KERALA STATE VACCINE POLICY

RECOMMENDATIONS

Kerala State Vaccine Policy Committee
Government of Kerala

KERALA STATE VACCINE POLICY

RECOMMENDATIONS

Kerala State Vaccine Policy Committee
Government of Kerala

November, 2022
Thiruvananthapuram

Preface

The Kerala Government has constituted a six member committee as per GO [G.O.(Rt)No.2582/2021/H&FWD Dated, Thiruvananthapuram, 20/11/2021] to submit recommendation for the formulation of a Vaccine Policy for the state. The committee held in depth discussions with experts regarding the various aspects of current trends in vaccinology and the global and national level vaccine policies. The challenges faced by the state in managing and preventing communicable diseases were also discussed.

Based upon these discussions the recommendations for formulating a Vaccine Policy for the state is submitted for consideration by the Government of Kerala.

We thank all those who came forward enthusiastically to give their valuable suggestions for the preparation of the Vaccine Policy document.

1, November, 2022
Thiruvananthapuram

Dr. B. Ekbal
Chairperson, Vaccine Policy Committee

1. BACKGROUND

As part of establishing a Vaccine Manufacturing Zone at Life Sciences Park, Thonnakkal, Thiruvananthapuram as per the Government Order [G.O.(Rt)No.2582/2021/H&FWD Dated, Thiruvananthapuram, 20/11/2021], Government have decided to frame a Vaccine Policy for the State of Kerala.

For this Government constituted a Committee for formulating the State Vaccine Policy with the following members.

1. Dr. Ekbal, Chairperson, State Expert Committee on Covid-19 Management (Chairperson)
2. Dr. Aravind R., Assistant Professor of Infectious Diseases, Government Medical College, Thiruvananthapuram & Member, State Level Expert Committee on Covid-19 Management (Convenor)
3. Dr. Chandni R., Professor of Medicine, Government Medical College, Kozhikode; Chairperson, Kerala State Medical Board and Member, State Level Expert Committee on Covid-19 Management.

4. Dr. Preetha P.P, Additional Director of Health Services & Member, State Technical Advisory Group on Immunization

5. Dr Prathapa Chandran C, Surveillance Medical Officer, WHO.

6. Dr. Sajith Kumar R, Professor of Infectious Diseases, Government Medical College, Kottayam

7. Dr Jayaraman T.P. Pediatrician, District Early Intervention Centre, Government Women and Children Hospital, Palakkad

Terms of Reference of the Committee are.

1. To examine the present Universal Immunisation Program being followed in the state and suggest any modification to be made.

2. To examine the possibility of introducing Vaccines for adults like Influenza Vaccine, Pneumococcal Vaccine, Human Papilloma Vaccine etc.

3. To prepare a protocol for vaccine to be given for Immunologically Compromised Persons, Organ Transplant Recipients, Cancer Patients etc.

4. To examine how to categorise Vaccines as Mandatory, Optional, and Advisory.

5. To advice the Health Department regarding epidemiological and cost effectiveness studies regarding vaccine usage wherever necessary.

2. INTRODUCTION

Vaccines are one of the most successful health interventions that bring about significant reductions in infectious diseases related mortality and morbidity. Health benefits due to immunization translates to improvement in quality of life in the population. Over the years vaccines have provided highly cost-effective improvements to human health by reducing avoidable human suffering, costs of care and treatment and economic consequences of work i.e., lower productivity and loss of work. More diseases are becoming vaccine preventable; including those for prominent killers like pneumonia and diarrhoea, and the technology used is evolving rapidly. Since vaccines are administered to healthy people, especially children, it

is pivotal to ascertain that they are safe and cost effective. Consequently, vaccine development has become time and resource intensive, with more stringent regulatory pathways to ensure safety and efficacy of vaccines. In a situation where there is abundance of new and expensive vaccines on one hand and limitations of resources on the other, it becomes imperative that use of vaccines through induction in the Universal Immunization Program (UIP) as well as in the free market is done through a framework of decision-making that confers positive health and economic benefits to the society.

Vaccination is a proven and one of the most cost-effective child survival interventions. All countries in the world have an immunization program to deliver selected vaccines to the targeted beneficiaries, specially focussing on pregnant women, infants, and children, who are at a substantial risk of diseases preventable by vaccines. There are at least 27 causative agents against which vaccines are available and many more agents are targeted for development of vaccines. The number of antigens in the immunization programs vary from country to country.

UIP in India was given the status of a national technology mission in 1986. A specific Immunization Strengthening Project (ISP) was designed to run from 2000-2003, which included three main components (polio eradication, strengthening routine immunization (RI), and strategic framework for development). The overarching goal of the UIP is to reduce morbidity and mortality due to Vaccine Preventable Diseases (VPD).

Adult immunization is equally important especially with regard to elderly above 65 years of age, Immunization for recipients of Solid Organ Transplants or Stem Cell Transplants, immunization of those on cancer chemotherapy, immunosuppressants, primary or secondary immunodeficiency syndromes, chronic kidney disease, chronic liver disease, diabetes mellitus, chronic obstructive pulmonary disease, congenital and acquired heart diseases, nephrotic syndrome, post splenectomy, bronchial asthma etc. Adult immunization is often a neglected part of vaccination programs across the globe especially in developing nations like India. A state like Kerala whose majority of the health care indices are comparable with that of developed nations should focus on adult immunization in focused groups to further bring down the morbidity and mortality associated with vaccine preventable diseases.

