Assessing the knowledge and awareness of developmental milestones among ante and post-natal care women in a tertiary care hospital in rural setup

Ira Indurkar[1], N. Nithinchandra Kini[2], Shweta Dani[3], Vedanti Nemad[4], Priya Soni[5], Yogita Shrivas[6]

[1]Associate Professor, Datta Meghe College of Physiotherapy, Wanadongri, Hingna, Nagpur
[2]Professor & Principal Canara Vikas College of Physiotherapy, Mangalore
[3]Asst. Professor, Smt. Vimladevi College of Physiotherapy, Chandrapur
[4]Student, Datta Meghe College of Physiotherapy, Wanadongri, Hingna, Nagpur
[5]Assistant Professor, Shri Chand Jain College of Physiotherapy, Jamner
[6]Professor, DMACHRC, Wanadongri, Hingna, Nagpur

Corresponding author:
Name: Ira Indurkar
Affiliation: Associate Professor, Datta Meghe College of Physiotherapy, Wanadongri, Hingna, Nagpur
Email: physioira@gmail.com

ABSTRACT

Background and Objectives Developmental milestones are key indicators of a child's physical, cognitive, language, and social-emotional growth. Parental knowledge of these milestones significantly influences early detection of developmental delays and timely intervention. Despite global efforts to educate parents, structured studies assessing maternal awareness in non-Western, semi-urban contexts like rural India remain limited.

This study assesses the knowledge and awareness of developmental milestones among ante- natal and post-natal care (ANC and PNC) women attending a tertiary care hospital in a rural setting. It aims to identify knowledge gaps and examine associations between awareness and socio-demographic factors.

Methods A total of 148 women attending ANC and PNC departments of the tertiary care hospital participated. Participants were selected through purposive sampling. Inclusion criteria included all consenting women visiting during the study period. Data was collected through a self-designed, structured questionnaire based on CDC developmental milestones and Ages and Stages Questionnaire (ASQ-3). Statistical analysis was done using MS Excel® 2019, with results presented via frequency distributions and graphs.

Results Of 148 participants, 73% (n=108) were aware of developmental milestones; 27% (n=40) were not. Only 1.35% (n=2) showed good awareness. Most (60.13%, n=89) had moderate awareness; 38.51% (n=57) had poor awareness. Moderate awareness was higher in gross motor (67.57%) and language (60.13%) skills, lower in cognitive (57.53%) and fine motor (52%) domains.

Conclusions Mothers in rural India have limited understanding of developmental milestones. Targeted education and community awareness programs are essential to improve maternal knowledge and support early recognition of developmental issues.

KEYWORDS: Developmental milestones, Maternal awareness, Child development, Developmental delay detection, Early childhood development

INTRODUCTION

The normal newborn baby is a complex individual innately capable of interacting with its environment and caregivers (1). The first five years of life mark a period of rapid brain growth, which begins in the fetal stage and continues well into early childhood (2). Hubel and Wiesel's foundational research underscored the importance of this "critical period" in brain development, during which experiences—both positive and negative—can have profound and lasting effects (3).

During these formative years, children typically achieve key developmental milestones, including independent gross motor skills such as rolling, sitting, crawling, and standing (4). Fine motor milestones like the pincer grasp, object transfer between hands, and holding a spoon are equally vital, as they reflect underlying neurodevelopmental integrity and adaptive functioning (5). Disruptions or delays in achieving these milestones may indicate permanent alterations in brain development, often caused by adverse experiences in early life (6).

Developmental milestones serve as functional benchmarks that help track a child's physical, emotional, and cognitive growth (7). Their timely achievement is influenced by genetic makeup and environmental, psychosocial, cultural, and economic factors. Parental awareness, especially maternal knowledge of these milestones, plays a very crucial role in a child's developmental trajectory (8). Informed parents are better equipped to provide enriching environments, recognize early deviations, and seek timely intervention. Evidence supports that early screening and early intervention significantly improve long-term outcomes across behavioral, academic, emotional, and social domains (9).

NEED FOR STUDY

Global healthcare and research organizations, like the World Health Organization (2009), the Centers for Disease Control and Prevention (2015), and the American Psychological Association (2008), have emphasized the need for targeted policies and parenting programs to promote early childhood development (ECD) awareness. These guidelines stress the importance of equipping caregivers with accurate knowledge about typical developmental norms and effective parenting strategies.

