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DEPARTMENT OF BIOMEDICAL ENGINEERING

VII Semester

OBT357 BIOTECHNOLOGY IN HEALTH CARE

UNIT- 2 CLINICAL DISEASES

2.1 Communicable diseases: Chickenpox / Shingles

2.1.1 Communicable Diseases:

- Diseases caused by infectious agents (e.g., viruses, bacteria, fungi, parasites) that can be transmitted from person to person, animal to person, or through environmental exposure.
- **Transmission Modes**:
  - **Direct**: Contact with infected bodily fluids (e.g., blood, saliva), skin-to-skin, or sexual transmission.
  - **Indirect**: Airborne (e.g., coughing/sneezing), contaminated surfaces, food/water, or vectors (e.g., mosquitoes).
- **Examples**:
  - **Viral**: Chickenpox (varicella-zoster), influenza, HIV/AIDS, COVID-19, measles.
  - **Bacterial**: Tuberculosis, cholera, streptococcal infections, syphilis.
  - **Parasitic**: Malaria, giardia, toxoplasmosis.
  - **Fungal**: Ringworm, candidiasis
- **Characteristics**:
  - Contagious, often with specific incubation periods (e.g., chickenpox: 10-21 days).
  - Can cause outbreaks or pandemics (e.g., COVID-19).

- Prevention often involves vaccines, hygiene, isolation, or vector control.

❒ **Prevention**:

- ❖ Vaccines (e.g., measles, polio, varicella).
- ❖ Hygiene practices (handwashing, masks).
- ❖ Public health measures (quarantine, contact tracing).
- ❖ Vector control (e.g., insecticide-treated nets for malaria).

❒ **Treatment**: Varies by agent (e.g., antibiotics for bacteria, antivirals for viruses, antifungals, antiparasitics).

2.1.2 Non-Communicable Diseases (NCDs):

NCDs are chronic conditions not caused by infectious agents and not transmissible between individuals. They typically develop over time due to genetic, lifestyle, environmental, or physiological factors.

❒ **Characteristics**:

- ❖ Chronic progression, often lasting years or a lifetime.
- ❖ Major contributors to global mortality (~71% of deaths, WHO).
- ❖ Linked to modifiable risk factors (e.g., diet, smoking, inactivity) and non-modifiable factors (e.g., genetics, age).
- ❖ Require long-term management rather than cure.

❒ **Transmission Mode**: NCDs are not transmissible. They arise from internal or external non-infectious factors, unlike communicable diseases (e.g., chickenpox, TB) that spread via agents like viruses or bacteria.

❒ **Examples of NCDs**

- ❖ **Cardiovascular Diseases**:
  - Examples: Heart disease (e.g., coronary artery disease), hypertension, stroke.
- ❖ **Cancers**:
  - Examples: Lung cancer, breast cancer, colorectal cancer.
- ❖ **Chronic Respiratory Diseases**:
  - Examples: Chronic obstructive pulmonary disease (COPD), asthma.
- ❖ **Diabetes**:

- Examples: Type 1 diabetes, Type 2 diabetes.

❖ **Mental Health Disorders**:

- Examples: Depression, dementia (e.g., Alzheimer's disease).

❖ **Other NCDs**:

- Examples: Chronic kidney disease, osteoarthritis, obesity.

2.1.3 Chickenpox / Shingles

Chickenpox and shingles are caused by the same virus, varicella-zoster virus (VZV), but they manifest differently. Below is a concise overview of their characteristics, causes, prevention, and treatment.

❒ Chickenpox

❒ **Characteristics**:

❖ **Symptoms**: Fever, fatigue, itchy rash (red spots progressing to fluid-filled blisters, then scabs), typically lasting 5–10 days.

❖ **Spread**: Highly contagious via respiratory droplets (coughing/sneezing) or direct contact with blisters.

❖ **Affected Population**: Primarily children, but can affect unvaccinated adults.

❖ **Complications**: Rare but include bacterial skin infections, pneumonia, or encephalitis (more severe in adults or immunocompromised individuals).

❖ **Incubation Period**: 10–21 days after exposure.

❒ **Causes**:

❖**Virus**: Varicella-zoster virus (VZV), a herpesvirus.

❖**Transmission**: Contact with infected person's respiratory secretions or blister fluid; contagious 1–2 days before rash until all blisters scab.

❒ **Prevention**:

- **Vaccination**: Varicella vaccine (2 doses, typically at 12–15 months and 4–6 years) is highly effective (~90–98% protection).
- **Hygiene**: Avoid contact with infected individuals; practice handwashing.
- **Isolation**: Keep infected individuals away from others until blisters scab over.

- **Post-Exposure**: Vaccine within 3–5 days of exposure or varicella-zoster immune globulin (VZIG) for high-risk groups (e.g., immunocompromised, newborns).

Treatment:

- **Symptom Relief**: Over-the-counter antihistamines (e.g., diphenhydramine) for itching; acetaminophen for fever (avoid aspirin due to Reye's syndrome risk).
- **Antiviral Drugs**: Acyclovir or valacyclovir for severe cases or high-risk patients (e.g., immunocompromised, adults), most effective if started within 24–48 hours of rash onset.
- **Supportive Care**: Oatmeal baths, calamine lotion, and keeping nails short to prevent scratching and infections.
- **Hospitalization**: Rare, for severe complications like pneumonia or encephalitis.

  - **Shingles (Herpes Zoster)**
  - **Characteristics**:
  - **Symptoms**: Painful, unilateral rash (blisters along a nerve path, usually on one side of the body), burning or tingling pain, possible fever or headache. Rash lasts 2–4 weeks.
  - **Affected Population**: Adults, especially those over 50 or immunocompromised; occurs in those previously infected with chickenpox.
  - **Complications**: Postherpetic neuralgia (chronic nerve pain), vision loss (if near eyes), or secondary bacterial infections.
  - **Contagion**: Less contagious than chickenpox; can spread VZV to unvaccinated individuals via blister contact, causing chickenpox (not shingles).

Causes:

- **Virus**: Reactivation of dormant VZV in nerve tissues, often years after chickenpox.
- **Triggers**: Aging, stress, weakened immune system (e.g., due to HIV, cancer, or medications like steroids), or fatigue.

Prevention:

- **Vaccination**: Shingrix (recombinant zoster vaccine), 2 doses, recommended for adults over 50 or immunocompromised individuals (90–97% effective). Zostavax (older vaccine) is less commonly used.
- **Immune Health**: Maintain a healthy lifestyle (balanced diet, exercise, stress management) to support immunity.
- **Avoid Contact**: Prevent exposure of unvaccinated individuals to shingles blisters.

❒ **Treatment**:

- **Antiviral Drugs**: Acyclovir, valacyclovir, or famciclovir, ideally started within 72 hours of rash onset to reduce severity and duration.
- **Pain Management**: Over-the-counter pain relievers (e.g., ibuprofen), gabapentin, or lidocaine patches for nerve pain; opioids for severe cases.
- **Supportive Care**: Calamine lotion, wet compresses, or antihistamines for itching.
- **Complication Management**: For postherpetic neuralgia, tricyclic antidepressants or anticonvulsants; eye involvement may require ophthalmologist care.

❒ **Summary**

- **Link Between Chickenpox and Shingles**: After chickenpox, VZV remains dormant in nerve cells and can reactivate as shingles, especially with weakened immunity.
- **Vaccination Impact**: Widespread chickenpox vaccination has reduced cases significantly, indirectly lowering shingles risk in younger populations.
- **Public Health**: WHO and CDC emphasize vaccination and early antiviral treatment to reduce disease burden.

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