Difäm Health Community (DHC)

Podcast:

Childhood vaccinations

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My name is xxx, I am a member of the health team of the German Institute for Medical Mission, also called Difäm. With me is my colleague xxx.

In this podcast we will talk about childhood vaccinations that the WHO recommends globally. We will learn about the different diseases childhood vaccinations prevent and their public health impact.

Immunization is one of the most successful public health interventions worldwide. It is a key component in primary health care. We can vaccinate against more than 20 life-threatening diseases thus saving around 5 million of lives and preventing severe and chronic diseases every year. It is highly cost-effective and one of the best things a state can buy for the health of its population.[1]

The COVID-19 pandemic has overwhelmed health systems, with 23 million children missing out on vaccination in 2020, 3.7 million more than in 2019 and the highest number since 2009. Of the 23 million more than 60% of these children live in 10 poor countries including DRC, Angola and Ethiopia in Africa.[1]

Which immunization is recommended in childhood?

Globally, the WHO recommends immunizations in childhood against 12 diseases: BCG against TB, diphtheria, pertussis, tetanus, polio, Hepatitis B, Haemophilus influenzae type B, pneumococcus, Rotavirus, Measles, Rubella and human papilloma virus, HPV.[2]

About BCG and HPV we will talk in other podcasts separately. Tetanus, pertussis, diphtheria, Hepatitis B and rubella we will cover in the next podcast where we will look into the diseases mainly affecting neonates and infants and how these diseases can be prevented by immunizing pregnant women.

We will recap the remaining five diseases now:

Polio

As we have heard in the introduction podcast to vaccines, polio epidemics frightened parents until the mid-1950s. Polio is caused by one of three types of poliovirus, an enterovirus. It is a highly infectious illness that spreads through contact between people, via nasal and oral secretions, and through contact with faeces.

95% of cases are asymptomatic but contagious. Abortive polio is a mild disease, with viral-like symptoms such as fever, fatigue, headache, sore throat, nausea, and diarrhoea. Non-paralytic polio is like abortive polio, with additional neurological symptoms, such as sensitivity to light and neck stiffness. Finally, these symptoms can progress into paralytic polio. It begins typically with loss of reflexes and muscle pain or spasms, asymmetric paralysis follows. In most cases of paralytic polio, the patient recovers completely. However, 2-5 % of infected children and up to 30% of adults die without artificial breathing support and lifelong paralysis or muscle weakness remains for many people.[1]

Polio has no cure, so prevention is the most effective means to combat it.

In 1988 the Global Polio Eradication Initiative started from an estimated 350 000 cases worldwide. Since then there has been a decline of polio cases by 99, 9 %. Two wild poliovirus types are eradicated.

Five out of six World Health Organization regions are now certified wild poliovirus free including the African Region. More than 18 million people who are currently healthy would have been paralyzed by the virus. As oral poliovirus vaccine, OPV, is a living virus there are still vaccine derived poliovirus outbreaks. Eradication efforts could stop 14 out of 29 of these viruses in 2019.[3]

Why do we use a living vaccine and risk outbreaks by the vaccine if we have also an inactivated dead vaccine, like the one Salk developed?

Well, a good question; OPV induces a very effective immune response why it is used in eradication efforts. With inactivated polio vaccine, IPV, a sterilizing immunity is not achieved, which means that even when the individual remains asymptomatic it can still spread polio. That's why we use in eradication a combination of both. Schedules in countries differ according to the endemic situation. We will come back to this later.

Haemophilus influenzae type B

Haemophilus influenzae type B, Hib, is a bacterium that can cause severe infections like meningitis, pneumonia and epiglottitis, particularly in young children. Meningitis resulted in 15-30% of permanent hearing impairment, blindness, mental retardation and neurological conditions in survivors[1]. People can carry it without being ill. It is spread by droplets and outbreaks can occur. Treatment with antibiotics is possible. Vaccinations were introduced in the late 1980s and are dead, inactivated combined vaccines containing a part of the Hib bacterium. It has a high efficacy between 95-100% in fully vaccinated children.

Pneumococcus

Streptococcus pneumonia, a bacterium, is one of the leading causes of disease in young children. Apart from pneumonia it can cause sinusitis, middle ear infection, meningitis, septicaemia and other infections. In meningitis, we can have sequelae as with Hib like brain damage or hearing loss.

Likewise, asymptomatic carriers might spread the disease. In the USA round 5-10% of adults carry it in their noses and throats, as are 27-58% of school students.[1]

Antibiotics are used to treat pneumococcal disease but drug resistance is an increasing problem. The case fatality rate for those with pneumonia complicated by sepsis is approximately 20%, but may be as high as 60% for elderly patients[1].

There are two dead recombinant vaccines a polysaccharide vaccine against 23 strains called PPSV23 mainly effective in adults and PCV13, a conjugate vaccine against 13 strains protecting against the most severe pneumococcal infections in childhood. In the US invasive pneumococcal disease has dropped in children by 80% since implementation of vaccination in the year 2000.[1]

Measles

Measles is an extremely contagious paramyxovirus, spread by droplets and aerosol. After coughing and sneezing it can remain in the air for 2 hours. A healthy person can be infected without getting into direct contact by breathing the same air as patients. Symptoms include high fever, conjunctivitis, coughing as well as the typical macular confluent rash with exception of palms and soles. It starts at the ears and face with afterwards bran-like desquamation of the skin. Also a whitish enanthema can occur in the mouth, so called Koplik spots. Measles is sometimes called ‘rubeola’, but should not be confounded with rubella or the so-called German measles.

