

Knowledge Related to Childhood Developmental Milestones Among Mothers in Mirpurkhas

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ABSTRACT

Background: Maternal knowledge of developmental milestones supports age-appropriate stimulation, early recognition of developmental concerns, and timely referral; however, evidence from Mirpurkhas is limited. **Objective:** To assess knowledge of childhood developmental milestones among mothers in Mirpurkhas and examine its association with maternal sociodemographic characteristics. **Methods:** This facility-based cross-sectional study included 200 mothers of children aged up to two years recruited through convenience sampling from private and government healthcare centres. Knowledge was assessed using the 20-item Caregiver Knowledge of Child Development Inventory. Descriptive statistics and chi-square tests were applied using IBM SPSS Statistics version 29.0. **Results:** Poor, average, and good knowledge were observed in 92 (46.0%), 44 (22.0%), and 64 (32.0%) mothers, respectively. Independent walking was the most frequently recognized milestone (82.0%), whereas introducing colourful objects to encourage reaching was least frequently identified (8.5%). Educational attainment was significantly associated with knowledge level ($\chi^2(8) = 102.848$, $p < 0.001$; Cramér's $V = 0.507$), as was number of children ($\chi^2(2) = 63.457$, $p < 0.001$; Cramér's $V = 0.563$). Maternal age and employment status were not significantly associated with knowledge. **Conclusion:** Considerable gaps were observed, particularly for early developmental stimulation. Developmental counselling should be incorporated into routine maternal and child-health services. **Keywords:** Child Development; Developmental Milestones; Maternal Knowledge; Early Childhood Development; Caregivers; Mirpurkhas.

INTRODUCTION

Early childhood development is a dynamic process involving the progressive acquisition of cognitive, language, motor, social-emotional, and adaptive abilities. The first years of life are particularly important because rapid brain development and interaction with the caregiving environment establish foundations for later health, learning, behaviour, and social functioning (1,2). Developmental milestones represent observable skills that most children acquire within expected age ranges and provide a practical framework for monitoring developmental progress. Although the timing of milestone attainment varies among children, a persistent delay in one or more developmental domains may indicate the need for formal developmental assessment and early intervention (3).

Parents and caregivers play an important role in developmental surveillance because they observe children across daily activities and are often the first to notice developmental concerns. Adequate knowledge of expected milestones can help caregivers provide age-appropriate stimulation, develop realistic expectations, recognize potential developmental concerns, and seek professional assessment in

a timely manner (4). Conversely, limited knowledge may lead caregivers to overlook early warning signs, delay help-seeking, or expect developmental skills either earlier or later than is appropriate for the child's age. Maternal knowledge is especially relevant in settings where mothers commonly provide most of the direct care during infancy and early childhood.

International evidence indicates that parental knowledge is often greater for visible physical milestones, such as sitting and walking, than for cognitive, language, social-emotional, and early stimulation milestones. A population-based survey in Canada found that adults were considerably more knowledgeable about physical development than cognitive, social, and emotional development (5). Similarly, research from Saudi Arabia reported poor parental knowledge across several developmental domains, with relatively greater awareness of physical milestones than cognitive or socio-emotional development (6). Studies conducted in other Middle Eastern and South Asian settings have also identified gaps in maternal understanding of early communication, fine-motor, social, and developmental stimulation activities.

Evidence from Pakistan remains limited but suggests that parental knowledge of child development is inadequate in several domains. A study conducted in Faisalabad and Jaranwala found that mothers demonstrated better knowledge of sensory and motor development than of language and cognitive development (7). More recently, a study of parents in Karachi reported substantial gaps in knowledge of gross-motor, fine-motor, language, and social developmental milestones and developmental warning signs among children aged up to five years (8). These findings demonstrate the need for locally relevant evidence because caregiver knowledge may differ according to educational attainment, previous parenting experience, access to health information, healthcare use, and sociocultural context.

