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REVIEW ARTICLE

Inequality in the Immunization Schedules of Different States of the Same Country: Are We Aware?

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With Universal Immunization Programme in India incorporating newer vaccines, the immunization schedule has been changing rapidly, varying from one state to another. The number of diseases being protected against has increased from 6 to 14 in the past few years. The immunization schedules of the states of Delhi, Himachal Pradesh, and Haryana were compared among themselves and also with the schedule recommended by the Indian Academy of Pediatrics. Variations were observed. The migrants, service providers, and those users switching between private and public sector many a time are affected due to this variation among the immunization schedules.

Key words: Delhi, Haryana, Himachal Pradesh, Immunization schedule, Indian Academy of Pediatrics, Universal Immunization Programme

INTRODUCTION

The national immunization programme in India has seen several new additions to the immunization schedule in the past few years. The challenges due to emerging and re-emerging diseases, in addition to the high under-five mortality (29/1000 live births)[1] are a good reason to take preventive steps in the early years of life.

Various new vaccines have been introduced in National immunization schedule (NIS). Inactivated polio vaccine was introduced in six states in 2015 and expanded to all the states in 2016, Rotavirus vaccine was introduced in a phased manner in four states in 2015, pneumococcal conjugate vaccine (PCV) in a phased manner in five states in 2017, and Rubella in the form of measles-rubella (MR) vaccine was also introduced in a phased manner in 2017.[2] The Hepatitis B vaccine was introduced in 36 selected districts in India on a pilot bases in 2002[3] and in 2007 it was incorporated into the Universal Immunization Programme (UIP) in all the districts and was to be given to newborns at the 6th, 10th, and 14th weeks.[4] Hib Pentavalent (DTP-Hib-HepB) was introduced in two states in 2011 and gradually expanded to all the states by 2015.[5]

The present paper focuses on the criteria of selecting a particular state or region for introduction of a vaccine in a phased manner and also seeks a practical solution for one country with multiple state-level vaccination schedules. These different immunization schedules have baffled not only the parents of the children to be immunized but also the health-care providers, for many years. The situation often worsens when parents move from one state of the country to the other in-between immunization sessions.

COMPARISON OF IMMUNIZATION SCHEDULES BEING FOLLOWED IN THREE STATES OF NORTH INDIA

Table 1 compares the different schedules in UIP in three states as well as the schedule advised by the Indian Academy of Pediatrics (IAP). Rotavirus is given to children at age of 6 weeks in state of Haryana and Himachal Pradesh (H.P.) and is also recommended by IAP but it has still not been introduced in Delhi. Similarly, PCV has been launched in H. P. but is still not given in Haryana and Delhi. At the age of 9 months, a child in Delhi and Haryana receives the first dose of Measles, whereas a child in H. P. will be given MR-1. At 16 months of age, a child in Delhi and Haryana receives protection against Measles,

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Table 1: The different schedules in universal immunization programme in states of Delhi, Haryana and Himachal Pradesh as well as the schedule advised by the Indian Academy of Pediatrics (2017)[22,23]

Age	Schedule in Delhi	Schedule in Haryana	Schedule in Himachal Pradesh	Vaccines recommended by IAP
At birth	BCG, hepatitis B	BCG, hepatitis B	BCG, hepatitis B	BCG
Birth-15 days	OPV-0 dose	OPV-0 dose	OPV-0 dose	
6 weeks	Pentavalent-1, OPV-1, fIPV-1	Pentavalent-1, OPV-1, fIPV-1, rotavirus-1	Pentavalent-1, OPV-1, fIPV-1, rotavirus-1, PCV-1	OPV-1, DPT+HiB+hepatitis B/IPV-1, PCV-1, rotavirus (monovalent)-1/rotavirus (pentavalent)-1
10 weeks	Pentavalent-2, OPV-2	Pentavalent-2, OPV-2	Pentavalent-2, OPV-2, rotavirus-2, PCV-2	OPV-2, DPT+HiB+hepatitis B/IPV-2, PCV-2, rotavirus (pentavalent)-2
14 weeks	Pentavalent-3, OPV-3, fIPV-2	Pentavalent-3, OPV-3, fIPV-2, rotavirus-2	Pentavalent-3, OPV-3, rotavirus-3, fIPV-2, PCV-3	OPV-3, DPT+HiB+hepatitis B/IPV-3, PCV-3
32 weeks				Rotavirus (monovalent)-2 : Can be given up to 32 weeks after 1st dose
9 months	Measles-1, Vitamin A	Measles-1, Vitamin A	MR-1, Vitamin A	Measles, live JE vaccine (1 dose)
15-18 months	Vitamin A	Vitamin A	Vitamin A	MMR-1, cholera-1,2 (4 weeks apart)
18 months onward				Hepatitis A-1,2 (at 0 and 6 months)
16-24 months	MMR, DPT-B-1, OPV-B-1, Vitamin A	MMR, DPT-B-1, OPV-B-1, Vitamin A	MR-2, DPT-B-1, OPV-B-1, Vitamin A	MMR-2, varicella-1
2 years	Typhoid			Typhoid, MCV (quadrivalent)
5 years	DPT-B-2, OPV-B-2, Vitamin A	DPT-B-2, OPV-B-2, Vitamin A	DPT-B-2, OPV-B-2, Vitamin A	Varicella-2
10 years	TT	TT	TT	TT (and every 10 years thereafter), HPV -1,2,3 (at 0,2,6 months)
16 years	TT	TT	TT	

