

## Changing concepts in universal immunization

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### Introduction

The Universal Immunization Programme (UIP) was launched in May 1974 as Expanded Programme on Immunization (EPI) by WHO globally with aim to protect all children against six vaccine preventable diseases by the year 2000. India launched its EPI in January 1978. The same programme was renamed as Universal Child Immunization (UCI) by UNICEF in 1990. The purpose of EPI was to assist health planners to develop an appropriate country specific immunization schedule based on local conditions. Though EPI initially started with six vaccines,

newer vaccines were added to schedule and now vaccines against Hepatitis B, Rubella, Rota virus, HiB, Pneumococcal and Japanese Encephalitis are also included in several country's Programme. But with passing years, the concepts in universal immunization are also fastly changing and health care providers are facing challenging situation and often get confused. Hence recent guidelines in these regard along with changes in vaccine content and schedule are to be adhered. The National Immunization Schedule for infants, children and pregnant mothers in India is as per Table 1.<sup>1</sup>

| National Immunization Schedule (NIS) for Infants, Children and Pregnant Women |  |                                  |                                  |                                  |
|---|--|----------------------------------|----------------------------------|----------------------------------|
| Vaccine   | When to give   | Dose                             | Route                            | Site                             |
| <b>For Pregnant Women</b>   |  |                                  |                                  |                                  |
| TT-1  | Early in pregnancy   | 0.5 ml                           | Intra-muscular                   | Upper Arm                        |
| TT-2  | 4 weeks after TT-1*  | 0.5 ml                           | Intra-muscular                   | Upper Arm                        |
| TT- Booster   | If received 2 TT doses in a pregnancy within the last 3 yrs*           | 0.5 ml                           | Intra-muscular                   | Upper Arm                        |
| <b>For Infants</b>  |  |                                  |                                  |                                  |
| BCG   | At birth or as early as possible till one year of age                  | 0.1ml (0.05ml until 1 month age) | Intra-dermal                     | Left Upper Arm                   |
| Hepatitis B - Birth dose  | At birth or as early as possible within 24 hours                       | 0.5 ml                           | Intra-muscular                   | Antero-lateral side of mid-thigh |
| OPV-0   | At birth or as early as possible within the first 15 days              | 2 drops                          | Oral                             | Oral                             |
| OPV 1, 2 & 3  | At 6 weeks, 10 weeks & 14 weeks (OPV can be given till 5 years of age) | 2 drops                          | Oral                             | Oral                             |
| Pentavalent 1, 2 & 3  | At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)    | 0.5 ml                           | Intra-muscular                   | Antero-lateral side of mid-thigh |
| Rotavirus#  | At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)    | 5 drops                          | Oral                             | Oral                             |
| IPV   | Two fractional dose at 6 and 14 weeks of age                           | 0.1 ml                           | Intra dermal two fractional dose | Intra-dermal: Right upper arm    |
| Measles /MR 1 <sup>st</sup> Dose\$  | 9 completed months-12 months. (can be given till 5 years of age)       | 0.5 ml                           | Sub-cutaneous                    | Right upper Arm                  |
| JE - 1**  | 9 completed months-12 months.  | 0.5 ml                           | Sub-cutaneous                    | Left upper Arm                   |
| Vitamin A (1 <sup>st</sup> dose)  | At 9 completed months with measles-Rubella                             | 1 ml (1 lakh IU)                 | Oral                             | Oral                             |
| <b>For Children</b>   |  |                                  |                                  |                                  |
| DPT booster-1   | 16-24 months   | 0.5 ml                           | Intra-muscular                   | Antero-lateral side of mid-thigh |
| Measles/ MR 2 <sup>nd</sup> dose \$   | 16-24 months   | 0.5 ml                           | Sub-cutaneous                    | Right upper Arm                  |
| OPV Booster   | 16-24 months   | 2 drops                          | Oral                             | Oral                             |
| JE-2  | 16-24 months   | 0.5 ml                           | Sub-cutaneous                    | Left Upper Arm                   |
| Vitamin A*** (2 <sup>nd</sup> to 9 <sup>th</sup> dose)                        | 16-18 months. Then one dose every 6 months up to the age of 5 years.   | 2 ml (2 lakh IU)                 | Oral                             | Oral                             |
| DPT Booster-2   | 5-6 years  | 0.5 ml.                          | Intra-muscular                   | Upper Arm                        |
| TT  | 10 years & 16 years  | 0.5 ml                           | Intra-muscular                   | Upper Arm                        |