Mirpurkhas includes urban, peri-urban, and surrounding rural communities with differing levels of access to maternal and child-health information. However, evidence regarding maternal knowledge of childhood developmental milestones in this district is scarce. Identifying specific knowledge gaps and the sociodemographic characteristics associated with them may support the development of focused caregiver-education strategies within maternal, paediatric, primary-care, and community-health services. Therefore, this study aimed to assess knowledge of childhood developmental milestones among mothers of children aged up to two years in Mirpurkhas and to examine the association of knowledge level with maternal age, educational attainment, employment status, and number of children.

MATERIALS AND METHODS

A facility-based cross-sectional study was conducted among mothers attending selected private and government healthcare centres in Mirpurkhas, Sindh, Pakistan. The study was completed over six months following approval of the research synopsis, while participant recruitment and questionnaire administration were conducted over approximately two weeks. The target population comprised mothers residing in Mirpurkhas who had at least one child aged up to two years.

Mothers were eligible to participate if they were residents of Mirpurkhas, had a child aged two years or younger, were able to understand the study instructions, and provided informed consent. Mothers with children older than two years and those with a previously diagnosed mental disorder that could interfere with their ability to understand or complete the questionnaire were excluded. Participants were selected through non-probability convenience sampling from mothers visiting the participating healthcare facilities during the data-collection period. A total of 200 eligible mothers were enrolled and included in the analysis.

Before data collection, eligible mothers were approached at the participating healthcare centres and informed about the purpose and procedures of the study. Mothers who agreed to participate received an explanation of the questionnaire and instructions for completing it. Completed questionnaires were collected and reviewed for completeness before data entry. Participation was voluntary, and mothers

were informed that they could decline or discontinue participation without any effect on the healthcare services available to them.

Data were collected using a sociodemographic form and the Caregiver Knowledge of Child Development Inventory. The sociodemographic form recorded maternal age, educational attainment, employment status, and number of children. Maternal age was categorized as 20–25, 26–30, 31–35, and 36–40 years. Educational attainment was recorded as primary, middle school, high school, undergraduate, or graduate. Employment status was categorized as employed or unemployed, and number of children was categorized as one or two or more.

The Caregiver Knowledge of Child Development Inventory comprised 20 items assessing caregivers' knowledge of childhood development. The first 10 items evaluated knowledge of the expected timing of developmental skills, including visual, communication, social, fine-motor, and gross-motor milestones. The remaining 10 items assessed knowledge of the appropriate timing of developmental stimulation activities, including talking to children, introducing colourful objects, encouraging supported sitting, providing safe objects for exploration, looking at books, and introducing drawing and self-feeding activities. The age ranges used to determine correct responses were based on established child-development guidance and the Guide for Monitoring Child Development (9,10).

Each response falling within the specified normative age range was assigned a score of 2, whereas a response outside that range was assigned a score of 0. The possible total score therefore ranged from 0 to 40, with higher scores indicating greater knowledge of childhood developmental skills and stimulation practices. Knowledge levels were categorized using the sample distribution. Scores below the 33rd percentile were classified as poor, scores from the 33rd to below the 66th percentile were classified as average, and scores at or above the 66th percentile were classified as good. In the analysed sample, these percentile-based categories corresponded to the score boundaries used to classify the 200 participants into poor, average, and good knowledge groups.

Data were entered and analysed using IBM SPSS Statistics version 29.0. Categorical variables were summarized as frequencies and percentages. The total knowledge score was summarized using the median and observed range because the manuscript analysis was based on percentile-derived categories. Item-level performance was presented as the number and percentage of mothers who provided correct responses. Associations between maternal knowledge level and maternal age, educational attainment, employment status, and number of children were evaluated using chi-square tests. Statistical significance was set at $p < 0.05$. Because some demographic categories contained small numbers of participants, particularly the oldest maternal-age category and the undergraduate education category, the validity of chi-square assumptions should be confirmed during final statistical verification, with category consolidation or an exact test applied where required.

Ethical approval was obtained from the relevant ethical review committee of the Bhitai Institute of Physiotherapy and Rehabilitation Sciences, Mirpurkhas, before participant recruitment. Mothers received an explanation of the study and provided informed consent before completing the questionnaire. Participation was voluntary, and participants retained the right to withdraw without disadvantage. No names were used in the analysis, and the collected information was coded, maintained confidentially, and used solely for research purposes.

