ORIGINAL ARTICLE

Knowledge, Attitude and Practice towards immunisation among parents of under-five children in select urban and rural areas of Bengaluru: a mixed methods study

Kimberley Dsouza[1], Nikita Raposo[2], Naveen Ramesh[3]

[1,3]Department of Community Medicine, St. John's Medical College, Bangalore

[2]Department of Paediatrics, St. John's Medical College, Bangalore

CORRESPONDING AUTHOR

Dr Kimberley Dsouza, Department of Community Medicine, St. John's Medical College, Bangalore

Email: kimberleydsouza1296@gmail.com

CITATION

Dsouza K, Raposo N, Ramesh N. Knowledge, attitude and practice towards immunisation among parents of under-five children in select urban and rural areas of Bengaluru: a mixed methods study. Journal of the Epidemiology Foundation of India. 2025;3(4):323-330.

DOI: https://doi.org/10.56450/JEFI.2025.v3i04.006

ARTICLE CYCLE

Received: 23/10/2025; Accepted: 15/12/2025; Published: 31/12/2025

Abstract

Background: Parental knowledge, attitude and practice (KAP) regarding vaccines are key determinants of immunisation coverage in low- and middle-income countries. However, direct urban–rural comparisons of parental KAP in Bengaluru, South India remain limited. **Aims and objectives**: To compare parental KAP on routine immunisation of under-five children in urban and rural Bengaluru and identify associated contextual factors. **Methodology**: This hospital-based mixed-methods study included 200 parents (100 urban and 100 rural) recruited through convenience sampling between February and August 2024. Quantitative data were collected using a structured interview schedule and analysed using logistic regression and correlation analysis. Qualitative data were obtained through in-depth interviews. **Results**: Urban parents demonstrated higher mean KAP scores than rural parents. Urban residence was associated with greater awareness of vaccination schedules (aOR 1.96, 95% CI: 1.8–3.8) and appropriately vaccinated children (aOR 5.19, 95% CI: 1.0–7.6), while rural parents showed greater participation in community immunisation programmes (aOR 0.26, 95% CI: 0.1–0.9). A moderate positive correlation was observed between knowledge, attitude and practice ($p < 0.001$). Qualitative findings highlighted persistent misconceptions in urban areas and logistical barriers in rural settings. **Conclusion**: Distinct urban–rural differences in parental KAP necessitate context-specific awareness and policy interventions to improve routine immunisation coverage.

Keywords

Immunization; Health Knowledge, Attitudes, Practice; Vaccine hesitancy; Urban population; Rural population

Introduction

According to the Knowledge, Attitude and Perception (KAP) theory, health behavioural change is achieved through the acquisition of the right knowledge, generation of attitudes, and adoption of behaviours or practices in three successive processes.(1,2) The KAP of parents towards vaccines is important for better immunisation coverage and prevention

of vaccine preventable diseases in any geographic area.(3,4)
Vaccination is a means of producing immunity against pathogens, such as viruses and bacteria, by the introduction of live, killed, or altered antigens that stimulate the body to produce antibodies against more dangerous forms. Vaccination has eradicated smallpox worldwide and prevents diseases such as cholera, rabies, diphtheria, tetanus and typhoid fever, to name a few. (5,6,7)

The World Health Organization (WHO) has defined immunisation as the process where by a person is made immune or resistant to an infectious disease, typically by administration of a vaccine. It also stated that immunisation is a proven tool for controlling and eliminating life threatening diseases and is estimated to alleviate around 3 million deaths every year. (8)
Each year more than 10 million children in low and middle-income countries die before they reach their fifth birthdays and most die because they did not access effective interventions that would combat preventable childhood illness.(9) Mission Indradhanush (MI) was launched in India in December 2014, aimed at increasing the full immunisation coverage to children aged 0-5 years and pregnant women to 90% and Intensified Mission Indradhanush (IMI) 5.0 focused on improving measles and rubella vaccination coverage.(10)
The knowledge, attitude and practice of parents especially the mothers towards vaccines is an important factor for better immunisation coverage which would help in achieving full immunisation targets (90% full immunisation coverage across all districts) according to Universal Immunisation Programme (UIP) and Intensified Mission Indradhanush (IMI). (11,12)
The comprehension of parents regarding the immunisation of their under-five children appears notably deficient, particularly within rural regions. (13) Nonetheless, the implementation of diverse health programs has notably transformed their attitudes and practices, leading to an enhancement in immunisation coverage. Moreover, it is evident that several influencing factors, such as socio-economic circumstances, literacy levels, and residential settings (urban versus rural), significantly impact the Knowledge, Attitudes, and Practices (KAP) concerning child immunisation.(11) Recent National Family Health Survey (NFHS) 5 data indicate a difference in full vaccination coverage between urban (75.5%) and rural (76.8%) areas. (14).

