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A COMPARATIVE STUDY OF IMMUNIZATION STATUS AMONG CHILDREN AGED 12–23 MONTHS IN RURAL AND URBAN FIELD PRACTICE AREAS OF A MEDICAL COLLEGE IN WESTERN MAHARASHTRA

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ABSTRACT

Background: Immunization is a cornerstone of child survival strategies, yet disparities in coverage persist across sociodemographic groups in India. Maharashtra presents an atypical pattern where rural coverage slightly exceeds urban, warranting localized analysis. **Objective:** To compare immunization status among children aged 12–23 months in rural and urban field practice areas of a medical college in Western Maharashtra and to identify associated sociodemographic determinants.

Materials and Methods: A community-based cross-sectional study was conducted between February 2017 and February 2019 in an urban slum (Wanowari Bazar) and a rural village (Kasurdi) of Pune district. A total of 192 children (96 rural, 96 urban) aged 12–23 months were enrolled. Data were collected through a pretested questionnaire and verified with immunization cards and anganwadi registers. Associations between immunization status and selected determinants were analyzed using chi-square tests.

Results: Complete immunization coverage was 68.4% in the urban area and 70.8% in the rural area, with no significant urban–rural difference ($p=0.717$). Gender was not significantly associated with immunization status in either setting. However, higher maternal education (>10th class) was significantly linked to better immunization (urban: 77.3% vs. 57.7%, $p<0.05$; rural: 79.2% vs. 60.5%, $p<0.05$). Similarly, socioeconomic status showed a strong gradient, with complete immunization increasing from lower-middle to upper-middle families in both areas ($p<0.05$). Religion was significantly associated with immunization status in rural but not in urban areas.

Conclusion: Immunization coverage was comparable between rural and urban settings, but maternal education and socioeconomic status emerged as consistent determinants. Strengthening maternal literacy and addressing inequities in disadvantaged groups are critical for achieving universal immunization coverage.

Keywords: Childhood immunization; maternal education; socioeconomic status; Rural–urban comparison; Maharashtra.

INTRODUCTION

Childhood immunisation is among the most cost-effective public-health interventions, averting morbidity and mortality from multiple vaccine-preventable diseases. India's Universal Immunisation Programme (UIP)—recast from the Expanded Programme on Immunization in 1985—now provides, free of cost, vaccines against tuberculosis (BCG), diphtheria, pertussis, tetanus, poliomyelitis, measles–rubella, hepatitis B and Haemophilus influenzae type b nationally, with rotavirus, pneumococcal conjugate vaccine and Japanese encephalitis delivered sub-nationally and

expanding in coverage.[1] Mission Indradhanush (2014) and its intensified phases targeted underserved populations and hard-to-reach areas to accelerate coverage gains.[1] Nationally, full immunisation among children aged 12–23 months increased from 62% (2015–16) to 76.4% (2019–21).[2] Despite progress, substantial inequities persist by socioeconomic position, maternal education, place of delivery, religion/caste, possession of health documentation, and place of residence. Multilevel analyses using NFHS data show strong pro-wealth and pro-education gradients, with institutional delivery and documentation (e.g., immunisation/birth cards) consistently associated with better completion of vaccine schedules.[3,5,8] Evidence from urban poor settlements in Delhi found complete immunisation at only 46.7%, with lower odds among girls and Muslim households, and higher odds with maternal literacy, facility birth, higher wealth, and possession of a birth certificate.[6] Classic urban-slum studies (e.g., Lucknow) similarly reported maternal illiteracy, low socioeconomic status, higher birth order, and home delivery as predictors of partial or non-immunisation.[7] In rural Bihar (Bhojpur), full immunisation was linked with maternal education (AOR≈2.3), facility delivery (AOR≈29), and the availability of an immunisation card (AOR≈120), underscoring the salience of health-system contact and record-keeping.[8] Maharashtra context and rationale: According to NFHS-5 state indicators, Maharashtra's full immunisation coverage among 12–23-month-olds is ~73.5%, with a slightly higher rate in rural (74.7%) than urban (71.7%) areas—an atypical pattern given national urban advantages and a signal that local determinants may operate differently across settings.[9] Against this backdrop, there is limited comparative, granular evidence from Western Maharashtra that dissects how sociodemographic factors—particularly maternal education, socioeconomic status, place of delivery, religion/caste, and documentation—shape immunisation completion in paired rural and urban field practice areas attached to a medical college.

Aim: To compare the immunization status of children of 12-23 months of age in a rural and an urban field practice area of a Medical College of Western Maharashtra.

Objectives:

(a) To assess and compare the immunization status of children up to 12-23 months of age in a rural and in an urban field practice area of a Medical College of Western Maharashtra.

