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300L

Epidemiology Assignments

Question; Discuss Immunization and Prevention

Immunization is the process by which an individual's immune system becomes fortified against an infectious agent (known as the immunogen).Immunization is the process whereby a person is made immuned or resistant to a disease, typically by an exposure to that specific disease or by the administration of a vaccine against that disease(WHO).Immunization can also said to be the outcome or the process that happens within the body after vaccination, where the immune system builds resistance to the disease without the person getting sick.

When the body system is exposed to molecules that are foreign to the body, called non-self, it will orchestrate an immune response, and it will also develop the ability to quickly respond to a subsequent encounter because of immunological memory.

Methods of Immunization

Active immunization: This is an immunization process that induces immune response following an exposure to an infection or through the administration of either killed (inactivated) or live (attenuated) whole pathogens, parts of inactivated microorganisms, or modified pathogen's product vaccines are given to stimulate the body's natural defense mechanisms (the immune system). The body's immune system responds to a vaccine by producing substances (such as antibodies) that recognize and attack the specific bacteria or virus contained in the vaccine.examples include a person's resistance to strep throat due to a previous infection or a person's immunity to polio due to the polio vaccine.

Passive immunization; This is the transfer of pre-formed antibodies from one person to another, providing immediate but temporary protection against a pathogen. This can occur naturally, such as when a mother passes antibodies to her baby via the placenta or breast milk, or artificially, through an injection of immune globulin or other antibody-rich blood products. While providing rapid protection,

Vaccination is a simple, safe, and effective process of introducing vaccines into the body system to protect the body against specific vaccine preventable infections or diseases, before the body comes into contact with the infections.Vaccination is also the act of administering a vaccine (usually by injection, but sometimes orally or nasally). It uses the body’s natural defenses to build resistance to specific infections and makes the body's immune system

stronger.

A vaccine is a biological preparation that trains that body's immune system to recognize and fight a specific disease-causing germ without causing the illness.

Vaccines train your immune system to create antibodies, just as it does when it’s exposed to a disease. However, because vaccines contain only killed or weakened forms of germs like viruLive-attenuated vaccines.

Types of Vaccine

There are several types of vaccines. Each type is designed to teach your immune system how to fight off certain kinds of germs—and the serious diseases they cause.When scientists create vaccines, they consider:

How the immune system responds to the germ

Who needs to be vaccinated against the germ

The best technology or approach to create the vaccine

There are several types of vaccines, includes

*Inactivated vaccines

*Live-attenuated vaccines

*Messenger RNA (mRNA) va

Subunit, recombinant, polysaccharide, and conjugate vaccines

*Toxoid vaccines.

*Viral vector vaccines

Inactivated vaccines

These are the killed version of the germ that causes a disease.Inactivated vaccines usually don’t provide immunity (protection) that’s as strong as live vaccines. So you may need several doses over time (booster shots) in order to get ongoing immunity against diseases.Inactivated vaccines are used to protect against:Hepatitis, AFlu,Polio,Rabies.

Live-attenuated vaccines

Live vaccines use a weakened (or attenuated) form of the germ that causes a disease.Because these vaccines are so similar to the natural infection that they help prevent, they create a strong and long-lasting immune response. Just 1 or 2 doses of most live vaccines can give you a lifetime of protection against a germ and the disease it causes.But live vaccines also have some

limitations. For example:Because they contain the weakened live virus, some people should talk to their health care provider before receiving them, such as people with weakened immune systems, long-term health problems, or people who've had an organ transplant.Live vaccines need to be kept cool,That means they can't be used in countries with limited access to refrigerators.Live vaccines are used to protect against:Measles, mumps, rubella (MMR combined vaccine),Rotavirus,Smallpox,Chickenpox,Yellow fever, Tuberculosis .