It is estimated that around 10 to 13% of cancers diagnosed globally every year can be attributed to carcinogenic infections. Among the most important infections associated with cancers are Human papillomavirus [HPV] and Hepatitis B [HBV] for which vaccines are available. HPV infections cause cervical, vaginal, vulvar, anal, penile, and oropharyngeal cancers and HBV causes liver cancer.

Another unique problem faced is with regard to the number of guest workers working in Kerala. Vaccination status of majority of the guest workers is not known. So, it is essential to have a vaccination policy with regard to immunization of guest workers in Kerala.

As a part of the broader health policy, an appropriate Vaccine Policy is needed, based on the principles of public health and Comprehensive Primary Health Care. This is to enable rational and evidence-based decisions for the development, entry, production, stable supply, pricing, promotion, and use of appropriate vaccines on scientific grounds. Additionally, this is also needed to protect the vaccine programs and health security, as well as to leverage indigenous capabilities to cater to domestic and overseas markets.

Objectives of the Vaccine Policy:

1. To contribute to prevention of mortality and morbidity due to communicable diseases.
2. To ensure consistent delivery and administration of vaccines to everyone in need.
3. To achieve self-reliance in vaccine Research and Development.
4. To achieve pre-eminence in the capabilities of the indigenous public sector for self-reliance.
5. To develop and use the interdisciplinary knowledge base.
6. To promote ethical conduct in the development, trials, adoption, and administration of vaccines.
7. To develop a system for monitoring and compensating Adverse Event Following Immunisation (AEFI).
8. To become self-reliant to ensure supply of affordable vaccines.

9. To synergize all relevant policies for effective implementation of the national vaccine policy.

In order to bring down the burden of vaccine preventable diseases, it is essential to have state specific Immunization Policy aimed at expanding and strengthening UIP, adult immunization and immunization of special groups including guest workers.

3. FOCUS AREAS

Focus areas comprise of

- Expanding and strengthening of Universal Immunization Program
- Adult Vaccination
- Vaccination of Immunologically Compromised including vaccination policy for Solid Organ Transplant Recipients and Stem Cell Transplant Recipients
- Vaccination of special population like migrant labourers [Guest workers], food handlers etc.

4. METHODOLOGY ADOPTED TO DRAFT KERALA STATE VACCINATION POLICY

The committee constituted to develop vaccination policy for state adopted a descriptive approach with in depth interviews and focus group discussions [FGD] with experts in various aspects of vaccinology.

1. FGD-1-Focussed on expanding Universal Immunization Program.
2. FGD-2-Focussed on Adult Immunization.
3. FGD-3-Focussed on Immunization in Stem cell Transplant Recipients.
4. FGD-4-Focussed on Immunization in Solid Organ Transplant Recipients.
5. FGD-5-Focussed on strengthening the implementation of UIP
6. FGD-6-Focussed on Immunization of special groups including guest workers.

FGD-1 was conducted with Dr A. Santhosh Kumar, Retired Professor of Pediatrics, SAT Hospital.

FGD-2 was conducted with Dr Harish Kumar and Dr Alexander George representing Association of Physicians of India Kerala Chapter.

FGD-3 was conducted with Dr Satheesan B, Director of Malabar Cancer Centre.

FGD-4 was conducted with Dr Noble Gracious, Associate Professor of Nephrology at Government Medical College Thiruvananthapuram, Executive director of Kerala State Organ and Tissue Transplant Organization [K-SOTTO].

FGD-6 was conducted with Dr Sandeep K, Deputy Director Family Welfare.

Based on in depth interviews and FGD's, State Vaccine Policy has been drafted.

5. RECOMMENDATIONS

State Vaccine Policy Committee has drafted the following recommendations based on in depth interviews and focus group discussions. The recommendations are time sensitive based on priorities to be achieved in short term, intermediate term, and long term.

SHORT TERM PRIORITY PLAN [To be achieved in 1.5 years]

1. The Universal Immunization Program [UIP] schedule includes two doses of Measles, Rubella [MR] vaccine. As Mumps is a problem in India it is better to include Measles. Mumps, Rubella [MMR] instead of MR in UIP schedule.

2. Current UIP schedule recommends Tetanus and Diphtheria [Td] vaccine at 10 years. Considering the possibility of re-emergence of Pertussis, combined Tetanus, diphtheria and acellular pertussis vaccine [Tdap], than Td at 10 years may be included in UIP.

3. As mortality and morbidity due to H1N1 in pregnancy is high, Quadrivalent Influenza Vaccine should be considered in pregnancy. In subsequent pregnancies also, Quadrivalent Influenza Vaccine will have

to be administered due to expected antigenic shift and drift in influenza virus.

4. For the potential benefit of preventing pertussis morbidity and mortality in infants, during each pregnancy Tdap should be administered during third trimester [preferably between 27 to 36 weeks of gestation] regardless of number of years from prior Td or Tdap vaccination. Tdap is to be administered during this period to maximize the maternal antibody response and passive antibody transfer to the infant. If Tdap is administered earlier in pregnancy, it should not be repeated between 27 and 36 weeks of gestation; only one dose is recommended during each pregnancy. Protection from pertussis vaccines does not lastlong, so Tdap is recommended during each pregnancy in order to provide optimal protection to the infant.

5. In order to prevent outbreaks of diphtheria, measles, mumps and rubella in adolescents /adults, Td+MMR should be administered at 10 th grade or at the time of joining college [if not vaccinated already with same vaccines earlier].

6. The mortality and morbidity due to influenza and pneumococcal infections is high in elderly, immunocompromised and in those with co-morbidities. In this context for people above 65 years, immunocompromised and in those with co-morbidities, Pneumococcal vaccines 13 valent conjugate vaccine [PCV13] and 23 valent polysaccharide vaccine [PPSV23] and annual Quadrivalent Influenza vaccine should be administered.

