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Prevalence of meningitis among different age

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اوصي باستلام وقبول بحث التخرج للطالب يوسف سالم يحيى بعد اكماله متطلبات البحث كاملة ودون اي نقص واكماله جميع الاحصائيات والتعديلات المطلوبة منه

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Introduction

Meningitis is an inflammation of the tissues that cover the brain and spinal cord. Bacteria, viruses, or fungi may cause meningitis. Viral meningitis is the most common form of meningitis and is caused by an infection with one of several types of viruses(1). Meningococcal meningitis is caused by the bacteria *Neisseria meningitidis*, and causes a more severe disease that requires prompt treatment of the patient with antibiotics(2)

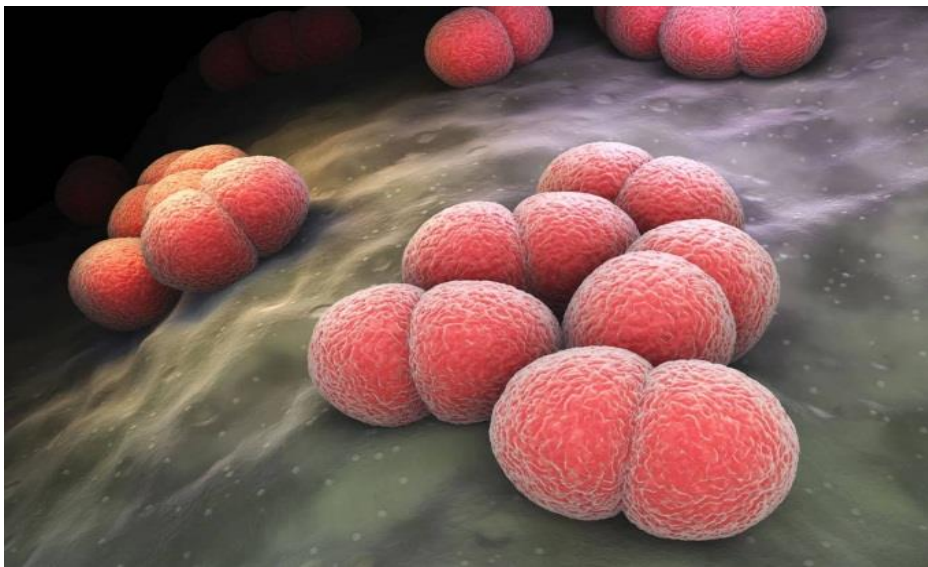
There are other types of bacterial meningitis, so it is also important to confirm which type of bacteria is causing the meningitis to determine if antibiotics are needed to prevent possible illness in exposed people. Symptoms of meningitis may include fever, rash, headache, stiff neck, nausea, vomiting, and fatigue(3). These symptoms are often difficult to identify in infants, who, when suffering from viral meningitis may become irritable lethargic, inconsolable, or refuse to eat. Since viral and bacterial meningitis often have similar symptoms, it is important to see a health care provider immediately if you or your child has these symptoms (4)

Bacterial meningitis, an infection of the membranes (meninges) and cerebrospinal fluid (CSF) surrounding the brain and spinal cord, is a major cause of death and disability worldwide (5)

In recent years, despite improvements in antimicrobial therapy and intensive care support, overall mortality rates related to bacterial meningitis of around 20 to 25 % have been reported by major centers . Early clinical suspicion and implementation of appropriate antimicrobial therapy are critical to minimize adverse outcomes(6)

The presence of microorganisms in normally sterile body fluid specimens may be representative of life-threatening infections(7) Infection of normally sterile body fluids often results in severe morbidity and mortality; therefore, rapid and accurate microbiological assessment of these specimens is important to successful patient management(8)

meningitis was first described in the 1020s in Avicenna's *The Canon of Medicine* and again more accurately by Avenzoar of al-Andalusia in the 12th century. symptoms of the disease were also noted in 1805 by the Swiss Gabinetto Vieusseux (a scientific literary association) during an outbreak in Geneva Switzerland in 1887 Dr. Anton Weichselbaum(1845-1920) of Vienna became the first to isolate the specific germ meningococci(9)



