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A CROSS SECTIONAL STUDY ON COVERAGE OF BCG, MR, OPV, HEPATITIS-B, VACCINES AMONG PAEDIATRIC POPULATION IN TERTIARY CARE TEACHING HOSPITAL WITH REFERENCE TO ANDHRA PRADESH STATE CENSUS DATA

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ABSTRACT

Immunization is a vital public health strategy that plays a significant role in reducing childhood morbidity and mortality. The present study aimed to assess the coverage of Bacillus Calmette– Guérin, Measles-Rubella, Oral Polio Vaccine, and Hepatitis B vaccines among the paediatric population in a tertiary care teaching hospital and to compare the findings with Andhra Pradesh state census data. A cross-sectional study was conducted using immunization records of children, and data were analyzed to evaluate vaccine coverage and adherence to the recommended immunization schedule. The results showed that 86% of children were fully immunized compared to 100% in Andhra Pradesh state data. Vaccine coverage was 100% for Bacillus Calmette–Guérin, Hepatitis B, and Oral Polio Vaccine, which was slightly higher than state coverage, whereas Measles-Rubella vaccine coverage was 72.6%, significantly lower than the 95% reported at the state level. Awareness regarding vaccination was also lower than state data. The study concludes that although institutional vaccine coverage is satisfactory, gaps in Measles-Rubella vaccination and caregiver awareness highlight the need for improved follow-up and education strategies to achieve complete immunization coverage.

KEYWORDS: Immunization coverage, Pediatric vaccination, Measles-Rubella vaccine, Public health.

INTRODUCTION

Immunization is one of the most effective and cost-efficient public health interventions for preventing infectious diseases and reducing childhood morbidity and mortality worldwide. Vaccines protect children against life-threatening

diseases such as tuberculosis, poliomyelitis, hepatitis B, and measles-rubella, thereby improving survival rates and overall quality of life.[1,2]

The success of immunization programs has led to the significant decline and near eradication of several vaccine-preventable diseases globally.[3]

In India, the Universal Immunization Programme (UIP), launched by the Ministry of Health and Family Welfare, aims to provide free vaccination against major vaccine-preventable diseases to all children. Vaccines such as Bacillus Calmette–Guérin (BCG), Oral Polio Vaccine (OPV), Hepatitis B, and Measles-Rubella (MR) are administered according to a defined immunization schedule beginning at birth and continuing through early childhood.[4,5] Despite the extensive reach of UIP, disparities in immunization coverage still exist due to factors such as socioeconomic status, lack of awareness, accessibility issues, and missed opportunities for vaccination.[6]

Tertiary care teaching hospitals play a crucial role in strengthening immunization services by providing structured vaccination programs, improving caregiver awareness, and maintaining accurate immunization records. These institutions often demonstrate better vaccination coverage compared to community settings due to regular follow-up and direct interaction with healthcare professionals.[7,8]

However, incomplete immunization, particularly missed booster doses such as Measles-Rubella, remains a significant challenge. Monitoring vaccine coverage in institutional settings and comparing it with population-level data, such as state census reports, is essential to identify gaps and improve immunization strategies.[9, 10]

Therefore, the present study was undertaken to assess the coverage of Bacillus Calmette–Guérin, Oral Polio Vaccine, Hepatitis B, and Measles-Rubella vaccines among the paediatric population in a tertiary care teaching hospital and to compare the findings with Andhra Pradesh state census data, thereby identifying gaps and contributing to improved immunization practices.

METHODOLOGY

Study Design and Setting

A cross-sectional observational study was conducted in a tertiary care teaching hospital in Andhra Pradesh, India, with a well-established paediatric department and immunization services.

Study Duration

The study spanned six months (October2025-March2026)

Study Population

The study population consisted of paediatric patients attending the outpatient and inpatient departments of the hospital for routine immunization and healthcare services.

Sample Size

A total of 150 paediatric subjects were included in the study based on availability of immunization records and study criteria.

Inclusion Criteria

- Children aged 0–24 months
- Children with available immunization records
- Parents/guardians willing to provide necessary information

Exclusion Criteria

- Children with incomplete or missing vaccination records
- Critically ill children
- Parents/guardians unwilling to participate

Data Collection Method

- Data were collected using a structured data collection form. Information included:
- Demographic details (age, gender, residence)
- Socioeconomic status
- Birth details (birth order, full-term status)
- Immunization status of BCG, OPV, Hepatitis B, and MR vaccines
- Awareness and knowledge of caregivers regarding vaccination
- Immunization status was verified using vaccination cards and hospital records.

Outcome Measures

The primary outcome was immunization coverage of:

- ✓ Bacillus Calmette–Guérin (BCG)
- ✓ Oral Polio Vaccine (OPV)
- ✓ Hepatitis B vaccine
- ✓ Measles-Rubella (MR) vaccine Secondary outcomes included:
- ✓ Awareness of vaccination among caregivers
- ✓ Association of demographic factors with immunization status

Statistical Analysis

The collected data were analyzed using descriptive statistics. Results were expressed in terms of frequency, percentages, mean, and standard deviation. The findings were compared with Andhra Pradesh state census data to evaluate differences in immunization coverage.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Informed consent was obtained from parents or guardians before data collection. Confidentiality of patient information was strictly maintained throughout the study.

RESULTS

Age-wise Distribution: Out of 150 paediatric subjects, the majority belonged to the 13–24 months age group (36.6%), followed by 7–12 months (36.1%) and 0–6 months (27.3%), indicating that most participants were in the later infancy stage.

Gender-wise Distribution: Among the study population, 81 (54%) were males and 69 (46%) were females, showing a slight male predominance.

Weight-wise Distribution: Most children had a weight range of 9.6–14 kg (42.6%), followed by 5.6–9.5 kg (34.7%), and 2.5–5.5 kg (22.7%), indicating normal growth trends in the majority.

Place of Residence: A large proportion of subjects were from rural areas (80.6%), whereas only 19.4% belonged to urban areas.