RESULTS

All 200 enrolled mothers completed the questionnaire and were included in the analysis. Most participants were aged 20–25 years (60.5%), had primary-level education (48.0%), were unemployed (78.5%), and had two or more children (66.0%) (Table 1). Item-level analysis demonstrated substantial variation in maternal knowledge across developmental skills and stimulation activities. Independent walking with good coordination was the most frequently recognized developmental milestone, with 164

mothers (82.0%) identifying the correct age range. Social smiling was correctly identified by 92 mothers (46.0%), while 81 (40.5%) correctly identified the age at which children begin to use single meaningful words.

Table 1. Sociodemographic Characteristics of Participating Mothers (n = 200)

Characteristic	Category	n (%)
Maternal age, years	20–25	121 (60.5)
	26–30	48 (24.0)
	31–35	30 (15.0)
	36–40	1 (0.5)
Educational attainment	Primary	96 (48.0)
	Middle school	22 (11.0)
	High school	25 (12.5)
	Undergraduate	3 (1.5)
Employment status	Graduate	54 (27.0)
	Employed	43 (21.5)
Number of children	Unemployed	157 (78.5)
	One	68 (34.0)
	Two or more	132 (66.0)

Knowledge was lower for several early developmental skills. Only 39 mothers (19.5%) correctly identified the age at which children begin reaching for a toy, 52 (26.0%) correctly identified the onset of imaginary play, and 57 (28.5%) correctly identified the age at which children begin vocalizing in response to speech. Within the developmental stimulation component, only 17 mothers (8.5%) correctly identified when colourful objects should be introduced to encourage reaching. Supported sitting and shared book-viewing were each correctly identified by 41 mothers (20.5%). Talking to children from intrauterine life or birth was correctly identified by 51 mothers (25.5%) (Table 2).

Table 2. Correct Responses to Caregiver Knowledge of Child Development Inventory Items (n = 200)

Component	Item	Normative age range	Correct response, n (%)
Developmental skills	Brain begins to develop and learn	Intrauterine period or birth	70 (35.0)
	Child begins to see	Intrauterine period or birth	74 (37.0)
	Follows a moving person or toy with the eyes	Birth–2 months	67 (33.5)
	Vocalizes in response to someone talking	Birth–2 months	57 (28.5)
	Smiles socially at another person	Birth–2 months	92 (46.0)
	Says single meaningful words	9–14 months	81 (40.5)
	Engages in imaginary play	12–24 months	52 (26.0)
	Reaches for a toy	4–5 months	39 (19.5)
	Grasps small objects with fingertips	7–9 months	60 (30.0)
	Walks independently with good coordination	10–15 months	164 (82.0)
Developmental stimulation	Mother begins talking to the child	Intrauterine period or birth	51 (25.5)
	Colourful objects introduced to encourage reaching	0–4 months	17 (8.5)
	Counting activities introduced	12–24 months	70 (35.0)
	Colour-learning activities introduced	12–24 months	68 (34.0)
	Spoon or fork introduced for independent eating	9–12 months	54 (27.0)
	Paper and crayons introduced	12–24 months	71 (35.5)
	Supported sitting introduced	3–4 months	41 (20.5)
	Safe objects introduced for mouthing	4–6 months	59 (29.5)
	Shared book-viewing introduced	4–6 months	41 (20.5)
	Safe household objects introduced for play	4–6 months	62 (31.0)

The median total knowledge score was 12, and the highest observed score was 32 of a possible 40. Based on the percentile-derived classification used in the study, 92 mothers (46.0%) were categorized as having poor knowledge, 44 (22.0%) as having average knowledge, and 64 (32.0%) as having good knowledge (Table 3). Knowledge levels were classified according to the percentile-based score categories used in the study. The precise numerical boundaries should be stated in the final manuscript after verification against the original scoring output.

Maternal educational attainment was significantly associated with knowledge level ($\chi^2(8) = 102.848$, $p < 0.001$; Cramér's $V = 0.507$). Good knowledge was observed in 46 of 54 graduates (85.2%), compared with 11 of 96 mothers with primary education (11.5%), 2 of 22 with middle-school education (9.1%), and 3 of 25 with high-school education (12.0%).