(b) To determine the selected socio-demographic factors associated with the Immunization status of both the rural and urban areas.

(c) To compare the availability of immunization facilities in the study areas.

MATERIALS AND METHODS

This study is a cross sectional comparative study conducted at urban slum of Wanowari bazar and rural area Kasurdi village in Pune. Wanowari bazar is an urban slum with population belonging to lower to upper lower socioeconomic strata and is under the administrative control Pune Cantonment Board. The number of household residing in this slum are 283 with an average population of 2305 and with an average family size of 4-5. The village has one Rural Health Training Centre which is regularly visited by residents of the medical college to provide basic specialists care and to do their research related to their studies.

Study population: All children of 12-23 months of age of both the areas were included in the study. Initially a spot was chosen randomly and houses were visited from one direction in each of the lanes/bastis. The mother or father were interviewed with the help of a pretested questionnaire.

Inclusion Criteria: All children born in the Wanwadi bazar and Kasurdi village between the periods of Feb 2017 – Feb 2019 were included in the study. Their dates of birth were confirmed from their immunization cards and or anganwadi registers.

Exclusion Criteria: All children of visitors and migrant population of less then 6 months of duration were excluded from the study.

RESULTS

Table 1: Association between Gender and Immunization Status among Children Aged 12–23 Months in Rural and Urban Areas.

	Urban		Total	Rural		Total
	Male	Female		Male	Female	
Partially immunized (%)	16 (31.4)	16 (35.6)	32 (33.3)	14 (29.2)	14 (29.2)	28 (29.2)
Completely immunized (%)	35 (68.6)	29 (64.4)	64 (66.7)	34 (70.8)	34 (70.8)	68 (70.8)
Total (%)	51 100	45 100	96 100	48 100	48 100	96 100

Chi square value: .188, df: 1, p value: .664 (urban area).
Chi square value: 00, df-1, p value: 1 (rural area).

In the urban area 68.4% boys were completely immunized and 64.4% girls were completely immunized whereas the same in the rural area was 70.8% for both boys and girls.

Table 2: Association between Socio Economic Status (SES) and Immunization Status among Children Aged 12–23 Months in Urban Areas.

	SES Lower middle	SES Middle	SES Upper middle	Total
Partially immunized (%)	12 (60)	18 (32.1)	2 (10)	32 (33.3)
Completely immunized (%)	8 (40)	38 (67.9)	18 (90)	64 (66.7)
Total (%)	20 (100)	56 (100)	20 (100)	96 (100)

Chi square value: 11.336, df: 2, p value < .003.

Table 3: Association between Socio Economic Status (SES) and Immunization Status among Children Aged 12–23 Months in Rural Area.

	SES Lower middle	SES Middle	SES Upper middle	Total
Partially immunized (%)	11 (42.3)	16 (29.1)	1 (6.7)	28 (29.2)
Completely immunized (%)	15 (57.7)	39 (70.9)	14 (93.3)	68 (70.8)
Total (%)	26 100	55 100	15 100	96 100

Chi square value: 5.849. df: 2, p value < .05.

In urban area 90% of upper middle SES, 67.9% middle SES and 40% of lower middle SES families children were completely immunized and the same in rural area were 93.3%, 70.9% and 57.7% respectively. In both the rural and urban areas the immunization status of children increases as per the SES and it is found to be statistically significant in both the areas.

Table 4: Association between Religion and Immunization Status among Children Aged 12–23 Months in Urban Area.

	Hindu	Muslim	Buddhist	Christian	Total
Partially immunized (%)	8 (26.7)	19 (36.5)	5 (41.7)	00 (00)	32 (33.3)
Completely immunized (%)	22 (73.3)	33 (63.5)	7 (58.3)	2 (100)	64 (66.7)
Total (%)	30 100	52 100	12 100	2 100	96 100

Chi square value: 2.215, df: 3, p value < .529.

Table 5: Association between Religion and Immunization Status among Children Aged 12–23 Months in Rural Area.

	Hindu	Muslim	Buddhist	Christian	Total
Partially immunized (%)	24 (30.8)	03 (75)	01 (7.1)	00 (00)	28 (29.2)
Completely immunized (%)	54 (69.2)	01 (25)	13 (92.9)	00 (00)	68 (70.8)
Total (%)	78 (100)	04 (100)	14 (100)	00 (100)	96 (100)

Chi square value: 7.451, df: 3, p value < .05.

In urban area 73.3% Hindu, 63.5% Muslim, 58.3% Buddhist, 100% Christian children were completely immunized and the same in rural area were 69.2%, 25%, 92.9% respectively and no Christian children were found to be residing in the rural area. This finding in urban area is not statistically significant where as in rural area it is statistically significant.