Socioeconomic Status: The majority of participants belonged to the upper middle class (43.3%), followed by lower middle class (40%), while lower class constituted 13.4% and upper lower class 3.3%.

Birth Order: Most children were second-born (42.6%), followed by first-born (41.3%), and third- born (16.1%).

Side Effects after Vaccination: Among the participants, 46.8% reported no side effects, while 33.3% experienced crying, 15.3% had fever, and 4.6% reported swelling after vaccination.

Distance from Healthcare Facility: The majority of participants (56.6%) resided within 2–5 km of the healthcare facility, followed by 32.1% within <2 km, and 11.3% beyond 5 km.

Child Birth Status: A total of 84% of children were born full-term, while 16% were preterm births.

Awareness Regarding Vaccination: About 67.3% of caregivers were aware of vaccination, whereas 32.7% lacked proper awareness. Additionally, only 60% recognized the importance of vaccination.

Immunization Status

Out of 150 children, 129 (86%) were fully immunized, while 21 (14%) were partially immunized.

Immunization Coverage of Vaccines

The study revealed 100% coverage for BCG, Hepatitis B, and OPV vaccines, while Measles- Rubella vaccine coverage was 72.6%, indicating a gap in booster dose compliance.

Comparison with Andhra Pradesh State Data

When compared with Andhra Pradesh state census data, the study showed higher coverage for BCG (100% vs 87%), Hepatitis B (100% vs 99%), and OPV (100% vs 99%). However, Measles- Rubella coverage (72.6%) was significantly lower than the state level (95%). Additionally, awareness levels and full immunization rates were lower compared to state data, highlighting the need for improved education and follow-up strategies.

Table 1: age wise distribution.

S. NO	AGE	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	0-6 Months	41	0.273 ± 0.445	27.3%
2.	7-12 Months	54	0.361 ± 0.480	36.1%
3.	13-24 Months	55	0.366 ± 0.481	36.6%
	TOTAL	**150**		**100%**

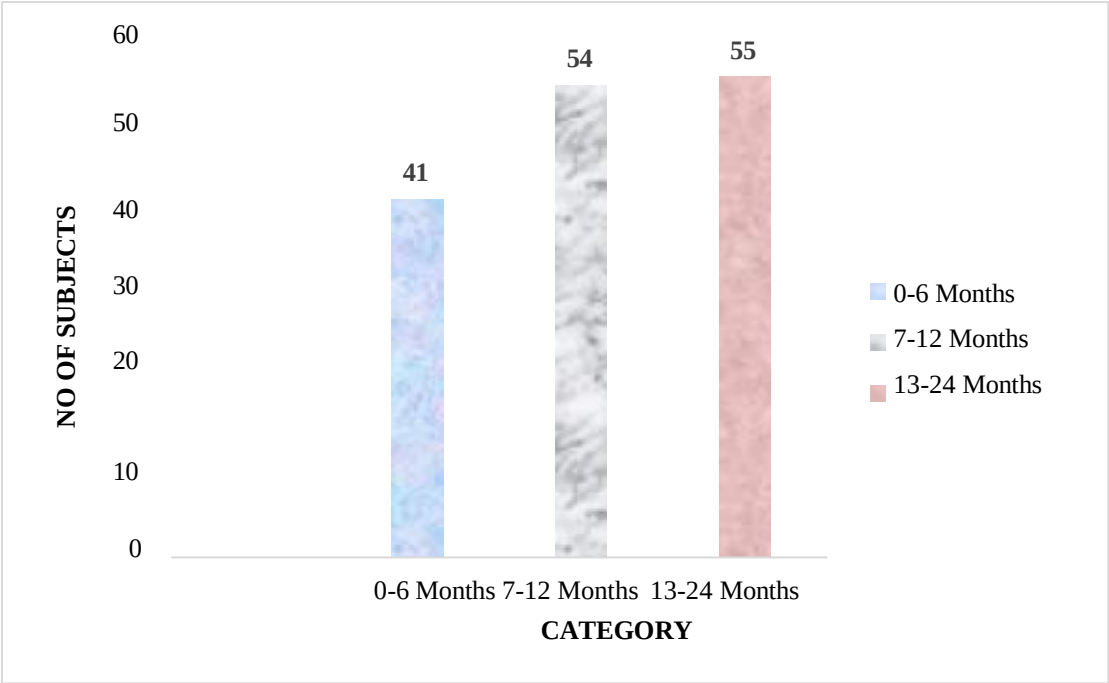

Figure 1: Grahical representation of distribution According to Age.

Table 2: Gender Wise Distribution.

S.NO	GENDER	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Male	81	0.54 ± 0.498	54%
2.	Female	69	0.46 ± 0.498	46%
	TOTAL	**150**		**100%**

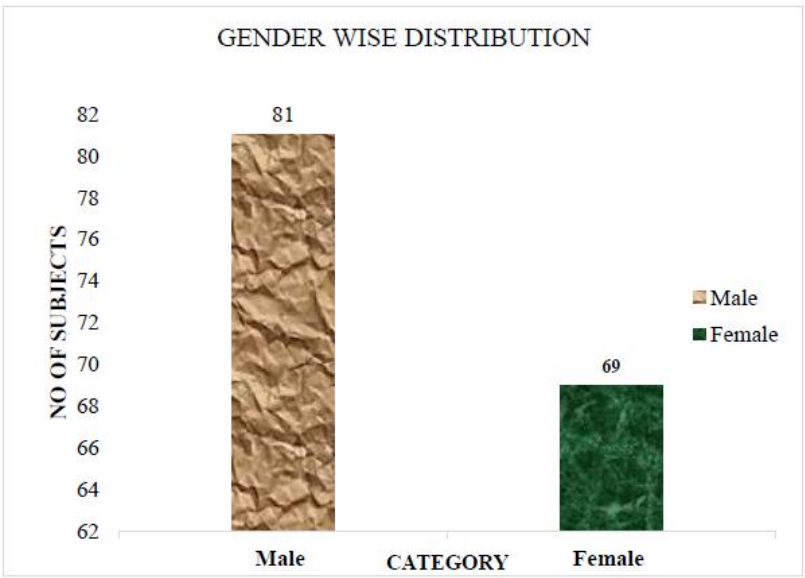

Figure 2-Grahical representation of distribution According to Gender.