Table 3. Distribution of Maternal Knowledge Levels (n = 200)

Knowledge level	n (%)
Poor	92 (46.0)
Average	44 (22.0)
Good	64 (32.0)
Total	200 (100.0)

The number of children was also significantly associated with knowledge level ($\chi^2(2) = 63.457$, $p < 0.001$; Cramér's $V = 0.563$). None of the 68 mothers with one child were classified as having good knowledge, whereas 64 of 132 mothers with two or more children (48.5%) were classified in the good-knowledge category. Poor knowledge was observed in 56 mothers with one child (82.4%) compared with 36 mothers with two or more children (27.3%).

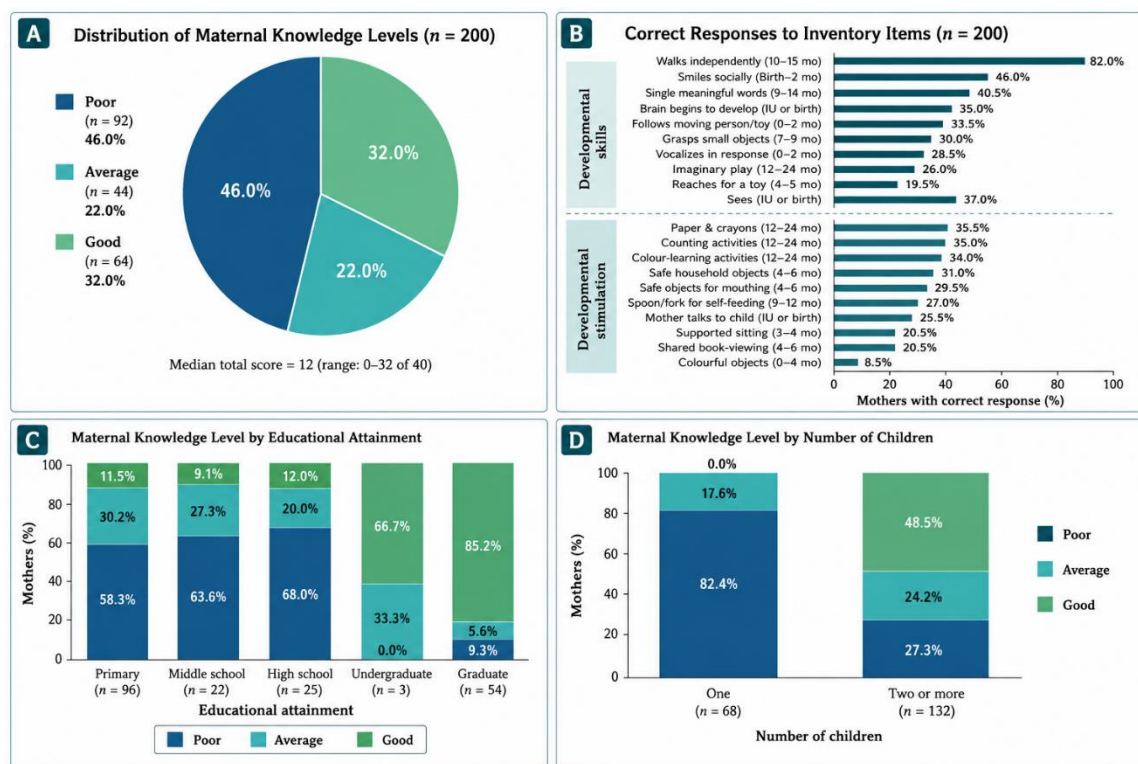


Figure 1 The multipanel figure shows that 46.0% of mothers had poor knowledge, 22.0% had average knowledge, and 32.0% had good knowledge. Correct responses were highest for independent walking (82.0%) and lowest for introducing colourful objects to encourage reaching (8.5%). Knowledge improved markedly with higher educational attainment, with 85.2% of graduates demonstrating good knowledge, while mothers with two or more children also showed substantially better knowledge than first-time mothers.

