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# METHODOLOGICAL RECOMMENDATIONS FOR TEACHERS FOR THE PRACTICAL STUDIES OF PREPARATION FOR PHTHISIOLOGY GENERAL PRACTITIONERS

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| *Academic discipline* | Phthisiology |
| *Subject lesson number 1* | Epidemiology of tuberculosis. Etiology, pathogenesis of tuberculosis. Immunity in tuberculosis. Clinical classification of tuberculosis. |
| *Course* | 4 |

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**Topic № 1: Epidemiology of tuberculosis. Etiology, pathogenesis of tuberculosis. Immunity in tuberculosis. Clinical classification of tuberculosis.**

**1.*Currency of the topic***

Tuberculosis epidemiology is considered as a fundamental science which supports the social health care system. Knowing of the science is a basis to successfully inculcate the National fighting tuberculosis (TB) programme, starting from the moment of being infected to the moment of one's recovery or death.

There are several stages in TB running: 1) getting infected (contact MTB); 2) the beginning and running of the 1st process; 3) TB development, ending by either recovery or death. In order to understand dynamics of TB spreading over population one has to single out 3 sorts of questions. They are analytical epidemiology, descriptional epidemiology and prognostic one. Main factors to define risk of a contact with MTB are as follows: a) general quantity of risk patients existing in society, b) contagiosis period duration, c) quantity and quality of 'healthy - invalid' contacts taking place per a unit of time.

It should be noted that risk of one being infected is higher under a prolonged contact period than that of under a short one. At the moment of MTB definition in an invalid' sputum, the number of infectious contacts equals to only 30% - 40%. That is, there might be a lot of people getting infected, if a correct diagnosis had not been set up or proper medical treatment hadn't been commenced.

Risk factors are as follows: population density, conditions of living, patient's conduct, and number of a patient's family, climate conditions, age, gender and sources of infection, illnesses such as diabetes mellitus, ulcer of the stomach, duodenum, alcoholism, pneumoconiosis, chronic unspecific disease of lungs).

Thus, knowing of TB etiology, epidemiology and pathogenesis would allow us 1) to better understand mechanism of the decease evolution, that is a processes of healing and pathomorphosis (changes which are due to MTB inculcation, chemo-therapy and evolution of drug stability of MTB), 2) to come down overall number of TB cases as well as level of TB mortality, risk of getting infected etc.

**2. General goal:** to master of the knowledge about general questions of tuberculosis.

**3. The concrete aims:**

-to find out TB development risk factors

-to find out TB stimulus peculiarities

-to find out ways of infecting by TB mycobacterium

-to analyze the main chapters of clinical classification of TB and to define a diagnosis according to that analysis.

**4. The tasks for student's independent work during the preparation for the class.**

-to have shown one's ability (skills) to practically apply physical methods for examining a patient and then to prove correctness of one's resume to be presented as a diagnosis.

-to evaluate data received under a patient observation from the point of their correspondence to either norm or pathology, being able to unite a disease signs into some well grounded clinical cases (syndromes).

-to be able compare likeness and difference of real clinical TB cases with those ones to be considered as theoretically possible.

-to have selected and well grounded a patient oriented observation scheme aiming to prove or expel a lung TB diagnosis.

-according to the plan (scheme) to collect data pertinent to a patient, evaluate whether such data is sufficient to answer the questions regarding:

a) type of the TB case ; b) TB whereabouts;

c) TB clinical form; d) TB phase;

e) Bacterium allocation presence; i) MBT drug sensitiveness;

f) TB category; j) TB cohort;

h) possible complications.

**4.1. The list of the main terms, parameters and characteristics which a student has to master during the preparation for the class.**

**MTB** (acid- fast bacterium-AFB) - Mycobacterium tuberculosis / acid- fast bacterium – pathogen of the disease; Grampositive, acid fast micro-organisms: obligatory anaerobes and facultative intracellular parasites, related to the genus Micobacteriacae of Actinomycetales family. Human being pathogenic ones (bacterium), which used to be tinted - according to Zheel Nelsen - by a rosy color over the blue background.