Figure(1):picture of Neisseria meningitidis

Meningitis may develop in response to number of causes most *pneumoniae*, *Neisseria meningitides*, *Haemophilus* prominently bacterial as *Streptococcus Influenzae*, *Escherichia coli*, Group B Streptococcus or viruses, physical injury, cancer and drugs(10)

Acute bacterial meningitis remains an important cause of death and neurological sequelae in children, the clinical features of meningitis are often non-specific and may overlap with those of other infections. Early diagnosis and appropriate treatment are perhaps the most important steps in management, but published data suggested that fewer than half of the cases of meningitis are identified at first assessment(11)

Approximately 90% of viral meningitis cases are due to a group of common intestinal viruses called enteroviruses. These viruses are typically spread from person-to-person through direct or indirect contact with fecal material, usually on unclean hands or contaminated environmental items(12)

Viruses can be passed on to others beginning about three days after someone is infected until about 10 days after symptoms occur, although very few exposed persons develop meningitis. Bacterial meningitis can be caused by bacteria such as *Haemophilus*, *Streptococcus*, or *Neisseria meningitidis*, which are spread by direct contact with saliva or respiratory droplets from the nose and throat of an infected person(13)

The type of meningitis can be confirmed through laboratory tests performed on spinal fluid if needed. There is no specific treatment for viral meningitis, most patients will completely recover on their own with bed rest and plenty of fluids. However, health care providers often will recommend medicine to relieve fever and headache. For bacterial meningitis, antibiotics are needed that treat the specific bacterial cause(14)

Antibiotics are only recommended as a preventative measure for those persons exposed to a person with meningitis caused by the bacteria *Neisseria meningitidis* or certain forms of *Haemophilus*. When a single instance of *Neisseria meningitidis* occurs, the state and county health departments work together to insure that appropriate contacts obtain antibiotics(15)

Only people who have been in close contact with saliva or respiratory secretions such as household members, intimate contacts, health care personnel performing mouth-to-mouth resuscitation, and day care center playmates are rifampin, recommended to obtain a ciprofloxacin, ceftriaxone, or azithromycin) from their prescription for a specific antibiotic physician or through the health department Casual contacts including classmates, co-workers, or those in a workplace setting are not usually at increased risk of disease and do not need treatment with the antibiotic. When clusters or outbreaks occur, the health department may expand the recommendations for which groups need to receive antibiotics to prevent possible spread. Antibiotics do not protect people from future exposure to *Neisseria meningitidis*. For persons exposed to a person with viral meningitis or meningitis caused by most bacteria, antibiotics are not a necessary preventative measure(16)

Viral meningitis occurs throughout the year, but it is most commonly seen in summer and autumn . A study conducted in England between 2011 and 2014 showed that the incidence of viral meningitis was 2.73 per 100,000, with the largest number of cases caused by non-polio enteroviruse(17)

study in the United Kingdom (UK) showed that the incidence of viral meningitis caused by EV and human parechovirus (HPEV) is double that of bacterial meningitis(18)

In addition, a study done in Denmark showed similar findings, with non-polio enteroviruses being the most common causative agent(19)

They also showed that the incidence of aseptic meningitis decreases with increasing age 58.7 per 100,000 after birth, 38.7 per 100,000 in 6-month-old infants, and 15.6 per 100,000 in 5-year-old children(19)

A study conducted in China found that viral meningitis caused by EV-71 accounted for approximately 55.2% of neurological disorders . In South Africa, children less than 10 years of age constituted 87.3% of those affected by an aseptic meningitis outbreak in which the responsible pathogen was coxsackievirus A9(20)

higher percentages of viral meningitis were reported in Jordan, reaching 83% of all meningitis cases between 2001 and 2004, and 81% in 2014 [19]. In a two-year study in Gaza