No statistically significant association was observed between maternal age and knowledge level ($\chi^2(6) = 6.908$, $p = 0.329$; Cramér's $V = 0.131$) or between employment status and knowledge level ($\chi^2(2) = 1.138$, $p = 0.566$; Cramér's $V = 0.075$) (Table 4).

Table 4. Association Between Sociodemographic Characteristics and Maternal Knowledge Level

Characteristic	Category	Poor, n (%)	Average, n (%)	Good, n (%)	χ^2 (df)	p-value	Cramér's V
Maternal age, years	20–25	50 (41.3)	29 (24.0)	42 (34.7)	6.908 (6)	0.329	0.131
	26–30	28 (58.3)	7 (14.6)	13 (27.1)			
	31–35	14 (46.7)	8 (26.7)	8 (26.7)			
	36–40	0 (0.0)	0 (0.0)	1 (100.0)			
	Graduate	0 (0.0)	0 (0.0)	1 (100.0)			
Educational attainment	Primary	56 (58.3)	29 (30.2)	11 (11.5)	102.848 (8)	<0.001	0.507

Characteristic	Category	Poor, n (%)	Average, n (%)	Good, n (%)	χ^2 (df)	p-value	Cramér's V
Employment status	Middle school	14 (63.6)	6 (27.3)	2 (9.1)	1.138 (2)	0.566	0.075
	High school	17 (68.0)	5 (20.0)	3 (12.0)			
	Undergraduate	0 (0.0)	1 (33.3)	2 (66.7)			
	Graduate	5 (9.3)	3 (5.6)	46 (85.2)			
	Employed	22 (51.2)	7 (16.3)	14 (32.6)			
	Unemployed	70 (44.6)	37 (23.6)	50 (31.8)			
Number of children	One	56 (82.4)	12 (17.6)	0 (0.0)	63.457 (2)	<0.001	0.563
	Two or more	36 (27.3)	32 (24.2)	64 (48.5)			

Percentages are calculated within each sociodemographic category. Cramér's V was derived from the reported chi-square statistic and total sample size. Values approaching 0 indicate weaker associations, whereas larger values indicate stronger associations.

DISCUSSION

The present study identified substantial gaps in maternal knowledge of childhood developmental milestones among mothers attending healthcare centres in Mirpurkhas. Almost half of the participants were classified as having poor knowledge, whereas approximately one-third demonstrated good knowledge. Knowledge varied markedly across individual milestones. Independent walking was correctly recognized by most mothers, whereas early developmental skills and stimulation activities—including reaching for objects, supported sitting, responsive vocalization, shared book-viewing, and the early introduction of colourful objects—were correctly identified by relatively few participants. Educational attainment and number of children were significantly associated with knowledge level, while maternal age and employment status were not.

The greater recognition of independent walking compared with earlier developmental milestones is consistent with previous research showing that caregivers generally recognize highly visible gross-motor achievements more readily than cognitive, language, fine-motor, and socio-emotional milestones. Ertem et al. similarly found that walking was among the milestones most frequently identified correctly by mothers in a developing-country setting (11). Population-based evidence from Canada and Saudi Arabia has also shown that parental knowledge tends to be greater for physical development than for cognitive, emotional, and social development (5,6). Walking is a prominent and culturally discussed developmental event, whereas early visual tracking, vocal responsiveness, fine-motor exploration, and parent-child interaction may be less readily recognized as meaningful developmental indicators.

Knowledge of early developmental stimulation was particularly limited. Only 8.5% of mothers correctly identified the appropriate period for introducing colourful objects to encourage reaching, while approximately one-fifth correctly identified the timing of supported sitting and shared book-viewing. These findings suggest that many mothers may recognize development primarily as the spontaneous acquisition of physical skills rather than as a process that can be supported through responsive interaction and age-appropriate stimulation. Similar gaps in knowledge of language, cognitive, fine-motor, and social stimulation have been reported among mothers in the United Arab Emirates, Saudi Arabia, Jordan, and Nepal (12–16). Limited counselling during routine maternal and child-health visits, reliance on informal family advice, and greater public emphasis on feeding, vaccination, and physical growth may partly explain why early stimulation activities receive less attention.

