

## Evaluation of vaccination status of children attending a private tertiary paediatric hospital in urban Hyderabad

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### ABSTRACT

**Objectives:** The objectives of this study were to understand the vaccination status and reasons for missed vaccination in the catchment of a tertiary private paediatric hospital in a densely populated area in urban Hyderabad. **Study Design:** This was a questionnaire-based cross-sectional survey. **Methods:** Data regarding the vaccinations for all the vaccines included in the guidelines provided by the Indian Academy of Pediatrics were collected from eligible parents attending the outpatient department after informed consent. **Results:** Vaccination coverage was almost 90% with private health facilities being used by both timely and missed vaccine groups. Factors such as gender bias, large families, or low educational status were absent in both groups in this urban population unlike rural populations. Vaccines perceived by the parents as optional and booster doses were most often missed and an unwell child was the most common reason for the missed vaccines. **Conclusion:** Even in urban areas like our densely populated catchment, specified dates for next vaccine at each visit to the pediatrician will improve timely vaccination. Awareness also needs to be raised regarding the importance of what are perceived to be optional vaccines.

**Key words:** Missed vaccination, Optional vaccination, Timely vaccination, Universal, Immunization program, Urban, Vaccination

After the WHO's comprehensive review [1] in 1993, many countries have published data [2-7] regarding logistic reasons, caretaker profiles, and parental attitudes that lead to incomplete vaccination. However, almost all researches have showcased data from the government health facilities in the rural areas. Different states in India have also tried to analyze their immunization coverage [8-12], but this too is predominantly representative of rural India and government health centers. There are not much data available which looked at vaccination coverage in densely populated urban areas with a preponderance of private health care.

Data from the national family health survey 2015–16 [13,14] in India showed that in the youngest state of Telangana, <70% of the children under the age of 2 years, in both urban and rural communities, were fully immunized. Data from the capital city of Hyderabad alone were equally disheartening at 71%. Government facilities are mostly used for the health needs by parents in the rural areas. In urban Hyderabad too 75% parents utilize Government services. In contrast, when Hyderabad alone is considered 50% of parents prefer the private sector. Our hospital provides vaccination services to a lot of children in the surrounding area in a very busy outpatient department. With the extensive usage of the private health sector in Hyderabad, we felt it would be a useful exercise to collect data regarding the vaccination coverage in our own urban catchment area and reasons for missed vaccination

and then reflect on any differences noted from existing data from rural government facilities from across the world. It is with this intention that we took up this project. The objective was to find the prevalence of timely vaccination in children under 6 years of age and explore possible reasons for missed vaccines in the children attending the outpatient department (ODP) of a tertiary children hospital in a densely populated urban area of Hyderabad, India.

### METHODS

This cross-sectional survey-based study was conducted in the outpatient department of a busy private children's hospital with five full-time pediatric consultants and with average cumulative outpatient numbers of 3500–4000 per month. All children between the ages of one completed month to six completed years attending the outpatient clinics were considered for recruitment to the study, whatever is the reason for the attendance. An arbitrary number of 1000 subjects was chosen as an opportunistic sample for data collection which was done between June 12 and June 30, 2017.

Few terminologies which were related to this study are as follows:

(1) Timely vaccine: Any vaccine that has been received by the subject within a month of being age eligible at the time of the data collection (based on the vaccination schedule they follow)

(2) Missed vaccine: A vaccine that the subject has not received for more than a month after being age eligible at the time of the data collection. (3) Catch-up subjects: Subjects who have received all vaccines expected for their age at the time of data collection, even if some of them have been missed vaccines. (4) Up-to-date vaccination: All subjects who have been vaccinated appropriately for their age at the time of data collection. (5) Underimmunization: Subjects with missed vaccination who have not caught up by the time of the study.