(2013–2014), 72% of meningitis cases were classified as viral meningitis, caused mainly by an EV infection (35%).(21)

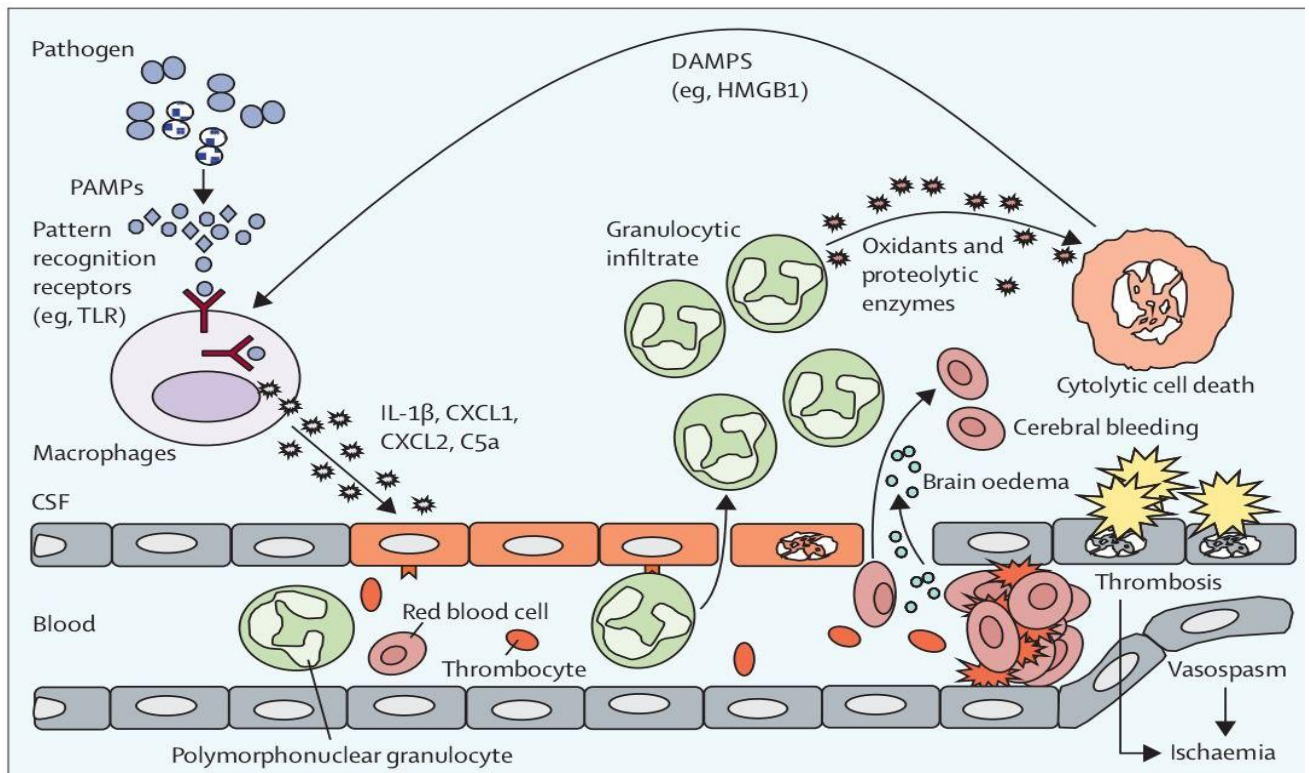
in 2014 in the USA and the Netherlands.^{4,5} However, globally, the number of reported cases has risen during the past decade, with incidence strongly related to measures of deprivation.² The greatest burden of disease remains in Africa, particularly within the Sahel region of west and central Africa, with incidences up to 1000 per 100 000 population.^{6,7} There is notable seasonality, with increased incidence rates occurring during cooler, drier seasons in both the northern and southern hemispheres(22)

major shifts during the past four decades. The incidence of the disease increased with the start of the HIV-1 epidemic in the 1980s, and subsequently decreased with the introduction of antiretroviral treatments in the 1990s and the introduction of conjugate vaccines for children from 1987 onwards.⁹ The persistence of bacterial meningitis and burden on children and young people has thus led to WHO developing a roadmap towards defeating meningitis by 2030(23)