-Mycobacterium tuberculosis (it is human type in 90-97% cases), human being TB stimulus.

-M.bovinus (in 2-8% cases), large size horny cattle stimulus.

-M.africanum (0.1-2%) - medium type.

-M.avium and M. intracellulare are not pathogenic as far as a healthy organism is concerned, but they can cause TB among HIVinfected ones (in AIDC related cases - from 15% to 24% cases )

**Infection rate** It’s the percentage of positive tuberculin skin test cases divided by the total number of the examined, excluding persons with postvaccination immunity. This parameter characterizes the reservoir of tuberculosis infection and reflects overall epidemic situation on TB. According to statistics, infection rate is 8.5 % in children of 7-8 years, 19.5 % in children aged 13-14 years, 80-90 % in adults for age before 40 years.

**Infection risk** Infection risk is the accretion of infection cases in a given year. This parameter should not exceed 1%. If infection risk exceeds 2%, then 90% population will be infected by the age of 70.

**Infectiousness parameter** This is a number of persons, who can be infected by one patient with the clinically active disease. With well-organized infection control infectiousness parameter should not exceed 10.

**MBT pathogenecity** It is the capability of mycobacteria species to cause diseases. The basic factor of pathogenecity is toxic glyco-lipid- cord factor, which invokes MBT growth in a nutrient medium, resulting in MBT getting shape of plaits. Saprophytes are not characteristic of the cord factor.

**MTB virulence** It is the degree of pathogenecity and capability of Mycobacteria to grow and multiply in human body causing specific (cheesy or caseous necrosis of epithelioid-cellular granulomas with Pirogov-Langhans' cells) pathological changes. Mycobacterium strain is said to be virulent if 0.1-0.01mg of it causes clinical symptoms of tuberculosis and death of a 250-300g guinea pig

in 2 months. MTB variability It is their capability to gain new or regain their properties. MTB morphological structure alteration means: appearance of different forms such as granular ones, coccal ones, filtrating, in capsulated ones, atypical strains and L-form. Filtrating forms are tiny fragments of MBT used to appear under adverse environment and being capable of reversing. L –form of MTB is weakly virulent one that either completely lost its shell or got a shell defect. That is a form to acquire shell changed morphology and decreased metabolism. L-forms are not tapped by a bacterioscopy method.

**MBT persistence** Loss of MTB virulence due to either environmental influence or antituberculous drugs, combined with MTB variability (7) [meaning transition MTB - L-forms, filtrating ones, granular ones, comminuted ones]. MBT reversion Restoration of virulence and structure of MBT, having been in a persistent state for 2-15 years, return MBT to a bacterial form.

**MBT drug resistance** MBT resistance with regard to anti-tubercular drugs MDR (multi drug resistance) Type of multiple resistances against the combination of isoniazid and rifampicin (H+R). WDR (wide drug resistance) Type of multiple resistances, including H+R + other medications of the 1st line. EDR (extreme drug

resistance) Type of multiple medication MBT resistance with regard to all drugs of the 1st line+ drugs of the 2nd line.

**Atypical MBT** Mycobacterium, which are not pathogenic with people and animals (saprophytes) plus relatively pathogenic MTB, being able in some cases to cause mycobacteriosis, similar to TB. Saprophytes don’t contain cord-factor. According to E.H.Runyon, next kinds of atypical MTB are as follows:

1.photochromogeneous (M. Kansasii M. marium)

2. scotochromogeneous (M. aguae M.scrofuloceum)

3. non photochromogeneous (M.avium M.intracellularae. M.xenopii M.haemophilum)

4. rapidly growing MBT (saprophytes): (M.phlei M.smegmatis M.fortbitum).

Sensitin Atypical mycobacterium vital activity product, which having been intradermal injected, leads to a positive reaction (papule).

**Dispensary follow up category**

Dispensary observation group being defined by both 1) a type of TB (revealed for the 1st time, relapse TB, chronic TB) and 2) presence or absence of destruction and bacteriological excretion. There are 4 categories (N1, N2, N3, N4) related to currently ill TB patients and one (N5) for those related to a group of risk illnesses

or relapse.

