GUIDELINES

Indian Academy of Pediatrics (IAP) Recommended Immunization Schedule for Children Aged 0 through 18 years – India, 2013 and Updates on Immunization

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Justification: There is a need to review/revise recommendations about existing vaccines in light of recent developments in the field of vaccinology where new developments are taking place regularly at short intervals.

Process: Following an IAP ACVIP meeting on 3rd and 4th August, 2013, a draft of revised recommendations for the year 2013 and updates on certain new vaccine formulations was prepared and circulated among the meeting participants to arrive at a consensus.

Objectives: To review and revise recommendations for 2013 Immunization timetable for pediatricians in office practice and issue statements on new vaccine formulations.

Recommendations: The major change in the 2013 Immunization timetable was made in the recommendations pertaining to pertussis immunization. Taking in to the consideration of recent outbreaks of pertussis in many industrialized countries using acellular pertussis (aP) vaccines and subsequent finding of faster waning of the same in comparison to whole-cell pertussis (wP) vaccines and superior priming with wP vaccines than aP vaccines, the committee has now recommended wP vaccines for the primary series of infant vaccination. Guidelines are now also issued on the preference/ selection of a particular aP vaccine in case it is not feasible to use wP vaccine, and use of Tdap vaccine during pregnancy. The administration schedule of monovalent human rotavirus vaccine, RV1 has been revised to 10 and 14 weeks from existing 6 and 10 weeks. Recommendation is made for the need of booster dose of live attenuated SA-14-14-2 JE vaccine. Updates and recommendations are issued on new typhoid conjugate vaccine, inactivated vero-cell culture derived SA-14-14-2 JE vaccine, inactivated vero-cell derived Kolar strain, 821564XY JE vaccine, and new meningococcal conjugate vaccines. This year the recommended immunization schedule with range for persons aged 0 through 18 years is being published together instead of two separate schedules. A subcategory of 'general instruction' is added in footnotes. The comments and footnotes for several vaccines are revised and separate instructions for 'routine vaccination' and 'catch-up vaccination' are added in the footnotes section wherever applicable.

Key words: Indian Academy of Pediatrics, Advisory Committee on Vaccines and Immunization Practices, Recommendations, Immunization Timetable 2013.

As stated earlier [1] it was decided in 2012 to revise IAP Immunization Timetable every year. The IAP Advisory Committee on Vaccines and Immunization Practices (ACVIP) has recently reviewed and revised the recommended immunization schedules for children aged 0 through 18 years to ensure that the schedule reflects recommendations based on recent evidence for licensed vaccines in the country. The mid-term meeting of the IAP ACVIP was held on 3rd and 4th August, 2013 in New Delhi. IAP ACVIP members and invited experts who attended the meeting are listed at the end of this paper. The aim of the meeting was to discuss and debate recent developments in the field, to revise recommendations for the IAP Immunization Timetable for the year 2013, and to issue recommendations for newly licensed vaccines in the country. Following the meeting, a draft of revised immunization schedule for the year 2013 was prepared and circulated among the meeting participants to arrive at a consensus.

Process for Issuing Recommendations

The detailed process behind issuing IAP recommendations on immunization is described earlier [1]. We reaffirm that the recommendations of IAP are primarily for the pediatricians in office practice. These recommendations provide guidelines to a pediatrician on how best to utilize available licensed vaccines in their office-practice settings. The members may use their own discretion while using them in a given situation within the framework suggested [2]. The existing national immunization schedule and government policies are also taken in to account while drafting recommendations.

AIMS AND OBJECTIVES

To revise IAP Immunization Timetable for the year 2013 and review and issue recommendations on the recently licensed pediatric vaccines.

RECOMMENDATIONS FOR IAP IMMUNIZATION TIMETABLE, 2013

The IAP ACVIP has issued recommendations for the IAP Immunization Timetable for the year 2013 that includes the following major changes from last year**:**

A. Pertussis Immunization

IAP ACVIP has now issued following recommendations on use of pertussis vaccines for office-practice in private health care:

Primary immunization: The primary infant series should be completed with 3 doses of whole-cell pertussis (wP) vaccines. Vaccination must start at 6 weeks. Acellular pertussis (aP) vaccines should be avoided for the primary series of infant vaccination until or unless there is a genuine compelling reason to use aP vaccine in a given child.

The recommendation on the use of wP vaccine in primary immunization series is based on the experience with wP vaccines in India and on demonstration of faster waning with aP vaccines in comparison to wP vaccines, and superior priming with wP vaccines than aP vaccines in studies conducted in the industrialized countries after recent resurgence of pertussis in many of these countries using aP vaccines. The evidences and reasons behind above recommendations are discussed in detail in IAP Position Paper on Pertussis immunization [3].

The aP vaccine combinations should be avoided for the primary series. However, the aP vaccines may be preferred to wP vaccines in those children with history of severe adverse effects after previous dose/s of wP vaccines or children with neurologic disorders, if resources permit. The parents should be counseled about the probable efficacy related disadvantages of using aP vaccines for the primary series. The schedule is same as with wP (DTwP) vaccines. Like DTwP vaccines, DTaP vaccines must not be used in children 7 years or older because of increased reactogenicity.

Boosters: The 1st and 2nd booster doses of pertussis vaccines should also be of wP vaccine. However, considering a higher reactogenicity, aP vaccine/ combination can be considered for the boosters, if resources permit.

Choice of aP vaccines: Considering the strong evidence in favor of superiority of multicomponent (≥3) aP vaccines in comparison to one- and two-component aP vaccines from recent systematic reviews and meta-analysis [3], IAP unambiguously recommends that if any aP containing vaccine is used, it must at least have 3 or more components in the product, the more the better.

Tdap during pregnancy: Maternal immunization, particularly of pregnant women may be an effective approach to protect very young infants and neonates [3]. IAP ACVIP therefore now suggests immunization of pregnant women with a single dose of Tdap during the third trimester (preferred during 27 through 36 weeks gestation) regardless of number of years from prior Td or Tdap vaccination. Tdap has to be repeated in every pregnancy irrespective of the status of previous immunization (with Tdap). Even if an adolescent girl who had received Tdap one year prior to becoming pregnant will have to take it since there is rapid waning of immunity following pertussis immunization.

However, only single administration of Tdap is permitted to all adolescents. Persons aged 7 through 10 years who are not fully immunized with the childhood DTwP/DTaP vaccine series, should receive Tdap vaccine as the first dose in the catch-up series; if additional doses are needed, use Td vaccine. For these children, an adolescent Tdap vaccine is not required.

B. Rotavirus immunization

Administration schedule of monovalent rotavirus vaccine (RV1)

Monovalent (RV1) and pentavalent rotavirus (RV5) vaccines when started at 8 weeks of age and given at 2 or 3 dose schedule respectively, has been found to be highly effective in preventing rotavirus gastroenteritis [4]. WHO position paper [5] recommends that 1st dose of rotavirus vaccination should be given with 1st dose of DPT vaccination both for RV1 and RV5, which effectively means starting the schedule at 6 weeks in India. It is also known that if rotavirus vaccines are to be co-administered with OPV in a setting with an EPI vaccination schedule beginning at 6 weeks of age, the second dose of RV1 may not be sufficient to provide adequate immunity against severe rotavirus disease [6]. The IAP committee on Immunization has already expressed its concerns on the proper administration schedule of rotavirus vaccines, particularly two-dose schedule of RV1 in India in order to achieve higher yields in term of protective efficacy [1].