Table 3: Weight Wise Distribution.

S.NO	WEIGHT	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCEENTAGE
1.	2.5-5.5 Kg	34	0.227 ± 0.419	22.7%
2.	5.6-9.5Kg	52	0.347 ± 0.476	34.7%
3.	9.6-14kg	64	0.426 ± 0.494	42.6%
	TOTAL	**150**		**100%**

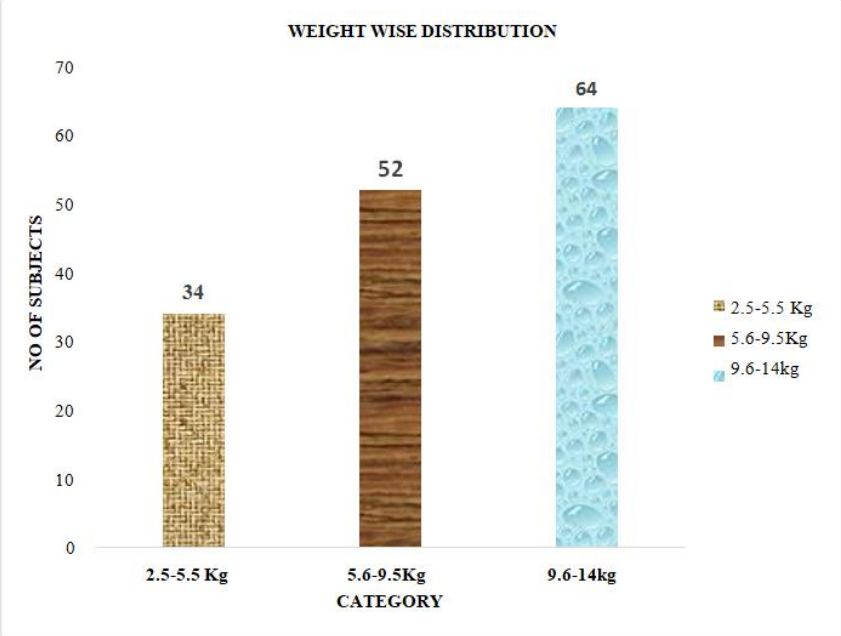

Figure 3: Grahical representation of distribution According to weight.

Table 4: Place of Residence.

S.NO	PLACE OF RESIDENCE	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCEENTAGE
1.	urban	29	0.194 ± 0.395	19.4%
2.	rural	121	0.806 ± 0.395	80.6%
	TOTAL	**150**		**100%**

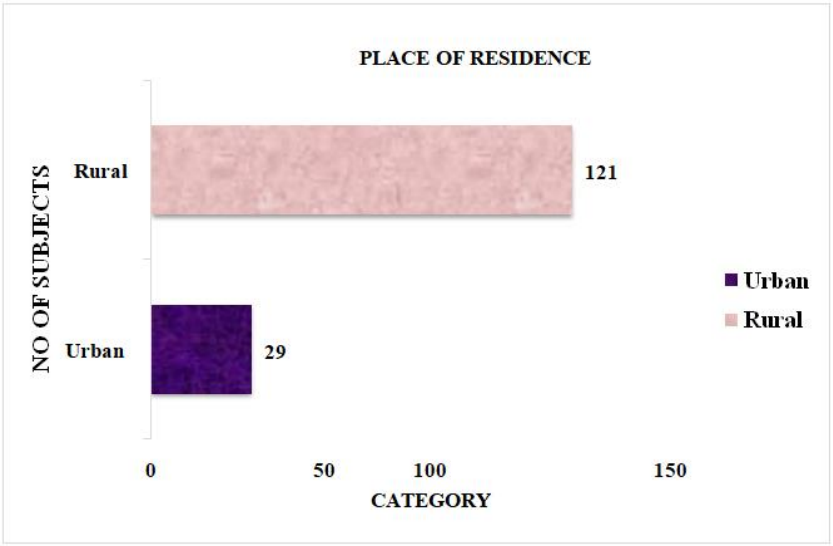

Figure 4-Grahical representation of distribution According to Residence

Table 5: Socio economic status.

S. NO	SOCIO ECONOMIC STATUS	NO .OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Upper middle	65	0.433 ± 0.496	43.3%
2.	Lower middle	60	0.40 ± 0.490	40%
3.	Upper lower	05	0.33 ± 0.180	3.3%
4.	Lower	20	0.134 ± 0.341	13.4%
	TOTAL	**150**		**100%**

