International Journal of Science and Healthcare Research
[Indexed, Peer-Reviewed Journal]
Vol. 11; Issue: 3; July-Sept. 2026
Website: ijshr.com
Original Research Article *ISSN: 2455-7587*

Beyond The Syringe: Prevalence And Determinants of Vaccine Hesitancy Among Caregivers of Children Aged 0-23 Months in Eastern India

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DOI: https://doi.org/10.52403/ijshr.20260335

Received: 25/04/2026; Revised: 28/07/2026; Accepted: 07/09/2026

ABSTRACT

Introduction: Vaccination is a cost-effective public health intervention, but sustaining coverage is challenged by vaccine hesitancy. Bihar shows high uptake of early vaccines with documented dropout as children age.

Objectives: To estimate the prevalence of vaccine hesitancy among primary caregivers of children aged 0-23 months in rural Patna, Bihar, and to identify socio-demographic factors associated with hesitancy.

Methods: A community-based cross-sectional study was conducted among 300 primary caregivers in rural Patna from July to December 2025 using probability proportional to size cluster sampling (10 clusters of 30 children). Hesitancy was assessed with the Parent Attitudes about Childhood Vaccines (PACV) global item. Active hesitancy was defined as a response of very hesitant or somewhat hesitant. Respondents who answered not sure were grouped with no active hesitancy in the primary analysis. Immunization history was verified from cards, facility registers, or the U-WIN portal. Associations were examined with Pearson chi-square or Fisher's exact tests and with multivariable logistic regression.

Results: Active vaccine hesitancy was present in 23 of 300 caregivers (7.7%; 95% confidence interval [CI] 5.2-11.2). A further 257 caregivers (85.7%) answered not sure, although 96.0% of children had received at least one routine vaccine. In multivariable analysis, secondary or higher maternal education (adjusted odds ratio [aOR] 0.37; 95% CI 0.15-0.94) and institutional delivery (aOR 0.28; 95% CI 0.12-0.67) were independently associated with lower odds of active hesitancy. The comparison by respondent gender was underpowered (one hesitant male caregiver) and is not interpretable.

Conclusions: Active hesitancy was uncommon in this rural cohort, but uncertainty was pervasive despite high uptake. The estimate depends on a single PACV item and on classifying "not sure" as no active hesitancy. Immunization programmes in this setting should treat coverage as distinct from caregiver confidence and should strengthen counselling for home-delivered births and caregivers with lower formal education.

Key Words: *vaccine hesitancy, PACV, pediatric immunization, maternal education, institutional delivery, Bihar*

INTRODUCTION

Vaccination is among the most cost-effective and impactful public health interventions, playing a critical role in the prevention of vaccine-preventable diseases and reduction of associated morbidity and mortality. According to the World Health Organization (WHO), vaccination currently prevents an estimated 3.5–5 million deaths annually from diseases including diphtheria, tetanus, pertussis, influenza, and measles [1]. Despite the expansion of government-funded immunization programmes, sustaining high coverage is challenged by delayed acceptance or refusal of recommended vaccines [2].

The World Health Organization (WHO) has identified vaccine hesitancy as one of the ten leading threats to global health [3]. The WHO Strategic Advisory Group of Experts (SAGE) on Immunization defines vaccine hesitancy as the delay in acceptance or refusal of vaccination despite the availability of vaccination services [4,5]. Hesitancy is a continuum rather than a simple yes or no decision. Caregivers may accept some antigens, delay others, or remain uncertain even while attending immunization sessions [5,6].

Psychological research often organizes the drivers of this continuum with the 5C antecedents model: confidence, complacency, constraints, calculation, and collective responsibility [7]. Confidence refers to trust in vaccine safety, effectiveness, and the system that delivers vaccines. Constraints include physical, structural, and psychological barriers. In low- and middle-income settings these domains frequently overlap. Concerns about adverse events and doubts about newer vaccines persist even where services are geographically close [8].

In Bihar these global patterns sit alongside a coverage paradox. Intensified campaigns such as Mission Indradhanush and the rise in institutional deliveries have improved first-contact immunization, yet dropout remains substantial as children age. In neighbouring Bhojpur district, dropout between Bacillus Calmette-Guerin (BCG) given at birth and measles-rubella vaccine at nine months was 21.82%[9]. A hospital-based study from Eastern India reported caregiver vaccine hesitancy of 9.18% [2]. Coverage in rural Bihar remains lower than in urban areas, which makes local estimates of hesitancy relevant for programme design [10].