While several studies from high-income countries have explored parental understanding of child development, structured research focusing on maternal knowledge in the Indian context remains limited, particularly in central India (10).

In rural regions, where access to pediatric screening and early intervention services is often constrained, empowering mothers with knowledge becomes even more crucial to ensure optimal child outcomes.

Aim

In light of these considerations, the present study aims to assess mothers' knowledge of their children's developmental milestones using a structured questionnaire in a tertiary care hospital setting in central India.

Objective

The study's objective is to examine the knowledge and awareness of antenatal and post-natal care amongst young mothers in rural central India. The findings may help identify knowledge gaps and inform strategies to promote early childhood development awareness in resource- limited settings.

MATERIALS AND METHODS

A simple random sampling methodology was used to select participants from the tertiary care hospital's target population. This method ensured that each eligible mother had an equal chance of being included in the study, thereby reducing selection bias and enhancing the sample's representativeness. Practical considerations such as participant availability and willingness were addressed during the recruitment process without compromising the randomness of selection.

This observational study utilized a cross-sectional design to examine the prevalence of knowledge and understanding of developmental milestones among mothers in rural India.

Data collection occurred over six months, allowing for a snapshot analysis of the population under study. The study included a sample size of 148 participants, determined using the formula:

$$\text{Sample Size (n)} = \frac{Deff \times N \times p(1-p)}{\left(\frac{d^2}{Z^2_{1-\alpha/2}}\right) \times (N-1) + p(1-p)}$$

Where:

      n = required sample size
      Deff = design effect
      N = population size
      p = estimated proportion of an attribute present in the population
      d = margin of error
      Z $1-\alpha/2$ = Z-score corresponding to the desired confidence level

Variable	Value	Explanation
N (Population size)	2000	Total number of mothers attending the tertiary care hospital
p (Estimated proportion)	0.5	Maximum variability
d (Margin of error)	0.08	Precision of ± 8%
Z $1-\alpha/2$ (Z-score for 95% CI)	1.96	Standard for 95% confidence
Deff	1.0	Simple random sampling

Sample Size (n) $= \dfrac{1 \times 2000 \times 0.5(1-0.5)}{\left(\frac{0.08^2}{1.96}\right) \times (2000-1) + 0.5(1-0.5)} = 139.66 \approx 140$

We took the sample size to be 148 to compensate for incomplete surveys

Inclusion Criteria
Women who came to the ANC and PNC departments in a tertiary care hospital and were willing to participate in the study were included.

Age group: 18-35 years.
The subjects should be able to provide informed consent.

Exclusion Criteria
Subjects not able to provide informed consent were excluded from the study.

Material Required
Consent form
Questionnaire
Stationaries

Questionnaire development
The questionnaire used in this study was developed specifically to assess maternal knowledge of developmental milestones in children. It was created based on developmental guidelines from the CDC (Centers for Disease Control and Prevention) and elements of the Ages and Stages Questionnaire (ASQ), with a focus on four key developmental domains: gross motor, fine motor, communication, and cognitive skills.

Each domain included four questions, resulting in a total of 16 multiple-choice items. Each correct response was awarded one point, with a maximum possible score of 16. Based on total scores, maternal knowledge was categorized into three levels- good, moderate, and poor- to aid analysis and interpretation.

The questionnaire underwent a pilot test with five mothers from a similar demographic to evaluate feasibility and clarity. Feedback from this pilot study informed minor revisions to question wording and format.

Content validation of the questionnaire was done by sending it for review by five healthcare professionals with expertise in pediatrics and child development. They rated each item on the questionnaire on a 4-point scale for relevance, clarity, and comprehensiveness. The average scores were 3 for all three criteria, indicating acceptable content validity. Although formal reliability testing (e.g., Cronbach's alpha) was not conducted due to resource constraints, the tool was refined based on expert and participant feedback.

To ensure accessibility and comprehension, the questionnaire was translated into the local language. A back-translation process was carried out and reviewed by language experts to ensure accuracy and preservation of meaning.

Data Collection
Data collection was done using self-designed questionnaires, which were administered by trained personnel. All data were anonymized to maintain participant confidentiality and adherence to ethical research standards.