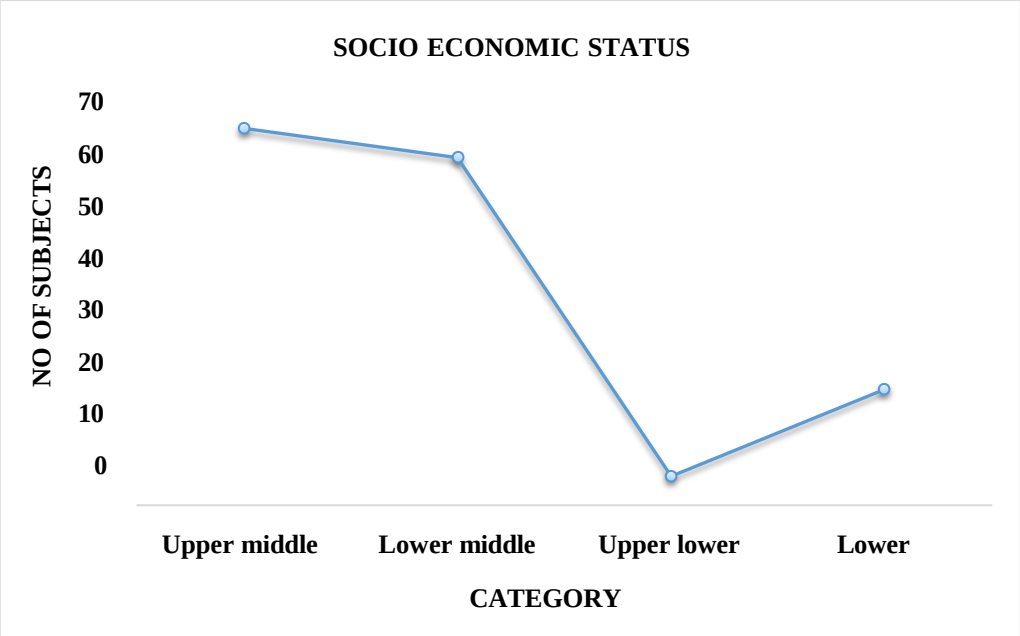

Figure 5-Grahical representation of distribution According to Socio Economic Status.

Table 6: Birth Order.

S. NO	BIRTH ORDER	NO .OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	**First child**	62	0.413 ± 0.492	41.3%
2.	**Second child**	64	0.426 ± 0.494	42.6%
3.	**Third child**	24	0.161 ± 0.368	16.1%
	TOTAL	**150**		**100%**

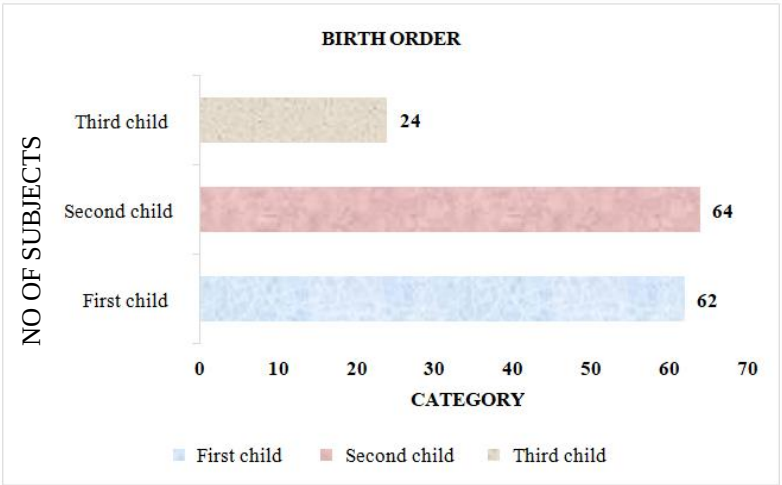

Figure 6-Graphical representation of distribution According to Birth order.

Table 7: Side effects after vaccination.

S. NO	SIDE EFFECTS.	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Fever	23	0.153 ± 0.360	15.3%
2.	Swelling	7	0.46 ± 0.210	4.6%
3.	Crying	50	0.333 ± 0.471	33.3%
4.	No side effect	70	0.468 ± 0.499	46.8%
	TOTAL	**150**		**100%**

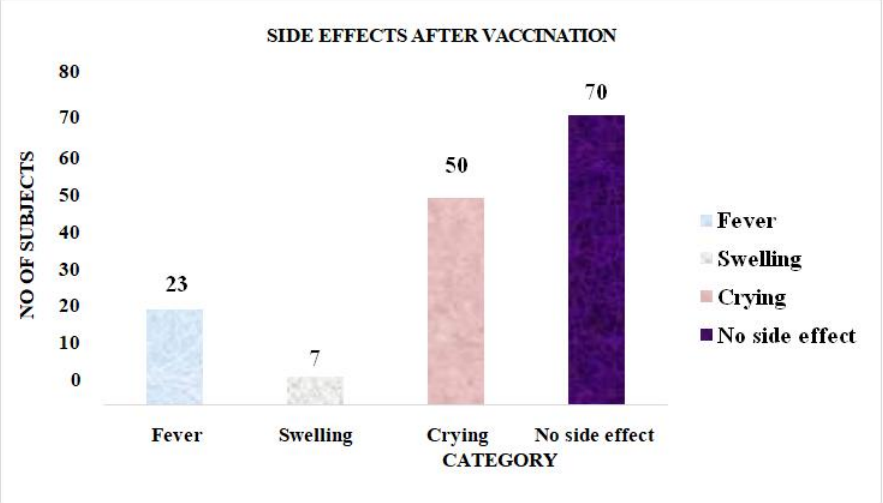

Figure 7: Graphical representation of distribution According to side effects after vaccination.

Table 8: distance from health care facility.

S. NO	DISTANCE	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	<2km	48	0.321± 0.467	32.1%
2.	2-5 km	85	0.566 ± 0.496	56.6%
3.	>5km	17	0.113 ± 0.317	11.3%
	TOTAL	**150**		**100%**

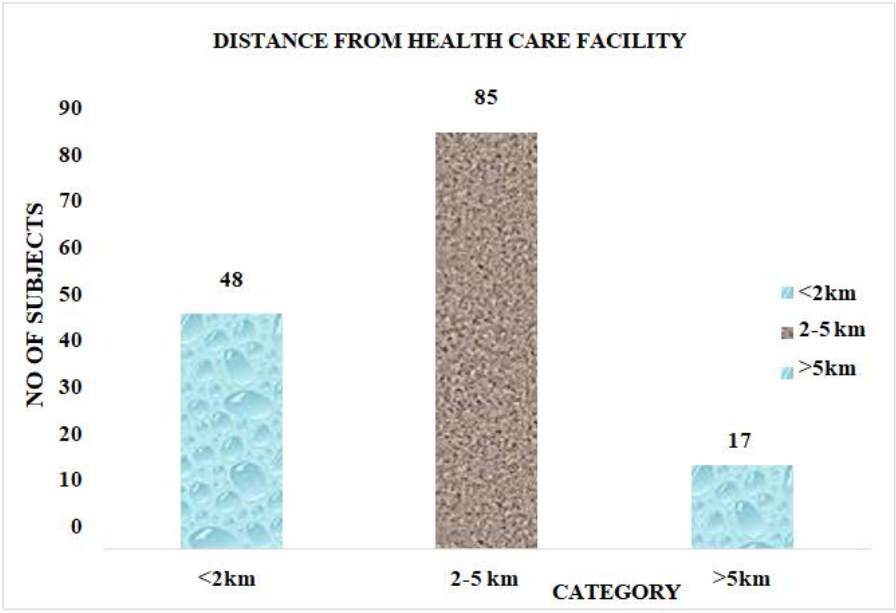

Figure 8: Graphical representation of distribution According to Distance from health care facility.