This study was designed to estimate the prevalence of vaccine hesitancy among primary caregivers of children aged 0-23 months in rural Patna and to examine socio-demographic factors associated with hesitancy. The analysis distinguishes unadjusted associations from multivariable associations and treats the large group of caregivers who answered not sure as a measurement issue rather than as confident acceptance.

MATERIALS AND METHODS

This community-based cross-sectional study was conducted from July to December 2025 in the rural field practice area of a tertiary care centre in Patna, Bihar. The study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cross-sectional studies [11].

Childhood immunization in the study setting follows India's Universal Immunization Programme (UIP) [12]. Antigens scheduled from birth to 23 months include BCG, hepatitis B birth dose, and oral poliovirus vaccine (OPV-0) at birth; OPV, pentavalent vaccine, rotavirus vaccine, fractional inactivated poliovirus vaccine (fIPV), and pneumococcal conjugate vaccine (PCV) at 6, 10, and 14 weeks; measles-rubella (MR) vaccine, vitamin A, and PCV booster at 9-12 months; and MR-2, diphtheria-pertussis-tetanus (DPT) booster, and OPV booster at 16-24 months. Japanese encephalitis vaccine is given in selected endemic districts as per state policy. In rural Patna, most sessions are held at Anganwadi centres and Village Health and Nutrition Days. Accredited Social Health Activists (ASHAs)

mobilize families. Coverage is increasingly recorded in the U-WIN digital registry in addition to the physical immunization card.

Cluster sampling with probability proportional to size (PPS) was used because eligible households were dispersed across villages. The field area was listed as villages (clusters). Ten villages were selected with PPS. Within each selected village, surveyors began at a random starting household near the geographic centre and proceeded in a predetermined direction, visiting consecutive households until 30 eligible children aged 0-23 months had been enrolled. The planned sample of 300 therefore comprised 10 clusters of 30 children. A cluster size of 30 reduced the number of villages that had to be visited while meeting the calculated sample size. This is larger than the seven children per cluster used in the classic WHO Expanded Programme on Immunization 30-cluster design [13]. A larger cluster size can increase the design effect. That trade-off is acknowledged as a limitation.

The sample size of 300 was obtained from $n = Z^2 p(1-p)/d^2$, using a hesitancy prevalence of 9.18% from Eastern India [2], 95% confidence, 4% absolute precision, and a design effect of 1.5 for cluster sampling.

Inclusion criteria were primary caregivers of children aged 0-23 months who were residing in the selected clusters at the time of the survey. Caregivers who had permanently migrated from the study area during data collection were excluded. Written informed consent was obtained before the interview. The study was approved by the Institutional Ethics Committee (Reference Number: 1305/IEC/IGIMS).

Data were collected with a semi-structured, interviewer-administered questionnaire. Socio-demographic characteristics, place of delivery, parity, immunization history, and a set of Likert items on beliefs, knowledge, trust, ability to discuss concerns with health staff, and views on natural immunity were recorded. The primary hesitancy measure was the Parent Attitudes about Childhood Vaccines (PACV) global item: "Overall, how hesitant about childhood vaccinations would you consider yourself to be?" Response options were very hesitant, somewhat hesitant, not sure, not too hesitant, and not at all hesitant [14,15]. This single item is part of the validated 15-item PACV instrument. It was not used as a full PACV score. Internal consistency (Cronbach's alpha) cannot be estimated for one item, and the present study does not claim to have used a validated multi-item hesitancy scale. The additional Likert items were analysed descriptively. They were not scored as a 5C scale [7]. Immunization history was verified by inspection of the immunization card. When the card was unavailable, local health-centre registers and the U-WIN portal were used.

For the primary analysis, vaccine hesitancy was dichotomized as active hesitancy (very hesitant or somewhat hesitant) versus no active hesitancy (not too hesitant, not at all hesitant, or not sure). This definition was chosen a priori to isolate expressed reluctance, to keep the outcome statistically stable given only 23 active events, and to avoid treating absence of a formed opinion as hesitancy. SAGE defines hesitancy as delay or refusal despite available services [4,5]. Classifying not sure with no active hesitancy can underestimate latent uncertainty. Sensitivity analyses therefore (i) reported the full five-level distribution, (ii) described a three-level grouping of active hesitancy, uncertain, and confident (not too hesitant or not at all hesitant), and (iii) estimated prevalence after excluding not sure responses.