Complications are severe diarrhoea, superinfections like otitis, pneumonia and encephalitis. Adults have typically more severe disease. Mortality can be up to 28% in low-income countries[1]. Measles cause 1 million deaths globally in young children every year[4]. Recovery can last long and worsen nutritional status of the child as the virus affects also the bowel.

There is only symptomatic treatment for measles and antibiotics for superinfections. If survived there is lifelong immunity.

An attenuated living vaccine is available since 1960 and provides also lifelong immunity if administered twice in childhood. WHO targets measles for eradication with this highly effective sterilizing vaccine. Providing two measles vaccinations in the first two years of life reduces the rate of accumulation of susceptible children and the risk of an outbreak later on in kinder gardens or schools.[2]

However, in the last 15 years outbreaks are occurring again not only in low-income countries due to insufficient funding. Also Britain has been experiencing a resurgence after false publications in 1998 that the measles-mumps-rubella vaccine might cause autism. The falsehood was proven by many independent scientists and the author lost his licence to practice medicine. But until now the vaccination levels have not returned to the same level[1].

Rotavirus

Worldwide rotavirus is the most common cause of severe diarrhoea in children. It is estimated by the WHO that it kills about 450,000 children under age 5 each year. Transmitted by the faecal-oral route it causes typically a severe watery diarrhoea but also fever, vomiting and abdominal pain may be present. 2% of children develop severe dehydration and hospitalization is necessary. Treatment is symptomatic and supportive[1,4].

It spreads easily among children. After the first infection, future infections may be mild to asymptomatic but a person can still carry it to others.

The vaccine is an attenuated or weakened rotavirus given twice orally by drops to young infants.

Efficacy is difficult to monitor as there are other viruses and bacteria causing gastroenteritis and usually a proof of rotavirus infection cannot be done routinely. But studies of the US show that hospitalisation rates for gastroenteritis dropped by 16 to 45% after the introduction of the vaccine. In addition, in the developing world there are studies from Mexico where deaths from diarrhoeal disease in children under 2 years dropped by over 30%. Death rates from diarrhoeal disease even dropped in non-vaccinated population suggesting that they profited by some herd immunity.[1]

So all these vaccines when and how often do we give them?

There are general recommendations of the WHO giving an answer to this complex task. When you search with google: 'WHO immunization schedule table 2' you can directly see and download a PDF file. A lot of considerations play a part in choosing a schedule for example:

We have a vaccine that combines Diphteria, Tetanus, Pertussis, Polio, Hepatitis B and Hib. It is very convenient for health care services to give this in three appointments after week 6, 10 and 14 in the life of the infant. Generally, compliance of parents is also high when you have to administer only one injection. However, in some regions, you still have polio cases and want the stronger and longer lasting immune response of the live vaccine of oral polio vaccination, or you have a high prevalence of hepatitis B and decide that it is best to immunize with the first dose already at birth. You see that regional considerations play a part in choosing a strategy. Moreover, think of diseases that are only prevalent in some regions like yellow fever or Japanese encephalitis.

In addition, economic considerations play a role. Is it worth e.g. to include other diseases in vaccines where we have combinations like in measles-mumps-rubella, MMR; there is now also a possibility of giving varicella vaccine in MMRV. What are potential risks and additional costs? Do benefits outweigh them? In Germany we decided: yes, it is worth it: Outbreaks and admissions to hospital are reduced. Germany is an aging society: Varicella can be reactivated and cause shingles, especially in elderly people and there you can develop severe nerve pains, which are difficult and costly to treat otherwise.

The WHO has tables that cover the current national strategies of every country or region. With google, you search 'WHO immunization schedule + name of the country'.

I have a last question that is often asked by German parents: Do we really have to immunize against so many diseases in so small babies? Why must it be done so early in life?

The reason why we give these vaccinations early is that with many diseases young children are the main affected age group and pay otherwise a high price. Why is that so? Well new-borns and infants have not yet had a chance to develop immunity after contact. And they have an immune system that has not grown and learned how to function well.

The immune system of a new-born is still immature. It receives effective maternal IgG antibodies via the placenta. The so-called nest protection helps the babies in the first months. In addition, breastfeeding can protect against respiratory tract and gastrointestinal infections for a little longer.

The trans placental antibodies in the baby's blood are broken down with a half-life of about 3 weeks. We can see that an IgG-antibodies deficiency in the serum sets in within 3 to 12 months after birth. As a result, the risk of infection increases. In contrast, the baby's own IgM level rises, indicating that the adaptive immune system becomes active immediately after birth. The initial delay in forming own IgG is due to the immaturity of the T cells. In the first months of life, the immune system begins to prepare itself to fight off disease cells. T-cells learn their task in the thymus, the maturation site of the T-cells. When they are ready, the can stimulate the production of specific antibodies, IgG, by B-cells.[5]

Now we have already gone a step into our next podcast, where we will talk about pregnancy, infants, and the other important childhood vaccinations we have not yet covered in detail.

We invite you to join us.

Be blessed and stay safe

Internet and other sources as of May 21, 2022

1 https://historyofvaccines.org/

2 https://cdn.who.int/media/docs/default-source/immunization/immunization_schedules/immunization-routine-table2.pdf?sfvrsn=3e27ab48_9&download=true

3 www.cdc.gov/polio/progress/index.htm

4 Gerd Herold und Mitarbeiter: Innere Medizin 2022, ISBN 978-3-9821166-1-7

5 https://link.springer.com/chapter/10.1007/978-3-662-58330-2_14