Recommendations for pneumococcal vaccination in adults who have never received a pneumococcal conjugate vaccine, by underlying medical condition or other risk factor and age group

Underlying medical condition or other risk factor	**19 through 64 years old**	**≥ 65 years old**
None	Not recommended	Administer1 dose of PCV13 followed by1 dose of PPSV23 at least 1 year later
Chronic heart disease Chronic liver disease Chronic lung disease Cigarette smoking Diabetes mellitus Cochlear implant Cerebrospinal fluid leak Chronic renal failure Congenital or acquired asplenia Congenital or acquired immunodeficiency Generalized malignancy HIV infection Hodgkin disease Iatrogenic immunosuppression Leukemia Lymphoma Multiple myeloma Nephrotic syndrome Sickle cell disease/other hemoglobinopathies Solid organ transplant Alcoholism Chronic heart disease	Administer1 dose of PCV13 followed by1 dose of PPSV23 at least 1 year later *The minimum interval (8 weeks) can be considered in adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak*	Administer1 dose of PCV 13followed by1 dose of PPSV23 at least 1 year later *The minimum interval (8 weeks) can be considered in adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak.* *Reminder: No additional doses are indicated at this age if PCV13 were administered at a younger age.*

7. If not fully immunized, Health Care Workers [HCWs] are at increased risk of contracting diphtheria, measles, varicella, rubella, and Hepatitis B following occupational exposure. Hence, based on immunization status, it should be made mandatory for HCWs to get immunized with Td+MMR+Varicella+Hepatitis B vaccines

8. The possibility of waning immunity following bivalent OPV needs to be addressed. As we are in a period of epidemiological transition with neighboring countries still having polio transmission, it will be better to consider IPV (Inactivated Poliovirus Vaccine)at one and half years also to cover all three types of polio virus.

9. Immunization status of all guest workers [migrant labourers] in Kerala should be assessed. Vaccination Cards should be made mandatory for all guest workers [migrant laborers]in Kerala. A mechanism has to be put in place to ensure that all guest workers get registered, their vaccination status checked, and catch-up vaccination administered if immunization is not complete for age on a priority basis.

10. Making vaccination certificate mandatory for school joining will be a major step towards achieving universal vaccination coverage. However as right to education is a fundamental right as per article 21 A of Indian Constitution, further focussed discussions with legal experts, Department of Education and the public is needed before a recommendation could be made in this regard. Intensive IEC (Information, Education and Communication) activities to engage with and educate parents of children without vaccination certificate are needed.

11. Vaccination status of all students should be recorded at the time of joining school and college. The details of students with incomplete immunization status should be reported to local health authorities. A digital platform integrated to e-Health may be developed for this purpose.

12. All transplant recipients should be made eligible to avail all benefits under Karunya Arogya Suraksha Padhathi [KASP]. As of now pre-transplant evaluation will cost around one lakh rupees. KASP has a ceiling of 5 lakh rupees for transplant which usually is not enough to cover pre-transplant evaluation. Hence, pre-transplant evaluation and

immunization should be included in KASP up and above the existing rates fixed. KASP rates should be modified in such a way that, once a patient is listed for transplant, he should be eligible to avail all benefits under KASP. Pretransplant Immunization for Solid Organ Transplant Recipients include PCV13, PPSV23, Quadrivalent Influenza Vaccine, Hepatitis B, and Varicella vaccine [based on prior immunization status].

13. All food handlers and those who work in food processing units should be vaccinated against Enteric fever and Hepatitis A. A uniform mandatory vaccination card should be issued to all food handlers.

14. A digital platform integrated with e-Health should be created to capture and collate all data with respect to immunization status of guest workers, inbound travelers, and food handlers.

15. Data regarding administration of various vaccines in pediatrics from private hospitals is not getting captured completely. A standardized certificate format should be created to capture vaccination details from private sector.

16. Keralites going to other states to pursue education/Jobs should have their immunization status verified. They should be administered Hepatitis A, Typhoid and Cholera vaccines if not previously immunized. They should also be administered Td/Tdap, MMR vaccines also based on immunization status.

17. Pre-exposure prophylaxis (PrEP) against rabies is recommended for individuals at higher risk of dog bites due to occupation like animal handlers, pet owners, and veterinary doctors etc and for the children in rabies endemic countries like India. With the increase in number of stray dog population and increase in number of cases of Rabies and rabies deaths it is worthwhile to introduce pre exposure prophylaxis which can avoid the need for rabies immunoglobulin and reduce the doses needed for postexposure prophylaxis to two in case of subsequent accidental exposure.

Rabies vaccines can be administered by two different routes: Intradermal (ID) or Intramuscular (IM), and according to different schedules.

For young children (aged<2 years] the anterolateral area of the thigh is recommended.

IM Regimen: One dose of vaccine on days 0, 7, and 21/28 into anterolateral aspect of thigh/deltoid region.

ID: Regimen: 0.1 mL of vaccine on days 0–7–21/28 in deltoid region/ anterolateral thigh.

Two-site ID administration of rabies vaccine has also been recommended on day 0 and 7.

Pre-exposure prophylaxis makes administration of Injecting Rabies Immuno Globulin (RIG) unnecessary after a bite. A routine PrEP booster or serology for neutralizing antibody titers would be recommended only if a continued substantial risk of rabies exposure remains like in those handling rabies viruses in laboratories.