Several studies from South Africa, Vietnam, and Philippines have indicated that the older the infant when they receive the first dose of vaccine, the better the

immune response in terms of sero-conversion and GMCs [7]. The titers of circulating maternal antibody in the infants and OPV co-administration have a negative impact on the immune response of the first rotavirus vaccine dose (lower sero-conversion rates and reduced GMCs) [7]. It is a well known fact that first dose of RV1 administered at 6 weeks along with OPV is non-immunogenic. In a study conducted in South Africa, the seroconversion of first dose of RV1 when administered at 6 weeks along with OPV was found to be only 13%, whereas when the same dose was administered at 10 weeks along with IPV, the seroconversion rose to 43% [8]. In the same study, the anti-rotavirus IgA antibody sero-conversion rates were higher for the 10-14 weeks schedule (55-61%) compared to the 6-10 weeks schedule (36-43%) [7].

In Africa trial, the 2 dose and 3 dose schedule of RV1 starting at 6 weeks of age showed that vaccine efficacy against severe rotavirus diarrhea for the first year with 2 dose schedule was 58.7 (95% CI 35.7 -74) while for 3 dose schedule the same was 63.7 (95% CI 42.4 – 77.8) [8]. There was no difference on the first year efficacy of both the schedules in Malawi, but a definite gradient favoring 3-dose schedule in South Africa (81.5, 95% CI, 55.1-93.7 for 3-dose versus 72.2, 95% CI, 40.4-88.3 for 2-dose) [8]. However, when second year efficacy against severe rotavirus diarrhea was considered, there was significant difference in the efficacy of the two schedules in both the countries (85% for 3-dose versus 32% for 2-dose in South Africa, and 49% versus 18%, respectively in Malawi) [8-10].

Most of the comparative studies with 2 versus 3 dose schedule have employed RV1 in 10, 14 weeks instead of recommended 6, 10 weeks schedule [8-11]. An immunogenicity study from India has shown that RV1 given in a 2 dose schedule, with 1st dose between 8 to 10 weeks and 2nd dose between 12 to 16 weeks is immunogenic and well tolerated in healthy Indian infants [12]. Pentavalent vaccine given in 3 doses has shown adequate immunogenicity in Indian infants when started at 6 weeks of age [13]. A 3-dose schedule of RV 116E starting at 8 weeks demonstrated a robust immune response [14]. Two ongoing studies in Pakistan and Ghana are studying the immunogenicity of 2 versus 3-dose schedule of RV1.

Considering all the above mentioned facts, the IAP ACVIP is of the opinion that if RV1 vaccine is to be administered in a 2-dose schedule, the first dose should start at 10 weeks of age instead of 6 weeks in order to achieve better immune response. The second dose can be administered at 14 weeks to fit with existing national immunization schedule. However 3-dose schedule of any rotavirus vaccine can start at 6 weeks of age with minimum interval of 4 weeks between the doses.

C. Typhoid vaccination

Vi-polysaccharide conjugate typhoid vaccine (Typbar-TCV®} by Bharat Biotech:

Typbar-TCV® is a Vi-capsular polysaccharide conjugate typhoid vaccine conjugated with tetanus toxoid. The manufacturer has used a dose of 25 µg/0.5 mL of Conjugate Vi Content polysaccharide which is the highest having been used in other trials as well on conjugate vaccine the world over.

According to the data submitted by the manufacturer, a phase IIa/IIb study revealed no difference in the GMTs between two doses (15µg/0.5 mL) and single (25 µg/0.5 mL) dose cohorts, and a single dose of 25 µg/0.5 mL showed excellent immune response (100% seroconversion). A phase III, randomized, multi-centric, controlled trial was conducted to evaluate the immunogenicity and safety of the test vaccine, Typbar-TCV® in a total of 981 healthy subjects and compared with the typhoid vi capsular polysaccharide vaccine of the same manufacturer (Typbar®) having similar amount of antigen per dose. The study group receiving the test vaccine (Typbar-TCV®) was divided into two cohorts i.e. ≥6 months to ≤ 2 years (327 subjects) and >2 years to <45 years (654 subjects). Cohort–I was single arm open label and all the subjects received single dose of the test vaccine. Cohort-II was randomized double blind trial and the subjects were recruited in to two groups who received single dose of either test vaccine (340 subjects) or reference vaccine (314 subjects).

Immunogenicity results: In cohort-I, 98.05% subjects showed seroconversion (≥4-fold titre rise) on day 42, and the geometric mean titres (GMTs) on day 0 and 42 were 9.44U/mL and 1952.03U/mL respectively. The GMTs were slightly higher in the >1-2 years than in 6m to <1 year age group while no difference was seen in seroconversion rates. In cohort-II, 97.29% and 93.11% subjects of test and reference vaccine groups respectively, were seroconverted (≥4-fold titer rise) on day 42. Whereas the GMTs on day 42 in the test and reference vaccine groups were 1301.44U and 411.11U, respectively (P=0.001). Both seroconversion and GMTs were higher in younger (>2 to <15 years) than older (15-45 years) age groups.

Long-term immunogenicity: The manufacturer has planned a 3-year follow-up for seroconversion data of phase III. So far, they have shared 18 months follow-up

data which show significant waning of GMTs and seroconversion levels in both the cohorts from day 42 levels while 100% of subjects of test vaccine subjects were still seroprotected (the protective level: Vi antibody > 7.4 Elisa unit/mL). Similar trend was observed in the subgroup of cohort-II that received reference vaccine.

Safety issues: No serious adverse event was noted. The most common local and systemic events reported were pain at injection site and fever, respectively in both the cohorts. Fever was noticed in 10.0%, 4.28%, and 2.75% in cohort-I, test, and reference vaccine groups of cohort-II, respectively. None of the enrolled subjects were withdrawn from study for vaccine related adverse reaction. The manufacturer has indicated to follow all subjects for up to 12 weeks post vaccination.

The vaccine has been licensed by the Drug Controller General of India (DCGI) in August, 2013 for clinical use in India.

The IAP ACVIP has reviewed the above pivotal trial (unpublished) and considers it to be a promising vaccine, fulfilling the critical gap of providing protection under 2 years of age. However, before a slot is created for the vaccine in the existing IAP Immunization Timetable, the committee has pinpointed following issues to be addressed:

1. The researchers have used a Vi-PS typhoid vaccine from the same manufacturer as a reference vaccine above 2 years of age and have shown almost equal seroconversion and significantly higher GMTs with the new Vi PS-conjugate vaccine in children >2 years and adults, no comparative vaccine was used for the cohort consisting of children <2 years of age. Though it may be more difficult to identify a typhoid/non-typhoid vaccine that could be used to maintain a double blind design in this age group, a double-blind, randomized controlled trial would have been much more acceptable.

2. It seems quite encouraging that almost similar or higher level of seroconversion and GMTs were achieved below 2 years of age than in older children with the same vaccine, and significantly higher (>3 folds) GMTs were achieved with the test vaccine than the reference vaccine in older age group and adults. Another Vi-PS vaccine from a different manufacturer (Typhim-Vi® from Sanofi Pasteur) has demonstrated effectiveness in a large field trial in Kolkata, India [15]. The researchers have used a cut-off of >7.4 Elisa unit/mL as a serologic correlate for protection. However, it is still debatable and well known that there is no universally accepted absolute correlate of protection for typhoid disease or vaccine. Thus, there is need of a large field efficacy trial since seroconversion is not a direct proxy for ultimate clinical efficacy/ effectiveness.

