen. Neurological squeal is relatively common in Survivors of meningitis, particularly after *pneumococcal MeninPgitis*. Hopkin, J. (2010), Kim, K.S (2010).

In 2013 meningitis occurred in about 16 million people worldwide Global Burden of Disease (2013). this resulted in 303,000 deaths – down from 464,000 deaths in 1990. With appropriate treatment, the risk of death in bacterial meningitis is less than 15%. Outbreaks of bacterial meningitis occur between December and June each year in an area of sub-Saharan Africa known as the meningitis belt. Smaller outbreaks may also occur in other areas of the world. Global Burden of Disease, (2013*)*

Bacterial meningitis accounted for 23,000 (2.4%) of the 0.96 million deaths caused by infectious diseases in a different region of the world and contributed 13.3% of death due to meningitis worldwide, Youssef, FG *et al*. (2003).

Bacterial meningitis remains a neurological emergency with a high mortality rate despite advances in diagnostic techniques and chemotherapy. Meningitis is a major public health problem in Egypt associated with significant morbidity and mortality. Hui, A *et al*. (2003).

The emergence of antibiotic-resistant bacterial strains has limited the effectiveness of treatment for acute bacterial meningitis in many locations Surveillance for antibiotic-resistant pathogens is of particular importance in developing countries where unregulated use of antibiotics in the general community is common and clinicians may have limited access to more effective, broad-spectrum antimicrobial agents. In the future,

more sensitive techniques, such as amplification of the 16S rRNA gene by a polymerase chain reaction,(PCR) may help to diagnose cases of bacterial meningitis in patients pretreated with antibiotics. PCR. has shown a sensitivity of 86% and specificity of 97% in detecting multiple organisms Chanteau *et al*, (2007)

Laboratory diagnosis is an essential component in surveillance of meningococcal epidemics, as it can inform decision-makers of the *Neisseria meningitidis* sero group's involved, and select the most appropriate vaccine for mass vaccination. However, countries more affected, face real limitations in laboratory diagnostics, due to lack of resources. Chanteau, S. (2007).

The present study aims to explore the magnitude of the disease and identify the type of bacteria that causes meningitis. Using data available from children hospital, Benghazi.

MATERIALS AND METHODS

Sample collection:

A total of 1498 cerebrospinal fluid (CSF) specimens were collected from suspected cases of meningitis, admitted to children's hospital, during the period from September 2012 to September 2013.

The technique to being used:-

For the purpose of the present study Physical tests or Gross Examination was used including, colors, clarity, and clotting.

The Kirby-Bauer disk diffusion method was used to determine the susceptibility of the recovered clinical isolates to antimicrobial agents and it was carried out as recommended by the Clinical and Laboratory Standards Institute. (2011). Isolates that were resistant to three or more classes of antimicrobials were considered as multi drugs resistance (MDR) isolates and were selected for further study.

Microscopic Examination:-

White Blood Cell count (WBC):- synovial fluid cell count, performed within 1 hour of collection. By using Hemocytometer count (count chamber). However more than 9 WBC recorded as abnormal *http:/www.who.int/emc. (2011)*

- Cerebral spinal fluid (CSF) slid Differential count: the neutrophil and lymphocyte by microscope (lens 40x), in low numbers, indicated viral meningitis, while for a high number of neutrophil indicated bacterial meningitis and may also contain visible bacterial or yeast.

Chemical examination including:-

a. Protein test as total protein by using spectrophotometer at a wavelength (546nm).
b. Glucose test by using spectrophotometer at wavelength (546nm). *Nagarathna S et al.* (2012).
c. CSF culture cultured on MacConkey agar, blood agar, and chocolate agar. were incubated at 37 $^{0}_{C}$ for24 hours.