Ethical Considerations
The study protocol was reviewed and subsequently approved by the Institutional Ethical Committee. All participants provided informed writing prior to their inclusion in the study.

Statistical Analysis
Data analysis of the findings was done using the MS Excel® 2019 software, and statistical analysis was done using GraphPad software.

Procedure
Before initiating the study, requisite permission was obtained from the Institutional Ethical Committee to ensure adherence to ethical research standards. All participants were informed about the nature of the study, and informed consent was obtained before their inclusion in the study, acknowledging their voluntary participation.

Participants were provided a detailed explanation of the study's objectives, procedures, and potential outcomes to ensure transparency and comprehension. This step aimed to foster trust and clarify any questions or concerns the participants might have had.

Each participant underwent a thorough systemic evaluation to determine eligibility based on the study's predefined inclusion and exclusion criteria. Only those meeting all requirements were included in the final sample.

Data collection was conducted through a structured interview process using a self-designed questionnaire. The self-designed questionnaire was created to capture all relevant variables and ensure interview consistency.

Following data collection, all responses were systematically analyzed using [specify analytical tools/software, if applicable]. Statistical analyses were performed to derive meaningful insights, and the results were interpreted in alignment with the study's objectives.

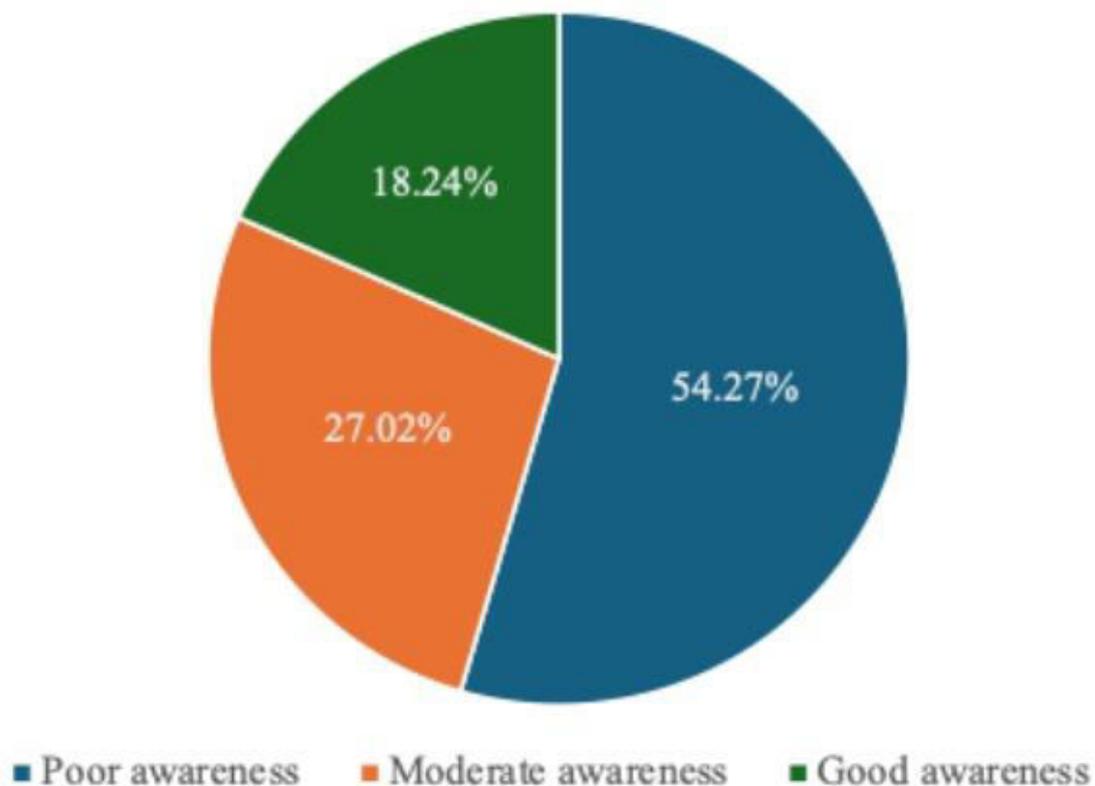## RESULTS

Questionnaire-wise awareness distribution

Each participant's awareness was classified as poor, moderate, or good based on their awareness score, using the following criteria:

Poor awareness: score below 6
Moderate awareness: score between 6 and 9
Good awareness: score above 9

Graph 1: Questionnaire-wise awareness distribution of mothers in the study

shown in graph 1, a majority of participants (54.72%, n=81) had poor awareness, while 27.02% (n=40) exhibited moderate awareness, and 18.24% (n=27) demonstrated good awareness.