3. Though the test subjects below 2 years of age could maintain reasonably good seroconversion even after 18 months of follow-up, the GMTs waned significantly and were far below the level achieved after the first dose. Hence, there may be a need of a booster dose of the vaccine. The impact of booster dose on antibody titres and exact timing of the same can only be determined after a longer follow-up.

4. The vaccine is licensed to be given at age 6 months and above. The manufacturers have recommended single dose of the vaccine at 9 months of age along with measles vaccine. However, the committee believes there is a need of studying interference with measles vaccine given to the subjects at 9 months before a universal recommendation is made. Similar studies are needed with MMR vaccine before recommending a booster of the vaccine at 15 months along with the former.

5. The new Vi-PS conjugate vaccine was found more than twice reactogenic (in term of fever) in children <2 years than older children and adults and almost 3 times more reactogenic in younger age group than the reference vaccine in older age group. However, the reactogenicity was almost similar as expected with any other vaccines given to infants. Nevertheless, the committee thinks there is a need to monitor the reactogenicity profile of the vaccine more closely and in higher number of subjects after licensure.

IAP recommendations for use

Considering the typhoid epidemiology in the country and analyzing the available data of the vaccine, IAP recommends the new Vi-PS conjugate vaccine below one year of age, preferably between 9-12 months (minimum age 6 months). Since the incompatibility data with measles vaccine is not available, it would be prudent to maintain an interval of at least 4 weeks with the former. The committee believes there is a definite need of a booster dose during second year of life; however, the available data is insufficient to specify exact timing of the same. The committee stresses the need of large scale field effectiveness trials in real life settings to establish superiority of the product over the existing Vi-PS vaccines, and to ascertain translation of

higher GMTs and better seroconversion rates in to greater protection.

D. Japanese Encephalitis vaccination

Live Attenuated SA-14-14-2 Vaccine

The IAP ACVIP reviewed the performance of SA-14-14-2 JE vaccine in India since its launch in 2006. Though this vaccine is not available in private market for office use, the committee deemed it necessary to respond to frequent queries from members on the critical issue of a need of 2nd dose (booster dose) of the vaccine.

The committee reviewed the efficacy of this vaccine in India. A small case–control study from Lucknow, India found an efficacy of 94.5% (95% CI, 81.5 to 98.9) after a single dose of this vaccine within 6 months after its administration [16]. However, data from post marketing surveillance (PMS) in India (ICMR unpublished study) showed that protective efficacy of the vaccine in India is not as high as that seen in Nepal. According to the study, sero-conversion rates at 28 days after vaccination were 73.9% and 67.2% in all individuals and in those who were nonimmune pre-vaccination, respectively. The protective efficacy of the vaccine at one year was 43.1% overall and 35% for those who were non-immune pre-vaccination, respectively [17]. Preliminary results of a recent case control study show an unadjusted protective effect of 62.5% in those with any report of vaccination [17]. According to this report, the JE vaccine efficacy has been around 60% in Uttar Pradesh and around 70% in Assam.

*Inactivated Vero cell culture-derived SA 14-14-2 JE vaccine (JE-VC), (*IXIARO® and *JEEV®)*

(*i*) *IXIARO® by Intercell AG:* This is an inactivated vaccine (JE-VC) derived from the attenuated SA 14-14-2 JEV strain propagated in Vero cells. This vaccine has been evaluated in several clinical trials in adults and children in India and in several other countries [18-20] IXIARO® has now been approved by US FDA and EU for use in children from the age of 2 months onwards [21, 22]. There is no efficacy data for IXIARO®, and the vaccine has been licensed in pediatric age group especially for travelers to Asian countries on the basis of a Phase III RCT conducted in the Philippines [23], and favourable interim data from a second Phase III trial in EU, U.S. and Australia [24]. The safety profile of the test vaccine was good, and its local tolerability profile was more favorable than that of the mouse brain vaccines [23].

(*ii*) *JEEV-the Indian variant of IC51, IXIARO:* Biological E. Ltd. has launched a vaccine for the endemic markets under the trade name JEEV® based on Intercell's technology and has already been WHO prequalified. In 2011, the BE Ltd. India conducted a multi-centric open label randomized controlled phase II/III study to evaluate safety and immunogenicity of JEEV® vaccine in ~450 children (≥1 to <3-year old) and compared to control Korean Green Cross Mouse Brain Inactivated (KGCC) vaccine (unpublished). This study demonstrated seroconversion (SCR) of 56.28% on day 28 and 92.42% on day 56 in JEEV® vaccinated group. Non-inferiority of JEEV® established against control in terms of proportion of subjects seroconverted. GMTs in JEEV® group were significantly higher than GMTs achieved in KGCC-JE vaccine group (218 vs 126). There was no significant difference between the groups in proportion of subjects' seroprotected, and in proportion of subjects reporting adverse events between groups. JEEV® has been licensed by Drug Controller General of India for use in prevention of JE virus infection in children and adult population on the basis of its ability to induce JEV neutralizing antibodies as a surrogate for protection.

Inactivated Vero cell culture-derived Kolar strain, 821564XY, JE vaccine (JENVAC®)

JENVAC® is a Vero cell culture derived, inactivated, adjuvanted and thiomersal containing vaccine developed by Bharat Biotech International Limited (BBIL). The original virus strain used in the vaccine was isolated from a patient in the endemic zone in Kolar, Karnataka, India by National Institute of Virology (NIV), Pune and later transferred to BBIL for vaccine development.

A Phase II/III, randomized, single blinded, active controlled study to evaluate the immunogenicity and safety of the vaccine was conducted among 644 healthy subjects. Out of 644 subjects 212 were between the age of ≤50 to >18 years, 201 subjects were between the age of ≤18 to >6 years and 231 subjects were between the age of ≤6 to >1 years. Subjects received two doses of the test vaccine or a single dose of a reference vaccine (Live attenuated, SA 14-14-2 Chinese vaccine) as the first dose and a placebo as the second dose.

The results revealed that even a single dose of the test vaccine was sufficient to elicit the immune response. On 28th day, the subjects who had received a single dose were 98.67% seroprotected and 93.14% seroconverted (4 fold) for ≤50 - ≥1 years, whereas the corresponding figures for the reference vaccine were 77.56% and 57.69%, respectively (p-value <0.001). There was no statistically significant difference in all

the 3 groups. The seroconversion (93.14% and 96.90%) and seroprotection (98.67% and 99.78%) percentages on the 28th and 56th day were not significantly different and similarly, no statistically significant difference in these rates was noted amongst different age groups. Higher GMTs were achieved in younger age groups. After the second dose of the test vaccine, the GMTs increased exponentially from day 28 (145) to day 56 (460.5) in ≤50 - ≥1 years. However, there was waning of both seroconversion and GMTs in both the test vaccine and reference vaccine groups at 18 months. All the subjects were followed up for 56±2 days. There was no serious adverse event or adverse event of any special interest noted in the study.

IAP Recommendations for use

The vaccination against JE is not recommended for routine use, but only for individuals living in endemic areas.

Live Attenuated SA-14-14-2 Vaccine: After analyzing the recent Indian efficacy/effectiveness data, the academy thinks there is a need of a second dose of the vaccine to provide more complete and sustained protection. First dose of the vaccine can be administered at 9 months along with measles vaccine and second at 16 to 18 months at the time of 1st booster of DTP vaccine.