TT=Tetanus toxoid; IAP=Indian Academy of Pediatrics; HiB=*Haemophilus influenzae B*; IPV=Inactivated polio vaccine; PCV=Pneumococcal vaccine; MMR=Measles, mumps and rubella; MR=Measles-rubella; BCG=Bacillus Calmette-Guérin; OPV=Oral poliovirus vaccine; DPT=Diphtheria-tetanus-pertussis; MCV=Measles-containing vaccine; fIPV=Fractional IPV; JE=Japanese encephalitis

Mumps and Rubella, whereas in state of H. P. he/she is given the second dose of MR. Varicella vaccine is recommended at the age of 16–24 months by the IAP, however, is not a part of the UIP in any state. Delhi is administering Typhoid at the age of 2 years which is not being given in the other two states. Human Papillomavirus vaccine has been recommended by the IAP but has not been incorporated by any state in the UIP.

REASONS BEHIND CHOOSING A PARTICULAR STATE FOR A VACCINE

The disease burden in the country guides the introduction of a new vaccine in country. The selection of vaccine for possible introduction in NIP is a complex process. NTAGI is a primary advisory committee advising the Ministry of Health and Family Welfare of all immunization-related issues and consists of representatives from a wide spectrum of relevant constituencies, for example, national organizations involved in health-care policies and research, professional organizations, representatives of the government of India (GOI) agencies, and Department of Biotechnology.[6]

The criteria for selection of four states, namely, Andhra Pradesh, Odisha, H. P., and Haryana for the introduction of Rotavirus vaccine in phased manner were dependent on the diarrheal disease burden, adverse effect following immunization (AEFI) preparedness, routine immunization coverage and system preparedness, and state willingness for introduction of vaccine. Hence, currently, 9% of the total birth cohort of country is being covered by rotavirus vaccine.[7] Similarly, pneumococcal conjugate vaccine (PCV) was launched in five states of country, namely, H. P., Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan in 2017.[8] The reason for the introduction of this vaccine being that despite many different causes of pneumonia, HiB, and Pneumococcus were the two most common causative agents for pneumonia and also for fatal pneumonia. HiB vaccine was introduced in the form of Pentavalent vaccine, therefore, the second dose of the same was also launched.

THE STAGES FROM SELECTION OF A STATE (FOR PHASED MANNER LAUNCH) TILL THE OFFICIAL LAUNCH OF THE VACCINE

After an official intimation to the states regarding their selection for the launch of the new vaccine a series of events occur till the states are finally equipped to launch the same.

A plan or a model of training is prepared at the center with the development of training materials for all levels to maintain uniformity in working. The capacity building is then started, first with a national master trainer's workshop. This is followed by state-level training of trainees followed by district and block level trainings. After capacity building, the preparedness of the state and the districts for the introduction of the vaccine is checked and strengthened. AEFI workshops are conducted with distribution of preparedness checklist. A column of vaccine is introduced in the mother and child protection cards. All immunization registers, records, and stock registers are updated. Cold chain assessment at each level of healthcare is conducted. After ensuring complete preparedness, a tender is floated to procure the vaccine by the central government. After procurement of the vaccine, a distribution plan is developed. Simultaneously information, education, and counseling materials for the vaccine are introduced. After a media advocacy workshop, the Honorable Union Minister for Health launches the vaccine. In the case of the vaccine for rotavirus, this entire exercise took a time of approximately 15 months before it could be launched in four states.[7]

PROBLEMS FACED AND CHALLENGES AHEAD

India's UIP started with providing protection against six vaccine-preventable diseases; with the introduction of PCV, Rubella, and Typhoid vaccine it will now offer protection to our children against 14 diseases (Tuberculosis, Polio, Diphtheria, Pertussis, Tetanus, Hepatitis B, Measles, Rubella, *Haemophilus influenzae* B (HiB), Rotavirus diarrhea, Typhoid, Japanese encephalitis [in endemic states], Rubella and Pneumococcal disease).[8] The immunization coverage report by WHO/UNICEF (2015), shows that out of 649 districts, 68% had ≥80% coverage for Hib/DPT/Hep-B-3 vaccine, whereas of 638 districts only 38% had ≥90% coverage of MCV1.[5] Although the vaccine-preventable diseases covered under UIP have doubled, yet the immunization coverage at 9 months (i.e. for MCV1) still remains very low. Whereas on one hand it is important to address challenges of the new diseases, on the other hand, the immunization coverage so far for the seven VPDs indicates toward gaps between delivery and utilization of the health-care services.