DISCUSSION

The immunization status of children of 12-23 months of age in urban community showed that 68.4% children are fully immunised whereas same at rural community it was 70.8%. The children who were partially immunised were 31.6% & 29.2% in urban & rural community. There no association between immunisation status & domicile and which was statistically not significant. The immunization status of others vaccines are as follows. BCG vaccination status is 90.8% & 92.5%, OPV-0 is 93.5% and 95.6%, Hep -B is 56.7% and 58.3% in urban and rural areas respectively. OPV-1 status was 90.3% & 81.6%, Pentavac-1 status was 93.4% & 76.6% OPV-2 status was 82.8% & 80.5%, Pentavac-2 status was 81.4% & 71.3%, OPV -3 status was 64.2% & 62.4%, Pentavac-3 status was 65.3% & 62.5% community was 72.5% & 64.4% respectively wherein DPT-4 status was 60.1% & 54%.

The national immunization status of children fully immunised in urban & rural Indian are 63.9% & 61.3% respectively. In Maharashtra the immunisation status are 55.8.% & 56.6% respectively. Regional variation has been observed in immunization status in various studies, the children fully immunised ranges from as low as 35% to 80%

in few states. The overall national coverage for various vaccines at urban & rural India are, BCG 92.3% & 76.2%, three doses of Polio vaccine is 82.3% & 77.8%, three doses of DPT vaccine 66.2% & 57.4% and measles vaccine 72.8% & 65.6%.[10] The immunization status at Maharashtra as per NFHS-4 are BCG 97.5.0% & 94.7%, 3 doses of polio vaccine 84.6% & 64.3%, three doses of DPT vaccine 83.5% & 79.6%, measles vaccine 89.6% & 83.7% respectively in urban & rural areas.[10] The NFHS-4 survey reported that 63.9% of urban infants were fully vaccinated compared to 61.3% in rural areas. The percentage of infants who were not vaccinated was 4.2% in rural areas compared to 3.3% in urban areas. The urban-rural gap existed for all individual vaccines, although the gap was lowest with the 3 doses of OPV.[11] The UNICEF 2009 coverage evaluation survey reported complete vaccination in 64.5% rural infants compared to 63.4% urban infants; the respective unvaccinated infants were 7.5% and 4.6%.[12] In a study conducted in Chandigarh it was reported that the vaccination status of 12-23 month old infants from 30 clusters (18 urban, 9 slum, and 3 rural) and taking 40 households from each. The population distribution was 78% in urban areas, 12% in slums and 10% in rural areas. The proportion of fully vaccinated infants was 30% in slums, 74% in rural areas and 62.5% in urban areas.[13] In study conducted in Kerala vaccination rates in three areas; urban, semi-urban and rural was compared. Standard 30-cluster sampling of infants 12-23 months old was done. The complete vaccination rates in the urban, semi-urban and rural area were 77.5%, 76.7% and 77.3% respectively. The percentage of fully immunised children was similar in all the three areas.[14]

In this study the gender differential was not significant in rural community. In rural community male children complete immunization status is 70.8% and females children complete immunization status is also same 70.8%. In the urban community also no such significant finding was observed, male children complete immunization status is 62% where as female children complete immunization status is 63% which is statistically not significant. As per NFHS-4 the complete vaccination rate was 59.7% for boys and 54.5% for girls. There were 4.4% boys compared to 5.30% girls who had not received any vaccination. The gap between the genders was about 5% for most of the individual vaccines including BCG, DPT (all three doses) and measles.[11] As per 2009 UNICEF coverage evaluation survey complete immunization status in boys is 61.9% and 59.9% in girls, the unimmunization status of infants were 7.9% and 7.2% in boys and girls respectively.[12] Studies in Rajasthan show that, in addition to being less likely to get fully immunised, girls drop out at a faster rate than boys for the three-dose vaccinations of DPT and oral polio and are immunised at a later age (6.1 months) than are boys (3.4 months).[15] In a study conducted in Goa which included 362 infants the proportions of boys who were fully vaccinated, partially vaccinated and unvaccinated were 84.6%, 13.8% and 1.6% respectively and it was 86.2%, 9.8% and 4.0% for girls.[16]