JEEV® by Biological E. Ltd: The committee believes that although Biological E. India Ltd. has used the same strain, adjuvant and technology in production of JEEV® as used by Intercell AG in development of IXIARO®, the two vaccines cannot be treated as the same product. Considering the proven efficacy and safety profile of its parent vaccine in many countries over past many years, and demonstration of good seroprotection in Indian trial, the committee endorses use of this vaccine in India and recommends a primary schedule of 2 doses of 0.25mL for children aged ≥1- ≤3 years and 2 doses of 0.5mL for children >3 years, adolescents and adults administered intramuscularly on days 0 and 28. However, the long term persistence of protective efficacy and need of boosters are still undetermined. In February 2011, ACIP approved recommendations for a booster dose of JE-VC (IXIARO®) in adults.

JENVAC® by BBIL: The committee reviewed the data provided by the manufacturer on the clinical trials of JENVAC® in India. Although it lacks the experience of multinational trials of IXIARO® in different settings, nevertheless the results of a pivotal phase II/III study conducted in India appear satisfactory for issuing recommendations for clinical use. The committee recommends two doses of the vaccine (0.5 ml each) administered intramuscularly at 4 weeks interval for the primary immunization series for office practice starting from 1 year of age. Since appreciable waning was noted in both seroconversion and seroprotection rates, and GMTs were also waned significantly, there is definitely a need of booster dose at later stage. The exact timing of the booster along with feasibility of single dose for primary series can be determined only after obtaining the long term follow-up data.

E. Meningococcal vaccination

Meningococcal conjugate vaccines (MCVs)

Currently two different types of meningococcal conjugate vaccines (MCVs) are licensed in India. The first which is now readily available in private market also, is a quadrivalent vaccine Menactra® from Sanofi Pasteur, and another a monovalent serogroup A vaccine from Serum Institute of India (SII).

Quadrivalent meningococcal polysaccharide-protein conjugate vaccine (*MenACWY-D, Menactra®,*)

This is a quadrivalent (A,C,W135,Y) meningococcal conjugate vaccine using diphtheria toxin as carrier protein (A,C,W135,Y-D), and was licensed in US in 2005. However, it is licensed in India only in 2012 for use among persons aged 2 through 55 years. In 2011, ACIP recommended a two-dose series of this vaccine for use in children aged 9-23 months. It contains 4 µg each of A, C, Y and W-135 polysaccharide conjugated to 48 µg of diphtheria toxoid. A single dose of 0.5 mL IM is recommended. Recent estimates of the effectiveness of MenACWY-D, the first licensed quadrivalent vaccine suggest that within 3 to 4 years after vaccination, effectiveness is 80% to 85% [25, 26]. It is associated with minor local side effects such as pain, and swelling. Guillain-Barré Syndrome was noted as a possible but unproven risk in some adolescents following immunization [27]. Interference with PCV13 immune responses was noted when MenACWY-D and PCV13 were administered simultaneously in patients with asplenia. Hence, it is now recommended that at least one month interval should be kept between PCV13 and MenACWY-D, and PCV13 should be administered first [27].

Monovalent serogroup A conjugate vaccine (PsA–TT, MenAfriVac®,)

Meningococcal Group A Conjugate Vaccine is a lyophilized vaccine of purified meningococcal A polysaccharide covalently bound to tetanus toxoid (TT) which acts as a carrier protein. It contains 10 µg of group

IAP Recommended Immunization Schedule 2013 for Children Aged 0-18 years (with range)

Age / Vaccine	Birth	6 wk	10 wk	14 wk	18 wk	6 mo	9 mo	12 mo	15 mo	18 mo	19-23 mo	2-3 yr	4-6 yr	7-10 yr	11-12 yr	13-18 yr
BCG	BCG	Hep B3														
Hep B	Hep B1	Hep B2		Hep B3												
Polio	OPV 0	IPV 1	IPV 2		IPV 3		OPV 1	OPV 2	IPV B1				OPV 3			
DTP		DTP 1	DTP 2	DTP 3					DTP B1				DTP B2			
Tdap															Tdap	
Hib		Hib 1	Hib 2	Hib 3					Hib Booster							
Pneumococcal		PCV 1	PCV 2	PCV 3					PCV Booster							PCV
PPSV23																PPSV
Rotavirus		RV 1	RV 2	RV 3												
Measles								Measles								
MMR									MMR 1				MMR 2			
Varicella										VAR 1			VAR 2			
Hep A										Hep A1 & Hep A2						
Typhoid												Typhoid				
Influenza											Influenza (yearly)					
HPV															HPV 1-3	
Meningococcal													Meningococcal			
Cholera												Cholera 1 & 2				
JE												Japanese Encephalitis				

- This schedule includes recommendations in effect as of November 2013.
- These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.

Range of recommended ages for all children
Range of recommended ages for catch-up immunization
Range of recommended ages for certain high-risk groups
Not routinely recommended

Footnotes: Recommended Immunization Schedule for Persons Aged 0 through 18 Years — IAP, 2013

I. General instructions:

- Vaccination at birth means as early as possible within 24 to 72 hours after birth or at least not later than one week after birth
- Whenever multiple vaccinations are to be given simultaneously, they should be given within 24 hours if simultaneous administration is not feasible due to some reasons
- The recommended age in weeks/months/years mean completed weeks/months/years
- Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible.
- The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines
- When two or more live parenteral/intranasal vaccines are not administered on the same day, they should be given at least 28 days (4 weeks) apart; this rule does not apply to live oral vaccines
- If given <4 weeks apart, the vaccine given 2nd should be repeated
- The minimum interval between 2 doses of inactivated vaccines is usually 4 weeks (exception rabies)
- Vaccine doses administered up to 4 days before the minimum interval or age can be counted as valid (exception rabies). If the vaccine is administered > 5 days before minimum period it is counted as invalid dose.
- Any number of antigens can be given on the same day
- Changing needles between drawing vaccine into the syringe and injecting it into the child is not necessary.
- Different vaccines should not be mixed in the same syringe unless specifically licensed and labeled for such use.
- Patients should be observed for an allergic reaction for 15 to 20 minutes after receiving immunization(s).
- When necessary, 2 vaccines can be given in the same limb at a single visit.
- The anterolateral aspect of the thigh is the preferred site for 2 simultaneous IM injections because of its greater muscle mass.
- The distance separating the 2 injections is arbitrary but should be at least 1 inch so that local reactions are unlikely to overlap
- Although most experts recommend "aspiration" by gently pulling back on the syringe before the injection is given, there are no data to document the necessity for this procedure. If blood appears after negative pressure, the needle should be withdrawn and another site should be selected using a new needle.
- A previous immunization with a dose that was less than the standard dose or one administered by a nonstandard route should not be counted, and the person should be re-immunized as appropriate for age.

II. Specific instructions:

1. BCG Vaccine

Routine Vaccination:

- Should be given at birth or at first contact

Catch-up Vaccination:

- May be given up to 5 years

2. Hepatitis B (HepB) Vaccine

Routine Vaccination:

- Minimum age: birth
- Administer monovalent HepB vaccine to all newborns within 48 hours of birth.
- Monovalent HepB vaccine should be used for doses administered before age 6 weeks.
- Administration of a total of 4 doses of HepB vaccine is permissible when a combination vaccine containing HepB is administered after the birth dose.
- Infants who did not receive a birth dose should receive 3 doses of a HepB containing vaccine starting as soon as feasible.
- The ideal minimum interval between dose 1 and dose 2 is 4 weeks, and between dose 2 and 3 is 8 weeks. Ideally, the final (3^{rd} or 4^{th}) dose in the HepB vaccine series should be administered no earlier than age 24 weeks and at least 16 weeks after the first dose, whichever is later.
- Hep B vaccine may also be given in any of the following schedules: Birth, 1, & 6 mo, Birth, 6 and 14 weeks; 6, 10 and 14 weeks; Birth, 6 ,10 and 14 weeks, etc. All schedules are protective.