Messenger RNA vaccines

Messenger RNA vaccines—also called mRNA vaccines,Researchers have been studying and working with mRNA vaccines for decades and this technology was used to make some of the COVID-19 vaccines. mRNA vaccines make proteins in order to trigger an immune response. mRNA vaccines have several benefits compared to other types of vaccines, including shorter manufacturing times and, because they do not contain a live virus, no risk of causing disease in the person getting vaccinated.mRNA vaccines are used to protect against:COVID-19

Subunit, recombinant, polysaccharide, and conjugate vaccines

These use specific pieces of the germ—like its protein, sugar, or capsid (a casing around the germ).Because these vaccines use only specific pieces of the germ, they give a very strong immune response that's targeted to key parts of the germ. They can also be used on almost everyone who needs them, including people with weakened immune systems and long-term health problems.One limitation of these vaccines is that you may need booster shots to get ongoing protection against diseases.These vaccines are used to protect against:Hib (Haemophilus influenzae type b) disease,,Hepatitis B,,HPV (Human papillomavirus),Whooping cough (part of the DPT combined vaccine),,Pneumococcal disease,Meningococcal disease,Shingles,.

Toxoid vaccines

Toxoid vaccines use a toxin (harmful product) made by the germ that causes a disease. They create immunity to the parts of the germ that cause a disease instead of the germ itself. That means the immune response is targeted to the toxin instead of the whole germ.Like some other types of vaccines, you may need booster shots to get ongoing protection against diseases.Toxoid vaccines are used to protect against:DiphtheriaTetanus

Viral vector vaccin

For decades, scientists studied viral vector vaccines. Some vaccines recently used for Ebola outbreaks have used viral vector technology, and a number of studies have focused on viral vector vaccines against other infectious diseases such as Zika, flu, and HIV.

Scientists used this technology to make COVID-19 vaccines as well.Viral vector vaccines use a modified version of a different virus as a vector to deliver protection. Several different viruses

have been used as vectors, including influenza, vesicular stomatitis virus (VSV), measles virus, and adenovirus, which causes the common cold. Adenovirus is one of the viral vectors used in some COVID-19 vaccines being studied in clinical trials. Viral vector vaccines are used to protect against:COVID-19.

Importance of Immunization

1; Individual and community protection

Disease prevention: Vaccines protect against a range of potentially fatal diseases, including measles, polio, tetanus, diphtheria, and hepatitis.

Community immunity: When enough people are vaccinated, it becomes difficult for diseases to spread, protecting everyone, especially infants and those with compromised immune systems who cannot be vaccinated.

Herd immunity: High vaccination rates create a protective shield for the community, preventing the spread of infectious diseases that have historically posed a significant threat.

2; Economic and social benefits

Reduces medical costs: By preventing illness, immunization reduces the need for medical treatment, saving families money on healthcare expenses.

Saves time: Preventing disease means fewer missed days of work and school, contributing to greater productivity and well-being.

Promotes healthy futures: Immunization is a cost-effective public health intervention that helps ensure children grow up healthy, contributing to a healthier Nigeria and protecting future generations.

3;Public health impact

Reduces morbidity and mortality: Immunization is one of the most effective ways to reduce childhood deaths and disabilities from infectious diseases.

Indicator of health system strength: High immunization coverage is a key indicator of a health system's capacity to deliver essential services to vulnerable populations.

Supports public health goals: Achieving high vaccination rates is critical for controlling communicable diseases and is a testament to successful public health programs.

National program on immunization schedule

At birth to 14 days.

BCG (Bacille Calmette Guerin) dose - 0.05ml,route - intradermal, site - Leftt upper arm.

OPV 0 (Oral Polio Vaccine) 2 drops

HBV (Hepatitis B vaccine) dose-0.5, route- intramuscular , Right Thigh

6 weeks

OPV 1 (Oral Polio Vaccine) 2 drops

PCV 1 (Pneumococcal Conjugate Vaccine) dose-0.5, route- intramuscular , Right Thigh

Rotavirus 1

Pentavalent 1 (DPT-HepB-Hib) dose-0.5, route- intramuscular ,Left thigh.

IPV 1(Inactivated polio vaccine) dose-0.5, route- intramuscular , Right Thigh

10 weeks

OPV 2 (Oral Polio Vaccine) 2 drops

PCV 2 (Pneumococcal Conjugate Vaccine) dose-0.5, route- intramuscular , Right Thigh

Rotavirus 2 (Oral) 5 drops

Pentavalent 2 (DPT-HepB-Hib) dose-0.5, route- intramuscular ,Left thigh.