Statistical Methods

Categorical variables were summarized as frequencies and percentages. Per-capita monthly income was obtained by dividing total monthly family income by household size. Socioeconomic status was classified with the modified B.G. Prasad scale updated for 2026. Continuous income was also split at the sample median for bivariate analysis.

Prevalence of active hesitancy was estimated with a Wilson 95% CI. Because cluster identifiers were not retained in the analysis file, cluster-robust standard errors could not be computed. A conservative interval was therefore also calculated by inflating the binomial variance by the design effect of 1.5 used in the sample-size calculation.

Bivariate associations used Pearson's chi-square test without continuity correction when all expected cell counts were at least 5, and Fisher's exact test otherwise. Chi-square statistics are reported with degrees of freedom and p values. Table percentages are column percentages within hesitancy groups, as requested for comparison of the composition of the two groups. Within-group prevalence (row percentages) is given in the text because that quantity answers the programme question of how common active hesitancy was in each subgroup. The comparison by respondent gender had only one hesitant male caregiver (expected count 1.84) and is reported as descriptive only.

Multivariable logistic regression was used to estimate independent associations with active hesitancy. With 23 events, the primary model was limited to the two variables that were significant in bivariate analysis and that reviewers identified as potentially correlated: maternal education (secondary and above versus primary or no formal education) and place of delivery (institutional versus home). Crude and adjusted odds ratios are presented with 95% CIs. Collinearity was assessed with the variance inflation factor. An exploratory model adding parity and family structure (bivariate $p < 0.20$) is reported only as a sensitivity check because events per variable fall below conventional thresholds. Firth penalized logistic regression was used for that expanded model. Two-sided $p < 0.05$ was considered statistically significant. Analyses were performed in Python 3 using pandas, SciPy, and statsmodels.

RESULT

The planned sample of 300 complete caregiver interviews was achieved (10 clusters of 30 children). Households without an eligible child were skipped. A household-level log of refusals and replacements was not maintained, so a non-response rate cannot be reported.

Most respondents were women (276/300, 92.0%). Child sex was balanced (154 boys, 51.3%; 146 girls, 48.7%). Most families were Hindu (271, 90.3%) and 167 (55.7%) lived in joint households. Maternal education ranged from literacy without formal schooling (56, 18.7%) to graduation or above (31, 10.3%). Median per-capita monthly income was Rs 1,500 (interquartile range Rs 1,111-2,200). Almost half of households were in modified B.G. Prasad Class V (139, 46.3%) and 121 (40.3%) were in Class IV. Institutional delivery accounted for 234 births (78.0%). Three-quarters of mothers were primiparous (225, 75.0%) (Table 1).

Table 1: Socio-demographic characteristics of primary caregivers and children (N = 300)

Characteristic	Category	n	%
Gender of respondent	Female	276	92.0
	Male	24	8.0
Gender of child	Male	154	51.3
	Female	146	48.7
Religion	Hindu	271	90.3
	Muslim	29	9.7
Family structure	Joint	167	55.7
	Nuclear	133	44.3
Maternal education	Graduation and above	31	10.3
	Higher secondary (till 12th)	46	15.3
	Secondary (till 10th)	83	27.7
	Primary (till 5th)	84	28.0
	Literate only (no formal education)	56	18.7

Socioeconomic status*	Class I (Upper)	0	0.0
	Class II (Upper middle)	4	1.3
	Class III (Middle)	36	12.0
	Class IV (Lower middle)	121	40.3
	Class V (Lower)	139	46.3
Place of delivery	Institutional	234	78.0
	Home	66	22.0
Parity	Primipara (1 child)	225	75.0
	Multipara (2 or more children)	75	25.0

**Modified B.G. Prasad classification, 2026, based on per-capita monthly income.*

Routine immunization uptake was high. Overall, 288 children (96.0%) had received at least one routine vaccine. BCG at birth was documented for 274 (91.3%) and DPT-1/pentavalent-1 for 288 (96.0%). An immunization card was available for 273 children (91.0%). Anganwadi centres were the usual vaccination site for 234 children (78.0%) (Table 2). Among the 12 children who had never received a routine vaccine, caregivers cited mistrust in the health system (n = 8) and fear of adverse events following immunization in the family (n = 4).