Catch-up Vaccination:

- Administer the 3-dose series to those not previously vaccinated.
- In catch-up vaccination use 0, 1, and 6 months schedule.

3. Poliovirus Vaccines

Routine Vaccination:

- Birth dose of OPV usually does not lead to VAPP.
- OPV in place of IPV, if IPV is unfeasible, minimum 3 doses.
- Additional doses of OPV on all SIAs.
- IPV: Minimum age - 6 weeks.
- IPV: 2 instead of 3 doses can be also used if primary series started at 8 weeks and the interval between the doses is kept 8 weeks
- No child should leave your facility without polio immunization (IPV or OPV), if indicated by the schedule!!

Catch-up Vaccination:

- IPV catch-up schedule: 2 doses at 2 months apart followed by a booster after 6 months of previous dose.

4. Diphtheria and Tetanus Toxoids and Pertussis (DTP) Vaccine

Routine Vaccination:

- Minimum age: 6 weeks
- The first booster (4^{th} dose) may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose.
- DTaP vaccine/combinations should preferably be avoided for the primary series.
- DTaP may be preferred to DTwP in children with history of severe adverse effects after previous dose/s of DTwP or children with neurologic disorders.
- First and second boosters may also be of DTwP. However, considering a higher reactogenicity, DTaP can be considered for the boosters.
- If any 'acellular pertussis' containing vaccine is used, it must at least have 3 or more components in the product.

Catch-up Vaccination:

- Catch-up schedule: The 2nd childhood booster is not required if the last dose has been given beyond the age of 4 years.
- Catch up below 7 years: DTwP/DTaP at 0, 1 and 6 months;
- Catch up above 7 years: Tdap, Td, and Td at 0, 1 and 6 months.

5. Tetanus and Diphtheria Toxoids and a Cellular Pertussis (Tdap) Vaccine

Routine Vaccination:

- Minimum age: 7 years (Adacel® is approved for 11-64 years by ACIP and 4 to 64 year olds by FDA, while Boostrix® for 10 years and older by ACIP and 4 years of age and older by FDA in US).
- Administer 1 dose of Tdap vaccine to all adolescents aged 11 through 12 years.
- Tdap during pregnancy: One dose of Tdap vaccine to pregnant mothers/adolescents during each pregnancy (preferred during 27 through 36 weeks gestation) regardless of number of years from prior Td or Tdap vaccination.

Catch-up Vaccination:

- Catch up above 7 years: Tdap, Td, Td at 0, 1 and 6 months.
- Persons aged 7 through 10 years who are not fully immunized with the childhood DTwP/DTaP vaccine series, should receive Tdap vaccine as the first dose in the catch-up series; if additional doses are needed, use Td vaccine. For these children, an adolescent Tdap vaccine should not be given.
- Persons aged 11 through 18 years who have not received Tdap vaccine should receive a dose followed by tetanus and diphtheria toxoids (Td) booster doses every 10 years thereafter.
- Tdap vaccine can be administered regardless of the interval since the last tetanus and diphtheria toxoid–containing vaccine.

6. Haemophilus Iinfluenzae Type b (Hib) Conjugate Vaccine

Routine Vaccination:

- Minimum age: 6 weeks
- Primary series includes Hib conjugate vaccine at ages 6, 10, 14 weeks with a booster at age 12 through 18 months.

Catch-up Vaccination:

- Catch-up is recommended till 5 years of age.
- 6-12 months; 2 primary doses 4 weeks apart and 1 booster;
- 12-15 months: 1 primary dose and 1 booster;
- Above 15 months: single dose.
- If the first dose was administered at age 7 through 11 months, administer the second dose at least 4 weeks later and a final dose at age 12-18 months at least 8 weeks after the second dose

7. Pneumococcal Conjugate Vaccines (PCVs)

Routine Vaccination:

- Minimum age: 6 weeks
- Both PCV10 and PCV13 are licensed for children from 6 weeks to 5 years of age (although the exact labeling details may differ by country). Additionally, PCV13 is licensed for the prevention of pneumococcal diseases in adults >50 years of age
- Primary schedule (For both PCV10 and PCV13): 3 primary doses at 6, 10, and 14 weeks with a booster at age 12 through 15 months.

Catch-up Vaccination:

- Administer 1 dose of PCV13 or PCV10 to all healthy children aged 24 through 59 months who are not completely vaccinated for their age.
- For PCV 13: Catch up in 6-12 months: 2 doses 4 weeks apart and 1 booster; 12-23 months: 2 doses 8 weeks apart; 24 mo & above: single dose
- For PCV10: Catch up in 6-12 months: 2 doses 4 weeks apart and 1 booster; 12 months to 5 years: 2 doses 8 weeks apart
- Vaccination of persons with high-risk conditions:
  - PCV and pneumococcal polysaccharide vaccine [PPSV] both are used in certain high risk group of children.
  - For children aged 24 through 71 months with certain underlying medical conditions, administer 1 dose of PCV13 if 3 doses of PCV were received previously, or administer 2 doses of PCV13 at least 8 weeks apart if fewer than 3 doses of PCV were received previously.
  - A single dose of PCV13 may be administered to previously unvaccinated children aged 6 through 18 years who have anatomic or functional asplenia (including sickle cell disease), HIV infection or an immuno compromising condition, cochlear implant or cerebrospinal fluid leak.
  - Administer PPSV23 at least 8 weeks after the last dose of PCV to children aged 2 years or older with certain underlying medical conditions.

8. Pneumococcal Polysaccharide Caccine (PPSV23)

- Minimum age: 2 years
- Not recommended for routine use in healthy individuals. Recommended only for the vaccination of persons with certain high-risk conditions.
- Administer PPSV at least 8 weeks after the last dose of PCV to children aged 2 years or older with certain underlying medical conditions like anatomic or functional asplenia (including sickle cell disease), HIV infection, cochlear implant or cerebrospinal fluid leak.
- An additional dose of PPSV should be administered after 5 years to children with anatomic/functional asplenia or an immunocompromising condition.
- PPSV should never be used alone for prevention of pneumococcal diseases amongst high–risk individuals.
- Children with following medical conditions for which PPSV23 and PCV13 are indicated in the age group 24 through 71 months:
  - Immunocompetent children with chronic heart disease (particularly cyanotic congenital heart disease and cardiac failure); chronic lung disease (including asthma if treated with high-dose oral corticosteroid therapy), diabetes mellitus; cerebrospinal fluid leaks; or cochlear implant.
  - Children with anatomic or functional asplenia (including sickle cell disease and other hemoglobinopathies, congenital or acquired asplenia, or splenic dysfunction);
  - Children with immunocompromising conditions: HIV infection, chronic renal failure and nephrotic syndrome, diseases associated with treatment with immunosuppressive drugs or radiation therapy, including malignant neoplasms, leukemias, lymphomas and Hodgkin disease; or solid organ transplantation, congenital immunodeficiency.