- Blood agar using sheep blood, to isolate various organisms.
- MacConkey agar to isolate Gram-negative bacilli.
- Chocolate agar (incubated in carbon dioxide) to isolate luxuriant growth of fastidious Neisseria and Haemophilus strains. Ahmed S., *et al*. (2008)

Gram stain and microscopic examination :

A colony was taken from each culture growth, and then examined microscopically.

The reactions are read according to the reading table and the identification is obtained by referring to the analytical profile index or using the identification software.

Identification of all bacterial was confirmed byAPI20E using phoenix100. Ahmed, S *et al*, (2008).

Data analysis :

Statistical analysis was performed with SPSS software version "18". As descriptive frequency and percentage and the type of bacteria causing the disease. Was tabulated.

RESULTS

The results of the current study included 1498 patients with different age groups of (less than 3 years) with a suspected case of meningitis were admitted to Benghazi children hospital, during the period of 5.9.2012 to5.9.2013. Overall 45 (3%) patents wear reported to be Infected with bacterial meningitis, There were no obvious differences, but it was male children is slightly more than female 57.8 to 42.2% respectively, and the *Klebsiella pneumonia*. is a highly bacterial spp. infectious, as 35.6% overall with 22.3 and 13.3 respectively for male and female. Table (1).

Table (1): Acute bacterial meningitis in children admitted in children hospital.

Bacteria species	Male		Female		Total	
	No	%	no	%	no	%
K. pneumonia	10	22.3	6	13.3	16	35.6
S. aureus	3	6.7	5	11.1	8	17.8
E. coli	3	6.7	4	8.9	7	15.6
S. pneumonia	3	6.6	3	6.7	6	13.3
P. aeruginasa	4	8.9	1	2.2	5	11.1
Enteracoccus	1	2.2	0	0.0	1	2.2
Acintobacter	2	4.4	0	0.0	2	4.4
Total	26	57.8	19	42.2	45	100.0

The antibacterial agent susceptibility level shows that sensitivity was high for antimicrobial Piperacillin/tazobactam, to bacteria *Enterobacteriaceae*. than the others in use in the hospital by 78.2%, antibiotics: Ciprofloxacin, Amikacin, Gentamicin and, Chloramphenicol, while the less susceptible one was chloramphenicol with a sensitivity level of 52.2%. table 2.

Table (2) Antimicrobial susceptibility of gram-negative to Enterobacteriaceae(n=23)

Antimicrobial type	Resistance		Intermediate		Sensitivity	
	No	%	No.	%	No	%
Ciproflaxcin	5	21.8	3	13.0	15	65.2
Chloramphenicol	1	47.8	0	00.0	12	52.2
Piperacillin/ tazobactam	5	21.8	0	00.0	18	78.2
Gentamicin	6	21.7	5	21.7	13	56.6
Amikacin	8	34.8	0	00.0	15	65.2

Antimicrobial agent susceptibility to gram-positive Streptococcus spp. , show that chloramphenicol and ampicillin (85.7, 71.5% respectively),was very sensitive against Streptococcus spp., while Ciproflexin was less sensitive for Streptococcus Spp. Table (3).

Table (3) Antimicrobial agents susceptibility of gram-positive Streptococcus spp. n= 7

Antimicrobial type	Resistance		Intermediate		Sensitivity	
	No	%	No	%	No	%
Pencillin	3	42.0	0	00.0	4	58.0
Ampicillin	2	28.5	0	00.0	5	71.5
Chloromphenicol	0	0.0	1	14.3	6	85.7
Ciproflexain	2	28.5	2	28.5	3	43.0
Vancumtcin	3	42.8	0	00.0	4	57.2

DISCUSSION

The total infection cases of acute bacterial meningitis, which has been admitted to Benghazi children hospital, count for 1498 expected cases of bacterial meningitis, Acute cases appeared in the current study accounted for 45 (3%) of cases. Similar finding has

been reported by Elsaid, *et al* (2006, Caroline, et al (2007), Bueno, *et al*. (2005). The reason may be patients already received antimicrobial therapy or vaccine administered in recent years, similar to that result reported in a control study done by *Al*-Tawfiq, and Abukhamsin, (2009).