In this study we found that the immunization status increases as per the SES of the family in both rural and urban areas and it is statistically significant which is similar with other studies. A study of the NFHS-4 data reported that 38% children among the urban poor were fully vaccinated; which is lower than the 56% fully vaccinated non-poor children.[11] In a study conducted in Bhojpur district of Bihar it is found that children of higher SES has more complete immunization status then the children of lower SES but however its not statistically significant.[21] In another study conducted in Tamilnadu it is observed that those families belonging to higher SES have more number of fully vaccinated children in comparison to lower SES families.[22] In a study of assessment of vaccination coverage and associated factors conducted in Kochi, Kerala it found that as the SES of the families increases the immunization status of the children also increases.[14]

In this study we found that there is an increase in immunization status of children from Hindu to other religions in both urban and rural areas, however its statistically not significant. In a study done in urban area Kerala it is analysed that there is gradually increase in immunization status from Muslim to Christian to Hindu community however its statistically not significant.[14] In a similar study conducted in rural, urban and urban slum areas of Tamilnadu, it's found that complete immunization status is more in Hindu community with respect to other communities and its statistically significant.[22]

In this study we found that in both the communities the main source of information on immunization was the doctor and paramedical staff followed by family members. In the rural community Anganwadi worker (AWW) played a significant role in providing information about the immunization. In a study conducted at Alwar revealed that the ANM/ Health staff (56.4%) and family members (27.0%) were main source of information for mother for the need of mother and child immunization.[23] In a study of knowledge, attitude and practices on immunization of children in urban slums of Bijapur city of Karnataka it is observed that family members are the main source of information 42.58% followed by health workers 34.19%.[24]

Recommendations: Knowledge of the immunization schedule and policies were found deficient at both rural and urban slums. The basic infrastructure for immunization to reach every child is in place. The need of the hour is an equitable, participatory and intersectoral approach to health and health care.

Following are the recommendations to bridge the gap between the community and the health care delivery system and improve the immunization outcome:

1. Continuous health education activities should be carried out about the immunization programme,

vaccines given and the benefits of vaccination at appropriate age through mass media campaign.
2. All measures should be taken to improve the literacy rate especially the female literacy rate because that is the vital for the improvement of immunization programme.
3. Counselling and social mobilization are integral to the success of routine immunization. Strategies need to be locally appropriate and community driven, based on a community analysis.
4. Continuous quality training and supervision of the grassroot workers should be carried out as they are the vitals of any immunization programme.
5. Local leaders, community and religious leaders should be taken into confidence to gain the belief against rumours and misconceptions.
6. Regular media briefing should be done about the immunization programme and against the rumours.
7. At service delivery level priority attention should be given to the use of registers and counterfoils to prevent left outs and dropouts; accuracy in reporting, and better tools to define the catchment target population.
8. Immunization Task Force (ITF) should be set up at district and state levels to guide the programme, improve coordination with other sectors and monitor the programme.
9. Funds and resources and vaccines should be released in advance.
10. Improved vaccine stock management for an uninterrupted supply of vaccines and minimize wastage.
11. Health Information Bureau to be established at every level, linked with all partners involved in immunization.
12. A simplified standard immunization schedule based on the appropriate local situation, culture and tradition.
13. Expand the basket of services: For better outcome along with immunization, other services like family planning counselling, iron & folic acid tab supply, nutrition counselling should be given to attract parents' attention.

CONCLUSION

This study found that immunization coverage among children aged 12–23 months was broadly comparable between rural and urban field practice areas of Western Maharashtra. However, maternal education and socioeconomic status consistently influenced immunization outcomes, with higher education levels and better economic standing strongly associated with complete immunization. Gender differences were not statistically significant, suggesting progress toward equity, though rural religious differentials require further exploration.

These findings highlight the need for context-specific strategies that go beyond service availability, focusing instead on maternal literacy, socioeconomic empowerment, and community-level engagement to address persistent inequities. Strengthening health education, mobilizing frontline workers, and reducing barriers for socioeconomically disadvantaged families remain critical to achieving India's universal immunization goals.