9. Rotavirus (RV) Vaccines

Routine Vaccination:

- Minimum age: 6 weeks for both RV-1 [Rotarix] and RV-5 [RotaTeq].

- Only two doses of RV-1 are recommended at present.
- RV1 should preferably be employed in 10 and 14 week schedule, instead of 6 and 10 week; the former schedule is found to be far more immunogenic than the later
- If any dose in series was RV-5 or vaccine product is unknown for any dose in the series, a total of 3 doses of RV vaccine should be administered.

Catch-up Vaccination:

- The maximum age for the first dose in the series is 14 weeks, 6 days.
- Vaccination should not be initiated for infants aged 15 weeks, 0 days or older.
- The maximum age for the final dose in the series is 8 months, 0 days.

10.Measles

Routine Vaccination:

- Minimum age: 9 months or 270 completed days.

Catch-up Vaccination:

- Catch up vaccination beyond 12 months should be MMR
- Measles vaccine can be administered to infants aged 6 through 11 months during outbreaks. These children should be revaccinated with 2 doses of measles containing vaccines, the first at ages 12 through 15 months and at least 4 weeks after the previous dose, and the second at ages 4 through 6 years

11. Measles, Mumps and Rubella (MMR) Vaccine

Routine Vaccination:

- Minimum age: 12 months
- Administer the first dose of MMR vaccine at age 12 through 18 months, and the second dose at age 4 through 6 years.
- The second dose may be administered before age 4 years, provided at least 4 weeks have elapsed since the first dose. Catch-up vaccination:
- Ensure that all school-aged children and adolescents have had 2 doses of MMR vaccine; the minimum interval between the 2 doses is 4 weeks.
- One dose if previously vaccinated with one dose

12. Varicella Vaccine

Routine Vaccination:

- Minimum age: 12 months
- Administer the first dose at age 15 through 18 months and the second dose at age 4 through 6 years.
- The second dose may be administered before age 4 years, provided at least 3 months have elapsed since the first dose. If the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.
- The risk of breakthrough varicella is lower if given 15 months onwards.

Catch-up Vaccination:

- Ensure that all persons aged 7 through 18 years without 'evidence of immunity' have 2 doses of the vaccine.
- For children aged 12 months through 12 years, the recommended minimum interval between doses is 3 months. However, if the second dose was administered at least 4 weeks after the first dose, it can be accepted as valid.
- For persons aged 13 years and older, the minimum interval between doses is 4 weeks.
- For persons without evidence of immunity, administer 2 doses if not previously vaccinated or the second dose if only 1 dose has been administered.
- Evidence of immunity' to varicella includes any of the following:
  - documentation of age-appropriate vaccination with a varicella vaccine
  - laboratory evidence of immunity or laboratory confirmation of disease
  - diagnosis or verification of a history of varicella disease by a health-care provider
  - diagnosis or verification of a history of herpes zoster by a health-care provider

13. Hepatitis A (HepA) Vaccines

Routine Vaccination:

- Minimum age: 12 months
- Start the 2-dose HepA vaccine series for children aged 12 through 23 months; separate the 2 doses by 6 to 18 months.
- Two doses of both killed and live Hepatitis A vaccines as of now

Catch-up Vaccination:

- Administer 2 doses at least 6 months apart to unvaccinated persons.
- For catch up vaccination, pre vaccination screening for Hepatitis A antibody is recommended in children older than 10 years as at this age the estimated sero-positive rates exceed 50%.

14. Typhoid Vaccines

Routine Vaccination:

- Both Vi-PS (polysaccharide) and Vi-PS conjugate vaccines are available
- Minimum ages:
  - Vi-PS (polysaccharide) vaccines: 2 years
  - Vi-PS (Typbar-TCV®): 6 months;
- Vaccination schedule:
  - Vi-PS (polysaccharide) vaccines: single dose at 2 years; revaccination every 3 years; (no evidence of hypo-responsiveness on repeated revaccination so far).
  - Vi-PS conjugate (Typbar-TCV®): Single dose at 9-12 months and a booster during second year of life.
- Vi-PS Conjugate vaccine (PedaTyph®): data not sufficient to recommend for routine use.
- Greater experience and more robust data with Vi-PS polysaccharide vaccines; whereas there is limited experience with Vi-PS conjugate vaccines.

Catch-up Vaccination:

- Recommended throughout the adolescent period, i.e. 18 years.

15. Influenza vaccine

Routine Vaccination:

- Minimum age: 6 months for trivalent inactivated influenza vaccine (TIV)
- Recommended only for the vaccination of persons with certain high-risk conditions.
- First time vaccination: 6 months to below 9 years: two doses 1 month apart; 9 years and above: single dose
- Annual revaccination with single dose.
- Dosage (TIV) : aged 6–35 months 0.25 ml; 3 years and above: 0.5 ml
- For children aged 6 months through 8 years: For the 2012–13 season, administer 2 doses (separated by at least 4 weeks) to children who are receiving influenza vaccine for the first time.
- All the currently available TIVs in the country contain the 'Swine flu' or 'A (H1N1)' antigen; no need to vaccinate separately.
- Best time to vaccinate:
  - As soon as the new vaccine is released and available in the market
  - Just before the onset of rainy season.

16. Human Papillomavirus (HPV) Vaccines

Routine Vaccination:

- Minimum age: 9 years
- HPV4 [Gardasil] and HPV2 [Cervarix] are licensed and available.
- Either HPV4 (0, 2, 6 months) or HPV2 (0, 1, 6 months) is recommended in a 3-dose series for females aged 11 or 12 years.
- HPV4 can also be given in a 3-dose series for males aged 11 or 12 years, but not yet licensed for use in males in India.
- The vaccine series can be started beginning at age 9 yrs.
- Administer the second dose 1 to 2 months after the first dose and the third dose 6 months after the first dose (at least 24 weeks after the first dose).

Catch-up Vaccination:

- Administer the vaccine series to females (either HPV2 or HPV4) at age 13 through 45 years if not previously vaccinated.
- Use recommended routine dosing intervals (see above) for vaccine series catch-up.

17. Meningococcal Vaccine

- Recommended only for certain high risk group of children, during outbreaks, and international travelers, including students going for study abroad and travelers to Hajj and sub-Sahara Africa.
- Both Meningococcal conjugate vaccines (Quadrivalent MenACWY-D, Menactra® by Sanofi Pasteur and monovalent group A, PsA–TT, MenAfriVac® by Serum Institute of India) and polysaccharide vaccines (bi- and quadrivalent) are licensed in India. PsA–TT is not freely available in market.
- Conjugate vaccines are preferred over polysaccharide vaccines due to their potential for herd protection and their increased immunogenicity, particularly in children <2 years of age.
- As of today, quadrivalent conjugate and polysaccharide vaccines are recommended only for children 2 years and above. Monovalent group A conjugate vaccine, PsA–TT can be used in children above 1 year of age.

18. Cholera Vaccine

- Minimum age: one year (killed whole cell vibrio cholera (Shanchol)
- Not recommended for routine use in healthy individuals; recommended only for the vaccination of persons residing in highly endemic areas and traveling to areas where risk of transmission is very high like Kumbh mela, etc.
- Two doses 2 weeks apart for >1 year old.