**Cohort** A group of patients to be registered within 3 current months. There are 4 cohorts shown in diagnosis, that is : Coh1, Coh2, Coh3, Coh4 .

**New case of TB** First diagnosed TB used to be made for either a human being never being infected before or one taking drugs for no more than a month.

**RTB** Relapse of TB, activation of the disease amidst people which got through a course of antimicrobial therapy and were considered to become cured [thus, they were transferred to Cat.5 1group].

**CTB** Chronic TB, that is diagnosed for patients which either 1)have not reached a state of TB process radiological stabilization or 2)have shown radiological deterioration when a cavern remains [regardless of whether MBT is taking place or it isn't] during 2 year season of observation and treatment.

**Destruction (Destr+)** Specific pathological inflammatory process taking place in any organ, to be characterized by TB affected tissue necrosis and disintegration. That is to say: at the place of destruction one can radiologically observe both tissue disintegration and a cavity appearing in the result of TB tissue melting down. Such diagnosis is denoted as (Destr+).

**4.2. Theoretical questions for the class:**

1. Meaning of classical works by Hippocrates, Avicenna, R.Laennec, R.Koch in TB studies.

2. Role of N.I.Pirogov, Calmette и Guerin, S.P Botkin, F.G.Yanovsky in TB study development.

3. Role of A.A.Kysil, Z.Waxmann, N.S.Pilipchuk, A.S.Mamolat, B.M. Chmelnitsky, M.G.Ivanovich, A.G.Homenko in TB study development. 4. TB infecting agent, its kinds, forms of existence (L-forms) and qualities. MBT persistence, МБТ reversion.

5. Atypical mycobacterium. Mycobacteriosis classification.

6. Main epidemiology indexes and extension of TB disease. TB indexes evaluation.

7. Sources of TB infection. MBT excretion into environment.

8. TB pathogenesis. Ways of MBT contamination and its multiplication inside an organism.

9. TB immunity.

10. TB pathogenesis.

11. TB clinical classification, its sections. TB diagnosis structure.

12. To make a thematic plan of lectures and conversation for TB patients

13. To enumerate ethic and deontological points to be considered: 1) at a patient newly observation; 2) during a conversation with the patient's relatives.

14. To carry out an objective inspection of a TB case and prescribe a plan of proper treatment.

15. According to objective inspection results one has to make a diagnosis, to specify a TB type, its localization, clinical form, having presence of destruction and bacterium excretion, MBT drug sensibility, diagnosis histological confirmation, category, cohort, complication.

**4.3. Practical work (tasks) which are doing within the class:**

**TB PATIENT' DIAGNOSTIC STUDY**

1. **What are typical complaints of those suffering from TB undependable on its locality?**

**A.** Weakness, sweating, loss of weight, enhanced temperature.

**B**. Fits of dyspnea dependent on weather changes.

**C.** Upsetting of sensibility, hands / feet numbness.

**D**. Short-lived swoons.

**E.** Head ache, stomach ache without clear localization

2. **What usual temperature curve at TB cases might be?**

**A.** Constant.

**B.** One-day.

**C.** Hectic

**D.** Three-day.

**E.** Wrong.

3. **What is the most likable kind of expectoration while a simple form of pulmonary TB?**

**A**. Mucous transparent

**B.** Bright yellow

**C.** Green-yellow

**D.** Green with pungent smell

**E.** Rusty

4. A 30-year-old patient has been registered high temperature up to 37.1-37.30C, loss of appetite, enhanced fatigue, night sweating. He has got alcohol abuses. Impartial assessment: malnutrition, over lungs rigid breath is heard. Blood analysis is L-9,5x109/l, ESR-27 mm/h. X-ray picture shows multiple locus shadows, size from 3mm to 8mm in diameter, with small/average intensity. It looks like disseminated pulmonary TB.