Despite the EPI/UIP (Expanded Programme on Immunisation/ Universal Immunisation Programme) since 1978/1985, the national full immunisation coverage in India for the fiscal year 2023-2024 stands at 93.5%. However, coverage varies significantly across states, with many falling well below the 90% threshold. (14,15).

There still remains a dearth of studies that directly compare the KAP of parents regarding the immunisation of their under-five children within urban and rural demographics in South India.
The objectives of this study were to

1) compare the knowledge, attitude, and practices (KAP) towards routine immunization among parents of under-five children in select urban and rural areas of Bengaluru
2) identify factors associated with their KAP and
3) explore the contextual influences shaping these practices in the study population.

Material & Methods

Study design: A hospital-based mixed-methods study design was employed.
Ethical approval Ethical approval for the study was obtained from the Institutional Ethics Review Board (IERB) of St. John's Medical College, Bengaluru, prior to its commencement. Written informed consent was obtained from all participants prior to data collection. Participants were informed about the purpose of the study, the voluntary nature of participation, and their right to withdraw at any point without any consequences. Confidentiality was maintained by anonymising all personal identifiers and

restricting access to the data to the study investigators only.

Quantitative

Sample size calculation: For the quantitive part of our study, sample size was calculated using the formula

$n = Z\alpha^2 p (1- p) / e^2$

where, n = sample size, Zα =1.96 at 95% confidence interval, *P* = 50%, e = allowable error

If e = 10%, n = 97 ≈ 100

A total sample size of 200 participants was calculated to ensure adequate power for statistical analyses, with 100 participants from an urban setting and 100 from rural settings. Data collection took place from February 2024 to August 2024.

Study Setting: The urban center selected for data collection was St. John's Medical College, Bengaluru, while the rural centers included General Hospital, Anekal; Primary Health Centre, Sarjapur and our rural health centre, the Community Health Training Centre, in Mugalur (in Sarjapur, Bengaluru).

Study Population: Inclusion criteria for participation required parents aged 18 years and above with children aged 5 years or below who visited the Department of Paediatrics at St. John's Medical College Hospital for immunisation, as well as parents within the same age range visiting the Community Health Training Centre in Mugalur, General Hospital, Anekal and Primary Health Centre, Sarjapur for immunisation. Exclusion criteria included parents below 18 years of age with intellectual disabilities or who could not comprehend the interview schedule.

Study tools: A pretested face validated structured interview schedule was administered. Our study tool included the demographic details of the participants, source of information regarding immunisation and Knowledge, Attitude and Practice Questions (details verified from the Thayi card or Institute's Well baby card). There was a total of 23 Knowledge questions with a maximum score of 23. There was a total of 11 Attitude questions with a maximum score of 44. A Likert scale was used with responses such as strongly agree, agree, disagree and strongly disagree with positive scoring weightage assigned to the positive attitude questions. There was a total of 6 Practice questions with a maximum score of 6.

Qualitative

For our qualitative part of our study, in- depth interviews were conducted both in the urban and rural areas until data saturation was achieved. Interviews were conducted either in English or local language and then translated ad verbatim into English. For both the quantitative and qualitative part of our study, convenience sampling was used.

