ORIGINAL ARTICLE

Immunization coverage and its socio-demographic determinants among 12-23 months children in rural areas of district Saharanpur

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ABSTRACT

Introduction: Immunization during the initial 1000 days of life is an important stage of development in children which prevents from vaccine preventable diseases (VPDs). Three million children, many of whom reside in impoverished nations, pass away from VPDs each year. **Aims and objectives:** To evaluate the immunization status and its social and demographic determinants among children age group 12 to 23 months. **Material and methods:** A cross-sectional study was undertaken in the rural areas of block Sarsawa of district Saharanpur among 510 children between the age group 12 to 23 months. Data was obtained using a semi structured questionnaire regarding the status of immunization and social and demographic factors in children. SPSS 25.0 was used for analysis. **Results:** Among study participants, fully immunized children were 90.4%, partially immunized were 9.4% and unimmunized children were 0.2%. About 56.3% were males and 43.7% were females. Children who belonged to general category and OBC had 99% and 91.8% fully immunized compared to SC and ST category (86.7% and 50%). Among children who belonged to upper and upper middle class had 100% full immunization. **Conclusion:** The findings emphasize the necessity to increase awareness and focused measures to enhance immunization coverage.

KEYWORDS

Fully Immunized; partially unimmunized; Socio-demographic; Rural; Children

INTRODUCTION

Routine immunization is a country's vital investment in its future.(1) Developing effective monitoring and surveillance mechanism as well as participation from the community are necessary for an immunization to be successful. India have the world's largest immunization programme known as Universal Immunization Programme.(2) Through this programme, it covers three crore pregnant women and 2.6 crore children annually.(3)

VPDs are key health concerns in the community due to deficient full vaccination coverage.(4) Children are considered fully immunized if they have received BCG, at least three doses of OPV, three doses of Pentavalent, and the measles vaccine by 1 year.(5) Approximately 3 million children worldwide die from VPDs(6) each year, accounting for 20% of all deaths under five.(7) According to National family health survey (NFHS-5) 76.4% children aged 12 to 23 months in India were fully vaccinated, increase from 62% in NFHS-4.(8) Achieving universal vaccination coverage remains difficult despite efforts, especially in rural areas. Various research carried out in India found that the primary causes of children's poor vaccination coverage were socioeconomic, demographic and cultural factors.(9,10,11) According to other studies, reasons for lower coverage of children's full

immunization were caste, gender, and income disparities, as well as parents' lower educational attainment.(12,13)

Aim & objective

1. To determine the proportion of full immunization among children between 12 to 23 months.
2. To find out the social and demographic variables associated with the full immunization coverage.

Material & Methods

Study type and design: Cross-sectional study conducted in the community

Study setting: Study was carried out in rural region of block Sarsawa, District Saharanpur.

Study population: Mothers and children between the age of 12 to 23 months.

Study duration: The duration of the study was one year.

Sample size (selection of study participants): According to NHFS - 5, the proportion of full immunization among children of 12 to 23 months in Uttar Pradesh is 69.6% and 5% of absolute precision with a confidence interval of 95%, the size of sample calculated was 487.(14)

Inclusion criteria: A mother with a child aged 12-23 months has been dwelling in the study area for the last six months.

Mothers who agreed to give consent to participate in the research.

Exclusion criteria: Mothers those who did not give consent or was not willing to participate in the study.

Children whose age was less than 12 or more than 23 months at the time of study.

Mothers who were not available at the time of study.

Strategy for data collection: Firstly, among eleven blocks in Saharanpur district, Sarsawa block was randomly chosen. Then the list of villages (143) of this block was obtained from block administrative office. Out of these 143 villages, 30 villages (clusters) were selected using 30 cluster sampling technique. From each selected village (cluster) 17 subjects were taken via house-to-house survey. First house from a village was selected using pencil/pen tip method. After that subsequent households were surveyed till desired sample from that village is completed. If there were more eligible children in the house then by lottery system method only one child from one household was selected. A semi structured questionnaire was used to interview the mothers of selected children.