18. The cornerstone of optimizing immunization coverage in the state is strengthening of existing UIP. Proper conduct of the sessions is the key for full immunization coverage.

1. Outreach immunization sessions are not held uniformly or in a planned way

   This can be optimized by

   A. Having a written immunization micro plan at PHC and district level.

   B. Having fixed outreach session days [instead of different days in each month] so that public is aware of their vaccination day.

   C. Every subcenter/JPHN/ANM should conduct outreach immunization sessions every week in different ward/village of their area [instead of once a month]

   D. Fixed immunization sessions at institutions should continue on all Wednesdays.

2. Practice of insisting for the presence of medical officers [MO] at every session site in Kerala limits the number of sessions that can be conducted on any day. Neighboring states are not insisting for the presence of MOs at every session site. This is a Kerala specific problem and hence tangible solutions have to be worked out through discussions with all stake holders.

3. Regular training/knowledge update for the vaccinators and front-line workers is essential. Periodic time schedule for the same should be created at State /District level.

4. Data entry by the vaccinators /Front Line Workers and incorporating data from private hospitals/clinics is an identified bottleneck

Suggestions

A) At least at the block level a data entry person should be appointed to support data entry updation.

B) A mechanism should be formulated to ensure that private hospitals/ clinics share immunization data with respective PHC.

C) **INTERMEDIATE TERM PRIORITY PLAN [To be achieved in 3 years]**

1. Typhoid Conjugate Vaccine [TCV] at 6-9 months of age should be incorporated to UIP, considering reports of drug resistant [MDR/XDR] *Salmonella typhi* infections from neighboring states and countries. Even though enteric fever is not a major problem in Kerala, as many students move to other states for education/job, it is better to include typhoid vaccination in UIP.

2. Hepatitis A vaccine at 12 months of age may be adopted to UIP after considering feasibility, supply chain and logistical challenges. Morbidity of Hepatitis A in children with regard to loss of school hours and possible mortality due to Hepatitis A in adults can be minimized by including Hepatitis A vaccine in UIP.

3. As per National schedule, Japanese Encephalitis [JE] vaccine is recommended to be administered as 2 doses at 9 months and 16 months respectively. In Kerala state immunization schedule, only one dose at 16 months is administered. Just like in National schedule, it is better to administer JE vaccine as 2 doses at 9 months and 16 months.

4. As of now JE vaccine is offered only in districts of Thiruvananthapuram and Alappuzha. An epidemiological study to assess the burden of JE should be planned and designed in Kerala. Based on the study results the need to expand JE vaccination to all districts in Kerala may be considered.

5. As we are in a period of epidemiological transition with neighboring countries still having polio transmission, it will be better to consider IPV booster at four and half years also to cover all three types of polio virus.

6. Meningococcal vaccination should be considered in following high risk groups

    - Anatomical or Functional Asplenia (including Sickle Cell Disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use: 2-dose series of Quadrivalent Meningococcal Vaccine at least 8 weeks apart and revaccinate every 5 years if risk remains

    - Travel to countries with hyperendemic or epidemic meningococcal disease, microbiologists routinely exposed to *Neisseria meningitidis*: 1 dose Quadrivalent Meningococcal Vaccine and revaccinate every 5 years if risk remains

7. A vaccination card with full details regarding the immunization status of the individual should be issued to all.

8. The vaccination status of inbound visitors to Kerala planning to reside here for more than 3 months should be assessed. Catch up vaccination should be offered if not vaccinated as per age group.

9. All adult guest workers should be administered Tdap, MR/MMR, Typhoid, and Cholera vaccine.

10. Post-splenectomy patients are at risk of rapidly progressing sepsis due to IgG-coated bacteria and encapsulated organisms. Although relatively rare, this rapidly progressing sepsis is associated with a high mortality rate. Immunization against encapsulated bacterial pathogens decreases the incidence of post-splenectomy sepsis. Pneumococcal, Meningococcal, and Haemophilus influenza (Hib) vaccinations are indicated for patients after splenectomy or prior to splenectomy.

Vaccination Timing

1. Emergency splenectomy- vaccinations to be administered 2 weeks after splenectomy or at time of discharge whichever is earlier.

2. Elective splenectomy- vaccinations to be administered 2 weeks prior to splenectomy

Vaccination protocol:

- Pneumococcal 13-valent conjugate (PCV13) 0.5 mL IM
- Haemophilus influenza type b vaccine - 0.5 mL IM
- Meningococcal vaccine 0.5 ml IM

Follow-up vaccination protocol

2 month follow up after the initial vaccination

- Pneumococcal polysaccharide vaccine (PPSV23) 0.5 ml IM
- Meningococcal vaccine [quadrivalent] 0.5 mL IM

LONG TERM PRIORITY PLAN [To be achieved in 5 years]

1. In order to bring down the morbidity and mortality associated with varicella and influenza in children, Varicella vaccination and annual Influenza vaccination may be adopted in UIP schedule.

2. Human Papilloma Virus [HPV vaccine] should be considered if there is increasing incidence of carcinoma cervix from baseline. As part of WHO [2018] 90-90-70 goal, 90% of adolescent girls should be administered HPV vaccine, 90% women with cervical cancer should be treated and 70% should be screened for CA Cervix. Even though WHO has recommended HPV vaccination for adolescent girls, in Kerala cervical cancer incidence is only 8/1 lakh. [WHO CA cervix eradication target is 4/1 lakh]. There has been a steady decline in carcinoma cervix incidence in Kerala probably due to improvement in hygiene practices. It is also observed that oropharyngeal carcinoma due to HPV is not a major threat in India. Incidence of HPV in cervical cancer in India is 83%.HPV vaccination can reduce incidence of pre-invasive cancer but not invasive cancer. Hence, despite HPV vaccination, screening is essential. [If HPV DNA PCR negative-screen after 5 years, if cytology negative-screen after 3 years]. Considering all these factors, in Kerala HPV vaccination is not indicated at present and is not cost effective also. [Cost of vaccinating 13 lakh girls will be 200 crores. Whereas cost of screening 50 lakh women will be 75 crores.]. Hence HPV vaccination

should be considered in Kerala only if there is an increasing trend in the incidence of cervical cancer from current base line.