Statistical Analysis: Data were collected using the Epicollect5 software and subsequently entered into Microsoft Excel for analysis with Jamovi 2.4.11 software. Socio-demographic characteristics were summarized using frequencies and proportions, as well as mean, standard deviation, median, and inter-quartile range. A cumulative knowledge, attitude, and practice score was generated along with mean scores, ranges and thresholds for good KAP. Logistic regression analysis was performed with 95% confidence intervals, and a p-value of <0.05 was considered statistically significant for all analyses. A cumulative knowledge, attitude, and practice score was generated, and correlation analysis was conducted to explore correlation patterns. For qualitative analysis, data from the in-depth interviews was manually coded inductively, with emergence of themes and sub-themes**.**

RESULTS

The median age of the children whose parents participated in the study was 3.5 months (IQR: 1.7–11.8). Significant differences were observed between the urban and rural groups with respect to parental education and occupation, with higher levels of education in the urban population and a greater proportion of homemakers in the rural population (Table 1).

Table 1: Sociodemographic Characteristics

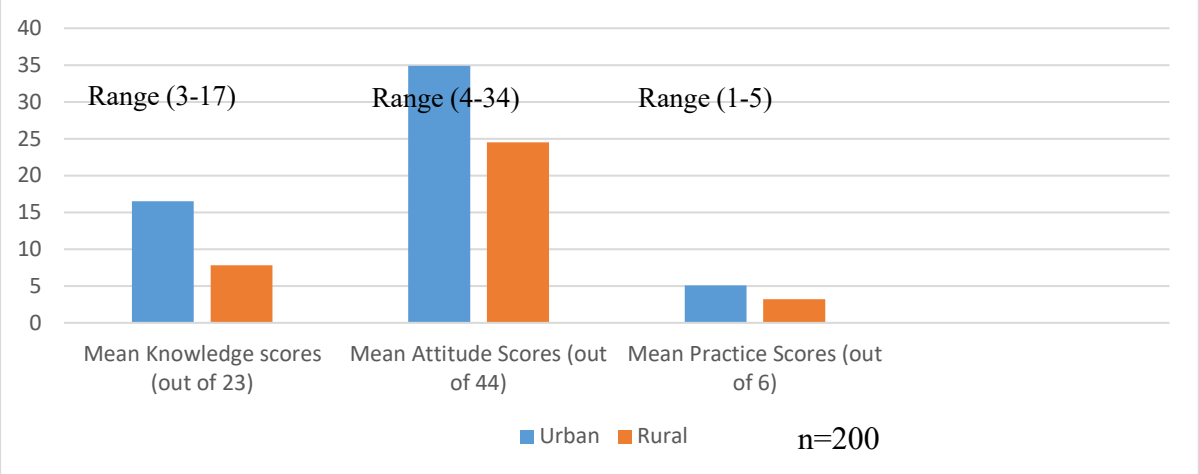
Sociodemographic variable	Urban (n=100)	Rural (n=100)
Age of the child (in months)	9.2 ± 16.5	11.3 ± 13.1
Gender of the child		
Male	48 (48%)	67 (67%)
Female	52 (52%)	33 (33%)
Mean age of parent (in years)	28.4 ± 2.6	26.2 ±3.1
Gender of the parent		
Male	57 (57%)	87 (87%)
Female	43 (43%)	13 (13%)
Type of Family		
Nuclear	72 (72%)	71 (71%)
Joint	25 (25%)	24 (24%)
Extended	3 (3%)	5 (5%)
Occupation of parent		
Homemaker	27 (27%)	85 (85%)
Salaried Employee	46 (46%)	13 (13%)
Government Employee	6 (6%)	-
Business	12 (12%)	2 (2%)
Professional	9 (9%)	-
Education		
Primary school	3 (3%)	14 (14%)
Middle school	6 (6%)	13 (13%)
High school	11 (11%)	20 (20%)
PUC	14 (14%)	33 (33%)
Diploma	13 (13%)	4 (4%)
Graduate	43 (43%)	16 (16%)
Post graduate	8 (8%)	-
Professional	2 (2%)	-
Socioeconomic status (BG Prasad 2024 classification)		
Upper class	97 (97%)	86 (86%)
Middle class	3 (3%)	14 (14%)

Healthcare workers were reported as the primary source of information regarding immunisation by 83% of urban parents and 72% of rural parents. The proportion of children vaccinated appropriate for age was higher among urban parents (91%) compared to rural parents (82%).

