As mentioned before, communicable diseases still one of the first causes of death in world, and vaccination as we all know is the main preventive service for the infectious diseases as it decreases both morbidity and mortality.

In this lecture we will go very briefly over these infectious diseases: Measles, Pertusis, Diphtheria, Polio and Tetanus which are included in the national immunization record. Hepatitis and Influenza will be mentioned also as infectious diseases but we will not go over them since we are considered only with the five main diseases that have been included in the immunization record a long time ago (triple vaccine DPT*, polio and measles)

* DPT = Diphtheria, Pertussis and Tetanus

We will talk also about vaccination.

What we have to know about these infectious diseases are mainly:

1. **Prevalence.** How much it's prevalent in the area?!
2. **Complications of the disease.** How serious the complications of a disease and how common is the disease,, (if it’s not common why should I give it a priority??)

If there are very serious complications so we have to put priority of the vaccine. Otherwise, it won’t be given a priority. (Chicken Pox for example is common but has minor complications so it won’t be given a priority while tetanus or diphtheria or sometimes measles in malnourished children would develop some complications like encephalitis, endocarditis, pneumonia, etc… so they will be given a priority).

* If in United Kingdom they decided to cancel one of the vaccines they may for example cancel the measles vaccine, since they don’t suffer from malnutrition in their country so that measles won’t cause any complications.

In addition, measles is considered a rare disease there, although it’s still considered an endemic disease in Jordan!

3. **Incubation period** which is from first exposure to bacteria until the symptoms start to appear.
4. **Isolation**. It’s part of the prevention.

It’s good to know that the doctor is not interested with the managements of diseases ;)) .. But it’s most important for her to know well about the Modes of transmission, Incubation periods, infectious periods and finally the types of vaccines

Now let’s start with the diseases..
1) **Diphtheria**: Can cause serious illness.

Sometimes it’s killing and it still so in certain developing countries in where there’s no management, treatment or vaccine coverage for it.

- **In Jordan**, diphtheria vaccine is being given since 1979 so the disease is very rare and even when found it’s in the subclinical form.
- In developing countries it kills 1 of 10 people infected with it.

**Diphtherial bacteria** lives in mouth, nose, and throat of an infected person and spreads through droplet infection.

If not treated, the child could die from suffocation because of the membrane filled with pus in throat.

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### KEEP IN MIND

For management and antibiotic concerns, always we’ve to know if the disease is **bacterial or viral**.

If it’s bacterial so we have to find the proper antibiotic.

If viral, usually it’s self limiting so we only treat the symptoms.

*Sometimes we give some certain viral infectious antibiotics to prevent secondary infections and not for the disease it self.*

Also it’s always important to determine the **Mode of Transmission** because it helps prevent the spreading of disease.

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**Incubation period**: Is two to seven days (nearly a week) with an average of three days.

**Symptoms**: Some people might not feel any thing or just look sick. (subclinical form)

Others might have:
- Sore throat
- Fever
- Chills
- Difficulty in swallowing cause it’s a throat infection
- Thick gray coating filled with pus over the back of the throat >> This is the most common distinctive feature of diphtheria and it may lead to suffocation in children.

Also they may develop a very bad smell that could be smelt immediately.

**Complications**: *(How fatal the disease could be)*

Within 6-10 days serious problems can occur if not treated and not given antitoxins

- Suffocation
- Paralysis
- Heart failure (causes myocarditis)
- Coma
- Death

It’s very serious infection and should be treated as soon as possible starting with prevention methods then treating the complications if found.
Treatment:

- **Antitoxins**—first management is to give antitoxins. The most important step is prompt administration of diphtheria antitoxin once doubt that the infection exists without waiting for laboratory results.
- **Antibiotics**—depend on the sensitivity of the bacteria; sometimes we give methicillin, erythromycin or others. Antibiotics are given to wipe out the bacteria, to prevent the spread of the disease to the lung and protect the patient from developing pneumonia.

The pathology of Diphtheria is not the bacteria itself! Although the bacteria multiply and spread, the important are the toxins of the bacteria that have the ability to reach the heart or kidney, etc..

**Isolation of patients:** Is very important because diphtheria is an infectious disease. Diphtheria patients must be isolated for one to seven days or until two successive cultures show that they are no longer contagious. Children placed in isolation are usually assigned a primary nurse for emotional support. All in all with incubation period is about 2 weeks.