A result of the success of childhood immunisation programmes, the focus of preventive measures has somewhat shifted away from the three most common causative pathogens, *Streptococcus pneumoniae*, *Neisseria meningitidis*, and *Haemophilus influenzae*, towards other common causative bacteria of meningitis. *Streptococcus agalactiae* (group B streptococci) is the most common cause of bacterial meningitis in neonates and young infants(24)

Neonatal meningitis is also associated with Gram negative bacteria, such as *Escherichia coli*. In a prospective, observational, single-site study of meningitis in infants aged younger than 90 days in Luanda, Angola, a causative pathogen was identified in only 212 of 1287 neonates with suspected or proven bacterial meningitis, most commonly *Klebsiella* spp, *S pneumoniae*, *S agalactiae*, and *E coli*(25)

Listeria monocytogenes causes food-borne meningitis in specific risk groups, particularly in immunocompromised individuals. The incidence of listerial meningitis is low in countries with regulated food hygiene requirement and food safety criteria, accounting for less than 5% of all community-acquired meningitis cases(25)



Figure(2):schematic diagram of the pathogenic steps of bacterial meningitis

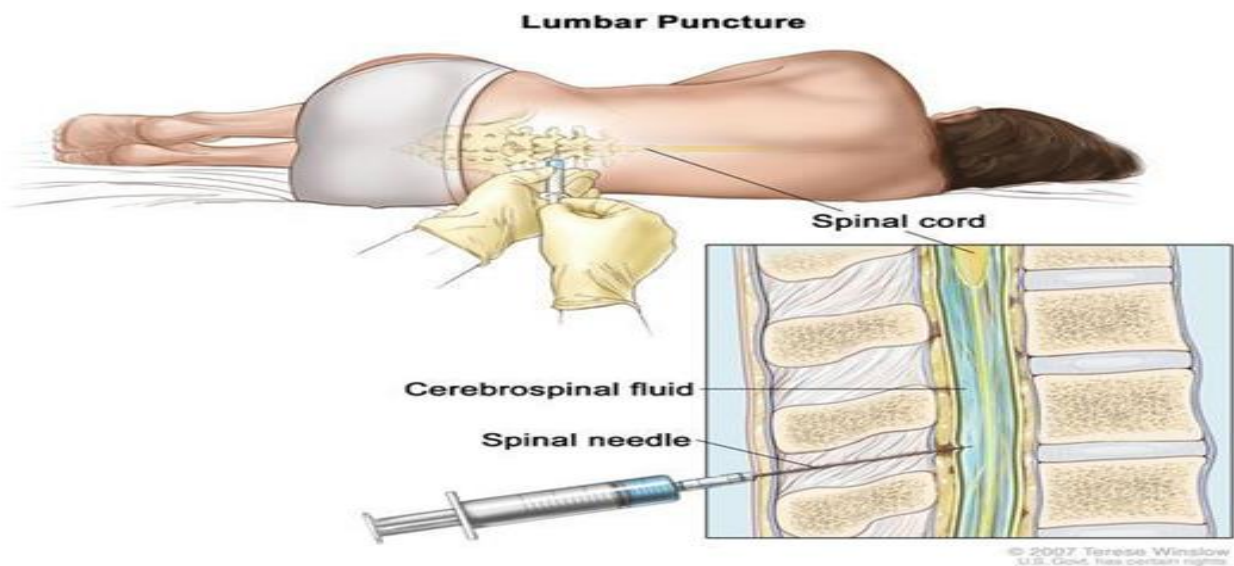
Bacterial meningitis develops when pathogens reach the CSF-filled subarachnoid space, either via a haematogenous route or by direct migration from nearby infection. Autolysis or host-induced and antibiotic-induced bacterial lysis results in the liberation of diverse PAMPs(17)