Knowledge, Attitude and Practice Findings

A cumulative knowledge, attitude and practice (KAP) score was generated, and mean scores were compared between urban and rural populations (Figure 1). Urban parents demonstrated higher mean scores for knowledge, attitude and practice compared to rural parents. Thresholds for good KAP were defined as scores above 70%, with good knowledge categorised as ≥16, good attitude as ≥31 and good practice as ≥4. The range of scores for knowledge was 6–17 in the urban group and 3–11 in the rural group. For attitude, the range was 10–34 in the urban group and 3–26 in the rural group. Practice scores ranged from 1–5 in the urban group and 1–4 in the rural group.

Figure 1: Mean scores of KAP of parents towards immunisation



Logistic Regression Analysis

Logistic regression analysis showed that parents in urban settings had significantly higher odds of being aware of vaccination schedules (aOR 1.96, 95% CI: 1.8–3.8) and having children vaccinated appropriate for age (aOR 5.19, 95% CI: 1.2–7.6), after adjusting for socioeconomic status and education. In contrast, urban parents had lower odds of participating in community immunisation programmes (aOR 0.26, 95% CI: 0.1–0.9) (Table 2).

Table 2: Logistic regression analysis for Knowledge and Practice factors

Knowledge and Practice questions	*Odds Ratio (OR)	95% (CI)	p-value
Awareness of any vaccination schedule	1.96	[1.8-3.8]	<0.001
Awareness of booster doses for vaccines	2.52	[1.0- 6.3]	<0.004
Child vaccinated appropriate for age	5.19	[1.2-7.6]	<0.001
Child vaccinated in community immunisation programs	0.26	[0.1-0.9]	<0.001

**All odds ratios adjusted for socioeconomic status and occupation, reference category is rural (p is significant at 0.001)*

Correlation Findings: Correlation analysis revealed a moderate positive relationship between knowledge and attitude ($r = 0.417$, $p < 0.001$), attitude and practice ($r = 0.584$, $p < 0.001$) and knowledge and practice ($r = 0.374$, $p < 0.001$), indicating that higher knowledge and positive attitudes were associated with better immunisation practices (Table 3).

Table 3: Correlation analysis of KAP

	Knowledge score	Attitude Score	Practice Score
Knowledge score	1		
Attitude score	0.417 ** (<0.001)	1	
Practice score	0.374 ** (<0.001)	0.584** (<0.001)	1

**correlation is significant at 0.001*

Qualitative Findings

We conducted 20 in-depth interviews, 10 from urban areas and 10 from rural areas. Each interview lasted approximately 20–25 minutes. Thematic analysis identified distinct themes in urban and rural contexts:

Urban Themes

Concerns About Vaccine Safety and Long-Term Effects

Some parents expressed misconceptions about vaccine safety, fearing severe side effects such as autism or poliomyelitis. These fears were often rooted in misinformation from social media, peers, or anecdotal accounts.

"I'm worried the vaccine might cause autism or other issues; I've heard scary stories." *(ID3)*

Challenges with Adherence to Immunization Schedules

Parents reported difficulty maintaining the vaccination schedule due to social events, forgetfulness, or reluctance to visit vaccination centers. These challenges often led to delays in immunization, potentially impacting the child's vaccination status.

"We missed a dose because we had a wedding in the family, and I completely forgot about the date." *(ID6)*

Rural Themes

1. **Barriers to Timely Immunization Access:** Rural participants highlighted logistical challenges, such as long wait times and overcrowding at vaccination centers on immunization days. These barriers often discouraged parents from seeking timely vaccination, even when centers were geographically accessible.
   "Despite living nearby, the long wait times and queues make vaccination very difficult for us." *(ID15)*
2. **Limited Awareness of Vaccine Benefits and Side Effects:** Many rural parents lacked awareness of the importance of vaccines or the potential side effects, further hindering timely immunization. This lack of knowledge was often linked to limited health education, awareness, health literacy or insufficient communication from healthcare providers.
   "I didn't know missing one vaccine could cause a problem later. I do not know how these things work" *(ID18)*