3. Vaccinations to be taken by recipients of Hematopoietic Stem Cell Transplantation and Solid Organ Transplantation prior to and after transplantation should be adopted as part of State Vaccination policy. [details given in Annexure]

6. ANNEXURES

6a. IMMUNIZATION IN HEMATOPOIETIC STEM CELL TRANSPLANTATION [HSCT]

Hematopoietic stem cell transplantation (HSCT) is a promising and often the only curative option for patients with hematological malignancies.

S No	Vaccine	Volume	Route	Start at	Comments	1st dose	2nd dose	3rd dose	
1	**Pneumococcal conjugate vaccine (PCV-13) 3 doses followed by**	0.5ml	IM	1 year	3 doses: 2 months apart. **0,2,4, months**				
2	**Pneumococcal polysaccharide capsular vaccine. (to be given in children after 24 months of age)**	0.5 ml	IM	At least 1 year 10 months post alllo BMT	**10 months after 1st dose of prevnar**				
2	**Inactivated Influenza (April to September)**	0.25ml (6mths – 3 yrs) 0.5ml (>3 yrs)	IM	6 months onwards and yearly	<9 years – 2 doses (0,1 month) >9 years – 1 dose				
3	**Inactivated polio**	0.5ml	IM	1 year	3 doses; 2 months apart. **0,2,4 months**				
4	**H influenza B**	0.5ml	IM	1 year	3 doses; 2 months apart. **0,2,4 months**				
5	**DTaP/DPT**	0.5ml	IM	1 year	3 doses; 2 months apart. **0,2,4 months**				
3,4,5	**Combination vaccine: (IPV, HiB, DTaP) given 2 months apart)**	0.5ml	IM	1 year	3 doses; Alternative to vaccines 3,4 & 5 2 months apart **0,2,4 months**				
6	**Hepatitis B**	0.5ml	IM	1 year	3 doses; **0,2,6 months**				
7	**HPV: 9-26 years. Vaccine be administered in sitting/lying down position. And the patient be observed for 15 min post vaccination.**	0.5ml	I/M	1 year	3 doses **(0,2,6 months)**				
8	**Hepatitis A**	1.0ml (adults) 0.5ml (<18 yrs)	IM only (deltoid or anterolateral thigh)	1 year	**2 doses: 0,6 months**		Booster at 6mths – 5 yrs)	**Never to be given in gluteal region**	
9	**Typhoid (Conjugate)**	0.5ml	IM	1 year	**2 doses 0,2**				

Post-HSCT, the immune system is temporarily suppressed due to prior conditioning and usage of immunosuppressive medication, resulting in infection-derived complications being a major cause of transplant-related mortality. Furthermore, pre-HSCT established immunity against vaccine-preventable diseases might be diminished through transplantation. To avoid infections, preventive strategies such as antibiotics, antiviral and antifungal prophylaxis and post-HSCT vaccinations are recommended.

Infection is a main concern after haemopoietic stem cell transplantation (HSCT) and a major cause of transplant-related mortality and morbidity. Some of these infections are preventable by vaccination. Most HSCT recipients lose their immunity to previous pathogens within few months after transplantation. Vaccination with inactivated vaccines is safe after transplantation and is an effective way to reinstate protection from various pathogens (e.g., influenza virus and *Streptococcus pneumoniae*), especially for pathogens whose risk of infection is increased by the transplant procedure. The response to vaccines in patients with transplants is usually lower than that in healthy individuals of the same age during the first months or years after transplant, but it improves over time to become close to normal 2–3 years after the procedure. Another challenge is to provide HSCT recipients the same level of vaccine protection as healthy individuals of the same age in a given country. The use of live attenuated vaccines should be limited to specific situations because of the risk of vaccine-induced disease.

Infection post HSCT often results in excessive morbidity and mortality, and antimicrobial therapy is typically less effective than in the immunocompetent host. So, prevention of infection in this group is of paramount importance through timely immunization. Timing appears to play a key role in vaccine effectiveness. Vaccination before proper immune reconstitution may impair vaccine responses. However, as the risk of infection increases with time, postponing revaccination unnecessarily is undesirable. Furthermore, recommendations for allogeneic HSCT (alloHSCT) and autologous HSCT (autoHSCT) recipients are uniform, whereas immunologic memory and immune reconstitution differ.

POST HEMATOPOEITIC STEM CELL TRANSPLANT [allogeneic] VACCINATION SCHEDULE

LIVE VACCINES TO BE STARTED AFTER 2 YEARS AND OFF IMMUNOSUPPRESSION FOR 12 MONTHS

10	**MMR (Live) (2-1-8 rule) (2yrs after BMT, 1 year after IST, 8 months after IVIg)**	0.5ml	**Deep S/C only**	2 years	**Chilrden 2 doses; 1 months apart. 0, 1 months Adults: 1 dose**			**2-1-8 rule**
11	**Varicella (Varilrix) – Live (2-1-8 rule) (>12 months)**	**0.5ml**	S/C only	**2 years**	**2 doses; 1 month apart. 0, 1**			**2-1-8 rule**

POST TRANSPLANT OPTIONAL VACCINES

Meningococcal vaccine (Conjugate)	0.5ml	IM	1 Year				2 doses 2 months apart.