Their presence is recognised by resident immunocompetent cells (eg, macrophages) by means of pattern recognition receptors (eg, TLRs), which results in cell activation and the production of a huge variety of cytokines, chemokines, and complement factors (eg, IL-β, CXCL1, CXCL2, or C5a). Consequently, large numbers of polymorphonuclear granulocytes are recruited into the CSF, which also liberate pro-inflammatory and chemotactic agents, thereby exaggerating and perpetuating inflammation(18)

Among the factors released by granulocytes are cytotoxic products such as oxidants and proteolytic enzymes that can damage host tissue. Damaged cells can, in turn, liberate so-called DAMPs, like high mobility group box 1 protein (HMGB1), which can fuel inflammation by interacting with pattern recognition receptors like TLR-4. The main target of inflammation is the cerebral vasculature(18)

Cerebrospinal fluid examination is essential in the diagnostic workup of all patients with suspected meningitis. Prior to a lumbar puncture, the safety of the procedure should be assessed. Lumbar puncture can be performed safely in the most patients with bacterial meningitis. Nevertheless, in patients with brain shift due to a mass lesion, a lumbar puncture might be contra-indicated due to the risk of brain herniation. Other contraindications for

lumbar puncture include coagulopathy, either due to anticoagulant use, severe thrombocytopenia or an uncorrected bleeding diathesis, and local skin infections at the site of the puncture(19)



Figure(3):Lumbar puncture procedure

Cerebrospinal fluid culture is the gold standard for the diagnosis of bacterial meningitis, being positive in 85% of cases, while allowing antimicrobial sensitivity testing of the identified pathogen. In a multicentre cohort study of adults with suspected meningitis, cranial imaging delayed lumbar puncture, with an associated reduced diagnostic yield from cerebrospinal fluid culture(20)


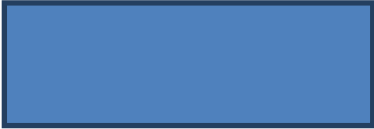

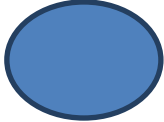



Recurrence of meningitis occurs in 7% of patients, with risk factors for recurrence including cerebrospinal fluid leakage and specific immunodeficiencies such as asplenia or hyposplenism. In patients with meningitis and persistent cerebrospinal fluid leakage, surgical repair of the leakage and vaccination against *S pneumoniae*, *N meningitidis*, and *H influenzae* type B are advised. Patients with asplenia or hyposplenism should be vaccinated against *S pneumoniae* and *H influenzae* type B all patients should be vaccinated with both PPV23 and PCV13, because of the high risk for recurrence(21)

Some of the most common complications associated with meningitis are hearing loss , which may be partial or total – people who have had meningitis will usually have a hearing test after a few weeks to check for any problems. recurrent seizures (epilepsy) problems with memory and concentration(22)

Patients and Methods

The study begin from 25 on September to 28 on December this cross-sectional, multi-center study was conducted at the albatool teaching hospital and from baqubah general hospital were performed using data from the patients , the collected data was 50 case ,20 case from albatool teaching hospital and 30 case from baqubah teaching hospital, the child aged from 1 year to 10 years and the adult aged from 15 to 75 years , all information was collected in a questionnarie, which was attached at the end of research.