Table 2: Immunization coverage and healthcare utilization (N = 300)

Characteristic	Category	n	%
Ever received routine vaccination	Yes	288	96.0
	No	12	4.0
Immunization card available	Yes	273	91.0
	No	27	9.0
BCG at birth	Yes	274	91.3
	Card not available	15	5.0
	No	9	3.0
	Missing or not recorded	2	0.7
DPT-1 received	Yes	288	96.0
	No	12	4.0
Primary vaccination facility	Anganwadi centre	234	78.0
	Primary health centre	25	8.3
	Community health centre	10	3.3
	Panchayat Bhawan or local outreach*	11	3.7
	Sadar hospital	5	1.7
	Private hospital	4	1.3
	School	2	0.7
	Not applicable	9	3.0
Payment required for vaccination	No	274	91.3
	Yes	17	5.7
	Not applicable	9	3.0

**Includes temporary session sites and outreach camps.*

On the PACV global item, 12 caregivers (4.0%) were very hesitant, 11 (3.7%) somewhat hesitant, 11 (3.7%) not too hesitant, and 9 (3.0%) not at all hesitant. The remaining 257 (85.7%) answered not sure. Using the primary definition, active hesitancy prevalence was 7.7% (23/300; Wilson 95% CI 5.2-11.2). Inflating the variance by a design effect of 1.5 widened the interval to 4.0-11.4%. Grouped in three levels, 23 caregivers (7.7%) were actively hesitant, 257 (85.7%) were uncertain, and 20 (6.7%) expressed a confident (not too or not at all hesitant) response.

The 257 not sure responses occurred in a cohort in which 288 children (96.0%) had already received at least one routine vaccine. All 257 caregivers who answered not sure reported that the index child had been vaccinated. This combination (high uptake with a dominant not sure response) is examined in the Discussion because it has

direct implications for how the 7.7% figure should be read.

Column percentages for socio-demographic characteristics within hesitancy groups are shown in Table 3. Caregivers with active hesitancy were more often in the lower education group (69.6% versus 44.8% of those without active hesitancy) and more often from home deliveries (47.8% versus 19.9%). Pearson chi-square tests were significant for maternal education (chi-square = 5.25, df = 1, p = 0.022) and place of delivery (chi-square = 9.68, df = 1, p = 0.002). Within-group prevalence of active hesitancy was 4.4% (7/160) among caregivers with secondary education or higher and 11.4% (16/140) among those with primary or no formal education. Prevalence was 5.1% (12/234) after institutional delivery and 16.7% (11/66) after home delivery. Parity (chi-square = 3.53, df = 1, p = 0.060), family structure (chi-square = 3.36, df = 1, p = 0.067), and per-capita income above the median (chi-square = 0.79, df = 1, p = 0.376) were not statistically significant. Respondent gender was analysed with Fisher's exact test because the expected number of hesitant male caregivers was 1.84. Only one of 24 male respondents was classified as actively hesitant (p = 1.00). That comparison is underpowered and is not interpreted as evidence of no association.

Table 3: Socio-demographic characteristics by active vaccine hesitancy, column percentages (N = 300)

Variable	Category	No active hesitancy n = 277 n (column %)	Active hesitancy n = 23 n (column %)	p-value
Maternal education	Secondary and above	153 (55.2)	7 (30.4)	0.022
	Primary or none	124 (44.8)	16 (69.6)	
Place of delivery	Institutional	222 (80.1)	12 (52.2)	0.002
	Home	55 (19.9)	11 (47.8)	
Parity	Primipara	204 (73.6)	21 (91.3)	0.060
	Multipara	73 (26.4)	2 (8.7)	
Family structure	Joint	150 (54.2)	17 (73.9)	0.067
	Nuclear	127 (45.8)	6 (26.1)	
Per-capita income	Above median (>Rs 1500)	135 (48.7)	9 (39.1)	0.376
	At or below median	142 (51.3)	14 (60.9)	
Respondent gender*	Female	254 (91.7)	22 (95.7)	1.00
	Male	23 (8.3)	1 (4.3)	

*Percentages are column percentages within hesitancy groups. Within-group prevalence (row percentages) is given in the Results text. *Fisher's exact test; expected count for hesitant male caregivers = 1.84. This comparison is underpowered and should not be interpreted as a null finding.*

Maternal education and institutional delivery were only weakly associated with each other (institutional delivery 80.0% in the higher-education group and 75.7% in the lower-education group; variance inflation factor 1.00 for both covariates). In the primary logistic model, both remained independently associated with active hesitancy (model likelihood-ratio p = 0.002; McFadden pseudo-R^2 = 0.08). Secondary or higher maternal education had an aOR of 0.37 (95% CI 0.15-0.94; p = 0.036). Institutional delivery had an aOR of 0.28 (95% CI 0.12-0.67; p = 0.005) (Table 4). An exploratory four-variable model that added parity and family structure produced sparse cells and very wide intervals. Firth penalization in that expanded model left institutional delivery associated with lower odds (aOR 0.38; 95% CI 0.18-0.80) while the education association was attenuated and no longer significant. The two-predictor model is therefore the basis for inference.