Table 9: Child Born Full Term.

S. NO	CHILD BORN	NO OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	YES	126	0.84 ± 0.366	84%
2.	NO	24	0.16 ± 0.366	16%
	TOTAL	**150**		**100%**

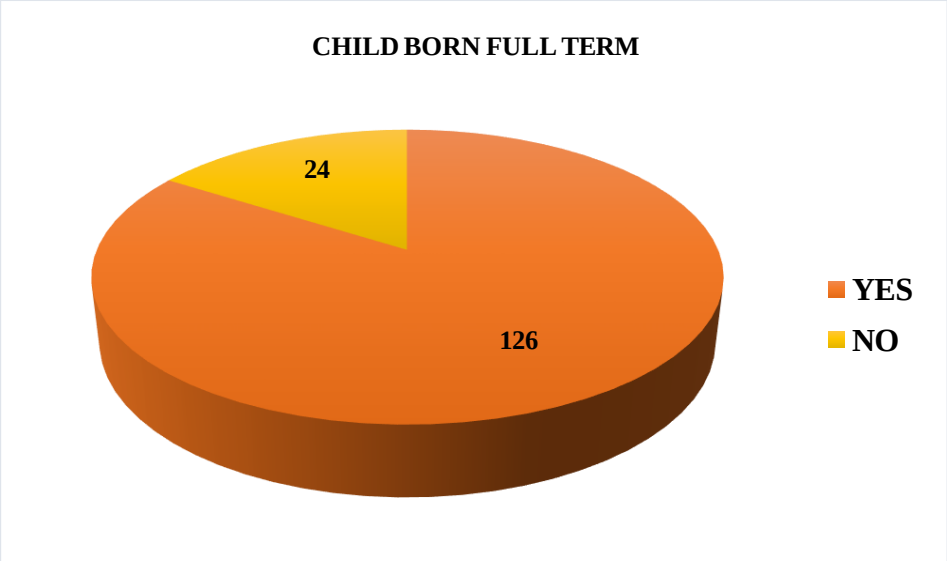

Figure 9: Graphical representation of distribution According to Child full term.

Table 10: Importance of Vaccination.

S.NO	IMPORTANT OF VACCINATION	NO OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Yes	90	0.60 ± 0.490	60%
2.	No	60	0.40 ± 0.490	40%
	TOTAL	**150**		**100%**

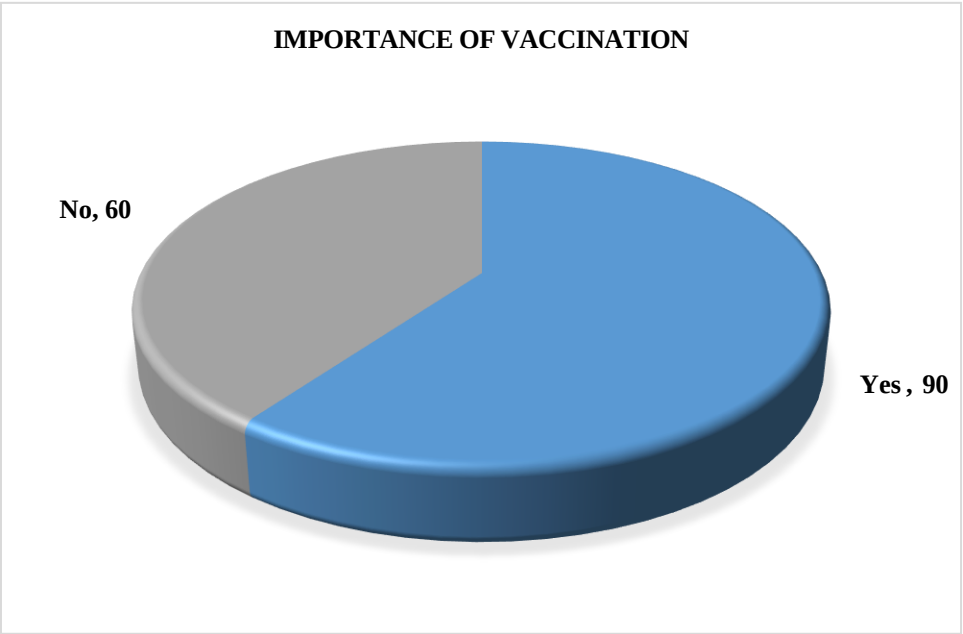

Figure 10-GraPhical representation of distribution According to Importance of Vaccination

TABLE 11: PROPER AWARENESS OF VACCINES.