A questionnaire was designed for the study with two components, general information and vaccination information. Eligible parents were invited to participate in the study after a full explanation and only the consenting parents were given questionnaires to fill at the registration counter. Epidemiology questionnaires were filled by the eligible caretakers in the OPD lounge as they waited to be seen by one of the consultants. The consultants cross-checked the information and filled out the vaccination questionnaire after consultation. For the parents who had the immunization cards with them, dates were cross-checked and for those who did not, data collection was based on recall. Reasons for missed vaccine were sought from all those who had missed vaccines as a part of the questionnaire. All consultants computed their data on a pre-designed excel spreadsheet which was analyzed at the end.

The standard used was the immunization schedule followed in the hospital based on the latest guidance of the Indian Academy of Pediatrics (IAP) which was published in 2013–14 guidebook [15]. The cutoff age for primary vaccination was set at 1 month after the recommended age similar to what was followed in various previous studies in the literature. Bacillus Calmette–Guérin, diphtheria, tetanus toxoids, and pertussis (DPT)+*Haemophilus influenzae* type b series, oral polio vaccine, hepatitis B and measles, mumps, and rubella (MMR) were analyzed based on this schedule. Vaccines which are not part of the universal immunization program of India such as pneumococcal vaccine, typhoid, hepatitis A, and chickenpox are considered “optional” by many parents, even though they form the part of the IAP recommendations. These were analyzed based on the vaccination schedules being followed by the parents as their timing can widely differ in individual office practices.

## RESULTS

A total of 1143 eligible children were recruited in the specified time period. 13 of these had to be excluded at the time of analysis due to incomplete data collection leaving a total of 1130 children that were analyzed. 616 (54.5%) of these children were male and 514 (45.4%) were female. The age distribution ranged from 1 month to 72 months with a median age of 15 months (interquartile range 7 m–29 m). Chart 1 shows the age-specific distribution of children in the study.

Of 1130 children, 888 had timely vaccinations and 242 had missed vaccinations. Of these missed vaccines, 119 children had catch-up vaccines by the time of the study so were up-to-date at the time of the study. Total 108 children had remained underimmunized. Status of 15 children could not be determined

due to lack of documentation as well as poor recall. Table 1 provides a summary of the above analysis.

Table 2 Provides the profile of the parents whose children had either timely or missed vaccines.

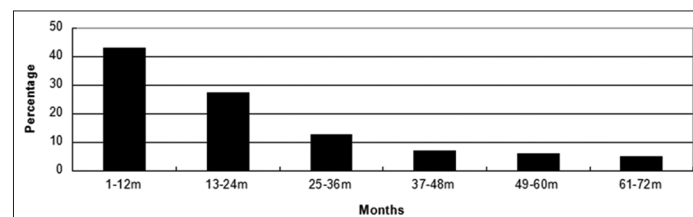


Chart 1: Age-specific distribution of children in the study

Table 1: Summary of vaccination status of children in the study

Immunization coverage	Number of subjects(%)
Up-to-date (A+B)	1007 (89.1)
A. Timely vaccine	888 (78.6)
B. Catch-up	119 (10.5)
C. Underimmunized	108 (9.55)
D. Undetermined	15 (1.32)
Total	1130 (100)

( Missed vaccines=B+C+D )

Table 2: Parental profiles

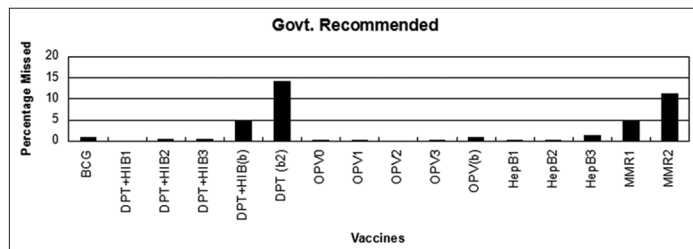
Profile	Subjects with timely vaccine (%)	Subjects with missed vaccine (%)
Sex of the child		
Male	54.3	54.9
Female	45.6	45.1
Birth rank		
First	71	68.1
Second	27	29.3
Maternal education		
Graduate	46.5	50.8
Postgraduate	48.7	43.3
Paternal education		
Graduate	35.8	38.4
Postgraduate	57.4	47.9
Employment		
Father alone	62.9	70.2
Both mother and father	35.3	26.8
Who brings for vaccine		
Mother alone	29.7	30.9
Father alone	6.6	8.2
Both	61.7	57.8
Place of vaccination		
Government sector	2.7	11.5
Private sector	93.5	79.7
Both	3.6	7.8
Data obtained by		
Documentation	62.8	73.1
Recall	37.1	26.8

Table 3 shows the cutoff ages for vaccines as per our hospital’s immunization schedule.