The differences in the delivery of services and their utilization by the clients in public and the private sector further lead to inequality. The immunization program in India being a centrally funded program cannot provide all the vaccines free of cost. Therefore, a large proportion of children are vaccinated with available and licensed non-UIP antigens. The newer vaccines added to UIP in recent times and others which are not provided in public sector in all the states are recommended by IAP either as "must be given vaccines" or "may be given vaccine after one to one discussion with parents." This "laissez-faire" approach in our country toward both free choice of the provider (public or private) and free access to any type of services has led to a situation where users can approach any sector of their choice.[9] The different schedules available in different states and the varied schedules followed by the private sector have led to problems at different levels.

1. The problem of handling children coming from neighboring states bordering the chosen districts after introducing vaccines in a phased manner in some states has yet not been discussed in detail. There are no guidelines on the problem of partial introduction faced by a health professional and user both
2. There are different types of the same vaccine available in private sector and the problem of interchangeability for a child receiving one dose of one type from private sector and then coming to public sector for next dose needs to be highlighted. The example of this is the rotavirus vaccine which has three types available
3. Interstate migration of large populations in our country has increased in the past decade and has been studied as a factor for incomplete vaccination.[10] From the perspective of a provider, it becomes difficult for a health professional in the public sector to deal with complex situations arising out of this. One of the examples of such a case is a child of age <1 year, migrated from Uttar Pradesh or Bihar to Delhi with no immunization card and an ambiguous history of vaccination given by the mother. For a medical officer or nurse who is not well versed with all the scenarios of immunization schedule, it becomes difficult to prescribe further vaccination. Moreover, a health professional from one state is generally not aware of all the schedules being followed in different states (after addition of newer vaccines). Another example of a child who has migrated from Delhi to H. P. and was being vaccinated from private sector. There are times when public sector of certain state could not adjust children in their own schedules because of unavailability of one type of vaccine started in the private sector in another state. The apprehensions of parents of children about recent addition of newer vaccines and availability being different in different states remain unanswered in the public sector. Probable reasons are lack of workforce and overburdened existing staff for whom counseling a parent remains the last priority. Hence, the private sector becomes the choice for these parents, particularly in urban areas. Now, they have to pay for the services which are otherwise provided free of cost by the government.

CHANGE IN VACCINE-PREVENTABLE DISEASES BURDEN PAST DECADE IN INDIA

The integrated disease surveillance programme (IDSP) publishes weekly and monthly updates on outbreaks of diseases from all over the country. It was observed that from April 2015 through 2017 the number of acute diarrheal diseases reported were 12.7 lakhs for 2015, 11.6 lakhs for 2016, and 12.8 lakhs for 2017. Similarly, sample positivity reported for enteric fever was 15.4%, 14%, and 13.5% for 2015, 2016, and 2017, respectively. The numbers reflect the picture for an entire population with no age- and region-specific analysis.[11] The national family and health survey (NFHS) also reported a decline of only 0.2% in the prevalence of diarrhea among children of age <5 years in the past one decade.[12,13] The number of cases of enteric fever has increased since 2005 in the next decade [Table 2].[14] The data can be used as a proxy indicator of heavy burden of diarrheal diseases and enteric fever in the country. To prevent diarrheal disease in children due to rotavirus, the vaccine has been launched since 2015 but only in four states. Similar is the situation for Typhoid vaccine. However, a large proportion is still devoid of these preventive measures.

The prevalence of symptoms of acute respiratory infections among children under the age of 5 years has increased from 2.7% to 5.8% in the past one decade.[12,13] Pneumococcal and *Haemophilus influenzae* B vaccine has been introduced lately after 2011, that too in phased manner. Hence, the results are yet to be commented on. India has a virtually nonexistent vaccine-preventable disease surveillance system and Pertussis and Diphtheria are not considered an important public health problem.[15,16] The national health profile releases the data on health status of country. The number of cases of Diphtheria has decreased but has increased in case of pertussis in the past one decade [Table 2]. It is also important that there should be an age-specific and country-specific data about vaccine-preventable diseases to plan and implement immunization programs.