S.NO	AWARENESS	NO OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Aware	101	0.673 ± 0.469	67.3%
2.	Not aware	49	0.327 ± 0.469	32.7%
	TOTAL	**150**		**100%**

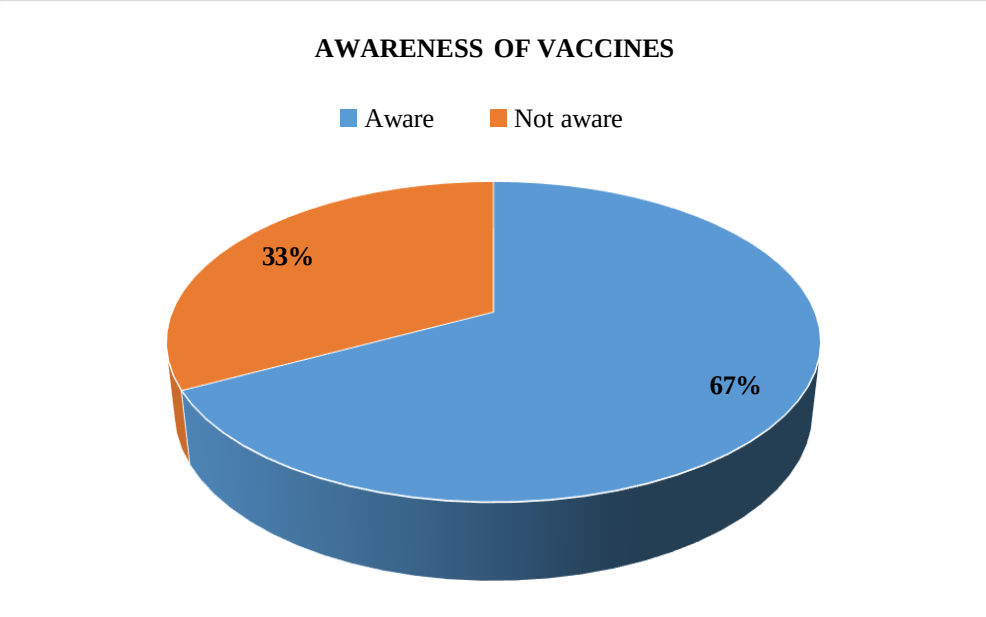

Figure 11: Graphical representation of distribution According to Proper Awareness of vaccination.

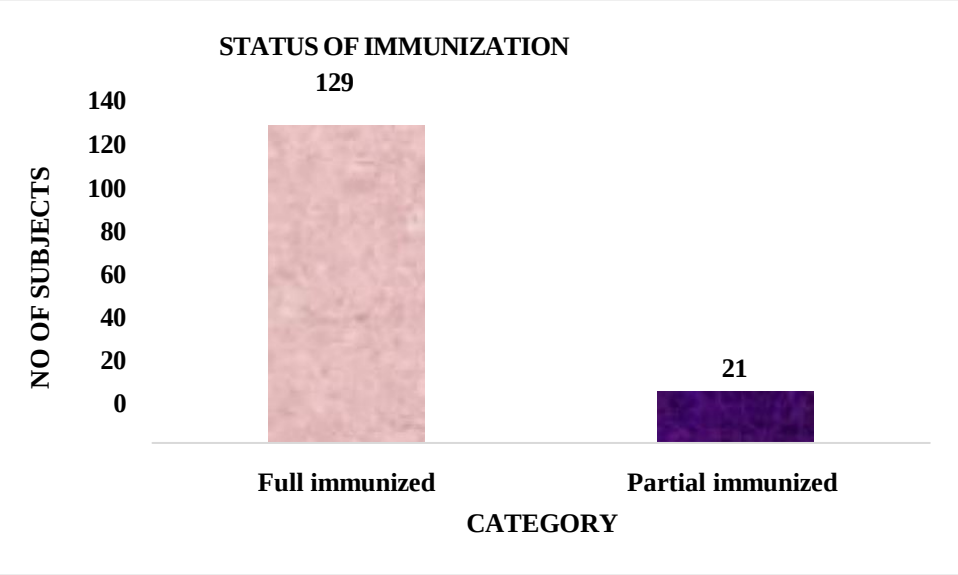

Figure 12: Graphical representation of distribution According to Status of immunization.

Table 12: Immunization Status.

S. NO	STATUS	NO OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	Full immunized	129	0.86 ± 0.347	86%
2.	Partial immunized	21	0.14 ± 0.347	14%
	TOTAL	**150**		**100%**

Table 13: immunization coverage of vaccines.

S. NO	VACCINES	NO. OF SUBJECTS	MEAN (P VALUE) ±SD (STANDARD DEVIATION)	PERCENTAGE
1.	BCG	150	1.00 ± 0	100%
2.	Hepatitis -B	150	1.00 ± 0	100%
3.	OPV	150	1.00 ± 0	100%
4.	MR	109	0.726 ± 0.446	72.6%

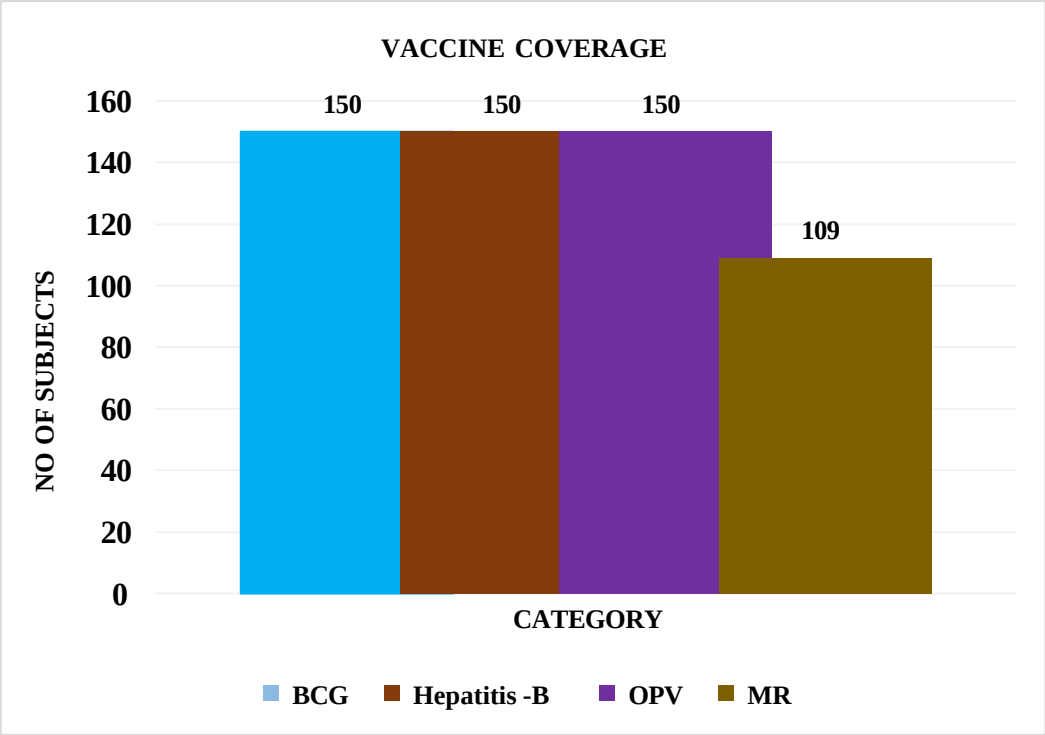

Figure 13: Graphical representation of distribution According to Vaccine coverage.