REFERENCES

1. National Health Mission, Ministry of Health & Family Welfare (MoHFW). Immunization (Background note on Immunization/UIP). Updated 2025 Aug 26. Available from: nhm.gov.in/index1.php?lang=1&level=2&lid=220&sublinkid=824. National Museum of Natural History
2. Press Information Bureau, Government of India. Update on NFHS-5 & Rural Health Statistics. 22 Jul 2022. (NFHS-5: 76.4% children 12–23 months fully immunised vs 62% in NFHS-4). Available from: pib.gov.in/PressReleasePage.aspx?PRID=1843842. Press Information Bureau
3. Hossain I, Pal R, Dey S, Pal S, Saha R. Socioeconomic inequality and determinants of immunization coverage in India: Evidence from NFHS-5. Health Economics Review. 2024;14(1):12. doi:10.1186/s13561-024-00566-8. PubMed
4. Srivastava S, Fledderjohann J, Upadhyay AK. Explaining socioeconomic inequality in immunization coverage in India: decomposition analysis. BMC Pediatrics. 2020;20:295. doi:10.1186/s12887-020-02196-5. PubMed
5. Jain N, Bhatnagar N, Pathak R, Gupta VK. Inequity and determinants of full immunization coverage among children aged 12–59 months in India (NFHS-4). J Trop Pediatr. 2022;68(2):fmac004. doi:10.1093/tropej/fmac004. ResearchGate
6. Shrivastava SR, Shrivastava PS, Ramasamy J. Determinants of childhood immunisation coverage in urban poor settlements of Delhi: cross-sectional study. BMJ Open. 2016;6:e013015. PMC
7. Nath B, Singh JV, Awasthi S, Bhushan V, Kumar V, Singh SK. Determinants of immunization coverage among 12–23-month-old children in urban slums of Lucknow district, India. Indian J Med Sci. 2007;61:598–606. doi:10.4103/0019-5359.37046.
8. Pandey S, Dhungana GP, Khatiwada N, Singh PK. Factors associated with full immunization coverage among 12–23-month-old children in Bhojpur, Bihar. Int J Dent Med Res. 2018;4(3):1–7. (Open-access PDF). Semantic Scholar
9. Ministry of Health & Family Welfare (MoHFW). NFHS-5 Fact Sheet Compendium: Phase-I States/UTs (includes Maharashtra). 2019–20. (Children 12–23 months fully vaccinated: Urban 71.7%, Rural 74.7%, Total 73.5). Ministry of Health and Family Welfare
10. 45. National Family Health Survey (NFHS-4). International Institute of Population sciences, Deonar Mumbai, 2019. Available at: http://rchiips.org/nfhs/factsheet_nfhs-4.shtml, accessed on 21 Feb 2019
11. UNICEF. Coverage evaluation survey 2009. New Delhi: United Nations Children Fund. 2010. Available at: http://www.indiaenvironmentportal.org.in/files /National_Factsheet_30_August_no_logo.pdf, Accessed on 25Feb 2019.
12. Karthik C, Shobha TS, Sushmitha P. Assessment of immunization coverage in an urban slum of bangalore city.
13. Joy TM, George S, Paul N, Renjini BA, Rakesh PS, Sreedevi A. Assessment of vaccine coverage and associated factors among children in urban agglomerations of Kochi, Kerala, India. Journal of family medicine and primary care. 2019 Jan;8(1):91.
14. Vinod Mishra, T.K. Roy and Robert D. Retherford. Sex differentials in childhood feeding, health care, and nutritional status in India Population And Development Review 30(2): 2004: 269-295.

15. Dalal A, Silveira MP. Imunization status of children in Goa. Indian Pediatr. 2005;42:401-2
16. Karthik C, Shobha TS, Sushmitha P. Assessment of immunization coverage in an urban slum of bangalore city.
17. Ahmad J, Khan ME, Hazra A. Increasing complete immunization in rural Uttar Pradesh. J Fam Welf. 2010;56:65-72.
18. Barman D, Dutta A. Access and barriers to immunization in West Bengal, India: quality matters. Journal of health, population, and nutrition. 2013 Dec;31(4):510.
19. Pandey S, Ranjan A, Singh CM, Kumar P, Ahmad S, Agrawal N. Socio-demographic determinants of childhood immunization coverage in rural population of Bhojpur district of Bihar, India. Journal of family medicine and primary care. 2019 Jul;8(7):2484.
20. Pandey S, Ranjan A, Singh CM, Kumar P, Ahmad S, Agrawal N. Socio-demographic determinants of childhood immunization coverage in rural population of Bhojpur district of Bihar, India. Journal of family medicine and primary care. 2019 Jul;8(7):2484.
21. Murhekar MV, Kamaraj P, Kanagasabai K, Elavarasu G, Rajasekar TD, Boopathi K, Mehendale S. Coverage of childhood vaccination among children aged 12-23 months, Tamil Nadu, 2015, India. The Indian journal of medical research. 2017 Mar;145(3):377
22. R S Gupta, A Gupta, H O Gupta, S Venkatesh, Shiv Lal J Common Dis Mar 2006 (Vol. 38, Issue 1 Pages 79-87) Mother and child service coverage: reproductive and child health programme in Alwar district. Rajasthan state.
23. Angadi MM, Jose AP, Udgiri R, Masali KA, Sorganvi V. A study of knowledge, attitude and practices on immunization of children in urban slums of Bijapur city, Karnataka, India. Journal of clinical and diagnostic research: JCDR. 2013 Dec;7(12):2803.