Study tool: The questionnaire consisted of social and demographic profile of child and parents such as age of child (months), gender, religion, caste, type of family, marital status of parents, education of mother and father, occupation of mother and father, type of house, Socioeconomic class, BPL status. It also included details of the child immunization status such as fully immunized/ partially immunized/ unimmunized.

Ethical issues : The institution's ethical committee approved the study protocol.

Data analysis: MS Excel was used for data compilation and tabulation. SPSS 25.0 was used for analysis. Qualitative data were expressed as proportions in percentages. The "Chi square test and Fisher exact test" were used to determine the p-value, and a p-value of less than 0.05 was regarded as statistically significant.

Results

Out of 510 children (12-23 months) surveyed majority of children were males (56.3%) and most of them belonged to age group 12-14 months (37.6%). Also, majority of them were Hindus (58.6%), of SC caste (36.9%), resided in joint family (65.5%), belonged to lower middle (48.6%) socio-economic class. Majority of them had pucca house (83.9%) and only 22.4% were below poverty line. Also, majority of parents of study participants were married (97.8%). The highest proportion of mothers were educated up to the intermediate level (30.6%), with high-school education being the next most common (28%). Similarly, fathers were educated up to intermediate and high school (21.2% and 21.6% respectively). Mainly mothers were housewives (87.1%) and fathers were unskilled workers (36.1%).

Table 1 depicts 90.4% of children were fully immunized and only 0.2% were not immunized at all. Immunization card was available with 95.3% respondents.

As shown in table 2 sociodemographic variables such as caste, socioeconomic status, type of house and BPL status was significantly associated with immunization status of children. 99% and 100% of children belonging to general category and upper/upper middle class socioeconomic status respectively were fully immunized. Also, 98.4% of children belonging to pucca house and 93.2% children not below poverty line were fully immunized. Whereas age, gender, religion, type of family did not show significant association.

Table 3 depicts that children whose parents were married, 91.2% of them were fully immunized. Also, parents who were educated up to high school or higher had shown significantly higher percentages of full immunization among children. 100% children were fully immunized among mothers who were skilled workers and semi-professionals. Similarly, fathers who worked as professionals had 100% of

their children fully immunized and their association was found to be significant statistically.

On assessing vaccine coverage in table 4 it was observed that vaccine coverage of children between 12 to 23 months were more than 90% for majority of vaccines scheduled under National immunization schedule except that of zero dose OPV and birth dose HBV where coverage was 69.8% and 52% respectively.

Table 5 summarizes the findings of univariate binary logistic regression assessing factors associated with immunization. All variables that showed statistical significance ($p < 0.05$) in the chi-square test were subsequently analysed using logistic regression. According to univariate analysis among all factors analysed education of mother (OR 21.57), occupation of mother (OR 0.0629) and type of house (OR 22.6) showed a significant association with status of immunization.

Table 1: Distribution of children (12-23 months) according to their Immunization status (N=510)

Immunization status	Frequency (N)	Percentage (%)
Fully immunized	461	90.4
Partial immunized	48	9.4
Unimmunized	1	0.2
Total	510	100.0

Table 2: Association between socio-demographic factors and immunization status of children (12-23 months) (N=510)