19. Japanese encephalitis (JE) Vaccine

Routine Vaccination:

- Recommended only for individuals living in endemic areas
- Three types of new generation JE vaccines are licensed in India : one, live attenuated, cell culture derived SA-14-14-2, and two inactivated JE vaccines, namely 'vero cell culture-derived SA 14-14-2 JE vaccine' (JEEV® by BE India) and 'vero cell culture-derived, 821564XY, JE vaccine' (JENVAC® by Bharat Biotech)
- Live attenuated, cell culture derived SA-14-14-2:
  - Minimum age: 8 months;
  - Two dose schedule, first dose at 9 months along with measles vaccine and second at 16 to 18 months along with DTP booster
  - Not available in private market for office use
- Inactivated cell culture derived SA-14-14-2 (JEEV® by BE India) :
  - Minimum age: 1 year (US-FDA: 2 months)
  - Primary immunization schedule: 2 doses of 0.25ml each administered intramuscularly on days 0 and 28 for children aged ≥ 1 to ≤ 3 years
  - 2 doses of 0.5 ml for children >3years and adults aged ≥ 18 years
  - Need of boosters still undetermined
- Inactivated Vero cell culture-derived Kolar strain, 821564XY, JE vaccine (JENVAC® by Bharat Biotech)
  - Minimum age: 1 year
  - Primary immunization schedule: 2 doses of 0.5 ml each administered intramuscularly at 4 weeks interval
  - Need of boosters still undetermined.

Catch up Vaccination:

- All susceptible children up to 15 yrs should be administered during disease outbreak/ahead of anticipated outbreak in campaigns

20. Rabies Vaccine

- Only modern tissue culture vaccines (MTCVs) and IM routes are recommended for both 'post-exposure' and 'pre-exposure' prophylaxis in office practice
- Post-exposure prophylaxis is recommended following a significant contact with dogs, cats, cows, buffaloes, sheep, goats, pigs, donkeys, horses, camels, foxes, jackals, monkeys, mongoose, bears and others. Rodent bites do not require post exposure prophylaxis in India.
- Post-exposure prophylaxis:
- MTCVs are recommended for all category II and III bites.
- Dose: 1.0 ml intramuscular (IM) in antero-lateral thigh or deltoid (never in gluteal region) for Human Diploid Cell Vaccine (HDCV), Purified Chick Embryo Cell (PCEC) vaccine, Purified Duck Embryo Vaccine (PDEV); 0.5 ml for Purified Vero Cell Vaccine (PVRV). Intradermal (ID) administration is not recommended in individual practice.
- Schedule: 0, 3, 7, 14, and 30 with day '0' being the day of commencement of vaccination. A sixth dose on day 90 is optional and may be offered to patients with severe debility or those who are immunosuppressed
- Rabies immunoglobin (RIG) along with rabies vaccines are recommended in all category III bites.
- Equine rabies immunoglobin (ERIG) (dose 40 U/kg) can be used if human rabies immunoglobin is not available;
- Pre -exposure prophylaxis:
- Three doses are given intramuscularly in deltoid/ anterolateral thigh on days 0, 7 and 28 (day 21 may be used if time is limited but day 28 preferred).
- For re-exposure at any point of time after completed (and documented) pre or post exposure prophylaxis, two doses are given on days 0 and 3.
- RIG should not be used during re-exposure therapy.

IAP Immunization Time Table 2013

I. IAP recommended vaccines for routine use

Age (completed weeks/ months/ years)	Vaccines	Comments
Birth	BCG OPV 0 Hep-B 1	Administer these vaccines to all newborns before hospital discharge
6 weeks	DTwP 1 IPV 1 Hep-B 2 Hib 1 Rotavirus 1 PCV 1	**DTP:** • DTaP vaccine/combinations should preferably be avoided for the primary series • DTaP vaccine/combinations should be preferred in certain specific circumstances/ conditions only **Polio:** • All doses of IPV may be replaced with OPV if administration of the former is unfeasible • Additional doses of OPV on all supplementary immunization activities (SIAs) • Two doses of IPV instead of 3 for primary series if started at 8 weeks, and 8 weeks interval between the doses • No child should leave your facility without polio immunization (IPV or OPV), if indicated by the schedule **Rotavirus:** • 2 doses of RV1 and 3 doses of RV5 • RV1 should be employed in 10 & 14 week schedule, instead of 6 & 10 week • 10 & 14 week schedule of RV1 is found to be far more immunogenic than existing 6 & 10 week schedule
10 weeks	DTwP 2, IPV 2 Hib 2, Rotavirus 2 PCV 2	**Rotavirus:** If RV1 is chosen, the first dose should be given at 10 weeks
14 weeks	DTwP 3 IPV 3, Hib 3 Rotavirus 3, PCV 3	**Rotavirus:** Only 2 doses of RV1 are recommended at present. If RV1 is chosen, the 2nd dose should be given at 14 weeks
6 months	OPV 1 Hep-B 3	**Hepatitis-B:** The final (third or fourth) dose in the HepB vaccine series should be administered no earlier than age 24 weeks and at least 16 weeks after the first dose.
9 months	OPV 2 Measles	Measles vaccine ideally should not be administered before completing 270 days or 9 months of life
12 months	Hep-A 1	**Hepatitis A:** For both killed and live hepatitis-A vaccines, 2 doses are recommended as of now
15 months	MMR 1 Varicella 1, PCV Booster	**Varicella:** The risk of breakthrough varicella is lower if given 15 months onwards
16 to 18 months	DTwP/ DTaP B1 IPV B1 Hib B1	The first booster (4th dose) may be administered as early as age 12 months, provided at least 6 months have elapsed since the third dose. **DTP:** • First & second boosters should preferably be of DTwP • Considering a higher reactogenicity of DTwP, DTaP can be considered for the boosters
18 months	Hep-A 2	**Hepatitis A:** For both killed and live hepatitis-A vaccines 2 doses are recommended as of now
2 years	Typhoid 1	**Typhoid:** Typhoid revaccination every 3 years, if Vi-polysaccharide vaccine is used.
4 to 6 years	DTwP B2/DTaP B2 OPV 3, MMR 2, Varicella 2, Typhoid 2	**MMR:** the 2nd dose can be given at anytime 4-8 weeks after the 1st dose. **Varicella:** the 2nd dose can be given at anytime 3 months after the 1st dose.
10 to 12 years	Tdap/Td HPV	**Tdap:** is preferred to Td followed by Td every 10 years. **HPV:** Only for females, 3 doses at 0, 1-2 (depending on brands) and 6 months.

II. IAP recommended vaccines for High-risk* children (Vaccines under special circumstances):

1. Influenza Vaccine,
2. Meningococcal Vaccine,
3. Japanese Encephalitis Vaccine
4. Cholera Vaccine,
5. Rabies Vaccine,
6. Yellow Fever Vaccine,
7. Pneumococcal Polysaccharide vaccine (PPSV 23)

**** High-risk category of children:***

- Congenital or acquired immunodeficiency (including HIV infection)
- Chronic cardiac, pulmonary (including asthma if treated with prolonged high-dose oral corticosteroids), hematologic, renal (including nephrotic syndrome), liver disease and diabetes mellitus
- Children on long term steroids, salicylates, immunosuppressive or radiation therapy
- Diabetes mellitus, Cerebrospinal fluid leak, Cochlear implant, Malignancies,
- Children with functional/ anatomic asplenia/ hyposplenia
- During disease outbreaks
- Laboratory personnel and healthcare workers
- Travelers

A polysaccharide conjugated to 10-33 μg tetanus toxoid, with alum as adjuvant and thiomersal as preservative [28]. The vaccine is licensed in India since 2009 and prequalified by WHO in 2010, but surprisingly, the company has not launched this inexpensive vaccine (costing around half a cent to African nations) in India so far. It has been used in large campaigns in Burkina Faso, Mali, and Niger and is being progressively introduced in other countries of the African meningitis belt [28].