- \* Give TT-2 or Booster doses before 36 weeks of pregnancy. However, give these even if more than 36 weeks have passed. Give TT to a woman in labour, if she has not previously received TT.
- \*\* JE Vaccine is introduced in select endemic districts after the campaign.
- \*\*\* The 2<sup>nd</sup> to 9<sup>th</sup> doses of Vitamin A can be administered to children 1-5 years old during biannual rounds, in collaboration with ICDS.
- # Phased introduction, at present in Andhra Pradesh, Haryana, Himachal Pradesh and Orissa from 2016 & expanded in Madhya Pradesh, Assam, Rajasthan, and Tripura in February 2017 and planned in Tamil Nadu & Uttar Pradesh in 2017.
- \$ Phased introduction, at present in five states namely Karnataka, Tamil Nadu, Goa, Lakshadweep and Puducherry. (As of Feb' 2017)

**Table 1:** National immunization schedule for infants, children and pregnant mothers in India

The recent changes to be adhered are as follows: In early old days all ANC mothers were used to get three anti tetanus (TT) shots before the child birth, but now only two TT doses are given four weeks apart. For those mothers who are pregnant within three years of her last pregnancy, a single TT booster is accepted to be sufficient. But now the mothers are given bivalent vaccine which protects mother against tetanus and diphtheria and hence dT has replaced TT. This also provides additional passive immunity against tetanus and diphtheria to newborn in early days after birth.

There are similar changes against polio vaccination. At the launch of EPI, oral polio vaccine was trivalent (tOPV), but now OPV type 2 has been declared eradicated in September 2015 and OPV type 3 has also not been detected since November 2012, hence presently bivalent OPV (bOPV) is only used. But in the areas with low vaccination coverage, Vaccine Derived Poliovirus (VDPV) is a new challenge for which single dose of injectable Inactivated Polio Vaccine (IPV) has been introduced at the age of 14 weeks under new Polio Eradication and Endgame strategic Plan 2013-2018. Hence it is recommended that the dose of IPV be added at 14 weeks when the third dose of DPT or pentavalent vaccine is given or at a contact soon thereafter (2). As an alternative to the full dose of intramuscular injection of IPV, 2 fractional (FIPV) intradermal doses at 6<sup>th</sup> and 14<sup>th</sup> weeks has shown to provide higher seroconversion rates, hence since April 2016 India introduced FIPV into routine immunization programme in 8 states, which was further expanded in another 8 states in August 2016 (3). Once the switch from tOPV to bOPV to IPV is made, OPV will no longer be used anywhere in the world (4). Now recently since May 2016 WHO has recommended 3 primary doses of IPV starting at 6-8 weeks at 4-8 weeks interval along with bOPV doses before all OPV formulations are withdrawn.

When EPI was launched, DPT vaccine was administered as combined vaccine, but now pentavalent vaccine has already replaced old trivalent vaccine at least for primary immunization. It had reduced the number of pricks to a child apart from providing additional immunity against Hepatitis B and HiB in same shot. For a first booster at the age of 18 months and second booster at four and half year DPT vaccine is recommended, previously DT was in use for second booster. Presently to boost up the weaning immunity against diphtheria dT vaccine has now replaced Tetanus Toxoid (TT) vaccine. Now dT is fastly replacing TT for all adolescent and adult immunization.

As far as measles vaccination is concerned, single dose of live attenuated vaccine was accepted to be safe and effective for past many years. Then recently second dose was added as supplementary immunization activity at 16-24 months to boost up the weaning measles immunity further and to offer coverage for those who had missed earlier. But

now this monovalent measles vaccine has been replaced with combined Measles-Rubella (MR) vaccine and two subsequent doses are given, one at 9 month and another at 16-24 months. This has helped to provide additional immunity against rubella at no extra cost.

Apart from above mentioned vaccines, Oral Rota Virus Vaccine is routinely provided along with pentavalent vaccine at 6, 10, 14 weeks. Similarly Japanese Encephalitis (JE) vaccination is also done in selected endemic areas and two subcutaneous doses are given, first at 9-12 months and other at 16-24 months. In the past revaccination with BCG was advised if it failed to result in scar formation, but now such revaccination is not recommended. In addition to above National Immunization Schedule, the WHO has also advised 3 primary doses of Pneumococcal conjugate vaccine starting at 6 weeks four weeks apart and single booster at 15-18 months. Similarly Human Papilloma Virus (HPV) immunization is also recommended in girl children above 9 years in two primary doses four weeks apart and booster dose after 6 months. The WHO also recommend Yellow Fever vaccination to be provided as combined vaccine with measles at the age of 9-12 months (5). India being typhoid endemic country, single dose of Vi Polysaccharide Vaccine at 2 years of age and a booster every three years is also strongly recommended. Alternately Ty21a oral vaccine is also available for adult and children above 5 years of age to be administered in three doses on empty stomach on alternate days, booster after every 3 years is recommended. There are many other commonly required vaccines like vaccine against Meningococcal conjugate, Influenza, Hepatitis A, Varicella, Cholera and Tick-borne Encephalitis which are recommended in children residing in specific high risk regions. These vaccines are generally offered as optional vaccines by pediatricians in many countries. Hence in this ever changing scenario of universal children immunization, health care providers are required to keep themselves updated in every regard.

## References

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