Variables	Fully immunized (n=461) No. (%)	Partially immunized (n=48) No. (%)	Unimmunized (n=1) No. (%)	Total (n=510) No. (%)	Fisher exact Df P value
Age (in months)					
12 - 14	173 (90.1)	19 (9.9)	0 (0.0)	192 (37.6)	7.835
15 - 17	99 (92.5)	8 (7.5)	0 (0.0)	107 (21.0)	df = 6
18 - 20	107 (93.0)	7 (6.1)	1 (0.9)	115 (22.6)	0.177
21 - 23	82 (85.4)	14 (14.6)	0 (0.0)	96 (18.8)	
Gender					
Male	265 (92.3)	21 (7.4)	1 (0.3)	287 (56.3)	4.021
Female	196 (87.9)	27 (12.1)	0 (0.0)	223 (43.7)	df =2
					0.092
Religion					
Hindu	273 (91.3)	26 (8.7)	0 (0.0)	299	7.924
				(58.6))	df =6
Muslim	177 (88.5)	22 (11.0)	1 (0.5)	200(39.2)	0.634
Sikh	7 (100.0)	0 (0.0)	0 (0.0)	7 (1.4)	
Christian	4 (100.0)	0 (0.0)	0 (0.0)	4 (0.8)	
Caste					
General	102 (99.0)	1 (1.0)	0 (0.0)	103 (20.2)	35.082
OBC	190 (91.8)	17 (8.2)	0 (0.0)	207 (40.6)	df =6
SC	163 (86.7)	25 (13.3)	0 (0.0)	188 (36.8)	< 0.05
ST	6 (50.0)	5 (41.7)	1 (8.3)	12 (2.4)	
Type of family					
Nuclear	305 (91.3)	28 (8.4)	1 (0.3)	334 (65.5)	1.720
Joint	156 (88.6)	20 (11.4)	0 (0.0)	176 (34.5)	df =2
					0.567
Type of house					
Pucca	420 (98.4)	7 (1.6)	0 (0.0)	427 (83.7)	151.135
Semi-pucca	40 (57.1)	29 (41.4)	1 (1.4)	70 (13.8)	df =4
Kutcha	1 (7.7)	12 (92.3)	0 (0.0)	13 (2.5)	< 0.05
Socio-economic status					
Class I (Upper)	12 (100.0)	0 (0.0)	0 (0.0)	12 (2.4)	33.412
Class II (Upper middle)	46 (100.0)	0 (0.0)	0 (0.0)	46 (9.0)	df =8
					< 0.05
Class III (Middle)	149 (96.8)	5 (3.2)	0 (0.0)	154 (30.2)	

Class IV (Lower middle)	217 (87.5)	30 (12.1)	1 (0.4)	248 (48.6)	
Class V (Lower)	37 (74.0)	13 (26.0)	0 (0.0)	50 (9.8)	
BPL status					
Yes	92 (80.7)	22 (19.3)	0 (0.0)	114 (22.4)	15.140
No	369 (93.2)	26 (6.6)	1 (0.3)	396 (77.6)	df =2
					< 0.05

Table 3: Association of educational, occupational and marital status of parents with immunization status of children (12-23 months) (N=510)