Table 2: Change in vaccine preventable diseases burden past decade in India

Diseases	2005	2015
Prevalence of diarrhea among children under 5 years in last 2 weeks preceding the survey[12,13] (%)	9.2	9.0
Prevalence of symptoms of ARI among children under 5 years in the last 2 weeks preceding the survey[12,13] (%)	2.7	5.8
Incidence of tuberculosis (per lakh population)[24]	279	217
Number of cases of diphtheria[14,15]	5826	4071
Number of cases of pertussis[14,15]	31122	61417
Number of cases of neonatal tetanus[14,15]	821	572
Number of cases of measles[14,15]	36711	23348
Number of cases of enteric fever[14,15]	567638	1707312
Number of cases of Japanese encephalitis[14,15]	1695	1652

ARI=Acute respiratory infection

Maternal and neonatal tetanus has been declared to be eliminated from India in 2015. The main factors responsible were safe delivery practices and cord care. Moreover, the second dose of tetanus toxoid (TT2) coverage had remained steady in India and had rather decreased in 2013.[17] It indicates that other factors have also played an important part in the elimination of maternal and neonatal tetanus from India. The decrease in tuberculosis incidence in 10 years can also be attributed to a mix of factors such as improvement in living conditions, nutrition, and sanitation.

DISCUSSION

Immunization in India is provided by the public as well as the private sector. UIP is only followed by the health-care providers in the public sector. The private sector is not bound by law of the land to abide by the policies laid down for health care. However, it is the duty of the pediatrician to explain and share all information regarding the optional vaccines recommended by IAP so that the parents are able to make the correct decision regarding the immunization of their child. The right to decide on the final immunization schedule for the child remains with the parents.[18] Those seeking care from private practitioners often face a baffling situation when they are given a list of vaccines which the government hospitals do not use. Hence, it becomes more of advice than a counseling process in our country and parents generally accept what a professional recommends for their child. Moreover, economic benefits to the private practitioner may outweigh the actual benefit to the client besides causing them discomfort. WHO reported that in 2015 only 39% of spending on vaccines and 42% spending on routine immunization program are financed by GOI.[5] Hence, a major part of demand is dealt with private sector. To regulate the private sector the government needs to ensure essential vaccination on the one hand through the private practitioners and avoid any unnecessary vaccination causing financial burden to the family. Immunization should finally be made free of cost, whether provided by the public or the private practitioner. A consensus between the IAP and the GOI is essential regarding the immunization schedule, so as to avoid any confusion to the clients and practitioners both. A countrywide single immunization schedule should be made with the consensus of the IAP along with other members of the NTAGI. This would encourage the participation of the private sector in delivering optimal immunization services accessible and affordable to all.

NTAGI, the primary advisory committee to the MOHFW, relies on data from research which may not have been necessarily carried out to provide specific data to take decisions and include vaccines in the UIP. There is lack of quantitative data on the frequency of diseases or mortality, from the agencies of GOI concerned with disease control, such as the national institute of communicable diseases and the Central Bureau of Health Intelligence. Lack of an efficient system for surveillance, lag in time taken between recommendations of the NTAGI and the implementation in the states and the ambiguity in the roles of the state Governments and the GOI while implementing the recommendations are just a few of the many factors leading to underperformance of the Immunization division.[19]

The variability in the immunization schedules is certainly a matter of concern, especially for the migrant population. In states where JE vaccine is a part of the UIP, the child whose parents have moved to other states in search of work may not receive the vaccine and remain susceptible. Mission Indradhanush is an effort toward immunizing the missing children in 254 districts across 24 states, however, there is no robust tracking system for every child in the country. Each newborn should be enlisted and his immunization schedule finalized at the time of birth. This entire record could be available on a database countrywide so that the child receives all the vaccines as per the schedule decided on at birth in any part of the country. This could be an interim arrangement till a common UIP schedule is finalized for the entire country.

The financial constraints have always been a challenge for the health system of the Country grappling with out of expenditure amounting to 60% and only 1.4% of GDP being invested in health.[20] Increasing the investment in health is now the need of the hour with funds being diverted toward immunization. This could make a single immunization schedule a reality, where similar services would be accessible in any part of the country.

Effective introduction of a vaccine into NIS should have a measurable impact on the epidemiology of the disease. The national level impact cannot be achieved by making the vaccine available in few pockets, for certain sections and limited duration. The "equity" needs to be ensured so that the vaccine reaches to the section of the society who needs it the most.[21] Encouraging research in the field of immunization is an equally important area that needs human resource as well as financial investment. Operational research to identify the gaps is essential to identify the way forward. The probable areas of research and focus are adoption of innovative methods in bringing immunization closer to communities, improving practices at fixed sites, and involvement of nonhealth workers. The web portal, the frequent seminars and conferences arranged by IAP can serve as a platform in delivering updates on immunization schedule of NIS and IAP both.

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