14 weeks

OPV 3 (Oral Polio Vaccine) 2 drops

PCV 3 (Pneumococcal Conjugate Vaccine) dose-0.5, route- intramuscular , Right Thigh

IPV 2 (Inactivated Polio Vaccine) dose-0.5, route- intramuscular , Right Thigh

Pentavalent 3 (DPT-HepB-Hib) ,dose-0.5, route- intramuscular ,Left thigh.

6 months

Vitamin A 1 , dose-100000 I.U,(oral)

9 months

Measles - dose - 0.5 ,route - Subcutaneous,Site - Leftt upper arm,

Yellow fever 0.5 ,route - Subcutaneous,Site - Leftt upper arm,

MenA (Meningococcal Vaccine)dose-0.5, route- intramuscular ,Left thigh.

12-15 months

Measles 2 dose - 0.5 ,route - Subcutaneous,Site - Leftt upper arm,

Vitamin A (oral) dose - 200,000 I.U

Disease Prevention

Disease prevention in public health involves strategies aimed at minimizing the burden of disease and associated risk factors through population and individual-based interventions.It also involves all actions taken to keep people healthy and well, and prevent or avoid risk of poor health, illness, injury and early death.

Levels of Prevention

Primordial prevention

This level of prevention involves population-level interventions aimed at stopping risk factors for disease from emerging in the first place. It focuses on altering social, economic, and environmental conditions to create a healthy environment, rather than targeting individual behavior. Examples include improving public sanitation, creating safe spaces for physical activity, promoting healthy lifestyles from childhood, and implementing policies like tobacco taxes or restrictions on harmful substances.

How it works

Targets the root cause: It addresses the underlying conditions that lead to the development of risk factors, such as those for cardiovascular disease, obesity, or diabetes.

Population-based: It is not focused on individuals, but on creating a healthier society through laws, national policies, and community-wide programs.

Early life focus: Efforts are often directed at children to prevent the formation of harmful lifestyle habits early in life.

Primordial prevention aims to mitigate medical harm before it reaches its point of impact by addressing socioeconomic and environmental risks. These risks can be mitigated at the government or institutional level by restricting access to harmful and dangerous substances or educating individuals and the public on how to avoid adverse health consequences.[2]

Governments effectively reduce these dangerous health factors by taxing tobacco products or preventing the advertisement of these harmful substances. For example, Hong Kong's reduction in tobacco advertising was associated with a subsequent decline in tobacco consumption.[3]

Many areas in continental Africa have significantly increased educational measures towards primary prevention. There is a significant difference between countries that receive preventive education on specific diseases and those that do not. Education of children on key topics, such as diet, exercise, and common diseases, has been statistically shown to help improve cardiovascular health in younger populations and reduce the risk of developing more serious illnesses later in life. These findings demonstrate the potential impact of childhood preventive education.

Primary Prevention

Primary prevention aims to reduce the risk of disease before it begins by targeting modifiable risk factors in individuals who are still healthy. In the case of cardiovascular disease (CVD), interventions include improving diet, increasing physical activity, avoiding tobacco use, and maintaining a healthy weight.

Research indicates that when combined, these lifestyle modifications can reduce the risk of coronary heart disease by more than 80%.[4] Additionally, sustained adherence to healthy lifestyle behaviors—such as exercising regularly, eating a balanced diet, quitting smoking, and maintaining normal weight, blood pressure, cholesterol, and glucose levels—has been associated with up to a 70% reduction in cardiovascular risk.[5] Despite this, fewer than 5% of individuals adopt and maintain these changes. Hospitals are well-positioned to help drive prevention efforts by offering services such as exercise counseling, nutritional support, smoking cessation programs, and emotional wellness resources. These strategies should be implemented before any cardiac event occurs. Healthcare providers are encouraged to recognize early risk factors and intervene proactively.

Creating a sustainable, health-focused lifestyle requires coordinated effort between patients and healthcare systems. When preventive strategies are prioritized and integrated into routine care, the overall risk of CVD can be meaningfully reduced across the population.