Variables	Fully immunized (n=461) No. (%)	Partially immunized (n=48) No. (%)	Unimmunized (n=1) No. (%)	Total No. (%)	Chi square/Fischer exact df P value
Marital status of parents					
Married	455 (91.2)	43 (8.6)	1 (0.2)	499 (97.8)	24.587
Divorced	1 (100.0)	0 (0.0)	0 (0.0)	1 (0.2)	df =6
Widow	2 (40.0)	3 (60.0)	0 (0.0)	5 (1.0)	< 0.05
Separated	3 (60.0)	2 (40.0)	0 (0.0)	5 (1.0)	
Education of mother					
Illiterate	5 (29.4)	12 (70.6)	0 (0.0)	17 (3.3)	191.812
Just literate	3 (18.8)	13 (81.3)	0 (0.0)	16 (3.2)	df =14
Primary	20 (50.0)	19 (47.5)	1 (2.5)	40 (7.8)	< 0.05
Secondary	47 (95.9)	2 (4.1)	0 (0.0)	49 (9.6)	
High school	142 (99.3)	1 (0.7)	0 (0.0)	143 (28.0)	
Intermediate	155 (99.4)	1 (0.6)	0 (0.0)	156 (30.6)	
Graduate	82 (100.0)	0 (0.0)	0 (0.0)	82 (16.1)	
Post graduate	7 (100.0)	0 (0.0)	0 (0.0)	7 (1.4)	
Education of father					
Illiterate	5 (31.3)	11 (68.8)	0 (0.0)	16 (3.1)	149.367
Just literate	13 (50.0)	13 (50.0)	0 (0.0)	26 (5.1)	df =14
Primary	60 (81.1)	13 (17.6)	1 (1.4)	74 (14.5)	< 0.05
Secondary	79 (95.2)	4 (4.8)	0 (0.0)	83 (16.3)	
High school	107 (97.3)	3 (2.7)	0 (0.0)	110 (21.5)	
Intermediate	107 (99.1)	1 (0.9)	0 (0.0)	108 (21.2)	
Graduate	86 (96.6)	3 (3.4)	0 (0.0)	89 (17.5)	
Post graduate	4 (100.0)	0 (0.0)	0 (0.0)	4 (0.8)	
Occupation of mother					
Housewife	419 (94.4)	24 (5.4)	1 (0.2)	444 (87.1)	89.088
Unskilled worker	4 (17.4)	19 (82.6)	0 (0.0)	23 (4.5)	df =8
Skilled worker	6 (100.0)	0 (0.0)	0 (0.0)	6 (1.2)	< 0.05
Shop-owner/farm owner	24 (82.8)	5 (17.2)	0 (0.0)	29 (5.7)	
Semi-professional	8 (100.0)	0 (0.0)	0 (0.0)	8 (1.6)	
Occupation of father					
Unemployed	7 (46.7)	8 (53.3)	0 (0.0)	15 (2.9)	45.803
Unskilled worker	160 (87.0)	23 (12.5)	1 (0.5)	184 (36.1)	df =12
Semi-skilled worker	1 (33.3)	2 (66.7)	0 (0.0)	3 (0.6)	< 0.05
Skilled worker	146 (95.4)	7 (4.6)	0 (0.0)	153 (30.0)	
Shop-owner/farm owner	110 (94.0)	7 (6.0)	0 (0.0)	117 (22.9)	
Semi-professional	26 (96.3)	1 (3.7)	0 (0.0)	27 (5.3)	
Professional	11 (100.0)	0 (0.0)	0 (0.0)	11 (2.2)	

Table 4: Vaccine coverage among children (12-23 months) (N=510)

Vaccine	Male (n=287) N (%)	Female (n=223) N (%)	Total (n=510) N (%)
BCG-0	282 (56.1)	221 (43.9)	503 (98.6)
OPV-0	196 (55.1)	160 (44.9)	356 (69.8)
HBV- birth dose	149 (56.2)	116 (43.8)	265 (52.0)
OPV-1	285 (56.2)	222 (43.8)	507 (99.4)
PENTA-1	286 (56.2)	223 (43.8)	509 (99.8)
RVV-1	286 (56.2)	222 (43.7)	508 (99.6)
fIPV-1	286 (56.2)	222 (43.7)	508 (99.6)
PCV-1	286 (56.2)	222 (43.7)	508 (99.6)
OPV-2	286 (56.5)	220 (43.5)	506 (99.2)
PENTA-2	286 (56.5)	220 (43.5)	506 (99.2)
RVV-2	286 (56.7)	218 (43.3)	504 (98.8)
OPV-3	286 (56.9)	217 (43.1)	503 (98.6)
PENTA-3	286 (56.9)	217 (43.1)	503 (98.6)
RVV-3	286 (57.0)	216 (43.0)	502 (98.4)
fIPV-2	284 (56.9)	215 (43.1)	499 (97.8)
PCV-2	286 (57.2)	214 (42.8)	500 (98.0)
MR-1	284 (57.4)	211 (42.6)	495 (97.1)
VIT-A	284 (57.3)	212 (42.7)	496 (97.3)
PCV-Booster	276 (57.0)	208 (43.0)	484 (94.9)
fIPV-3	276 (57.7)	202 (42.3)	478 (93.7)
JE-1	282 (57.2)	211 (42.8)	493 (96.7)