DISCUSSION AND CONCLUSION

In our study, knowledge, attitude, and practices toward immunization were significantly better among urban parents, likely due to greater access to information through digital platforms like social media and the internet. The internet has become an important source of immunisation related knowledge which facilitates better awareness about the importance of immunisation and updates on vaccination schedules. Urban parents demonstrated higher odds of vaccine awareness and adherence to schedules, even after accounting for socioeconomic and educational factors, highlighting the critical role of access to information. This finding highlights that access to information, along with education, plays a crucial role in shaping health behaviours related to immunisation. However, rural parents excelled in community-based immunization program participation, benefiting from the efforts of ASHAs and ANMs who mobilize communities for immunization drives. These campaigns likely foster a sense of community involvement and trust, which could be leveraged to improve immunisation rates. The correlation analysis underscored the link between knowledge and immunization practices, irrespective of location, reinforcing the need for accurate, targeted education to address barriers and misconceptions identified in our qualitative findings, directly influencing parental immunisation practices positively.

Childhood immunisations have a massive impact in the prevention of many serious childhood infections. However, the under-five mortality in India is still high, in spite of having one of the oldest and the largest immunisation program in the world. Vaccine Preventable Deaths (VDPs) continue to be major contributors to this mortality. Knowledge and attitude of parents greatly influence the immunisation status of the child and thereby preventing mortality. (16) (17)

In comparing our findings with those from a similar study conducted in Bangalore (18), notable similarities and differences emerge. Both studies highlighted healthcare providers as the primary source of immunisation information, with 71.7% of parents in the Bangalore study reporting maternity hospitals and healthcare workers as their main resource, which aligns with our finding that 83% of the urban population and 72% of the rural population relied on healthcare workers for information.

The vaccination knowledge among parents of children under five years in both urban and rural areas of Bangalore were similar to an underprivileged area of Bangalore (19), which highlighted that only 53% of children in an urban slum were fully immunized. While they reported a significant drop-out rate in the vaccination schedule, we noted barriers related to socioeconomic status, knowledge

deficits, and attitudes toward vaccination that contributed to lower immunisation rates, especially among vulnerable populations, along with misconceptions and logistical barriers as well.

In contrast to another study done in the same state of Karnataka (only on a rural population) (20), where 99.8% of mothers were aware of the preventive role of vaccination, our study found a lower level of knowledge among mothers, with only 77% demonstrating adequate awareness. Both studies, however, show that the majority of mothers believed in the importance of childhood vaccination, although our study revealed a smaller percentage (60%) of mothers believing in the necessity of multiple vaccine doses compared to 76.8% in the other study. Both studies reported high adherence to maintaining vaccination records and following immunisation schedules. Our study differed in that it also included fathers in the participant group, incorporated both urban and rural populations and had a mixed method type of study design.

Recommendation

The findings highlight the need for context specific communication strategies and strengthened community outreach to address urban misconceptions and rural access barriers, thereby improving equitable immunisation coverage and reducing vaccine preventable morbidity and mortality.

Limitation of the study

The hospital-based convenience sampling limits generalisability to the wider community and the cross sectional design precludes causal inference regarding determinants of parental KAP.

Relevance of the study

This study adds comparative mixed methods evidence on urban–rural differences in parental immunisation KAP in Bengaluru, informing context tailored interventions for improving routine vaccination uptake.

Authors Contribution

KD: Conceptualisation of the study, protocol development, data collection, data analysis and manuscript writing. NR: Conceptualisation of the study, protocol development, data collection and manuscript writing. NR: Conceptualisation of the study, protocol development and critical review of the manuscript.

Financial Support and Sponsorship

Nil

Conflict of Interest

There are no conflicts of interest.

Acknowledgement

We acknowledge the Department of Paediatrics at St John's Medical College and the administrative heads of General Hospital Anekal and Primary Health Centre Sarjapur for permitting and facilitating data collection at their institutions.

Declaration Of Generative Ai And Ai Assisted Technologies In The Writing Process

During the preparation of this work, the authors used a generative artificial intelligence tool developed by OpenAI to refine language and improve clarity. The authors reviewed and edited the content as needed and take full responsibility for the final manuscript.