**What clinic syndromes are registered in this case?**

5**.** A 10-year-old child has complaints with strong ache at the right side, that used to enhance while coughing, having deep take in. Temperature runs up to 38-38.50C. There is dyspnea. Ache has lessened for the last 2 days. There is dullness, placed to the right under/below of the 2nd rib. Heart limits have moved to the left. Breathing over the right lung is much weakened, but above lower part of right lung isn't heard. X-Ray picture shows: 1) right lung homogeneous darkening, placed to the right under/below of the 2nd rib; 2) mediastinum organs have shifted to the left. Tuberculin test "range" was revealed. **What diagnostic method should be firstly applied to prove liquid presence in the pleural cavity?**

**Patterns of answers:**

1.A. 2.E. 3.A. 4.Intoxication syndrome, bronchial-pulmonary affection syndrome; 5. Diagnostic pleural puncture.

**TB CLINICAL CLASSIFICATION**

**1. What phases of progressing TB do exist?**

**A.** Infiltration, dissemination, cavitation

**B.** Resorption, consolidation

**C.** Incrustation, mineralization, alkalization

**D.** Hyperemia, exudation, resorption.

**E.** Proliferation, degeneration.

**2. What changes in biopsy material are the basic ones to prove TB character of inflammation by histology?**

**A.** Pirogov-Langhans cells, caseous necrosis

**B.** Foreign body cells

**C.** Great number of neutrophils, caseous necrosis

**D.** Lymphocytes proliferation, LE – cells.

**E.** Proliferation of low-grade cells.

**3. What organs used to be infected by TB in Ukraine mostly?**

**A.** Lungs

**B.** Sexual organs

**C.** Kidneys

**D.** Bones and joints

**E.** Eyes

**4. What is definition of the primary TB?**

**A.** Primarily diagnosed TB

**B.** Primary signs of TB

**C.** Nondestructive TB

**D.** TB to appear right after infecting

**E.** TB located in only one organ or a system

**5. What is definition of the secondary TB?**

**A.** Multisystem TB

**B.** Destructive TB.

**C.** TB which appears in long term after patient being infected.

**D.** TB with overall clinical pattern.

**E.** Generalized TB.

**6.** A 31-year-old patient has revealed a primary TB case with infiltrate in the right lung II segment, MBT (-).

**Which category the patient should be concerned to?**

**7.** A 36-year-old patient's X-Ray showed newly discovered low intensity nodular shadow of average size with unclear contours. No complaints. The formal examination: no pathology. Blood test is normal. Looks like pulmonary TB.

**What should be a correct diagnosis according to clinic classification?**

**8.** A 25-year-old patient has low intensity nodular shadow with unclear contours.

**What phase of TB process is it? What should be a correct diagnosis according to clinic classification?**

**9.** A 5-year-old child complains of having dry cough. Body temperature is 37.1-37.40C. There is some bluntness over the right lung upper part. Much weakened breath without rales is heard. Blood analysis is leucocytes - 9,1x109/liter, ESR – 21 mm/hour. X-Ray picture shows that the right lung upper part is homogeneously darkened, lessened in size. The lung root is dilated, unstructured, its camber turned outside. Mantoux reaction is 2 TU of PPD-L – infiltrate diameter of 17 mm. 4 years ago the child was Mantoux test negative.

**What should be a correct diagnosis according to clinic classification?**

**10.** There is a 25-year-old patient who has got a diagnosis of TB meningitis. The lungs X-Ray picture showed alkalized lymphatic nodes. No MBT in liquor appeared. **What should be a correct diagnosis according to clinic classification?**

**The patterns of answers:**

1.A. 2.A. 3.A. 4.D. 5.C. 6.Category 3, 7. New case of TB (date of diagnosis) of the right lung II segment (nodular), Destr-, MBT-M- C0 Resist0, HIST 0, Cat 3, Coh.( a year quarter # of diagnosis). 8.Infiltration, 9.New case of TB (Date of ) of the right intrathoracic lymph nodes, Destr-, MBT-, M0, C0, Resist0, HIST 0, atelectasis of upper part of right lung, Cat 3., Coh.(a year quarter # of diagnosis). 10. New case of TB (Date of diagnosis) of meningeal membrane.