بسم الله الرحمن الرحيم

PEDIATRICS

Dr: Sabah Al-Maamuri Lecture: No.1

VACCINATION

BCG vaccine

It is a live attenuated strain of Mycobacterium bovis known as bacillus Calmette-Guérin (BCG) uses shared antigens to stimulate the development of cross-immunity to Mycobacterium tuberculosis. It lost its virulence in humans by being specially cultured in an artificial medium for years.which gives considerable protection against TB.

It is given routinely to all newborns, when vaccination is delayed to end of first year prior tuberclin testing is important, vaccine can be given to tuberclin negative children and to adolescent.

The dose is 0.1ml intradermal in the deltoid region, successful vaccine produces a small indurated area (2-4mm) after 3-4weeks. The lesion progresses to a papule or shallow ulcer of approximately 10 mm diameter and heals within 12 weeks to form a small, flat scar.

Side effects

local abscess, axillary lymphadenitis, allergy, dizziness, vertigo, keloid scarring and disseminated BCG in immuncompromised patient.

No live vaccine should be given within 3weeks except (OPV) and there be no vaccination in the same area for 3months.

Efficacy 80%.

Polio vaccines

Poliovirus

Enterovirus (RNA), Three serotypes: 1, 2, 3,Human is the reservoir, transmission by fecal-oral or possible oral-oral, communicability 7-10 days before onset, the virus present in stool for 3-6 weeks. Entry into mouth, Replication in pharynx, GI tract, local lymphatic's, Hematologic spread to lymphatic's and central nervous system ,Viral spread along nerve fibers leads to Destruction of motor neurons.

Most poliovirus infections are asymptomatic The two vaccines have eradicated polio from most of the countries in the world and reduced the worldwide incidence from an estimated 350,000 cases in 1988 to less than 2000 cases in 2008.

Salk’s Polio vaccine “Inactivated Polio Vaccine” IPV injectable

Based on polio grown in a type of monkey kidney tissue culture, which is then inactivated with formalin.Contains 3 serotypes of vaccine virus, the injected Salk vaccine confers IgG-mediated immunity in the bloodstream, which prevents polio infection from progress to viremia and protects the motor neurons, thus eliminating the risk of bulbar polio and post-polio syndrome. It offers no protection to the mucosal lining of the intestine; i.e. people vaccinated with Salk's vaccine can still carry the disease and spread it to unvaccinated individuals.

IPV has essentially no adverse effects associated with it other than possible rare hypersensitivity reactions to trace quantities of antibiotics.

Sabin's polio vaccine “Oral live-attenuated vaccine”

Sabin's “Oral Polio Vaccine" is a live-attenuated vaccine, Contains 3 serotypes of vaccine virus It replicates very efficiently in the gut, the primary site of infection and replication, Unable to replicate efficiently within nervous system tissue, Shed in stool for up to 6 weeks following vaccination

The OPV proved to be superior in administration, and also provided longer lasting immunity than the Salk vaccine. The trivalent Oral Polio Vaccine (Sabin) on very rare occasions has been associated with paralysis (vaccine-associated paralytic poliomyelitis, about 1 case per 750,000 vaccine recipients).

It is given in 3doses, each of 2drops(oral) at age of 2,4,6 months. A booster dose is given at age of (1.5-2years). 2nd booster dose is given at age of 4-6yrs.a period of fasting for 1-2hrs after vaccination is recommended.
Efficacy is 95%.

DPT vaccine

Diphtheria

Caused by Aerobic gram-positive bacillus; *Clostridium diphtheriae,* complication most attributable to toxin
Severity generally related to extent of local disease, most common complications are myocarditis and neuritis, death occurs in 5%-10% for respiratory disease

Tetanus

Caused by Anaerobic gram-positive spore-forming bacteria; Clostridium tetani, *Spores found in soil,animal fece.s,* tetanus Complications: Laryngospasm, Aspiration pneumonia and Death

Pertussis

Highly contagious respiratory infection caused by Bordetella pertussis, complication: Pneumonia, Seizures, Encephalopathy
Mixture of 3vaccines (toxoid of diphtheria, tetanus and killed highly antigenic organism of pertussis). Dose is 0.5ml IM given to all infants same as for OPV.
Efficacy diphtheria 87% , pertussis 80%.
– Minor reactions are quite frequent in 20–50% of vaccines. Local reactions include:
Inflammation, induration or a painless nodule at the site of injection. These are progressively more common after the first injection
– Moderate reaction occur in 0.1% to 1.0% of children and include:

1. ongoing crying (for three hours or more in the first 12 hours)
2. a high fever (up to 40°C)
3. an unusual (screaming), high-pitched crying

– Severe problems happen very rarely (1 in 140,000 doses of DPT). Include;

1. a serious allergic reaction,
2. prolonged seizures,
3. encephalopathy, or even death

DT vaccine

It is a mixture of toxoid of diphtheria & tetanus is given to children >6years of age, as pertussis vaccine is contraindicated after this age. Dose 0.5mlIM

Measles vaccine

It is a live attenuated vaccine given to all infants at age of 9-10 mos. But it can be given to children & adolescent too.
Dose 0.5ml S.C.(single dose). It is generally safe vaccine,
Children with egg allergy &asthmatic patient it should be given under hospital supervision.

MMR vaccine

It is a mixture of 3 vaccines (live attenuated of measles, mumps &rubella).
Measles**;** Caused by Paramyxovirus (RNA)
complication: Diarrhea, Otitis media, Pneumonia, Encephalitis
Mumps**;** caused by Paramyxovirus (RNA)
Complication: CNS involvement, Orchitis, Pancreatitis, Deafness
Rubella**;** Caused by Togavirus (RNA)
Complication in children; rare; arthralgia or arthritis, thrombocytopenic purpura, Encephalitis,
Neuritis, Orchitis.
Major concern is **Congenital Rubella Syndrome** as Up to 85% of infants affected during first trimester when placenta and fetus infected during viremia; Infection may affect all organs, may lead to fetal death or premature delivery, Deafness, Cataracts, Heart defects, microcephaly, Mental retardation, Liver and spleen damage.
It is given to children at age of 15mo, it can also given to older children,A booster dose at age of 4-6years is currently recommended.
dose is 0.5ml subcutaneously (single dose).the vaccine is safe because MMR is a live-attenuated vaccine, non–allergy-related side effects are noted 5 to 12 days following immunization.

1. Fever and rash are relatively common, experienced by 5% to 15% of recipients.
2. Transient arthritis has been reported.

3. Thrombocytopenia (rare)
4. Encephalopathy (very rare)

Contraindications and Precautions

1. Severe allergic reaction to vaccine component or following prior dose
2. Pregnancy
3. Immunosuppression
4. Moderate or severe acute illness
5. Recent blood product

Efficacy ; mumps 90%, rubella 95%.

Hepatitis B vaccine

Hepatitis B infection: Caused by Hepadnaviridae family (DNA),It is a recombinant DNA vaccine contains purified HBsAg particles of viruses (inactivated viral antigen), produced through recombinant DNA technology in yeast.

Vaccine usually is given intramuscularly as a three-dose series, (0, 1, and 6). Three doses induce seroconversion in 90-95% of healthy infants, children and adults. Dose for infants and children is 0.5ml IM (not in the buttock).

It is indicated in children & adults who are at risk of infection especially health care personnel and patients subjected to repeated blood transfusion.

Side effects

Transient erythema and induration at the site of injection, fever malaise, flu-like illness, arthritis, myelgia and arthralgia.

Rotavirus vaccine

In early childhood, the single most important cause of severe dehydrating diarrhea is rotavirus infection.

Rotaviruses; Reoviridae family,The Pentavalent vaccine protects against rotavirus gastroenteritis, Oral route, Three doses; 2,4, and 6 months

Meningococcal vaccine

It is indicated at age > 2years (it is live attenuated vaccine) in cases of

1- Functional or anatomic asplenia.
2- Travel to an endemic area.
3- Local outbreak.
4- HIV.
5- Contact of cases.
6- Terminal complement or properdin deficiency.

Dose 0.5ml SC (single dose), booster is given after 2-3 years especially in school age children.

Efficacy is 90%.

Hemophilus influenza type b vaccine

It is indicated for prevention of invasive diseases caused by H.influenza especially meningitis, septicemia, epiglottitis, arthritis & cellulitis,Important for infants and children <5years (universal splenectomy& asplenia &HIV).

Dose 0.5ml IM or SC.

Efficacy 94-100%.