Age-wise distribution and impact of the mother's age on awareness

Graph 2 illustrates the age distribution of participants. Most mothers (49.3%) were aged 26 to 30 years, accounting for 73 participants. This was followed by 30 participants (20.2%) in the 20 to 25 age group and 45 participants (30.4%) in the above 30 age group.

Age-wise distribution of mothers

■ 20-25 ■ 26-30 ■ Above 30 ■
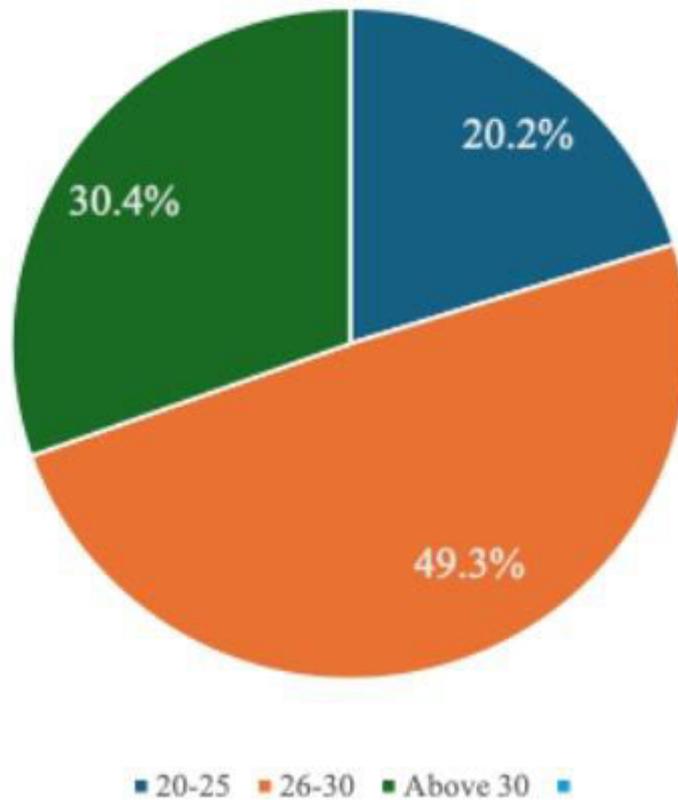
Graph 2: Age-wise distribution of mothers who participated in the study

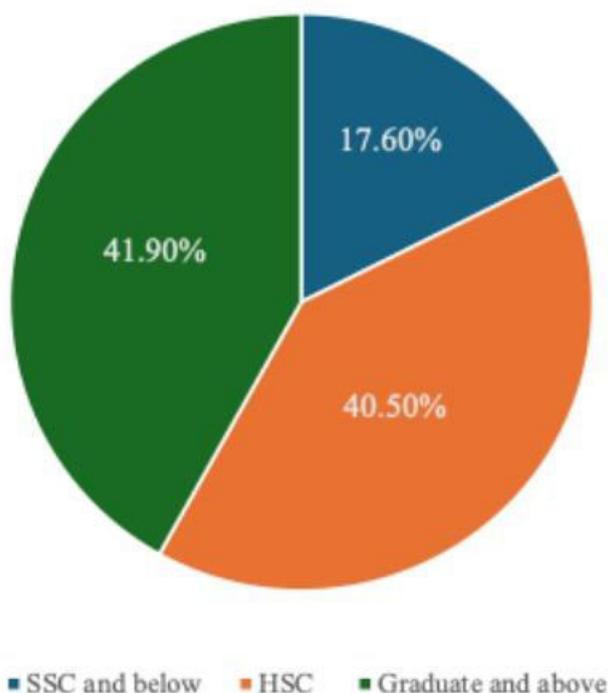| Age group	Poor awareness	Moderate awareness	Good awareness	*Total*
20-25	23	5	2	30
26-30	42	19	12	73
Above 30	16	16	13	45
	81	40	27	**148**

Table 1: Statistical analysis of association between age group and average awareness score

Statistical analysis done using the Chi-square test showed a strong correlation between maternal age and awareness of milestones. The data (Table 1) indicates a statistically significant association between age group and average awareness score (p=0.0056).