**Identification and treatment of contacts:** Because diphtheria is highly contagious and has a short incubation period, family members and other contacts of diphtheria patients must be watched for symptoms and tested to make sure they’re not carrying the bacteria. They are usually given antibiotics for seven days and a booster shot of diphtheria/tetanus toxoid.

**Reporting cases to public health authorities is very important coz one case may cause an epidemic.** Reporting is necessary to: track potential epidemics, help doctors identify the specific strain of diphtheria, and to see if resistance to penicillin or erythromycin has developed.
2) Tetanus:
Is a very important bacterial infection, very serious and a killer disease especially for newborns in where they get it at the time of cutting the umbilical cord when it’s exposed to dirt. It’s a medical condition characterized by a prolonged contraction of skeletal muscle fibers. The primary symptoms are caused by Tetanospasmin, a neurotoxin produced by the Gram-positive, rod-shaped, obligate anaerobic bacterium and Clostridium tetani. Exactly like diphtheria, the problem here is mainly the toxins so vaccines are antitoxins for both diphtheria and tetanus.

Incubation period: (once infected)
The incubation period of tetanus may be up to several months but is usually about eight days. (average of one week)

Symptoms:
• Stiff muscles (neonates mainly) in the jaw and neck with swallowing difficulty.
• Difficulty in opening mouth.
• Muscle rigidity in the arms, legs, and stomach with painful convulsions.

Complications:
• Broken bones from muscle spasms
• Breathing problems and lung infections
• Coma and death
- A child has painful muscle spasms from tetanus nearly it's impossible for him to move or control the muscles in his body.
- Baby has tetanus cannot breast-feed or open his mouth because the muscles in his face have become so tight (there should be a nasogastric tube for the sake of help).
- Babies with neonatal tetanus are completely rigid! As a consequence, tetanus kills most babies who get it.
- Tetanus can cause serious illness and death.
- Tetanus bacteria live in dirt and the intestines and feces of animals.

Modes of transmission: It enters the body through cuts, punctures, or other wounds

Treatment: Should be very quickly.
- Mild cases: firstly antitoxins are given to decrease the activity of disease and then we give antibiotics, generally Metronidazole IV for 10 days and Diazepam which is used for dispastic muscles to relax them.
- Severe cases: will require admission to intensive care.
Tracheotomy may be done for them because of the respiratory distress they suffer from. (Respiratory distress is the case in where patient is unable to breath.)
Autonomic effects of tetanus can be difficult to manage. It’s another important serious sign of cause of death in babies in which severe alternating hyper and hypothermia may be developed (body temperature goes down under 35°C then up to 40°C).
3) Pertussis:

Commonly called Whooping Cough
Is a highly contagious bacterial disease caused by Bordetella pertussis.
- In some countries, this disease is called the 100 days' cough or cough of 100 days since it starts as a whooping cough then continues as a normal cough for the next two months.

- Symptoms are initially mild, and then develop into severe coughing fits, which produce the namesake high-pitched "whooping cough" sound in infected babies and children when they inhale air after coughing for almost 10 minutes.
The coughing stage lasts approximately six weeks before subsiding.

- Whooping cough in neonates is very serious and killing.
It’s transmitted from the mother to the baby in the first three months. So at the beginning of the 2nd or 3rd month they start to give the whooping cough since the cough reflex of the baby needs 6 to 12 months to be developed.
The problem is that this bacteria causes a very viscous sputum in where it may close the airways and accordingly the baby would die from suffocation. Older children have the ability to protect themselves by coughing this sputum out while babies under the age of a year or mainly fewer than six months can’t do so because of their delayed reflex, so for the problem will be killing.

- Coughing stage lasts approximately six weeks before subsiding.

- Prevention is mainly by vaccination.
Although treatment is of little direct benefit to the person infected, antibiotics are recommended because they shorten the duration of infectiousness and thus prevent spread.
The antibiotic Erythromycin and Azithromycin are front line treatment. Usually the drug used is Erythromycin.

- It is estimated that the disease currently affects 48.5 million people yearly, resulting in nearly 295,000 deaths which is a serious number!