VACCINES CONTRAINDICATED POST BMT

BCG	Not to be given
Oral polio vaccine (live)	Not to be given – NOT TO GIVE ORAL POLIO VACCINE TO ANY ONE AT HOME They also have to be vaccinated with Inactivated polio vaccine.
Intranasal influenza	Not to be given
Typhoid (oral live)	No data were found regarding safety and immunogenictiy among HCT recepients
Cholera	No data were found regarding safety and immunogenictiy among HCT recepients

Vaccines for Contacts (Children and close family members) and Health Care Workers Sibling: **Of the transplant patient should continue vaccination as per the age. Oral polio to be replaced by injectable polio (IPV)**

Vaccine	Volume	Route	Start at	1st dose	2nd dose	3rd dose	Comments
Varicella (Varilrix)	0.5ml	**S/C only**	1 year of age				2 doses for >13 yrs.
Inactivated Influenza (Vaxigrip)	0.5ml (>3 yrs) 0.25ml (6 mon – 3 yrs)	IM	6 months post-transplant				And then yearly

6b. VACCINATION IN SOLID ORGAN TRANSPLANT [SOT] RECIPIENTS

Prevention of infection is of paramount importance to the increasing population of solid organ transplant recipients. Infection in these patients results in substantial morbidity and mortality, and antimicrobial therapy is often less effective than in the immunocompetent host. Although immunization appears to be an obvious way to prevent infection, immunocompromised patients are less likely to mount protective immune responses following vaccination. Immunization with live virus vaccines is generally avoided in solid organ transplant recipients as it may result in adverse events from proliferation of attenuated vaccine strains.

Adult solid organ transplant (SOT) candidates and recipients should receive all vaccines indicated based on their age, medical conditions, and other factors that apply to nonSOT candidates or recipients except for the below-listed exceptions or additions.

- All SOT candidates and recipients should be vaccinated against pneumococcus with PCV13 and PPSV23.
- All SOT candidates and recipients should receive a HepB vaccine series with post-vaccination titers unless they have a documented anti-HBs titer of ≥ 10 mIU/mL after a properly timed HepB series or unless they have known hepatitis B virus infection.
- Live-attenuated vaccines should not be administered to SOT recipients, SOT candidates on immunosuppression, or SOT candidates who may undergo SOT within 4 weeks. If recipient is not immune to varicella, varicella immunization must be done prior to transplantation.

Timing of vaccination

1. Ideally, vaccinations should be given as early before SOT as possible when the patient is first being evaluated for SOT candidacy.
2. Inactivated, subunit, or toxoid vaccines should ideally be given 2 weeks or more prior to immunosuppression or SOT to achieve maximum immunogenicity.
3. To maximize immunogenicity and effectiveness, inactivated, subunit, or toxoid vaccines should preferentially be given starting at 6 months post-SOT, though they can be given as early as 2 months based on

patient-specific risk factors. Influenza vaccination can begin as early as 1 month after SOT if there is significant local influenza activity. Similarly, to maximize vaccine effectiveness, vaccination should ideally be delayed during other periods of intensified immunosuppression.

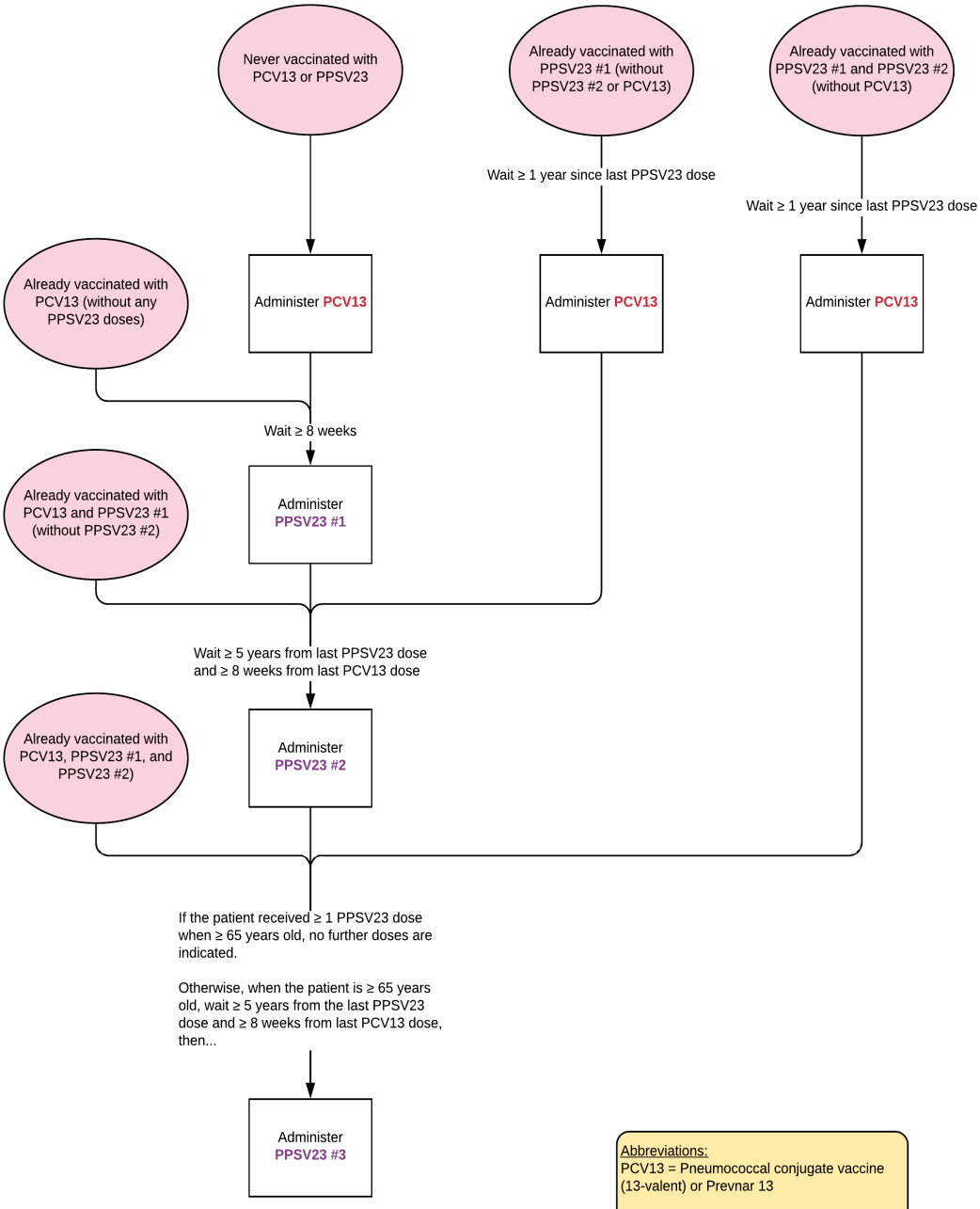
Vaccination of family members and household contacts of SOT candidates and recipients