Table 4: Crude and adjusted associations with active vaccine hesitancy (primary logistic model, N = 300)

Variable	Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Maternal education (secondary and above vs primary or none)	0.35 (0.14-0.89)	0.027	0.37 (0.15-0.94)	0.036
Place of delivery (institutional vs home)	0.27 (0.11-0.64)	0.003	0.28 (0.12-0.67)	0.005

Adjusted estimates are from a multivariable logistic model containing both variables. Likelihood-ratio p for the model = 0.002. Events = 23. Residual confounding by unmeasured factors (antenatal care, health-system trust, wealth beyond the median split) remains possible.

Sensitivity to the not sure classification was large. After excluding 257 not sure responses, 23 of the remaining 43 caregivers (53.5%; 95% CI 38.9-67.5) were actively hesitant. That figure describes only those who gave a directional answer and should not replace the primary prevalence. It shows that the 7.7% estimate is heavily influenced by placing the uncertain majority in the no active hesitancy group.

Attitude items were not used as a validated scale, but they differed by hesitancy group. Strong agreement that natural immunity is better than vaccination was more common among actively hesitant caregivers (13/23, 56.5%) than among those without active hesitancy (40/277, 14.4%; chi-square = 25.85, df = 1, $p < 0.001$). Disagreement that immunization is important for child health was reported by 3 of 23 actively hesitant caregivers and by none of the 277 others. Disagreement that concerns could be discussed openly with health staff was 17.4% (4/23) versus 0.7% (2/277).

DISCUSSION

In this rural Patna sample, 7.7% of caregivers (95% CI 5.2-11.2) expressed active hesitancy on the PACV global item. The point estimate is close to the 9.18% reported among caregivers of under-five children at a tertiary institution in Eastern India [2]. Direct comparison still requires caution. That study used a different setting and a broader caregiver population. A community study of children aged 1-5 years from Eastern India, using a different operationalization, reported vaccine-hesitant parents at 41.6% [16]. International PACV work has also shown that full 15-item scores identify more hesitant parents than a single global item alone [14,15]. The 7.7% figure in the present study is therefore a lower-bound estimate of expressed reluctance, not a comprehensive PACV prevalence.

The most striking descriptive finding is not the 7.7% active-hesitancy rate but the 85.7% not sure response in a cohort with 96.0% ever-vaccination. Several explanations can sit together. First, an interviewer-administered item with a mid-point labelled not sure can capture genuine absence of a formed attitude among caregivers who vaccinate because it is the local default, a pattern sometimes described as passive acceptance [6]. Second, social desirability may push respondents away from saying they are hesitant while they are sitting with a health-linked interviewer. Third, item comprehension may have been limited in a predominantly low-literacy sample. The PACV was developed and validated in high-income clinic settings [14,15]. A single translated global item does not inherit that full validation. The implication of the primary coding rule is explicit: treating not sure as no active hesitancy keeps the outcome aligned with expressed reluctance, but it almost certainly understates uncertainty and overstates confident acceptance. The sensitivity analysis in which 53.5% of directional responders were actively hesitant illustrates how strongly the definition drives the headline prevalence.

Higher maternal education and institutional delivery were associated with lower odds of active hesitancy in both unadjusted and multivariable models. The two exposures were not strongly correlated in this sample, so one is unlikely to be a simple proxy for the other. That addresses the concern that education and institutional delivery were

being presented as independent effects on the basis of bivariate tests alone. The language must still remain associational. This is a cross-sectional study. Education may mark health literacy, agency in the household, or ability to process rumours. Institutional delivery may mark contact with postnatal counselling and birth-dose BCG, or it may mark a pre-existing willingness to use facilities [9,10]. Residual confounding by antenatal care, household wealth beyond a median split, and trust in the health system is likely. The primary model could include only two covariates because there were 23 events. Independent determinants in a fully confounder-adjusted sense were not identified.

Parity and joint family structure showed non-significant bivariate associations in the direction of higher hesitancy among primiparous mothers and joint households. Adding them to the logistic model produced unstable estimates, and Firth penalization did not support a firm parity effect. Respondent gender should not be discussed as a null result. One hesitant man among 24 male caregivers yields an expected cell below 2. The test has essentially no power.