COMPARISION BETWEEN THE STUDY RESULTS TO ANDHRA PRADESH STATE CENSUS DATA

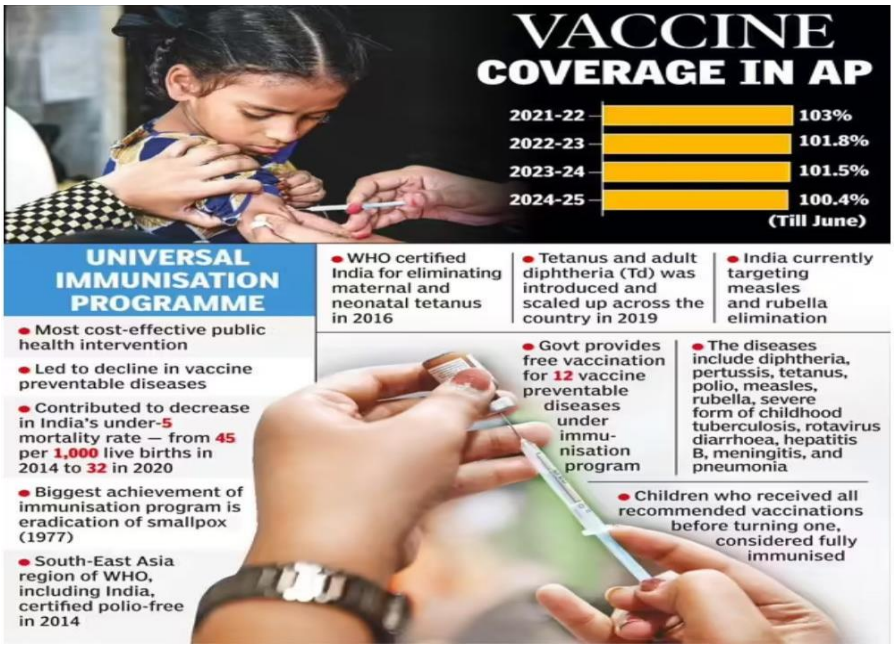

Figure 14: Vaccine coverage in AP.

While full immunization coverage was extended to an impressive 103% of the targeted children in 2021-22, it remained exceptional at 102% in 2022-23 in Andhra Pradesh.

- This remarkable trend continued in 2023-24 with a 101% achievement rate. Even in the ongoing fiscal year (2024-25), the coverage surpassed 100% as of June 2024. According to nationwide data acquired by TOI from 2022, several states reported immunization rates hovering 90-95%, with only five states/Union Territories, including Andhra Pradesh, attaining the targeted coverage.
- Driven by its increased vaccination coverage, Andhra Pradesh is now aiming for elimination status for Measles and rubella atleast in some districts within the next few years. State immunization officer Dr Devi said that immunization coverage is a crucial indicator within the Sustainable Development Goals (SDGs).
- The state leverages the Union government's RCH portal more effectively to identify unvaccinated children and ensure comprehensive coverage. Public participation in immunization is largely voluntary, except in some tribal areas. Designated vaccination days, such as Wednesdays and Saturdays, are observed with a minimum of 40 vaccinations per session.
- However, Andhra Pradesh demonstrates exceptional commitment by conducting sessions even the state immunization officer said the significant advantage of Andhra Pradesh is its increased field-level workforce. “While the national norm assigns an auxiliary nurse midwife (ANM) to every 6,000 people, our state boasts a ratio of one ANM per 3,000 individuals. This staffing allows for close monitoring of vaccine stocks and timely resupply to ensure uninterrupted vaccination drives. Children who receive all recommended vaccinations before they turn one are considered fully immunized according to guidelines,” said Dr Devi.

Table 14: Comparision Between The Study Results To Andhra Pradesh State Census Data.

CATEGORIES	STUDY %	A PRADESH STATE CENSUS DATA (2024-2025)
Age group (0-6) months	27.3%	25%
Age group(7-12) months	36.1%	35%
Age group(13-24) months	36.6%	40%
Male children	54%	51%
Female children	46%	49%
Urban residence	19.4%	30%
Rural residence	80.2%	70%
Upper middle SES	43.3%	40%
Lower middle SES	40%	38%
Lower SES	73.4%	18%
Know importance of vaccination	60%	80%
Proper awareness of vaccines	67.3%	85%
Full immunization	86%	100%
Full term birth	84%	90%
BCG coverage	100%	87%
Hepatitis- b coverage	100%	99%
OPV coverage	100%	99%
MR coverage	72.6	95%

Under universal immunization programme, the govt provides vaccines free of cost against 12 vaccine preventable diseases, including diphtheria, pertussis, tetanus, polio, measles, rubella, severe form of childhood tuberculosis, rotavirus Diarrhoea, hepatitis B, meningitis, and pneumonia.