A prospective study by Shembesh, *et al,* (1998). of bacterial meningitis in children from north-eastern Libya. 77 children (excluding neonates) with bacterial meningitis were studied. The causative organisms were identified in 60 children during 14 months. The case mortality rate was 13% and nine children (12%) were left with permanent neurological squeal. The infection rate is higher than what was seen in our present study, this is likely to be the results of health awareness programs and routine vaccination coverage programs in recent times.

Types of bacteria that cause bacterial meningitis in infected children, was shown to be *(K. pneumonia*) as high prevalence of 35.6%. However, Gram-negative bacteria were found to be responsible for highest contribution to bacterial meningitis in Infected Children, of 30 cases out of the 45 cases mainly as *Enterbacteriaceae* n=23, P. *Aeruginosa* n=5 and *Acinetobacter* spp n=2 isolates, while in case of Gram-positive *S. aureus n=8 and Streptoceccus n=7.*
Comparing our results with a study conducted in Libya by Shembesh, NM *et al.* (1998*).* Was (*Haemophilus influenzae*and *Streptococcus pneumoniae*) Gram-positive as the leading cause, another study in Egypt Abdelkader, *et al.* (2017).
It was found that *S. pneumoniae* described as the leading cause of bacterial meningitis, reflecting a change in disease epidemiology for bacterial meningitis. No big exception for both gender, which is consistent with the study by Shembesh, NM *et al*. (1998*) and* Caroline, LT (2007*).* that the male to female ratio was 1.2:1, other studies reported a similar result.
About antimicrobial resistance patterns and efficacy of vaccines to emphasize the importance of periodic surveillance for appropriate preventive and treatment strategies.

Antibiotic susceptibility tests were evaluated according to Clinical and Laboratory Standards Institute document. (2011). guidelines. Antimicrobial susceptibility testing of the *Entrobacteriaceae* (n=23) Gram-negative isolates, showed the lowest resistance observed to Gentamicin, Ciprofloxacin, and Piperacillin/tazobactam (21.7, 21.8 & 21.8%) respectively.
The *Sterptococcus. Spp* (n=7) isolates show highest resistance observed to *chloramphenicol*. That the lowest resistance was observed to *Ampicillin*, Ciprofloxacin (28.5%).

The results indicate high prevalence of antibiotic resistance, It is recommended to monitor drug-resistant and consider rational use of antimicrobials agents to limit the spread of the underlying resistance mechanisms.

CONCLUSION

Acute bacterial meningitis is an important cause of death and long-term neurological disability in the world. Out of the present study, the highest infection rate of bacteria *K. pneumonia* (35.6%) next comes a *S. aureus* (17.8%). As the result of present study no

big differences for the effect of sex factor, This is consistent with other's studies. High rate of antibiotic resistance, indicates the need to apply the new guidelines implemented in Libya to rationalize the use and avoid the misuse and abuse of antimicrobial agents.

As a public health problem, the responsibility of the health authorities should consider that more attention to increasing health awareness and improve health lifestyle, of the general people. Laboratory diagnosis is an essential component in the surveillance of meningococcal epidemics, as it can inform decision-makers to be able to take appropriate action (mass vaccination to be implemented). Chemo-prophylaxis's to the contacts of patients should be started, to reduce and protect from getting the infections. The molecular techniques such a real-time seem to be accurate, sensitive, and rapid for the detection of this agent in CSF, which needs to be introduced. Moreover, continuous surveillance to detect changes in the microbiology of organisms causing bacterial meningitis or their sensitivity in our community is essential to update these recommendations.