Table 5: Correlates of Immunization coverage: logistic regression analysis

Sociodemographic Factors		Odds Ratio	Coefficient	S.E	P value
Caste	General Others (OBC/SC/ST)	6.21	1.82	1.35	0.17
Marital status of parents	Married Others (divorced/separated/widow)	0.91	0.08	0.82	0.91
Education of mother	Upto high school > High school	21.57	3.07	1.11	<0.01
Occupation of mother	Housewife Working	0.06	2.76	0.57	<0.01
Education of father	Upto High School >High School	0.68	0.38	0.73	0.60
Occupation of father	Upto skilled worker Others	1.40	0.34	0.59	0.56
Type of house	Pucca Others (semi-pucca/kutcha)	22.66	3.12	0.56	<0.01
Socio-economic class	Class I, II, III Class IV & V	2.33	0.84	0.68	0.21
BPL status	Yes No	1.32	0.28	0.46	0.54

DISCUSSION

This study revealed that among 510 children, 287 (56.3%) were males and 223 (43.7%) were females. In this study, majority of the study children were Hindus (58.6%) and belonged to OBC category (40.6%). Consistent findings were documented by Pandey S et al (2019)(15) in rural area of Bhojpur district, Bihar, 89.2% children were Hindus and 46.1% belonged to OBC category. In our study it was found that majority of children belonged to joint family (65.5%) whereas contrary results were shown by Gupta P et al (2015)(16)in Lucknow reporting that 76.8% of children belonged to nuclear family. In the present study, the majority of participants were classified as lower-middle class (48.6%) and middle class (30.2%) but these results were inconsistent with the findings of Dhalaria P et al (2023)(17) where majority of the children belonged to lower class. Present study reported that only 22.4% children belonged to BPL family whereas Pandey S et al (2019)(15) revealed that

46.1% children belonged to BPL families. The majority of mothers in the present study were housewives (87.1%) and similar findings were observed by Wani RT et al (2017)(18). Present study reported that majority of the fathers were unskilled workers (36.1%) followed by skilled worker (30%) whereas Ghosh A et al (2022)(19) reported that almost 40.7% fathers were skilled workers. In our study out of 510 children surveyed, 90.4% were fully immunized, 9.4% were partially immunized and 0.2% were unimmunized. These things were similar to the study conducted by Pathak NK et al (2020)(20) in Uttar Pradesh reported that full immunization was observed in 98% of children, with the remaining 2% having received partial immunization. Immunization status didn't show significant association with gender in the study. Parallel outcomes were noted by Pandey S et al (2019)(15). The study found no statically significant relationship between religion and immunization status of children but Joseph J et al (2015)(21)reported significant association. The current study found that most children from general category and OBC were fully immunized compared to children those who belonged to SC and ST category. Comparable results were reported by Mahajan et al (2017)(22)in Uttar Pradesh. Socioeconomic status was found to have an important role in influencing childhood immunization. Majority of the children who belonged to upper and upper middle class had 100% full immunization. These findings contrast with those reported by Thapar R et al (2021)(23). It was observed that majority of the children who did not belong to BPL category were fully immunized and similar results were seen in the study conducted in Etawah by Singh C M et al (2012)(24). Marital status of parents was identified as an important factor influencing childhood immunization. where Eze P et al (2021)(25) also concluded similar findings in their study. It was found that children of parents with higher education level had higher proportion of full immunization. Similar findings were observed in the study conducted by Mahajan et al (2017)(22)in Gautam-Budh Nagar, Uttar Pradesh. In our study it was found that mothers and fathers occupational status had a significant association with immunization status of the children. Similar results have been reported by Mahore et al (2018)(26) in Madhya Pradesh, reporting that majority of the fathers who were in professional by occupation had their children fully immunized (80%) compared to those fathers who were non-professionals. In the present study on univariate simple linear binary logistic regression three factors education of mother (OR 21.57), occupation of mother (OR 0.0629) and type of house (OR 22.6) were significantly related to immunization status. Similar results were shown by Singh et al (2019)(27).