References

1. Kim TR, Ross JA, Smith DP. Trends in Four National KAP Surveys, 1964-67. Studies in Family Planning. 1969;1(43):6–11.
2. Lindgren, D, & Kelley S. A new way of measuring behavioural compliance for prevention programme interventions using KAP Score. Development in Practice. 2019; 29(4): 489–500.
3. Md. S, A. A, Athira A, Thotamsetty L, Ravilla S, Doddayya NN. Assessment of knowledge, attitude and perception among mothers towards immunisation in a tertiary care teaching hospital. Int J Community Med Public Health. 2017 Aug 23;4(9):3429.
4. Alghamdi AA, Alghamdi HA. Knowledge, Attitude, and Practice of Vaccination Among Parents in Jeddah City, Saudi Arabia. Cureus. 2023 Jul 11;15(7): e41721
5. Montero DA, Vidal RM, Velasco J, Carreño LJ, Torres JP, Benachi O, et al. Two centuries of vaccination: historical and conceptual approach and future perspectives. Front Public Health. 2024 Jan 9; 11:1326154.

6. Bentley DW. Vaccinations. Clinics in geriatric medicine. 1992 Nov 1;8(4):745-60.
7. Plotkin SA. Vaccines, vaccination, and vaccinology. The Journal of infectious diseases. 2003 May 1;187(9):1349-59.
8. World Health Organization. Vaccines and immunization [Internet]. www.who.int. 2022. Available from: https://www.who.int/health-topics/vaccines-and-immunization
9. Lee J. Child survival: a global health challenge. The Lancet. 2003 Jul;362(9380):262.
10. Intensified Mission Indradhanush [Internet]. pib.gov.in; [cited 2024 Dec 8]. Available from: https://pib.gov.in/PressReleasePage.aspx?PRID=1966931.
11. Lamiya KK, Mundodan JM, Haveri SP. Knowledge, attitude and practice among mothers of under five children on immunization. International Journal of Community Medicine Public Health. 2019;6(3):1252–7.
12. Ministry of Health and Family Welfare (MoHFW), Government of India. Roadmap for achieving 90 % full immunization coverage in India. New Delhi: National Health Mission; 2018. Available from: https://nhm.gov.in/New_Updates_2018/NHM_Components/Immunization/Guildelines_for_immunization/Roadmap_document_for_90%25_FIC.pdf
13. Singh S, Sahu D, Agrawal A, Vashi MD. Barriers and opportunities for improving childhood immunization coverage in slums: A qualitative study. Preventive medicine reports. 2019 Jun 1; 14:100858.
14. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019-21. Mumbai: IIPS and ICF; 2021.
15. Update of immunisation of children [Internet]. pib.gov.in; [cited 2024 Dec 8]. Available from: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2042058.
16. Almutairi WM, Alsharif F, Khamis F, Sallam LA, Sharif L, Alsufyani A, et al. Assessment of Mothers' Knowledge, Attitudes, and Practices Regarding Childhood Vaccination during the First Five Years of Life in Saudi Arabia. Nursing Reports. 2021 Jul 5;11(3):506-516
17. Trushitkumar BP, Pathak R, Singh R, Alves V, Mahesh NM, Chaluvaraj TS. Assessment of parents' knowledge, attitude and practice about child vaccination in rural areas. Journal of Pharmaceutical Research. 2017; 16:229–36.
18. Joseph J, Devarashetty V, Reddy SN, Sushma M. Parents' knowledge, attitude, and practice on childhood immunisation. International Journal of Basic Clinical Pharmacology. 2015; 4:1201–7
19. Mathew G, Johnson AR, Johnson, AR., Thimmaiah, S, Kumari, R, & Varghese, A. Barriers to childhood immunisation among women in an urban underprivileged area of Bangalore city, Karnataka, India: a qualitative study. International Journal Community Medicine & Public Health. 2016 Jun;3(6):1525-30.
20. Sowmya SG, Adavalath S, Avabratha KS. Immunization of children under 5 years: Mother's knowledge, attitude, and practice in a rural community. Muller Journal of Medical Sciences & Research. 2023 Jun;14(1):6.