العنوان // استمارة معلومات المريض

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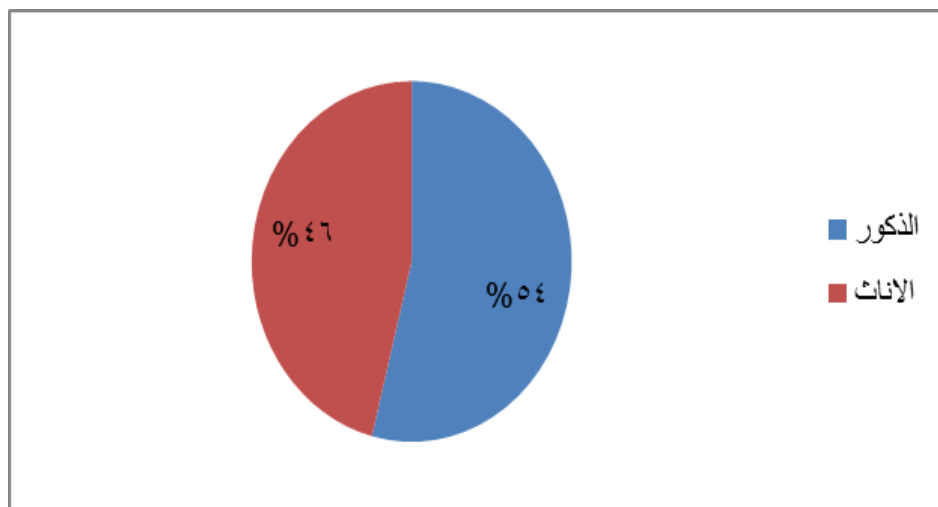
Result and Discussion

The results of my study that tilted (prevalence of bacterial meningitis among different age) showed that most meningitis cases at the age group (1-10) years in percentage 42% while cases were few in the age group (17-18),(31-40)in percentage 40% and 60% respectively as show in table (1)

Table(1)Distribution of meningitis cases according to age groups

| Age groups | Frequency | Percentage % |
|------------|-----------|--------------|
| ١-١٠ | ٢١ | %٤٢ |
| ١١-٢٠ | ٥ | %١٠ |
| ٢١-٣٠ | ٥ | %١٠ |
| ٣١-٤٠ | ٣ | %٦ |
| ٤١-٥٠ | ٦ | %١٢ |
| ٥١-٦٠ | ٥ | %١٠ |
| ٦١-٧٠ | ٣ | %٦ |
| ٧١-٨٠ | ٢ | %٤ |
| total | ٥٠ | %١٠٠ |

The percentage of female was 54% Compared to 46% for males as show in the figure(4)



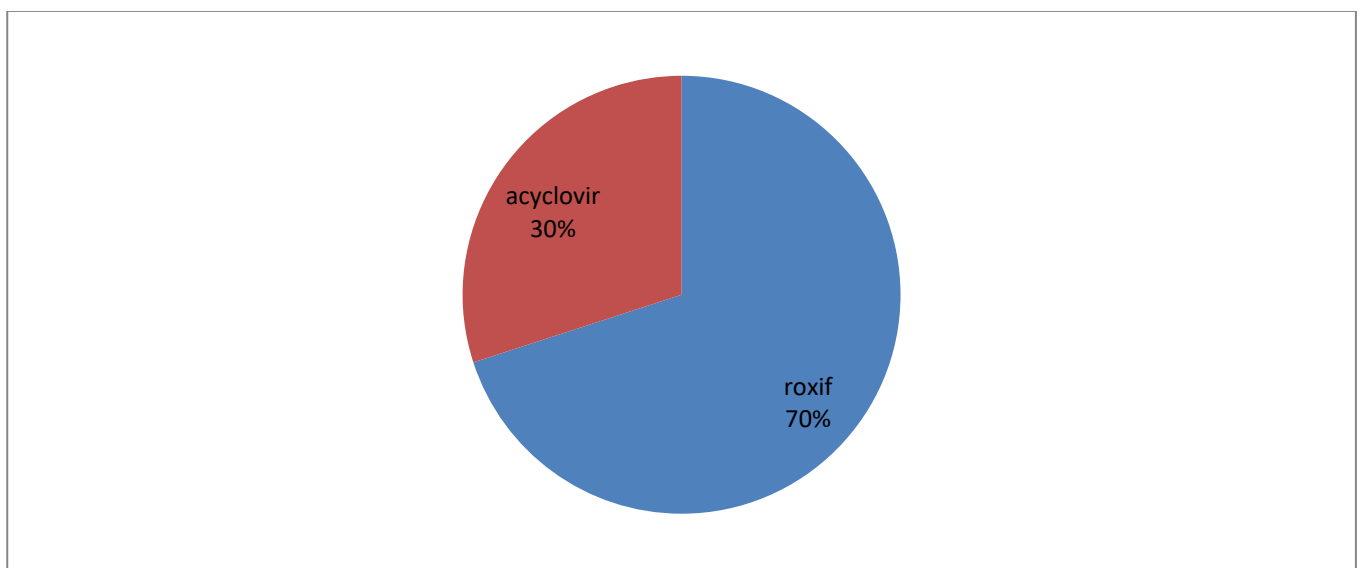
Figure(4): Distribution of meningitis cases according to gender.