REFERENCE

1. Abdelkader. M. M, Aboshanab. K. M , El-Ashry. M.A, Aboulwafa.M..M (2017) Prevalence of MDR pathogens of bacterial meningitis in Egypt and new synergistic antibiotic combinations. PLOS ONE DOI:10.1371/journal. pone. 0171349.p :1,16.
2. Ahmed ,S . Thomas ,V. and Qasim S. (2008) :Cerebro spinal Fluid Analysis in Childhood Bacterial Meningitis. Oman Medical Journal, Volume 23, Issue 1,p: 1-2.
3. Al-Tawfiq JA[1], Abukhamsin A. (2009) A 24-year study of the epidemiology of human brucellosis in a health-care system in Eastern Saudi Arabia. J Infect Public Health. 2(2):81-5. doi: 10.1016/j. jiph.2009.03.003.
4. Bueno, S.C. McCracken, G.H (2005) Bacterial Meningitis in Children. Pediatr Clin N Am 52 :795– 810
5. Caroline.LT, and Brian. M.G (2007) Meningococcal carriage in the African meningitis belt Tropical Medicine, London, UK. Lancet Infect Dis; Vol 7: 797–803
6. Chanteau , S. Angela, M.C. Djibo , S Nato, F. and Boisier, P (2007) Biological diagnosis of meningococcal meningitis in the African meningitis belt: Current epidemic strategy and new perspectives. Vaccine 25S (2007) A30–A36.
7. Clinical and Laboratory Standards Institute document M100-S21. (2011) .Performance Standards for Antimicrobials Susceptibility, Testing; Twenty-First Informational Supplement.
8. Elsaid, M F. Flamerzi, A. A. Bessisso, M S .and Elshafie , S. S (2006) Acute bacterial meningitis in Qatar .Saudi Med J; Vol. 27 (2):204-210.
9. Global Burden of Disease, (2013). "Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013.". Lancet. 385 (9963): 117–71.

10. Hopkin, J. (2010). Acute bacterial meningitis in infants and children. Journal of Lancet infect Disease. 10, 32-42
11. http://www.who.int/emc. (2011) access date Nov. (2017)
12. Hui, A.; Tong, P.; Mok, V.; Chow, K. and Wong, L. (2003). Bacterial meningitis in Hong kong. Journal of Clinical Neurology and Neurosurgery. Elsevier. in the Chinese. Pp 366-370.
13. Kim, K.S. (2010): Acute bacterial meningitis in infants and children. *Lancet Infect Dis*; Vol 10: 32–42.
14. McCracken, G.H and Llorens, X.S (2003)."Bacterial meningitis in children". Lancet 361 (9375):2139–48.
15. Muangchana, Ch.; Chunsuttiwat, S.; Ngarm, S.R. and Kunasol, P. (2009). Bacterial meningitis incidence in the children estimated by a rapid assessment tool (RAT). Journal of infection. Pp 553-557. England.
16. Nagarathna, S, Veenakumari, H.B.and Chandramuki,A. (2012). Laboratory Diagnosis of Meningitis, Prof. George Wireko-Brobby (Ed.), ISBN: 978-953-51-0383-7.
17. Shembesh, N.M, Bargathy, S.M, Rao, B. N. and Kashbur, M.A (1998) prospective study of bacterial meningitis in children from north-eastern Libya US National Library of Medicine National Institutes of Health Search database;18(3):203-7
18. Tunkel, A.R. Hartman, B.J and Kaplan, SL. (2004). "Practice guidelines for the management of bacterial meningitis" (PDF). Clinical Infectious Diseases. 39 (9): 1267–84.
19. World Health Organization (2001) V method and materials Antimicrobial and support therapy for bacterial meningitis in children. WHO/IVB/11.09.
20. Youssef, F.G.; El-sakka, H.; Azab, A.; Eloun, S.; Chapman, G.D.; Ismail, T.; Mansour, H.; Hallaj, Z. and Mahoney, F. (2003). Etiology, antimicrobial susceptibility profiles, and mortality associated with bacterial meningitis among children in Egypt. Journal of infection. Elsevier. Pp 1047-2797.