- Pertussis is a serious disease especially for babies.
Most babies who get pertussis have to be hospitalized and some even die.
- Pertussis germ lives in the mouth, nose, and throat and spreads through coughing and sneezing (Respiratory transmission, droplet infection) and it spreads very easily from parent to child or from child to child.
Generally droplet infections transmit more easily than oral-fecal transmitted infections.

Incubation period: Is about 5-10 days to get sick.
Symptoms:
- fever
- coughing
- severe cough with a "whooping" sound
- vomiting and exhaustion after severe coughing
- difficulty in breathing

Complications:
- pneumonia
- seizures
- brain damage
- death

Children under 7 years of age need to be vaccinated against pertussis.

Prevention: The primary method of prevention for pertussis is vaccination.

Vaccination is the main preventive method for all of those diseases.

The duration of protection is between five to ten years because it’s a killed vaccine not an attenuated one. This covers childhood, which is the time of greatest exposure and greatest risk of death from pertussis.

**The duration of protection for killed vaccine is shorter than that of attenuated vaccine.** As a consequence pertussis vaccine is given at the age of 2 months, 3 months, 4 months, 5 years and finally 15 years.

For children, the immunizations are commonly given in combination with immunizations against tetanus, diphtheria, polio and haemophilus influenza type B.
4) Poliomyelitis:

Often called Polio or Infantile paralysis. Is an acute disease and may cause a life long paralysis. Is a viral infectious disease spread from person to person, primarily via the fecal-oral route so it’s considered harder than the spread of diphtheria and measles.

- Approximately 90% of polio infections cause no symptoms at all, which mean that there may be some carriers for the disease. That’s why polio vaccine should be given for all members in the environment in case of epidemic of polio.

In Jordan, last epidemic of polio was in 1995 in where all children were given polio in an extra dose than the routinely one which is 3 doses for all children under the age of five. At that time all children in surrounding schools in Al-Ghor were examined to make sure they are not carriers because in many times it comes as carrying with no symptoms. Symptoms like high body temp, muscles’ pain or joints’ pain are all appear in serious cases.

- In about 1% of cases the virus enters the CNS and that considered the most dangerous situation, preferentially infecting and destroying motor neurons, leading to muscle weakness and acute flaccid paralysis. This is considered the most serious problem.
Not all patients enter muscle weakness and flaccid goes paralysis; some return to normal situation after the flaccid paralysis while others might go through a subsequent attack.

Incubation period: is usually 6 to 20 days (1-3 weeks) with a maximum range of three to 35 days.

Virus particles are excreted in the feces for several weeks following initial infection. Poliomyelitis is transmitted primarily via the fecal-oral route, by ingesting contaminated food or water. Normally it’s a water source.

- Polio is most infectious between seven and 10 days before and after the appearance of symptoms (10 days before and 10 days after), but transmission is possible as long as the virus remains in the saliva or feces cause carriers remain found.

Factors that increase the risk of polio infection or affect the severity of the disease include:
- Immune deficiency & malnutrition. People with such conditions are at higher risks of developing the worst stage of polio which is Paralysis,
- Tonsillectomy. Also may increase the risk in where there’s no secretion of WBCs in tonsils which are responsible for immune response.
- Physical activity immediately following the onset of paralysis. Motility when muscles are weakened will increase the risk to go into paralysis and that’s why polio patients must have complete bed rest. >> COMPLETE BED REST IS A MUST <<
Symptoms:
• fever
• severe muscle pain or spasm
• paralysis
• headache
• some people do not look or feel sick (they’re only carriers).

Complications: (here are the most dangerous ones)
• long-term paralysis
• inability to breath without the help of a machine
• and finally death in case of respiratory disease

Treatment:
There is NO CURE for polio because it’s a viral infection. We’re only treating the symptoms providing relief of symptoms..
Supportive measures include antibiotics just to prevent secondary infections and not for the viral infection.
We have to provide complete bed rest for the patient to prevent increase of paralysis. if it increased to paralysis patient may need occupational therapy, physical therapy, and in some cases orthopedic surgery because of the shortness. Treatment of polio often requires long-term rehabilitation.

Prevention: Is by passive immunization
There are two types of vaccines used throughout the world to combat polio.
1. Oral Polio Vaccine: is an attenuated vaccine (weakened virus).
2. Injectable Polio vaccine: is an inactivated or killed virus vaccine.