The result show that the percentage of infected male within the age group (1-10),(41-50) was higher in percentage 24%,and 10% respectively while the percentage of female was higher within (21-30),(61-70) in percentage 10% and 4% respectively

Table(2):Distribution of age groups of the patients according to gender

| Age groups | Gender | Frequency | percentage | Total |
|------------|--------|-----------|------------|-------|
| 1-10 | Male | 12 | ٪٢٤ | ٢1 |
| | Female | 9 | ٪١٨ | |
| 11-20 | Male | 3 | ٪6 | ٥ |
| | Female | 2 | ٪٤ | |
| 21-30 | Male | 0 | ٪0 | 0 |
| | Female | 0 | ٪١0 | |
| 31-40 | Male | 2 | ٪٤ | 3 |
| | Female | 1 | ٪٢ | |
| 41-50 | Male | 0 | ٪١0 | 6 |
| | Female | 1 | ٪٢ | |
| 51-60 | Male | 4 | ٪٨ | 0 |
| | Female | 1 | ٪٢ | |
| 61-70 | Male | 1 | ٪٢ | 3 |
| | Female | 2 | ٪٤ | |
| 71-80 | Male | 0 | ٪0 | 2 |
| | Female | 2 | ٪٤ | |
| total | Male | 27 | ٪٥٤ | ٥0 |
| | Female | 23 | ٪٤6 | |

The treatment within Roxif showed high efficacy in treatment and in different age groups,whith apercentage of 70%,followed by the acyclovir whith apercentage 30% where it is considered one of the most used antibiotics in treatment as shown In figure (5) and table(3)

