**Mid-term assignment**

**Pathology and microbiology (DPT 4th)**

**Instructor: Dr. Imran khan**

**Max Marks: 30**

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**Q1**: **Write down any viral or bacterial disease in detail**

**ANSWER**: **VIRAL DISEASE:**

Definition: Viruses are very small infectious agents. They’re made up of a piece of genetic material, such as DNA or RNA, that’s enclosed in a coat of protein.

Viruses invade cells in your body and use components of those cells to help them multiply. This process often damages or destroys infected cells.

**EXPLANATION**:

**Respiratory viral diseases**

Respiratory viral diseases are contagious and commonly affect the upper or lower parts of your respiratory tract.

Common symptoms of a respiratory viral disease include:

* runny or stuffy nose
* coughing
* sneezing
* fever
* body aches

**Examples**

* Examples of respiratory diseases include: adenovirus infection
* Parainfluenza virus infection
* Severe acute respiratory syndrome (SARS)
* Common cold
* Respiratory syncytial virus infection
* Flu

**Respiratory syncytial virus** (RSV) causes infections of the lungs and respiratory tract. It's so common that most children have been infected with the virus by age 2. Respiratory syncytial virus can also infect adults.

In adults and older, healthy children, RSV symptoms are mild and typically mimic the common cold. Self-care measures are usually all that's needed to relieve any discomfort.

RSV can cause severe infection in some people, especially premature babies, older adults, infants and adults with heart and lung disease, or anyone with a very weak immune system.

**Transmission**

Respiratory viruses are spread by droplets generated through coughing or sneezing. If someone with a viral illness coughs or sneezes nearby and you inhale these droplets, you may develop the disease.

These viruses can also be spread through contaminated objects, such as doorknobs, tabletops, and personal items. If you touch one of these objects and then touch your nose or eyes, you could develop a disease

**Symptoms**

Signs and symptoms of respiratory syncytial virus infection most commonly appear about four to six days after exposure to the virus. In adults and older children, RSV usually causes mild cold-like signs and symptoms. These include:

* Congested or runny nose
* Dry cough
* Low-grade fever
* Sore throat
* Mild headache

Respiratory syncytial virus infection can spread to the lower respiratory tract, causing pneumonia or bronchiolitis that is inflammation of the small airway passages entering the lungs. Signs and symptoms may include:

* Fever
* Severe cough
* Wheezing sound
* Rapid breathing or difficulty breathing
* Bluish color of the skin due to lack of oxygen (cyanosis)

Infants are most severely affected by RSV. You may notice your child's chest muscles and skin pull inward with each breath. This is a sign that he or she is struggling to breathe. Other signs and symptoms of severe RSV infection in infants include:

* Short, shallow and rapid breathing
* Cough
* Poor feeding
* Unusual tiredness (lethargy)
* Irritability

Most children and adults recover in one to two weeks, although some might have repeated wheezing. Severe or life-threatening infection requiring a hospital stay may occur in premature babies or infants and adults who have chronic heart or lung problems.

**Microscopic (histologic) description**

* Prominent airway obstruction
* Giant cells with inconspicuous, round, pink intracytoplasmic inclusions and acute inflammation
* Affects small bronchiole epithelium, type 1 and 2 pneumocytes, not basal cells
* Inflammation centered on bronchial and pulmonary arterioles, due to monocytes, T cells, neutrophils

**Treatment**

Respiratory viral diseases usually heal on their own. But over-the-counter (OTC) medications, including nasal decongestants, cough suppressants, and pain relievers, can help to reduce symptoms.

In addition, Tamiflu, an antiviral drug, is sometimes prescribed if someone is in the very early stages of developing the flu.

**Complications:**

* **Pneumonia.** RSV is the most common cause of inflammation of the lungs (pneumonia) or the lungs' airways (bronchiolitis) in infants. These complications can occur when the virus spreads to the lower respiratory tract. Lung inflammation can be quite serious in infants, young children, immunocompromised individuals, or people with chronic heart or lung disease.
* **Middle ear infection.** If germs enter the space behind the eardrum, you can get a middle ear infection (otitis media). This happens most frequently in infants and young children.
* **Asthma.** There may be a link between severe respiratory syncytial virus in children and the chance of developing asthma later in life.

**Prevention**

The best way to avoid respiratory viral diseases is to practice good personal hygiene. Wash your hands often, cover your mouth when you cough or sneeze, and limit your interactions with people who show symptoms of a respiratory condition.

There’s also a vaccine that can help to reduce your risk of getting the seasonal flu.