1. To protect immunocompromised patients from transmissible diseases, immunocompetent family members and household contacts should be encouraged to receive all age-appropriate vaccinations, particularly an annual influenza vaccine and live-attenuated vaccines such as MMR and VARICELLA.

2. Rotavirus: SOT candidates and recipients should avoid handling diapers of infants who have been vaccinated with rotavirus vaccine for 4 weeks after vaccination.

3. VAR/ZVL: Uncommonly, VAR or ZVL recipients can develop a localized or generalized varicella-like rash within 1 month after vaccination. Non-immune SOT candidates and recipients should avoid contact with these persons until skin lesions clear. Except in those rare individuals who develop a varicella-like rash, recipients of VAR or ZVL vaccines are not capable of transmitting varicella zoster virus (VZV) and can interact with SOT candidates and recipients without restriction. This issue is not relevant if already immune to VZV.

PNEUMOCOCCAL VACCINATION FOR SOT CANDIDATES AND RECIPIENTS



Abbreviations:
PCV13 = Pneumococcal conjugate vaccine (13-valent) or Prevnar 13

PPSV23 = Pneumococcal polysaccharide vaccine (23-valent) or Pneumovax 23

Everyone ≥ 65 years old should have received:
PCV13: once
PSV23: 2-3 doses, including ≥ 1 dose ≥ 65 years old

Vaccines in kidney transplantation

Vaccine	Type (LA/ inactivated - I)	Permitted for children		Permitted for adult	
		Before Tx.	After Tx.	Before Tx.	After Tx.
Hepatitis B	I	Yes (R)	Yes (R)	Yes (R)	Yes (R)
Pneumococcus	I	Yes (R)	Yes (R)	Yes (R)	Yes (R)
Influenza inactivated	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Influenza live attenuated	LA	No	No	No	No
Meningococcus	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Human papillomavirus	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Varicella (chicken pox - Varivax)	LA	Yes (R)	No	Yes (R)	No
Varicella (Zoster - Zostavax)	LA	-	-	Yes (R)	No
Hepatitis A	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Diphtheria	I	Yes (U)	Yes (U)	-	-
Pertussis	I	Yes (U)	Yes (U)	-	-
Tetanus	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Injectable polio vaccine	I	Yes (U)	Yes (U)	-	-
Oral polio vaccine	LA	Yes (U)	No	-	No
Haemophilus influenzae	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Measles	LA	Yes (U)	No	-	No
Mumps	LA	Yes (U)	No	-	No
Rubella	LA	Yes (U)	No	-	No
BCG	LA	Yes (U)	No	-	No
Rotavirus	LA	Yes (U)	No	-	No
Rabies	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Salmonella typhi oral typhoid 21a	LA	Yes (U)	No	Yes (U)	No
Parenteral typhim (V1 polysac) vaccine	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Cholera - oral live cholera vaccine	LA	Yes (U)	No	Yes (U)	No
Oral killed cholera vaccine (Dukoral/Shanchol)	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Japanese encephalitis	I	Yes (U)	Yes (U)	Yes (U)	Yes (U)
Yellow fever	LA	Yes (U)	No	Yes (U)	No
Smallpox	LA	No	No	No	No

U: Usual indication and dose as per standard recommendation for general population, R: Recommended specifically in the transplant context, No: Contraindicated/ not advisable to use in most cases, LA: Live attenuated, Tx: Transplant

6c. EXPANDING UNIVERSAL IMMUNIZATION PROGRAMME

In view of new developments in vaccinology and the availability of new vaccines, there is a need to review and revise the existing recommendations with regard to UIP. Also considering the reemergence of vaccine preventable diseases like diphtheria and measles in adults, State specific modifications should be incorporated into existing UIP schedule.