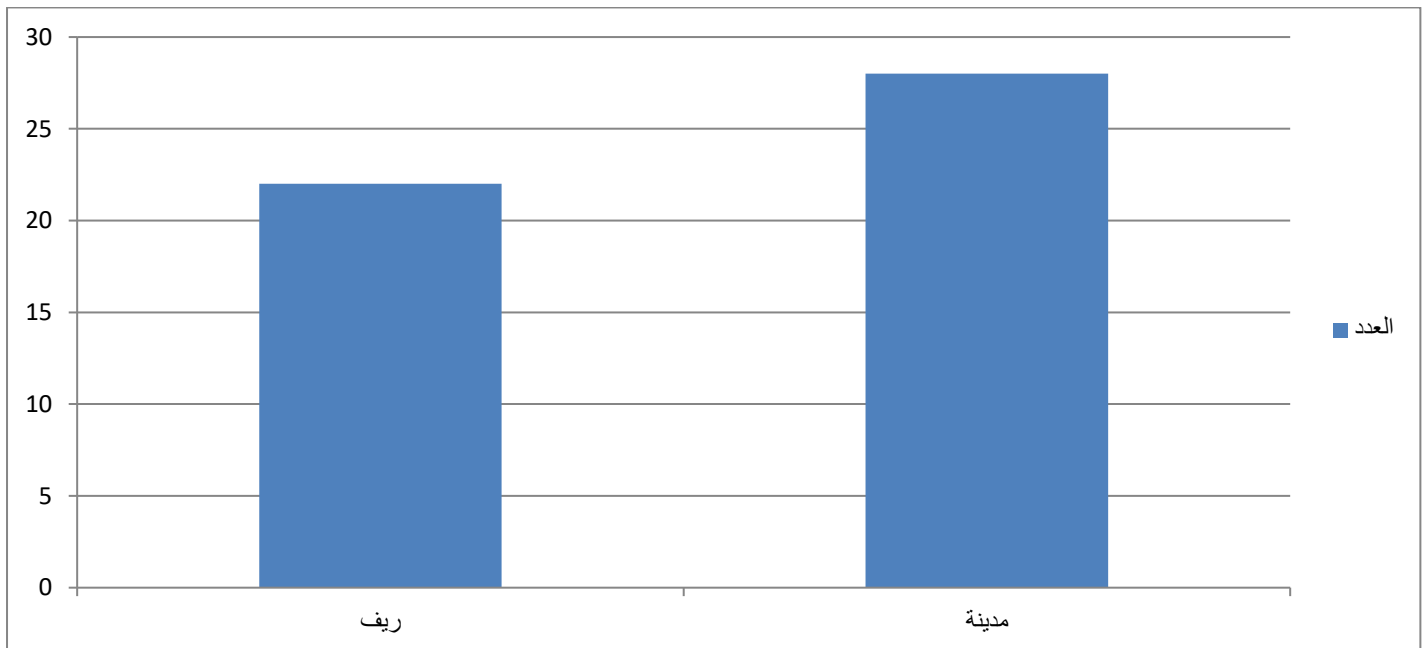


Figure(5): percentage of the treatmentst used in the study.

Table(3): Distribution of treatments used according to age groups

| Age groups | Treatment | Number | Percentage | Total |
|------------|-----------|--------|------------|-------|
| ١-١٠ | roxif | ١٩ | %٣٨ | ٢١ |
| | acyclovir | ٢ | %٤ | |
| ١١-٢٠ | roxif | ٢ | %٤ | ٥ |
| | acyclovir | ٣ | %٦ | |
| ٢١-٣٠ | roxif | ٣ | %٦ | ٥ |
| | acyclovir | ٢ | %٤ | |
| ٣١-٤٠ | roxif | ١ | %٢ | ٣ |
| | acyclovir | ٢ | %٤ | |
| ٤١-٥٠ | roxif | ٤ | %٨ | ٦ |
| | acyclovir | ٢ | %٤ | |
| ٥١-٦٠ | roxif | ٢ | %٤ | ٥ |
| | acyclovir | ٣ | %٦ | |
| ٦١-٧٠ | roxif | ٢ | %٤ | ٣ |
| | acyclovir | ١ | %٢ | |
| ٧١-٨٠ | roxif | ٢ | %٤ | ٢ |
| | acyclovir | ٠ | %٠ | |
| total | roxif | ٣٥ | %٧٠ | ٥٠ |
| | acyclovir | ١٥ | %٣٠ | |

The percentage of patients 56% from urban(city) according to informations in quissionairs ,where the age group(1-10) years showed the highest percentage , in urban and rural as shown in figure(6)



Figure(6): research sample according to residence.

The results of the study showed that for patients with meningitis,the percentage of children of this age group (1-10)years were the most frequent in meningitis cases, while in the country side or in the city ,and the percentage of males was higher than females ,where the meninges are considered aserious diseases,and the infection does not occur easily unless

the csf fluid penetrated , also.other infections,viruses and parasite , need infection to inter the blood stream or csf.

Conclusion

Meningitis is a serious disease that can lead to severe complications in young and old, and that therapeutic intervention, whenever it was early, was the reason for saving lives, and that early treatment led to an improvement in the condition of patients, both young and old,with the different speed of recovery

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