Education-wise distribution and impact of mothers' education on awareness
To explore whether a mother's level of education is associated with her awareness of developmental milestones, the participants in the study were grouped into three groups based on their highest level of education:

Education-wise distribution of mothers

Graph 3: The distribution of education levels of the mothers participating in the study

Educational level	Poor awareness	Moderate awareness	Good awareness	*Total*
SSC and below	15	8	3	26
HSC	35	19	6	60
Graduate	31	13	18	62
	81	40	27	**148**

Table 2: Statistical analysis of the association between education level and average awareness score

A Chi-square test was conducted to test the relationship between education level and awareness category. The test yielded a Chi-square statistic (χ^2) of 8.73 with a corresponding p-value of 0.068.

Although the result approaches statistical significance, it does not meet the alpha level of 0.05, suggesting that the observed association between a mother's education level and her awareness of developmental milestones is not statistically significant.

However, some previous studies indicate that higher educational attainment may be associated with better awareness. The results contradict this observation, warranting further investigation with a larger and varied sample size to confirm these findings.

Maternal parity and its impact on awareness
The impact of maternal parity on the mother's awareness and knowledge was assessed by classifying the subjects into two categories:

Maternal parity of surveyed mothers

First child   More than one children
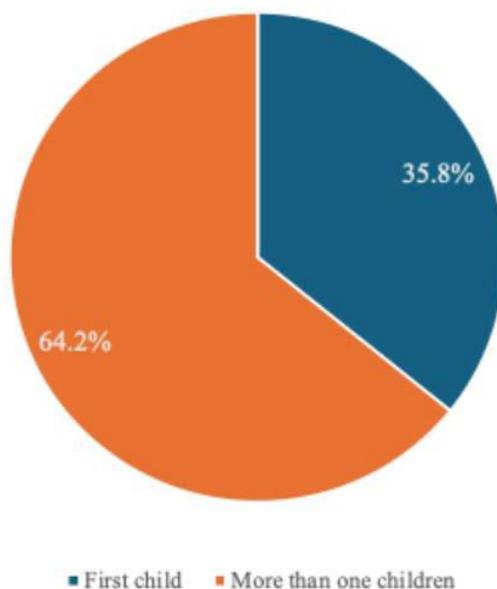
Graph 4: Maternal parity of mothers surveyed

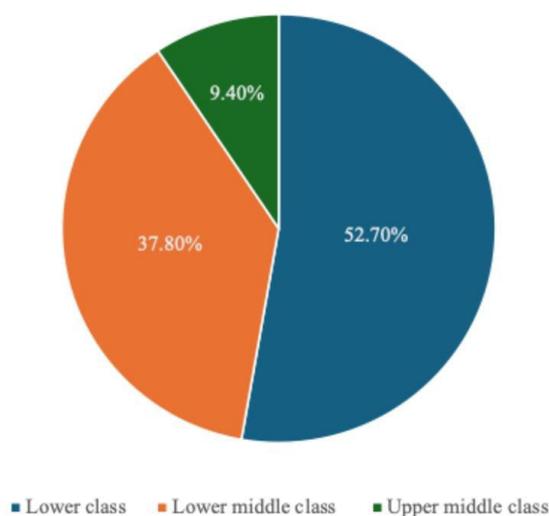| Maternal parity	Poor awareness	Moderate awareness	Good awareness	*Total*
First child	41	9	3	53
More than one children	40	31	24	95
	81	40	27	**148**

Table 3: Statistical analysis of the association between maternal parity and awareness score

A Chi-square test was then done to determine whether maternal parity significantly affected the overall awareness. The Chi-square statistic (χ^2) was 17.9743 with p=0.000125, suggesting a strong association between maternal parity and awareness about developmental milestones.

Socioeconomic class distribution
Graph 5 presents the socioeconomic class distribution of participants. A majority of mothers (78 participants) belonged to the lower class, 56 participants to the lower-middle class, and 14 participants to the upper class.