Universal immunization schedule followed in India

Age	Vaccination schedule after PCV introduction
At birth	BCG, OPV-Zero doses, Hep B – birth dose
6 weeks	OPV-1, Rota-1, fIPV-1, PCV-1, Pentavalent-1
10 weeks	OPV-2, Rota-2, Pentavalent-2
14 weeks	OPV-3, Rota-3, fIPV-2, PCV-2, Pentavalent-3
9 months	MR-1, Vit A, JE-1*, PCV – booster
16-24 months	DPT first booster dose, OPV-booster dose, MR-2, JE-2*
5-6 years (up to 7 years of age)	DPT second booster
10 years	Td
16 years	Td

*JE in endemic districts

The differences between UIP schedule and other childhood immunization schedules were discussed in detail and based on that following observations were made. Based on the observations, recommendations were drafted. The need to expand UIP schedule in Kerala should be considered based on the pre-identified challenges with regard to feasibility and logistics based on prior experience. There is also a possibility that deviation from UIP schedule might lead to confusion at ground level. So, changes in UIP schedule should be considered and implemented only after addressing possible supply chain related issues.

1. UIP schedule includes two doses of MR vaccine. As mumps is a problem in India it is better to include MMR instead of MR in UIP schedule. Supply chain issues need to be sorted out prior to implementation of this recommendation.

2. Typhoid conjugate vaccine at 6-9 months is not mentioned in UIP. Considering reports of drug resistant [MDR/XDR] *Salmonella typhi* infections from neighboring states and countries, adopting typhoid conjugate vaccine to UIP may be considered. Even though enteric fever is not a major problem in Kerala, as many students move to other states for education/job, it is better to include typhoid vaccination.

3. Hepatitis A vaccine at 12 months is not part of UIP schedule. This may be adopted to UIP after considering feasibility, supply chain and logistical challenges. Morbidity of hepatitis A in children with regard to loss of school hours and possible mortality due to Hepatitis A in adults can be minimized by including Hepatitis A vaccine in UIP.

4. Varicella vaccination and annual influenza vaccination may be adopted to UIP schedule.

5. UIP recommends Td at 10 years of age. Considering the possibility of re-emergence of pertussis, Tdap than Td at 10 years may be included in UIP.

6. As per National schedule, Japanese Encephalitis [JE] vaccine is recommended to be administered as 2 doses at 9 months and 16 months respectively. In Kerala state immunization schedule, only one dose at 16 months is administered. Just like in National schedule, it is better to administer JE vaccine as 2 doses at 9 months and 16 months.

7. The last case of wild polio virus (WPV) in India was reported on 13 January 2011 and on 27 March 2014, India along with the rest of Southeast Asia was declared polio free. It needs to be emphasized that until worldwide polio eradication is achieved, cases of imported WPV from endemic neighboring countries or cases of circulating vaccine derived poliovirus(cVDPV), remains a real threat unless population immunity is maintained by vaccinating children adequately in their early years of life. Outbreaks of cVDPVs have occurred in countries which have been polio free for severalyears. In the absence of inapparent infection, universal vaccination of infants and children is the only way to establish and maintain population immunity against polio. In 2018, the ACVIP [Advisory Committee on Vaccines and Immunization Practices] had recommended an all IPV schedule at 6-10-14 weeks followed by an IPV booster at 15-18 months, and the recommendation for the OPV booster at 4-6 years was dropped. A birth dose of OPV continues to be recommended.

The possibility of waning immunity following bivalent OPV needs to be addressed. As we are in a period of epidemiological transition with neighboring countries still having polio transmission, it will be better to consider IPV at one and half and four and half years also to cover all

three types of polio virus. In the absence of a booster at 4-6 years, the seroprotection rates (SPR) against PV 1 and PV2 had fallen to 91% and 91.2% compared to a SPR of 100% in those who had received a school entry booster at 4-6 years

7. REFERENCES

1. Indian Academy of Pediatrics (IAP) Advisory Committee on Vaccines and Immunization Practices (ACVIP): Recommended Immunization Schedule (2020-21) and Update on Immunization for Children Aged 0 Through 18 Years: IndianPediatr 2021;58: 44-53

2. Recommended Adult Immunization Schedule for ages 19 years or older: CDC-USA- 2022

3. Arulrhaj, Sundaram & Joshi, Shashank & Shah, Siddharth &Tiwaskar, Mangesh &Nadkar, Milind & Vora, Agam. (2020). API Guidelines on Immunizations during COVID 19 Pandemic. The Journal of the Association of Physicians of India. 68. 58-60.

4. Universal Immunization Program: Ministry of Health and Family welfare, Government of India.2022

5. Guidelines for vaccination in kidney transplant recipients. Indian J Nephrol 2016;26, Suppl S1:19-25

6. Danziger-Isakov L, Kumar D. Vaccination of solid organ transplant candidates and recipients: guidelines from the American Society of Transplantation Infectious Diseases Community of Practice [published online April 19, 2019]. *Clin Transplant*. doi: 10.1111/ctr.13563

7. Cordonnier C, Einarsdottir S, Cesaro S, Di Blasi R, Mikulska M, Rieger C, de Lavallade H, Gallo G, Lehrnbecher T, Engelhard D, Ljungman P; European Conference on Infections in Leukaemia group. Vaccination of haemopoietic stem cell transplant recipients: guidelines of the 2017 European Conference on Infections in Leukaemia (ECIL 7). Lancet Infect Dis. 2019 Jun;19(6): e200-e212. doi: 10.1016/S1473-3099(18)30600-5. Epub 2019 Feb 8. PMID: 30744963.

8. National Guidelines for Hematopoietic cell transplantation-ICMR 2021

NOTES

Kerala State Vaccine Policy Committee
Government of Kerala