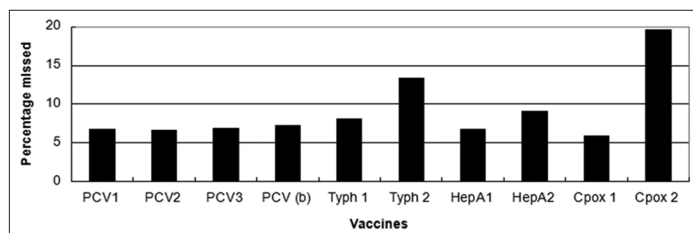
Missed vaccines percentage was determined by counting the number of kids who missed a particular vaccine based on the cutoff age divided by the total number of children who should have had the vaccine by that age. The percentage of children who missed vaccines recommended in the UIP of India including two doses of MMR is given in Chart 2. The missed vaccines in the “optional” vaccines category are given in Chart 3. Parents were asked to either tick boxes in the present questionnaire for reasons for missed vaccines or free text in the “other” category. Some parents had more than one missed vaccine and more than one reason. Table 4 shows the pre-designed questionnaire and the responses of parents.

**DISCUSSION**

The arbitrary number of 1000 ensured good quality data which covered all vaccines given until 6 years of age. The median age of 15 m was in keeping with the norms of pediatric practice [16] where infants and toddlers form the largest percentage of the clientele in any outpatient clinic. The timely immunisation percentage



**Chart 2: Missed vaccines as per the universal immunization program (UIP)**



**Chart 3: Missed vaccines in the “optional” vaccines category**

**Table 3: Cutoff ages for vaccines as per immunization schedule of the hospital**

Vaccine	Cutoff age (months)	Vaccine	Cutoff age (months)	Vaccine	Cutoff age (months)
BCG	2	Hep B 1	2	PCV 1	3
DPT+HIB 1	3	Hep B 2	3	PCV 2	4
DPT+HIB 2	4	Hep B 3	7	PCV3	5
DPT+HIB 3	5	MMR 1	10	PCV booster	16
OPV 0	2	MMR 2	16	Typhoid 1	13
OPV 1	3	DPT+HIB (booster1)	19	Typhoid 2	25
OPV 2	4	DPT (booster2)	61	Hep A 1	13
OPV 3	5 months	OPV booster	19	Hep A 2	19
				Varicella 1	16
				Varicella 2	37

OPV: Oral polio vaccine, MMR: Measles, mumps, and rubella, DPT: Diphtheria, tetanus toxoids, and pertussis, HIB: *Haemophilus influenzae* type B, BCG: Bacillus Calmette–Guérin

among the urban population clientele of the hospital was 78.6% which was well above the 71% mentioned for Hyderabad . This percentage further rose to 89% by 6 years of age, among our hospital clientele, due to 10% catch up immunisation. However, 10% of the children in this area remained underimmunized for their age at the time of the study.