Secondary Prevention

Secondary prevention focuses on reducing the risk of recurrent cardiovascular events in patients who are already diagnosed with other diseases. Lifestyle modifications, when combined with appropriate pharmacotherapy, play a crucial role in achieving this goal. Evidence shows that exercise programs, smoking cessation, and adherence to heart-healthy diets significantly lower the risk of mortality and hospital readmission after myocardial infarction.

Research further emphasizes that cardiac rehabilitation and increased physical fitness are related to the reduction of cardiovascular mortality. Smoking cessation following a cardiac event can reduce mortality risk much more than high-intensity therapy. However, many patients continue to smoke after they are discharged from the hospital. Lack of emotional support and depression make recovery even harder, highlighting the need for targeted hospital-based programs.

Evidence supports the incorporation of lifestyle changes into everyday routine to improve overall cardiovascular health. Hospitals should implement these strategies as foundational, long-term measures to reduce the risk of repeated cardiovascular events.[6]

Tertiary Prevention

Tertiary prevention focuses on reducing the long-term impact of chronic diseases by minimizing complications, preventing disability, and improving overall quality of life. In rheumatic heart disease, this includes interventions such as surgical valve repair or replacement, anticoagulation monitoring, heart failure management, and access to rehabilitation services. These strategies become especially important once permanent cardiac damage has occurred.[7]

Evidence shows that tertiary prevention is not limited to advanced medical interventions but also includes system-level support to help patients adapt and recover after diagnosis. This support can involve structured follow-up appointments, emotional and psychosocial support, and guidance in resuming daily routines. In settings with a high burden of rheumatic heart disease, the absence of such services can lead to early mortality and significantly reduced life expectancy.

For healthcare programs to be truly effective, they must extend care beyond the initial treatment phase. Tertiary prevention plays a vital role in ongoing disease management by incorporating rehabilitation, socioeconomic support, and continuous monitoring. In cases of rheumatic heart disease and similar chronic conditions, these efforts are essential to sustaining long-term health and reducing preventable deaths.

Quaternary Prevention

Quaternary prevention aims to ensure that medical interventions offer more benefit than harm by protecting patients from unnecessary or excessive treatments. This approach emphasizes the need to apply ethical scrutiny to all stages of health care, including extreme or complex conditions, particularly in an era where expanding medical technology increases the risk of overdiagnosis and overtreatment.

Unlike earlier forms of prevention, quaternary prevention serves as a safeguard against interventions that may unintentionally reduce quality of life. It builds upon tertiary prevention by introducing an ethical dimension: ensuring that interventions are not only effective but also appropriate. For example, some tertiary strategies, such as intensive glycemic control, have failed to improve outcomes and, in certain cases, have even increased mortality, highlighting the need for ongoing evaluation of medical decisions.[8]

A practical application of quaternary prevention is observed in sports medicine, where clinicians intentionally avoid unnecessary imaging or invasive procedures in athletes to minimize medical overuse and potential harm. This approach reinforces the principle that not all medical action is beneficial, and that restraint can be protective.[9]

Quaternary prevention reinforces the principle of first do no harm.[10] This approach requires

careful clinical judgment, patient feedback, and a commitment to avoiding unnecessary complexity or interventions that may negatively impact well-being. Ultimately, it acts as a safety net within tertiary care to ensure that treatments remain safe, ethical, and patient-centered.

Importance of Disease Prevention

Individual benefits

Protects against chronic diseases: Preventive care, such as regular check-ups, can detect early symptoms of diseases like high blood pressure or diabetes before they become serious.

Increases lifespan: Practices like weight management, physical activity, and getting vaccinated can help people live longer, healthier lives by correcting weaknesses and protecting against illnesses.

Reduces costs: Preventive medicine is often less expensive than treating an advanced illness. For example, wearing a seatbelt is a small action that can prevent costly injuries in a car accident.

Societal benefits

Improves health systems: By reducing the number of people who become seriously ill, prevention can make health systems more sustainable.

Reduces economic burden: It lowers the overall cost to society by decreasing the need for extensive medical treatment for preventable diseases and injuries.

Promotes health equity: Prevention efforts, such as public health campaigns on nutrition and exercise or policies that reduce exposure to harmful substances, can improve health for everyone, especially vulnerable populations.