Socio-economic class distribution of mothers

Lower class   Lower middle class   Upper middle class

Graph 5: Socio-economic distribution of mothers

Socio-economic class	Poor awareness	Moderate awareness	Good awareness	*Total*
Lower class	44	22	12	78
Lower-middle class	30	15	11	56
Upper-middle class	7	3	14	14
	81	40	27	**148**

Table 4: Statistical analysis of association between mother's socio-economic class and awareness score

A Chi-square test was run to determine the effect of the socioeconomic background of the mothers on the level of awareness. The Chi-square statistic (χ^2) was found to be 19.5934 atp=.000601, indicating a strong correlation between the mother's socioeconomic class and the awareness about developmental milestones.

DISCUSSION

The study explored maternal awareness of early developmental milestones and their association with key socio-demographic factors in a tertiary care hospital's rural population in central India. To our knowledge, this is among the first studies in this region to specifically assess mothers' knowledge of childhood developmental domains and their influencing factors.

Our findings from the study indicate that a significant proportion of mothers exhibited limited awareness regarding developmental milestones. Specifically, more than half (54.72%) had poor awareness, 27.02% had moderate awareness, and only 18.24% demonstrated good awareness. These findings are concerning, given the critical role of early parental recognition in identifying developmental delays and ensuring timely intervention.

Our data also revealed distinct gaps in knowledge across developmental domains. While awareness of gross motor and language skills was relatively moderate, 67.57% and 60.13% of mothers showed moderate understanding. Awareness of cognitive (57.53%) and fine motor (52%) milestones was notably poor.

This finding is consistent with previous regional and international studies, which report that cognitive and fine motor development are often under-recognized domains among caregivers (11). These gaps may stem from the subtler nature of cognitive milestones or limited access to parenting education resources in rural communities.

A statistically significant association was found between the mother's age and awareness levels ($\chi^2 = 10.420$, p = 0.0056). Mothers aged above 30 showed comparatively better awareness than younger age groups. This may be attributed to greater life experience, exposure to previous parenting, or increased health-seeking behavior among older mothers.

Interestingly, while some international studies report no significant link between parental age and children's developmental outcomes (11), our findings suggest that age may influence maternal knowledge, at least regarding awareness and recognition.

Although a trend toward better awareness was observed among mothers with higher education, the association between education level and awareness did not reach statistical significance ($\chi^2 = 8.73$, p = 0.068). This finding diverges slightly from other studies, such as those conducted in Gulf countries and South Asia (12), where maternal education has significantly impacted awareness and timely recognition of developmental milestones (13).

The near-significance in our data suggests that this relationship may become more evident with a larger sample size. The quality and relevance of educational curricula in the local context may also influence the actual awareness, despite formal qualifications.

A strong association was found between maternal parity and developmental milestone awareness ($\chi^2 = 17.97$, p = 0.0001), with mothers with more than one child demonstrating significantly higher awareness than first-time mothers. This supports the hypothesis that parenting experience contributes to knowledge acquisition, consistent with findings from similar studies conducted in India and other LMICs (14).

First-time mothers may rely more heavily on social or institutional guidance, whereas experienced mothers draw from personal experience and accumulated knowledge.

Socioeconomic background also significantly influenced maternal awareness ($\chi^2 = 19.59$, p = 0.0006). Mothers from higher socioeconomic classes demonstrated greater knowledge of developmental milestones. These findings reflect existing literature

that links socioeconomic status to health literacy, access to educational resources, and parenting support systems (15).

Lower-income families may face structural barriers, including limited time, lower access to healthcare, and fewer educational opportunities, that hinder their capacity to gain and apply knowledge about child development.

LIMITATIONS
The cross-sectional nature of the study prevents us from inferring causality. Also, the reliance on self-reported awareness may introduce reporting bias.

Furthermore, the study sample was limited to mothers attending a tertiary care hospital, potentially excluding home-bound populations with differing knowledge levels.

Despite these limitations, this research provides crucial baseline data on maternal awareness in a rural Indian context and highlights key areas for future intervention.

Implications and Future Directions
The findings underscore the immediate need for targeted public health interventions, especially for first-time mothers, those with lower educational backgrounds, and those from socioeconomically disadvantaged communities.

Awareness campaigns, community health worker initiatives, and hospital-based parent education sessions could bridge existing knowledge gaps.