There was equal number of boys and girls in both the timely and missed vaccination groups. This decreased the possibility of gender bias in the parents who miss vaccination in contrast to some parts of rural India where vaccination status was higher and dropout rates lower in boys when compared to girls [17]. Large families had been found as one of the risk factors for missing vaccinations in the Istanbul study [4], yet in our study, the families were small in both the timely and missed vaccine groups with the majority having only one or two children. Parents in both the groups were either graduates or higher, and there were a higher percentage of postgraduate fathers in the timely vaccine group than in the missed vaccine group. Furthermore, a higher percentage of both parents were employed in the timely vaccine group than in the missed vaccine group. Although emphasis was laid on maternal education and awareness in some studies from both rural and urban India [17,18], the study from Philippines did say that there was a better vaccine status in children where both parents were educated [3] and employed. A latest study from urban areas in Delhi by Kakeri *et al.* actually shows that father’s education has a greater bearing on vaccination status in these areas [19]. Interestingly, in our study, a higher percentage of fathers alone were employed in the missed vaccines group. This may indicate that father’s availability is a key factor when a vaccination visit can be made. However, majority of the times, in the missed and timely vaccine group, mother and father together bring the child for vaccination. This leads us to hypothesize that parent in the timely vaccine group plan their vaccination visits better.

Almost all parents in the timely vaccine group used the private health facilities for immunization. In the missed vaccine group too, a majority used only private sector, although a significant percentage still used government facilities alone or both. There was universal acceptance for the primary vaccines in the 1<sup>st</sup> year specified in the UIP in India with a

**Table 4: Reasons for missing vaccines among the missed vaccines category**

Reason	Number of subjects
Did not find time to come	25
Vaccine is too expensive	5
Did not know when the next vaccine date was	6
Forgot to come for the vaccine	23
Out of station and did not want to take vaccine there	24
Child unwell	54
Doctor advised against vaccine	8
Did not want to take optional vaccines	37
Did not feel booster doses important	1
Long waiting times for vaccine administration	2
Vaccine is not available	19
Vaccination schedule keeps changing	22
Other	35
Lived outside India	14

near zero missed vaccination percentage for all except MMR at 9 months of age. However, the percentage of missed vaccines gradually rose for the booster vaccines in both the DPT series and the MMR and to a minor degree even in the Hep B and OPV series. This increased defaulter rate for MMR is the same as was found by Mohanlal *et al.* [20], and interestingly, the same as found by Deshpande *et al.* [21] almost 15 years ago. It can only be attributed to long duration between 3<sup>rd</sup> dose DPT visit at 14 weeks and the MMR visit at 9 months and a lack of awareness of the importance of MMR vaccine. Father's educational status seems to increase the MMR status in urban areas [19].

Even the vaccines perceived as “optional” by parents had a good acceptance of >80% for all vaccines in our catchment. Pneumococcal vaccine had a 93% acceptance for all doses including the booster. This is really encouraging as the Government of India is planning to introduce the pneumococcal vaccine this year as part of the UIP, recognizing the morbidity associated with the disease based on the latest evidence by Megiddo *et al.* [22]. The second dose of chickenpox vaccine at 3 years had the worst acceptance with 19.6% of eligible children missing it.

Child being unwell was the most common reason cited by parents in the missed vaccine category, which was similar to other urban studies [23]. This was followed by decision to not take the so-called “optional” vaccines even when vaccinating in the private sector. Miscellaneous reasons like taking primary vaccinations in government sector where so-called “optional” vaccines are not available and losing the vaccination record were also quoted by parents for missing vaccines.

The strength of this study is that more than a thousand eligible children and families have been analyzed and this is the largest study of its kind to our knowledge. The vaccination practices of this study population are not specific to the study setting of our

hospital because majority of them have used other vaccination providers too. We also acknowledge the limitation that this was a single-center study and may not be truly representative of the urban population in general. A greater proportion of results in the timely vaccine category were obtained by recall than in the missed vaccine category. A significant proportion of subjects in the missed vaccine category used government health services which do not provide some of the vaccines recommended by IAP. Many of these vaccines are recommended by our practitioners on their visit to the hospital, but parents may take time to catch-up.

## CONCLUSION

This study has provided some very useful data about vaccination coverage in a very large cohort using a private health facility and helped us understand our local urban population better. Rates of vaccination at the right time can be improved by checking the vaccination status, providing catch up vaccines or providing dates for the next vaccine at each visit to the pediatrician, whatever be the reason for the visit. The importance of the so-called optional vaccines needs to be emphasized too.

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