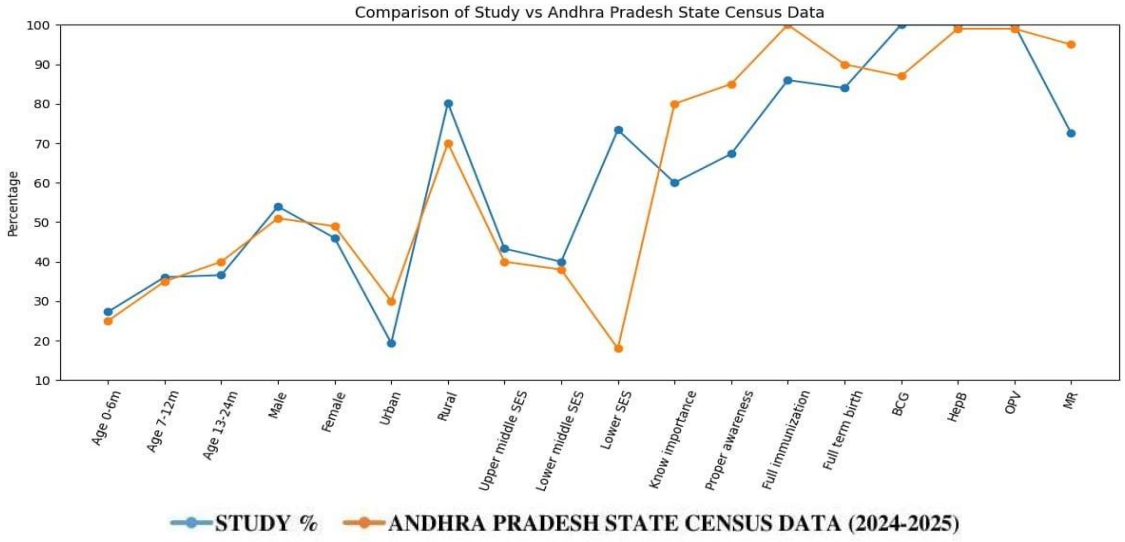

Figure-15: Graphical Representation of our study vs Andhra Pradesh state census data.

DISCUSSION

The present cross-sectional study was conducted to evaluate the immunization coverage of Bacillus Calmette–Guérin, Oral Polio Vaccine, Hepatitis B, and Measles-Rubella vaccines among the paediatric population in a tertiary care teaching hospital and to compare the findings with Andhra Pradesh state census data.

In the present study, the majority of children belonged to the age group of 13–24 months (36.6%), which is consistent with the active immunization period where most vaccines and booster doses are administered. A slight male predominance (54%) was observed, which is in line with several hospital-based studies where male children tend to have higher healthcare utilization.

A significant proportion of participants were from rural areas (80.6%), indicating that tertiary care centers serve as important healthcare access points for rural populations. However, this also reflects potential disparities in access to primary healthcare services in rural settings.

The study revealed that 86% of children were fully immunized, which, although satisfactory, is lower compared to 100% immunization coverage reported in Andhra Pradesh state data. This difference may be attributed to missed follow-ups, lack of awareness, and socioeconomic barriers. Similar findings have been reported in previous studies where incomplete immunization was associated with parental education and accessibility issues.

Vaccine-specific coverage showed 100% coverage for BCG, Hepatitis B, and OPV, which is higher compared to state data (87%, 99%, and 99% respectively). This indicates effective administration of birth and early infancy vaccines in the hospital setting. However, Measles- Rubella vaccine coverage was 72.6%, which is significantly lower than the 95% reported at the state level. This highlights a major gap in booster dose compliance, which is commonly observed due to lack of follow-up and awareness among caregivers.

Awareness regarding vaccination was found to be 67.3%, and only 60% of caregivers understood its importance, which is considerably lower than state data (85% and 80% respectively). This suggests that lack of knowledge and health education remains a key barrier to achieving complete immunization.

The occurrence of side effects was minimal, with 46.8% reporting no side effects, indicating that vaccines are generally safe and well tolerated, which supports existing literature on vaccine safety.

CONCLUSION

The present study demonstrates that immunization coverage for primary vaccines such as Bacillus Calmette–Guérin, Oral Polio Vaccine, and Hepatitis B is satisfactory in a tertiary care setting.

However, the coverage of Measles-Rubella vaccine remains suboptimal, indicating poor compliance with booster doses.

When compared with Andhra Pradesh state census data, the study shows relatively better coverage for primary vaccines but lower overall immunization completion and awareness levels. This emphasizes the need for strengthening follow-up mechanisms, enhancing caregiver education, and improving accessibility to vaccination services.

The findings of this study highlight the importance of targeted interventions, including awareness programs, reminder systems, and healthcare provider engagement, to achieve complete immunization coverage. Improving these aspects will contribute significantly to reducing vaccine- preventable diseases and enhancing child health outcomes.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

AUTHORS' CONTRIBUTION

All authors contributed significantly to the conception and design of the study. **Dr. Sandhya Malepati** was involved in study planning, data collection, analysis, and manuscript preparation. The co-authors contributed to data collection, literature review, and interpretation of results. All authors participated in drafting and revising the manuscript critically for important intellectual content. All authors have read and approved the final version of the manuscript for publication.

REFERENCES

1. World Health Organization. Immunization coverage. World Health Organization, 2023.
2. Ministry of Health and Family Welfare. Universal Immunization Programme. Government of India; New Delhi, 2022.
3. Plotkin SA, Orenstein WA, Offit PA. Vaccines. 7th ed. Elsevier; Philadelphia, 2018.
4. National Family Health Survey (NFHS-5). India Fact Sheet. Ministry of Health and Family Welfare, 2021.
5. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. 9th ed. Elsevier, 2018.
6. Park K. Park's Textbook of Preventive and Social Medicine. 26th ed. Banarsidas Bhanot Publishers; Jabalpur, 2021.

7. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine- Preventable Diseases. 14th ed., 2021.
8. World Health Organization. Expanded Programme on Immunization. WHO; Geneva, 2019.
9. Bloom BR, Lambert PH. The vaccine book. Academic Press, 2016.
10. Indian Academy of Pediatrics. IAP Guidebook on Immunization. Indian Academy of Pediatrics, 2020.