Among the 12 never-vaccinated children, stated reasons were mistrust and fear of adverse events, not distance or session timing. Actively hesitant caregivers more often endorsed natural immunity as superior to vaccination and more often said they could not discuss concerns with staff. These items are compatible with the confidence domain of the 5C framework [7]. They do not constitute a 5C diagnosis. Coverage in this field area appears to be maintained by a dense Anganwadi and ASHA network (Table 2) more than by internalized caregiver confidence. That reading is consistent with work from Eastern India and with systems analyses of Bihar's immunization programme that emphasize both supply-side reliability and the need to handle safety concerns [2,10,16].

This study has several limitations. The cross-sectional design cannot establish temporality or causation. The outcome is a single PACV global item rather than a validated multi-item score, and reliability statistics cannot be reported. Classifying not sure as no active hesitancy may have misclassified latent hesitancy; the opposite coding would have been equally arbitrary and is not presented as prevalence. Only 23 events limited multivariable adjustment, so residual confounding remains. Cluster membership was not stored, so confidence intervals are not cluster-robust. Consecutive sampling from a village centre can introduce spatial selection bias. The sample is from one tertiary-care field practice area in rural Patna and does not represent Bihar as a whole. Immunization status for 9.0% of children relied on registers or recall rather than a card. A refusal log was not kept, so non-response bias cannot be quantified.

Public Health Implications

The operational message is not that 7.7% active hesitancy is a coverage emergency. Uptake of at least one routine antigen was 96.0%, and most sessions already run through Anganwadi outreach. The message is that high coverage in this rural block coexists with very high attitudinal uncertainty. Programme reviews that use only dose counts will miss that gap. Communication strategies should assume that many caregivers who bring children to sessions do not have a stable, favourable attitude that will survive an adverse event, a rumour, or a negative encounter with staff.

Within that general approach, two groups had higher odds of expressed reluctance: caregivers with primary or no formal education, and families with home delivery. These are already priority groups for ASHAs and for Janani Suraksha Yojana and related maternity schemes. Immunization counselling can be attached more deliberately to the institutional-delivery and postnatal contact, including a clear explanation of birth doses and of common, self-limited reactions. Home-delivered mothers who are later registered at Anganwadi sessions need a first-contact conversation that is not limited to due-list

completion. Lower-education caregivers need explanations that do not assume literacy or prior knowledge of the UIP schedule.

Frontline healthcare workers should receive appropriate training on how to respond to and effectively address patients' uncertainty or indecision regarding vaccination. A not sure response is an opening for a short, two-way discussion, not evidence that the caregiver is confident. The never-vaccinated minority in this sample named mistrust and AEFI fear. Those reasons point to confidence-building and AEFI communication rather than to new session sites. Because independent determinants from a rich multivariable model were not established, these implications are targeted hypotheses for programme managers, not a claim that education or institutional delivery alone will remove hesitancy.

CONCLUSION

Among primary caregivers of children aged 0-23 months in rural Patna, active vaccine hesitancy on a single global item was 7.7% (95% CI 5.2-11.2). Secondary or higher maternal education and institutional delivery were independently associated with lower odds of active hesitancy after multivariable adjustment. Most caregivers answered not sure despite near-universal receipt of at least one routine vaccine. The prevalence estimate is sensitive to that coding choice and to use of a single item rather than a validated multi-item scale. Immunization programmes in this setting should measure confidence as well as coverage and should strengthen counselling at the points already used for maternity and outreach care.

Declaration by Authors

Ethics Approval and Consent to Participate: Ethics approval was obtained from the Institutional Ethics Committee of the tertiary care centre (Reference Number: 1305/IEC/IGIMS). Written informed consent was obtained from all participating caregivers before data collection.

Authors' contributions: Tajwar Yasmeen contributed to study conception and design, coordination of data collection, statistical analysis, and the first draft of the manuscript. Kaushikee K contributed to study design and statistical analysis. Anshuman Sinha contributed to data interpretation. Sanjay Kumar contributed to critical revision of the manuscript. All authors read and approved the final manuscript.

Acknowledgement: The authors thank the participating caregivers, the data collectors, and the healthcare staff in rural Patna who supported fieldwork.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Yasmeen T, Kaushikee K, Sinha A, Kumar S. Beyond the syringe: prevalence and determinants of vaccine hesitancy among caregivers of children aged 0-23 months in Eastern India. *Int. J. Sci. Healthc. Res.* 2026; 11(3): 319-328. DOI: *https://doi.org/10.52403/ijshr.20260335*

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