Attenuated vaccine is considered severe vaccine and is routinely given to normal people because it has a longer activity BUT people with immune deficiency must be given injectable vaccine because they may go into paralysis with the attenuated vaccine.

- As a precaution against infection, public swimming pools were often closed in affected areas during poliomyelitis epidemics because they may be a source of infection.
- Hygiene is very important
- Water sanitation is also very important
- Good Nutrition also to prevent serious complications.

Picture In slide 57 shows the shortness and the paralysis of muscle.
Muscle is thinner and shorter
5) **Measles:**

Is a *viral infection* spreads easily between people and *transmitted through droplet infection.*
Can cause serious illness in children and death in serious cases

Measles virus is the cause of measles. It’s a single-stranded RNA virus, spreads through coughing, sneezing, or just talking to an infected person.

**Incubation period:** Takes 8-12 days to get sick.
A person is not contagious during the measles incubation period.. usually the person is mildly contagious when he or she first experiences symptoms, and is most contagious about four days before the onset of the measles rash (rash comes after the symptoms). Some risk of measles transmission lasts until about four days after the rash starts.
So infection period is almost 1 week; 4 days before the rash and for days after it.

**Early symptoms:** occur several days before the measles’ rash begins.
They usually include:
- High fever (up to 105°F or 40.6°C)
- Hacking cough
- Red watery eyes (pink eye - “conjunctivitis” )
- Tiredness
- Muscle and body aches
- Irritability
- Swelling of the eyelids
- Runny nose
- Rash that begins along the hairline from the head and moves downward to the face, neck, body, hands, and feet (starting from the base and spreading to the abdomen and extremities).

**Most dangerous measles are in child which is malnutritioned**

**Complications** caused in such cases are:
Pneumonia, ear infections, encephalitis causes brain damage, seizures and death

Child has a bad rash caused by measles
- eyes are red and runny
- has a runny nose and fever
VACCINATION

It’s very important for the exam to know the type of each vaccine. For example the doctor might ask about vaccines. Which one is attenuated and which one is killed!

Vaccines as mentioned before are of two main types:

1. **Live/ attenuated vaccines** in which the immunity is more active. They are highly effective, induce slight subclinical infections, long lasting protection even when given in small doses.

   Examples of attenuated vaccines:
   - BCG (vaccine of tuberculosis)
   - Measles
   - MMR (immunization against measles, mumps, and rubella.. They’re given together)
   - TOPV (the ORAL polio vaccine or Sabin vaccine)

2. **Killed/ Inactivated vaccines** mainly used in cases of immune deficiency for people who have immunity problems NOT in immune deficiency acquired from certain temporary conditions like fever..

   Produce lower immune responses to a single dose in comparison to live vaccines so multiple doses are usually required to give long term protection

   Examples of killed vaccines:
   - Pertussis
   - Polio (only the injectable ones: IPV-inactivated polio vaccines)
   - Whooping cough vaccine

>> The vaccines for Diphtheria and Tetanus are prepared from the bacterial exotoxin.. These are referred to as **Toxoid Vaccines**. <<

**Rationale for Immunization:**

Every year, still in developing countries, out of 100 children:

- 3 children die from measles
- 2 children from pertussis
- 1 child from tetanus

**Expanded Program on Immunization – EPI :**

- WHO set a target which was that 90% of all children below one year should be fully immunized by the year 2000.
- It is a program that was started worldwide and called: EPI .
- EPI was **launched in Jordan in 1979.. and Jordan achieved universal child immunization in 1988.**
NOTE:
According to the tables in the last slides (Recommended vaccination schedules), you won’t be asked about the time in which each one of the vaccines should be given but it’s worth to look to the Jordanian one in where:

- **BCG** is given at birth
- **Hepatitis B** at birth and at 1st month
- **Triple vaccine (DPT)** at 2nd, 3rd and 4th month … etc.

JUST KNOW WHAT ARE THE VACCINES GIVEN IN JORDAN WITHOUT KNOWING THE EXACT TIMES… MAINLY THE ONES WE’VE MENTIONED BEFORE

National vaccination schedule/ Jordan

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… BEST WISHES …

Done by: Athar Abu Samha