Pneumococcus vaccine

2 types

1- Polysaccharide protein conjugate for <2yrs 2-3 doses

2- Polysaccharide >2yrs single dose

It is indicated for

1. Chronic respiratory diseases
2. Diabetes mellitus
3. Chronic heart diseases
4. Chronic renal diseases
5. Chronic liver diseases
6. Asplenia
7. Immunosuppression

8. Immunodeficiency
9. Hemoglobinopathies

Efficacy; type1 = 98% type2 = 60-70%

Influenza vaccine

Inactivated virus trivalent (TIV) minimal age 6 mos.or 2 yrs. For live attenuated (LAIV)
Efficacy 50-90%.
Dose 0.5ml IM or SC for children >6yrs, 0.025ml for 1-6yrs.
Indicated in

1. Immunosuppression
2. Cardiac disease
3. Chronic lung diseases
4. Chronic renal diseases
5. Hemoglobinopathy
6. Long term aspirin treatment
7. Chronic metabolic diseases
8. Given in epidemic
9. Close contacts to above
10. Diabetes mellitus

Rabies vaccine

Inactivated virus vaccine, human diploid cell vaccine (HDCV) is available in 5 doses (1ml) at 0, 3, 7, 14, 30 days.
Efficacy; 98% in pre exposure.

Chicken pox vaccine

Live attenuated virus vaccine, it can be given above 1year of age in a dose of 0.5ml IM or SC. And >12yrs, 2doses with one month interval. It is indicated to a child with 13yrs of age with no history of chicken pox and negative serology and for immunocompromised children and these with increased risk for varicella.
Precautions; DON'T give salicylate for 6weeks after vaccination.
Efficacy 97%.

Hepatitis A vaccine

Inactivated virus, it is given as one dose followed by booster dose at 6-12mo.
Dose 0.5ml IM (1-5yrs) of age, 1ml (adult)
Indications

1. Travel to endemic area
2. During outbreak
3. Hemophilia
4. Hepatitis B, C and other chronic liver diseases

Efficacy; 80-90%.

Passive immunization

A- anti-toxins ; derived from hoarse serum used for prophylaxis and treatment of tetanus , diphtheria & others
B- Human Immunoglobulins , from human plasma , generally safe. Used for:
1- Prophylaxis against infections as chicken pox and measles.
2- Treatment of agammaglobulinemia e.g. IV immunoglobulin used in treatment of Gullain- Barrie syndrome, acute and a chronic I.T.P and neonatal septicemia.

Vaccination schedule in Iraq

Age / Vaccine	At birth	2 months	4 months	6 months	9 months	15 months	18 months	4-6 years
BCG	BCG							
OPV	OPV	OPV	OPV	OPV			OPV	OPV
HBV	HBV							
Hexavalent (DTaP, Hib, HBV and IPV)		Hexavalent		Hexavalent				DTaP
Pentavalent (DTaP, Hib, and IPV)			Pentavalent				Pentavalent	
PCV 13		PCV 13	PCV 13	PCV 13				
Measles					Measles			
MMR						MMR		MMR
*Rota V		RV	RV	RV				

*Could be 2 Doses or 3 Doses.

PERSONS AGED 4 MONTHS THROUGH 6 YEAR

Vaccine	Minimum Age for Dose 1	Interval Between Doses			
		Dose 1 Dose 2	Dose 2 Dose 3	Dose 3 Dose 4	Dose4 Dose 5
HBV	Birth	4 wks	8 weeks (at least 16 weeks after first dose)		
RotaV /PCV 13	6 wks	4 wks	4 wks		
DTaP	6 wks	4 wks	4 wks	6 ms	6ms
Hib	6 wks	4 wks (If younger than 12ms) 8wks (If at 12ms or older) No dose (If at 24ms or older)	4 wks (If younger than 12ms) 8wks (If at 12ms or older) No dose (If at 24ms or older)	8wks (at 12ms received 3 doses before 12msor high risk who received 3 doses at any age)	
OPV/IPV	6 wks	4 wks	4 wks	6 ms	
MMR	12ms	4 wks			

PERSONS AGED 7 YEAR THROUGH 18 YEAR

Vaccine	Minimum Age for Dose 1	Interval Between Doses			
		Dose 1 Dose 2	Dose 2 Dose 3	Dose 3 Dose 4	Dose4 Dose 5
HBV	Birth	4 wks	8 weeks (at least 16 weeks after first dose)		
Td,TdaP ©	7yrs	4 wks	4 wks (If younger than 12ms) 6ms (If at 12ms or older)	6 ms (If first dose younger than 12ms)	
OPV/IPV	6 wks	4 wks	4 wks	6 ms	
MMR	12ms	4 wks			

©Tetanus and diphtheria toxoids (Td) and tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap).

• Doses of DTaP are counted as part of the Td/Tdap series.

• Tdap should be substituted for a single dose of Td in the catch-up series for children aged 7 through 10 years or as a booster for children aged 11 through 18 years; use Td for other doses.