Conclusion & Recommendation

The present cross-sectional study revealed that despite the proven benefits of childhood immunization, achieving comprehensive immunization coverage remains a challenge. The study highlights that gaps in immunization are not only due to service availability but also due to lower socio-economic status, less educated parents. These results indicate the urgent need to address the social and demographic disparities that hinder optimal immunization coverage in rural populations.

Recommendation

Strengthen routine immunization services through outreach sessions in remote villages. Implement targeted health education campaigns to raise awareness among mothers, especially those with low literacy, about the importance and schedule of immunization. Should provide small rewards for mothers/care-givers such as baby care products, financial rewards for completing the vaccination schedule and incentives should be provided to health care workers for motivating mothers to complete full immunization of their children.

Limitation of the Study

The study is conducted only in rural areas, the findings may not be generalizable to urban population.

Relevance of the Study

Immunization is a cornerstone of child survival. Assessing immunization coverage shows how effectively these life-saving services are reaching children. This study highlights the last-mile service delivery gaps. Immunization coverage reflects the health system performance. Provides actionable data to strengthen ongoing initiatives.

Authors Contribution

All authors contributed to study designing, data collection and analysis, manuscript drafting, critically reviewed the content and approved the final manuscript.

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Nil.

Conflict of Interest

No.

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

I affirm that no part of this study has been generated or written solely by AI. All sources of information have been properly cited in accordance with academic standards.

