



**MEDICAL UNIVERSITY - PLEVEN  
FACULTY OF MEDICINE**

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**DISTANCE LEARNING CENTRE**

**DEPARTMENT OF INFECTIOUS DISEASES, EPIDEMIOLOGY,  
PARASITOLOGY AND TROPICAL MEDICINE**

**PRACTICAL EXERCISE № 5 –  
VIRAL INFECTIONS OF THE CENTRAL NERVOUS SYSTEM –  
CLINICAL FEATURES, DIAGNOSIS,  
DIFFERENTIAL DIAGNOSIS, TREATMENT  
THESIS**

**FOR E- LEARNING IN INFECTIOUS DISEASES  
ENGLISH MEDIUM COURSE OF TRAINING**

**SPECIALTY OF MEDICINE**

**ACADEMIC DEGREE: MASTER**

**PROFESSIONAL QUALIFICATION: DOCTOR OF MEDICINE**

**PREPARED BY**

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**PRACTICAL EXERCISES – THESES**

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**I. Aim of the practical exercise** – after completed exercise, the students must be able to take informative history and physical examination of patients with central nervous system (CNS) infectious diseases, to group symptoms in syndromes, to prepare plan for diagnosis (and differential diagnosis), to be familiar with major principles of etiological and supportive treatment of CNS infectious diseases.

**II. Tasks for achievement of mentioned above aim:**

1. Discussion on specific features of history in CNS infectious diseases emphasizing on specific features of CNS infectious diseases with viral etiology.
3. Importance of epidemiological part of history of mentioned above viral agents.
4. Information about past history and comorbidity.
5. Taking of physical examination of a patient with CNS infectious disease.
6. Discussion about syndromes in viral CNS infectious diseases and their diagnostic value.
7. Discussion about major principles of etiological (if has) and supportive treatment of viral CNS infectious diseases.

**III. Theoretical part of the exercise:**

**INTRODUCTION**

Historically, aseptic meningitis was the term for an illness with acute onset, clinical signs of meningitis, white blood cells (WBC) but no bacteria in the CSF, and a short and benign course. This illness was most likely enteroviral meningitis. Aseptic meningitis is most commonly caused by a viral agent, especially an enterovirus, when the disease occurs in epidemics (summer and autumn). Aseptic meningitis can also result from a wide variety of infectious (**Table 1**) and noninfectious causes.

**Table 1.** Infectious Causes of Aseptic Meningitis

<b>Bacteria*</b>	<i>Mycobacteriom tuberculosis</i> , bacteria originated from brain abscess, epidural abscess, acute or subacute bacterial endocarditis; <i>Bartonella henselae</i> (cat scratch disease)
<b>Viruses</b>	Enteroviruses, mumps, lymphocytic choriomeningitis, Epstein-Barr virus, arbovirus, Varicella-zoster virus, Herpes simplex virus, HIV, influenza A and B viruses, adenovirus, measles virus, rubella virus, Cytomegalovirus, and other viruses
<b>Rickettsiae</b>	<i>Rickettsiae rickettsiae</i> (Rocky Mountain spotted fever), <i>Rickettsiae prowazecki</i> (typhus), <i>Coxiella burnetii</i> (Q fever), <i>Ehrlichia chafeensis</i>
<b>Chlamydia</b>	<i>Chlamydia psitacii</i>
<b>Spirochetes</b>	<i>Treponema pallidum</i> , <i>Borrelia burgdorferi</i> , <i>Leptospira interrogans</i>
<b>Mycoplasmas</b>	<i>Mycoplasma pneumoniae</i> , <i>Mycoplasma hominis</i> , and <i>Ureaplasma urealyticum</i>
<b>Fungi</b>	<i>Candida albicans</i> , <i>Cryptococcus neoformans</i> , <i>Coccidioides immitis</i> , <i>Hystoplasma capsulatum</i> , <i>Blastomyces dermatidis</i>
<b>Protozoa</b>	<i>Toxoplasma gondii</i> , <i>Plasmodium falciparum</i> , <i>Naegleria fowleri</i> , <i>Acanthamoeba</i> , <i>Trichinella spiralis</i>
<b>Nematodes</b>	<i>Toxocara</i> , <i>Baylisacaris procyonis</i> , <i>Angyostrongylus cantonensis</i>
<b>Cestodes</b>	<i>Taenia solium</i> , <i>Echinococcus granulosus</i>

\* Partially treated meningitis may present as an aseptic meningitis

## A. Viral meningitis

### 1. Etiology

a. The **enteroviruses** (coxsackieviruses A and B, echovirus, numbered enteroviruses, and poliovirus) are the most common causes of viral meningitis.

b. **Mumps virus** used to be relatively frequent cause of viral meningitis, but the frequency of its involvement has decreased with vaccination.

c. **Herpes simplex virus (HSV), rubella, cytomegalovirus (CMV), rabies virus, the arboviruses,** and many other viral agents also may cause meningitis.

### 2. Epidemiology

a. Enterovirus infections commonly occur in late summer and early autumn; mumps viral infections typically occur in late winter and early spring.

b. Viral meningitis is principally a disease of the young; it rarely occurs after age 40.

**3. Clinical manifestations.** Signs and symptoms of viral meningitis develop gradually over a few days to a week.

a. Patients usually complain of a sore throat, fever, anorexia, malaise, and myalgia.

b. More indicative symptoms develop with time, including lethargy, vomiting, severe headache and stiff neck.

c. Physical findings include fever and nuchal rigidity, with or without Brudzinski's sign and Kernig's sign.

**4. Diagnosis.** As in bacterial meningitis, the diagnosis is usually confirmed by the examination of CSF obtained by lumbar puncture (see *Table 2*).

**Table 2.** Characteristics of Cerebrospinal Fluid in Different Types of Meningitis

Type of Meningitis	Leucocytes x 10 <sup>6</sup> /L (Range)	Predominant Cell Type	Protein Levels	Glucose concentration	Microbiological Tests
Bacterial	0 – 60 000	Neutrophils	Elevated	Very low	Positive*
Viral	0 – 1 000	Mononuclear cells**	Normal to slightly elevated	Normal	Negative
Tuberculous	25 – 500	Mononuclear cells	Elevated	Low	Negative
Fungal	0 – 1 000	Mononuclear cells	Elevated	Low	Negative***

\* Uncluding Gram stain, culture, and rapid diagnostic tests for bacterial antigens.

\*\* Neutrophils may predominate in early stages.

\*\*\* India ink tests, fungal cultures, and agglutination tests for fungal antigens may be positive.

a. The opening pressure may be elevated.

b. The **number of leucocytes** is moderately increased, typically to 100-500 to 10<sup>6</sup>/L; counts over 1000 to 10<sup>6</sup>/L are rarely observed.

c. The CSF **protein concentration** may be normal or moderately elevated.

d. The CSF **glucose concentration** is usually normal.

e. Identification by **cell culture** of a specific virus as the causative agent is successful in about 25%-30% of cases and is not routinely used.

**5. Treatment** for most cases of viral meningitis is symptomatic and supportive. In an otherwise healthy individual, hospitalization is not absolutely required when the diagnosis of viral meningitis is unequivocal.

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