It should be administered as a single intramuscular injection of 0.5 mL to individuals 1-29 years of age [28]. The possible need for a booster dose has not yet been established. Persons who have previously received a meningococcal A polysaccharide-containing vaccine can be vaccinated with the conjugate vaccine.

The single intramuscular dose induces functional antibody titres against meningococcal serogroup A which are significantly higher and more persistent than those induced by a corresponding polysaccharide vaccine [29-31].The immune response seems to persist for a long time. The vaccine has also got a very good safety profile. There is moderate level of evidence for protection of children against Group A meningococcal disease in both children >12 months to <5 years, and in individuals ≥5 years old [32]. Furthermore, the vaccine has demonstrated a great effectiveness when used in Africa in campaigns.

IAP position on use of meningococcal vaccines in India

The current epidemiology and burden of meningococcal diseases (MD) in India do not justify routine use of meningococcal vaccines. Meningococcal vaccines are recommended only for certain high-risk conditions and situations as enumerated below in children aged 2 years or more (3 months or older if risk of meningococcal disease is high, e.g. outbreaks/ close household contact). Conjugate vaccines are preferred over polysaccharide vaccines due to their potential for herd protection and their increased immunogenicity, particularly in children <2 years of age.

Sporadic outbreaks of meningococcal disease have been recorded for last many decades in India. These outbreaks, particularly the larger epidemics have almost universally been caused by serogroup A meningococci [33]. The committee believes that the new affordable serogroup A-containing monovalent conjugate vaccine manufactured by SII should have a critical role in containing future epidemics. The Academy urges the Indian manufacturer to make this vaccine available in the country also. The quadrivalent MenACWY-D should be employed in individuals having certain high-risk conditions and situations (mentioned below) and amongst international travelers.

IAP recommendations on dosage in different categories: IAP now recommends the use of MCVs in different categories as per following description:

A. *During disease outbreaks*: Polysaccharide vaccines can be used to control outbreaks in countries where limited economic resources or insufficient supply restrict the use of MCVs [28]. However, due to the limited efficacy of polysaccharide vaccines in children <2 years of age, conjugate vaccines should be used for protection of those aged 12–24 months, particularly for Men A disease. Since majority of documented outbreaks in India are caused by Men A, monovalent MCV, like PsA-TT should be employed in mass vaccination.

B. *Vaccination of persons with high-risk conditions/ situations*

(*i*) *Children with terminal complement component deficiencies:* A two-dose primary series of MCV administered 8–12 weeks apart is recommended for persons aged 24 months through 55 years with persistent deficiencies of the late complement component pathway. A booster dose should be administered every 5 years. Children who receive the primary series before their seventh birthday should receive the first booster dose in 3 years and subsequent doses every 5 years.

(*ii*) *Children with functional/ anatomic asplenia/ hyposplenia (including sickle cell disease):* Administer 2 primary doses of either MCV with at least 8 weeks between doses for individuals aged 24 months through 55 years. Vaccination should ideally be started two weeks prior to splenectomy.

(*iii*) *Persons with Human Immunodeficiency Virus:* Administer two doses at at least 8 weeks interval.

(*iv*) *Laboratory personnel and healthcare workers:* who are exposed routinely to *Neisseria meningitides* in solutions that may be aerosolized should be considered for vaccination. A single dose of MCV is recommended. A booster dose should be administered every 5 years if exposure is ongoing.

(*v*) *Adjunct to chemoprophylaxis:* in close contacts of patients with MD (health care workers in contact with secretions, household contacts, day care contacts) single dose of appropriate group MCV is recommended.

C. International travelers

(*i*) *Students going for study abroad:* (mandatory in most universities in the USA) Some institutions have policies requiring vaccination against MD as a condition of enrollment. Persons aged ≤21 years should have documentation of receipt of a MCV not more than 5 years before enrollment. In US, ACIP recommends routine vaccination of all adolescents with single dose of MCV4 at age 11-12 years, with a booster dose at age 16 years (available online at http://www.cdc.gov/vaccines/pubs/acip-list.htm). For further details, follow the catch-up recommendations for meningococcal vaccination of the destination country.

(*ii*) *Hajj pilgrims:* Vaccination in the 3 years before the date of travel is required for all travelers to Mecca during the annual Hajj. The quadrivalent vaccine is preferred for Hajj pilgrims and international travelers as it provides added protection against emerging W-135 and Y disease in these areas. A single dose 0.5 ml IM is recommended in age group 2-55 years.

(*iii*) *Travelers to countries in the African meningitis belt:* A single dose of monovalent or quadrivalent vaccine is recommended. Conjugate vaccine is preferred to polysaccharide vaccine. A booster dose of MCV is needed if the last dose was administered 5 or more years previously.

F. Poliovirus immunization

No change is made to the existing polio immunization schedule. However, in the comment section of Table 1 and in the footnotes after Figure 1, extra-emphasis is given to the need of vaccinating all eligible children with polio vaccines, IPV or OPV. The Academy is committed to polio eradication initiative in the country. This is to reaffirm again that the current IAP recommendations on polio immunization are one suggested way to the practitioners on how to best utilize available polio vaccines (OPV and IPV) in their office practices. However, they may use the polio immunization schedule as suggested by the Universal Immunization Program (UIP), if it is not feasible to follow IAP schedule. The members/pediatricians are advised to encourage administration of all OPV doses during the ongoing campaigns, NIDs or SNIDs of GoI/NPSP.

G. Other changes

(*i*) ***Figures* 1** and **2** of earlier schedule [1] are now combined to illustrate recommended immunization schedule with range for persons aged 0 through 18 years.

MAJOR CHANGES IN RECOMMENDATIONS FOR IAP IMMUNIZATION TIMETABLE, 2013

Pertussis immunization:

- Whole-cell pertussis vaccines for primary infant series of immunization
- Acellular pertussis vaccines in certain specific circumstances/conditions only
- Multicomponent (≥3) aP vaccine products to be preferred over other aP vaccines
- Tdap vaccine recommended for pregnant women with every pregnancy

Rotavirus immunization:

- Administration schedule of RV1 revised
- Two-dose schedule to begin at 10 weeks, 2nd dose at 14 weeks

Typhoid immunization:

- Guidelines are provided for the use of new Vi-polysaccharide conjugate typhoid vaccine

JE immunization:

- Two doses of live attenuated SA-14-14-2 vaccine
- Guidelines are provided for the use of new inactivated JE vaccines, *JEEV*® and JENVAC ®

Meningococcal immunization:

- Guidelines are provided for the use of new meningococcal conjugate vaccines
- Recommendations are issued on the dosage of meningococcal use in different categories

Polio immunization:

- Emphasis is given to the need of vaccinating all eligible children with polio vaccines
- Encouragement for administration of all OPV doses during campaigns

Other changes:

- Only single figure to illustrate recommended immunization schedule with catch-up range for persons aged 0 through 18 years
- Footnotes are revised and updated.

(*ii*) The footnotes of the two figures have also now been merged. The recommendations contained in the footnotes section is now divided in to two broad subheads, 'routine vaccination' and 'catch-up vaccination' wherever applicable.

(*iii*) The footnotes section of all the recommended vaccines is updated and revised with addition of new information on many vaccines.

Conflicts of interests: None. *Funding*: None.

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