References

1. IMMUNIZATION AGENDA 2030. [cited 2025 Oct 25]. Available from: https://www.who.int/docs/default-source/immunization/strategy/ia2030/ia2030-document-en.pdf?utm_source=chatgpt.com
2. Ministry of Health and Family Welfare. Immunization: National Health Mission. nhm.gov.in. 2021 [cited 2025 Oct 25]. Available from: https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=824&lid=220
3. Focus on Universal Immunization: Dr. Mansukh Mandaviya launches Intensified Mission Indradhanush (IMI) 4.0 [Internet]. Pib.gov.in. 2022 [cited 2025 Oct 25]. Available from: https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1796099
4. Budu E, Seidu AA, Ahinkorah BO, Agbaglo E, Dadzie LK, Yaya S. Determinants of complete immunizations coverage among children aged 12–23 months in Papua New Guinea. Children and Youth Services Review. 2020; 118:105394.
5. Farzad F, A Reyer J, Yamamoto E, Hamajima N. Socio-economic and demographic determinants of full immunization among children of 12-23 months in Afghanistan. Nagoya J Med Sci. 2017;79(2):179-188.
6. Immunization coverage. (n.d.). Who.int. [cited Oct 25, 2025]. Available from https://www.who.int/news-room/fact-sheets/detail/immunization-coverage
7. Global vaccine action plan 2011-2020. (2013, February 21). Who.int; World Health Organization. [cited Oct 25, 2025]. Available from: https://www.who.int/publications/i/item/global-vaccine-action-plan-2011-2020 .
8. Dhsprogram.com. [citied Oct 25, 2025], Available from: https://dhsprogram.com/pubs/pdf/OF43/India_National_Fact_Sheet.pdf.
9. Shrivastwa N, Wagner AL, Boulton ML. Analysis of state-specific differences in childhood vaccination coverage in rural India. Vaccines. 2019;7(1):24.
10. Francis MR, Nuorti JP, Kompithra RZ, Larson H, Balraj V, Kang G, Mohan VR. Vaccination coverage and factors associated with routine childhood vaccination uptake in rural Vellore, southern India, 2017. Vaccine. 2019;37(23):3078-87.
11. 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. Indian Journal of Medical Research. 2017;145(3):377-86.
12. Vikram K, Vanneman R, Desai S. Linkages between maternal education and childhood immunization in India. Social science & medicine. 2012;75(2):331-9.
13. Islam T, Mandal S, Chouhan P. Influence of socio-demographic factors on coverage of full vaccination among children aged 12–23 months: A study in Indian context (2015-2016). Human Vaccines & Immunotherapeutics. 2021;17(12):5226-34.
14. Ministry of Family and Health welfare Government of India. National Family Health Survey (NFHS-5), 2021 [cited Oct 25, 2025]. Available from: https://mohfw.gov.in/sites/default/files/NFHS-5_Phase-II_0.pdf .
15. 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;8(7):2484-9.
16. Gupta P, Prakash D, Srivastava JP. Determinants of immunization coverage in Lucknow district. North American journal of medical sciences. 2015;7(2):36.
17. Dhalaria P, Kapur S, Singh AK, Priyadarshini P, Dutta M, Arora H, et al. Exploring the Pattern of Immunization Dropout among Children in India: A District-Level Comparative Analysis. Vaccines. 2023;11(4):836.
18. Wani RT, Dar H, Raina ZA. Knowledge, attitude and practices of mothers with children under five years of age about vaccination. Journal of Medical Science and Clinical Research. 2017;5(4):24452.
19. Ghosh A, Annigeri S, Hemram SK, Dey PK, Mazumder S, Ghosh P. Demography and determinants of incomplete immunization in children aged 1–5 years and vaccine-hesitancy among caregivers: An Eastern Indian perspective. Clinical Epidemiology and Global Health. 2022;17:101155.
20. Pathak NK, Kumar P. An evaluational study: the perception of mother about routine immunization attending anganwadi centre in urban Hapur, Uttar Pradesh. International Journal of Community Medicine and Public Health. 2020;7(6):2159.
21. Joseph J, Devarashetty V, Reddy SN, Sushma M. Parents' knowledge, attitude, and practice on childhood immunization. Int J Basic Clin Pharmacol. 2015;4(6):1201-7.
22. Mahajan H, Srivastava S, Nagesh S. Immunization coverage in an urban resettlement colony of district Gautam-Budh Nagar, Uttar Pradesh, India using WHO 30×7 cluster sampling technique. Int J Community Med Public Health [Internet]. 2017;4(11):4089-95.
23. Thapar R, Kumar N, Surendran P, Shahdiya A, Mahendran V, Ramesh R, Shetty DJ, Unnikrishnan B, Mithra P, Holla R, Bhagwan D. Vaccine hesitancy among mothers of under-five children in Coastal South India: a facility-based cross-sectional study. F1000Research. 2021;10:186.
24. Singh CM, Kaushik A, Jain PK, Kumar S, Srivastava DK, Singh NP, Chandra S, Singh AP. Immunization coverage in Etawah: A border district of Uttar Pradesh. Indian journal of community health. 2012;24(2):134-9.
25. Eze P, Agu UJ, Aniebo CL, Agu SA, Lawani LO, Acharya Y. Factors associated with incomplete immunisation in children aged 12–23 months at subnational level, Nigeria: a cross-sectional study. BMJ open. 2021;11(6):e047445.
26. Mahore R, Agarwal AK, Jamra V, Mahore RK. A study to identify factors responsible for low immunization coverage in a high priority district of Madhya Pradesh. National Journal of Community Medicine. 2018;9(07):512-8.
27. Singh S, Sahu D, Agrawal A, Jeyaseelan L, Nadaraj A, Vashi MD. Coverage, quality, and correlates of childhood immunization in slums under national immunization program of India: A cross-sectional study. Heliyon. 2019;5(9):e02403.