Future research should include more extensive and diverse populations, explore paternal awareness, and assess the effectiveness of educational interventions over time.

CONCLUSION
Based on the results, this study reveals that developmental milestone awareness among women in rural areas is an area of concern. The gaps identified in our study highlight the urgent need to carry out effective health education programs.

Ethics
The study was approved and reviewed by the institutional ethical committee.

Acknowledgements
The authors would like to acknowledge the families of the participating women in the study.

Conflict of Interest
The authors declare no conflicts of interest.

Author Contributions Statement
Ira Indurkar: Writing- Original draft, visualization, resources, conceptualization, formal analysis, and investigation.

Vedanti Nemad: Writing - editing, and reviewing, investigation, data analysis Shubhangi Shambharkar: Writing - editing, and reviewing, data analysis Yogita Shrivas: Writing - editing, and reviewing

Data Availability
The raw data can be obtained from the authors upon request.

REFERENCES
1. Varghese SS, Joseph M, Gohil R, Thomas S, Jose SM, Lukose P, et al. How aware are mothers about early childhood developmental milestones? A cross-sectional study at a maternity hospital in rural South India. Indian J Child Health. 2020 Nov 29;7(11):441–5.
2. Sheel H, Suárez L, Marsh NV. The Use of the Parents' Evaluation of Developmental Status and Developmental Milestones in Screening Children for Developmental Delay in India. Children. 2024 Dec;11(12):1530.
3. Wiesel TN, Hubel DH. Comparison of the effects of unilateral and bilateral eye closure on cortical unit responses in kittens. J Neurophysiol. 1965 Nov;28(6):1029–40.
4. Tan JSY, Lim CBS. The development of gross motor skills in children: Insights from the Motor Assessment Test for Children. J Exp Child Psychol. 2025 Apr 11;256:106255.
5. Awad MYH, Warasna HJM, Shahin FBY, Awad BYH, Jobran AWM, Abdulrazzak M, et al.
6. Understanding parental awareness of child developmental milestones in West Bank- Palestine: a cross-sectional study. BMC Public Health. 2025 Mar 24;25(1):1128.
7. Developmental difficulties in early childhood: prevention, early identification, assessment and intervention in low- and middle-income countries: a review [Internet]. [cited 2025 Apr 22]. Available from: https://www.who.int/publications/i/item/9789241503549

8. UNICEF Programme Guidance for Early Childhood Development | UNICEF [Internet]. [cited 2025 Apr 22]. Available from: https://www.unicef.org/documents/unicef- programme-guidance-early-childhood-development

9. Chauhan S, Prasad PL, Rai PL, Khurana B. Parental Perceptions Influencing the Utilization of Early Intervention Services in Children with Developmental Delay. J Nepal Paediatr Soc. 2017 Oct 4;37(1):51–8.

10. Booij L, Nicolosi M. Early childhood care, support and research: how early screening and longitudinal studies can help children thrive. J Pediatr (Rio J). 2021 May 18;97(6):579– 81.

11. Montedori KT, Lima MCMP. Early childhood development monitoring during the first thousand days: Investigating the relationship between the developmental surveillance instrument and standardized scales. Early Hum Dev. 2024 Mar;190:105965.

12. Aldayel AS, Aldayel AA, Almutairi AM, Alhussain HA, Alwehaibi SA, Almutairi TA. Parental Knowledge of Children's Developmental Milestones in Riyadh, Saudi Arabia. Int J Pediatr. 2020 Oct 22;2020:8889912.

13. Habbash AS, Qatomah A, Al-Doban R, Asiri R. Parental knowledge of children's developmental milestones in Aseer, Saudi Arabia. J Fam Med Prim Care. 2022 Sep;11(9):5093.

14. Maternal knowledge of child development and quality of parenting among White, African-American and Hispanic mothers - ScienceDirect [Internet]. [cited 2025 Apr 22]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S019339730400142X

15. Basak P. Parental Behavior and Child Schooling aMicro Level Study in Rural West Bengal, India. J Econ Econ Educ Res. 2022 Aug 15;23(4S):1–15.

16. Pathways among Caregiver Education, Household Resources, and Infant Growth in 39 Low- and Middle-Income Countries - PubMed [Internet]. [cited 2025 Apr 22]. Available from: https://pubmed.ncbi.nlm.nih.gov/26273231/