**Q2**: **What is cancer? How cancer is diagnosed? What is the role of genetics in cancer? Also explain TNM diagnostic test for cancer**

**Cancer**: **Definition**: Disease caused by an uncontrolled division of abnormal cells in a part of the body.

OR

A term for diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems.

**How cancer is diagnosed?**

Imaging tests used in diagnosing cancer may includes

* computerized tomography (CT) scan
* magnetic resonance imaging (MRI)
* Biopsy positron emission tomography (PET) scan
* ultrasound and X-ray
* bone scan

**Role of genetics in cancer:** Cancer is a genetic disease caused by accumulation of DNA mutations and epigenetic alterations in neoplasm formation**.**

* It is caused by few changes to genes that control way of our cells function, like how they grow and divide. Genes carry the instructions to make proteins which acts in cell formation as a component.

Most cancers are not obviously hereditary, although for certain cancers, like breast cancer, there may be a hereditary component to the disease. However, all cancers are genetic which means that they result from the unnatural function of one or more genes.

**TNM diagnostic test for cancer:** TNM system stands for tumor, node, and metastasis.

TX: Main tumor cannot be measured.

T0: Main tumor cannot be found.

T1, T2, T3, T4: Refers to the size of the main tumor. The higher the number after the T, the larger the tumor or the more it has grown into near tissues. T's may be further divided to provide more detail, such as T3a and T3b.

Regional lymph nodes (N)

NX: Cancer in nearby lymph nodes cannot be measured.

N0: There is no cancer in nearby lymph nodes.

N1, N2, N3: Refers to the number and location of lymph nodes that contain cancer. The higher the number after the N, the more lymph nodes that contain cancer.

Distant metastasis (M)

MX: Metastasis cannot be measured.

M0: Cancer has not spread to other parts of the body.

M1: Cancer has spread to other parts of the body.

**Q3**: **Explain structure of bacterial cell. How antibiotics kill bacteria? What is the mode of action of antibiotics?**

**BACTERIAL** CELL: A type of biological cell which constitute a large domain of prokaryotic microorganisms. Typically a few micrometers in length, bacteria have a number of shapes, ranging from spheres to rods and spirals. Bacteria were among the first life forms to appear on Earth, and are present in most of its habitats.

**Structure of bacterial cell:** The components that make the structure of bacterial cell are:

1) **Cell Envelope:**

It is the outer covering of protoplasm of bacterial cell. Cell envelope consists of 3 components

* 1. Glycocalyx
  2. Cell wall
  3. Cell membrane.

**2) NUCLEOTIDE:** A cell can have 2 or more nucleoids but all are replicated copies of same nucleoid. It is equivalent to a single chromosome of eukaryotes because nucleoid consists of a single DNA double strand. Nucleoid may be directly attached to the plasma membrane or through the mesosome. It represents the genetic material of prokaryotes

**3) CYTOPLASM**: forms the protoplasm excluding its nucleoid**,** it is granular because of ribosomes helping synthesizes protein it also it contains mesosomes which contain respiratory enzyes and chromatophores which acts as a photosynthetic pigment.

**4) PLASMIDS:** Plasmids provide unique phenotypic characters to bacteria. They are independent of main nucleoid**.**

**5) INCLUSION BODIES:** The inclusion bodies may occur freely inside the cytoplasm, inclusion bodies are of 3 types which are; gas vacuoles, inorganic inclusions and food reserve.

**6) BACTERIAL FLAGELLA**: Bacterial flagella perform rotation type movement that brings about backward pushing of the water. It results in the bacterium moving forward.

**7) Pili and Fimbriae:** Pili are made up of protein pilin they are helpful in attaching to recipient cell and forming conjugation tube. Fimbriae are small bristle-like fibers sprouting from cell surface in large number. Fimbriae are involved in attaching bacteria to solid surfaces or host tissues

**How antibiotics kill bacteria?**

Attacking the wall or coating surrounding bacteria. interfering with bacteria reproduction. Antibiotics disrupt essential processes or structures in the bacterial cell. This either kills the bacterium or slows down bacterial growth. Depending on these effects an antibiotic is said to be bactericidal or bacteriostatic.

**Mode of action of antibiotics:**

Mode of Action. Different antibiotics have different modes of action, owing to the nature of their structure and degree of affinity to certain target sites within bacterial cells. Inhibitors of cell wall synthesis .A drug that targets cell walls can therefore selectively kill or inhibit bacterial organisms. It might stop; Inhibition of Cell Wall Synthesis, Inhibition of Protein Synthesis (Translation), Alteration of Cell Membranes, Inhibition of Nucleic Acid Synthesis or Antimetabolite Activity.