The overall distribution of knowledge in the present study differed from some previous South Asian studies. Marahatta and Bajracharya reported that most Nepalese mothers had average knowledge, with only a smaller proportion demonstrating adequate knowledge (12). Suresh et al. also found that most mothers in a rural Indian population had average knowledge and relatively few had poor knowledge (13). By contrast, 46.0% of participants in the current study were categorized as having poor knowledge. Differences in study populations, maternal education, healthcare access, child-age eligibility, sampling strategies, instruments, and score-classification criteria may account for this variation. In particular, the present study used sample-based percentile categories; therefore, the proportions classified as poor,

average, and good should not be interpreted as directly equivalent to categories used in studies applying predetermined cut-off scores.

Educational attainment showed a significant association with maternal knowledge. Good knowledge was observed in 85.2% of graduates but in only 11.5% of mothers with primary education. The magnitude of this association was comparatively large based on the derived Cramér's V of 0.507. Higher educational attainment may improve health literacy, comprehension of developmental information, ability to evaluate information sources, and access to printed or digital parenting resources. Similar associations between education and parental developmental knowledge have been reported in Saudi Arabia and other settings (6,15). However, some studies have found no significant relationship between maternal education and milestone knowledge (7,16), indicating that formal education alone does not ensure access to accurate child-development information. Differences in healthcare counselling, cultural expectations, instrument sensitivity, and sample composition may explain these inconsistent findings.

The number of children was also significantly associated with knowledge level, with a derived Cramér's V of 0.563. None of the mothers with one child were classified as having good knowledge, compared with 48.5% of mothers with two or more children. This direction of association suggests that previous caregiving experience may improve familiarity with developmental progression and opportunities for stimulation. Mothers caring for multiple children may have greater exposure to healthcare professionals, vaccination services, family advice, and direct observation of developmental variation. Nevertheless, this association should not be interpreted causally because parity or number of children may be related to maternal age, education, family structure, and healthcare use. Multivariable analysis would be required to determine whether previous parenting experience remains independently associated with knowledge after adjustment for these factors.

Maternal age was not significantly associated with knowledge, and the corresponding effect size was weak. This finding may reflect the concentration of participants in the 20–25-year age category and the very small number of mothers in the oldest category. The sparse distribution limited the study's ability to detect a stable age-related pattern. Employment status was also not associated with knowledge level, suggesting that employment alone may not determine exposure to reliable developmental information. Similar non-significant findings for selected sociodemographic variables have been reported in Pakistan, the United Arab Emirates, and Jordan (7,14,16). The type of employment, educational demands of the occupation, access to childcare information, household resources, and social support may be more informative than a simple employed–unemployed classification.

The findings have practical implications for maternal and child-health services in Mirpurkhas. Routine antenatal, postnatal, vaccination, paediatric, rehabilitation, and primary-care encounters provide opportunities to educate caregivers about early developmental milestones and responsive stimulation. Educational material should extend beyond walking and other visible motor skills and should emphasize early communication, visual engagement, reaching, play, supported positioning, book-sharing, and safe object exploration. Mothers with lower educational attainment and first-time mothers may particularly benefit from simple, culturally appropriate counselling supported by visual materials and demonstrations. Healthcare professionals should also encourage caregivers to seek assessment when milestone concerns arise rather than relying exclusively on informal reassurance.

This study contributes district-level evidence from an understudied population and provides item-level information across both developmental skills and developmental stimulation. Nevertheless, several limitations should be considered. Participants were recruited through non-probability convenience sampling from healthcare facilities; therefore, they may differ from mothers who do not attend such centres, and the findings cannot be generalized to all mothers in Mirpurkhas. The cross-sectional design establishes associations but cannot determine causality. The use of sample-derived percentile categories limits comparability with studies using validated absolute thresholds. Some demographic categories contained very small numbers, potentially affecting chi-square assumptions. The analysis was bivariate

and did not adjust for confounding. The manuscript also did not provide sufficient information regarding local-language translation, cultural adaptation, or reliability testing of the questionnaire. Finally, responses may have been affected by recall, interpretation, or social-desirability bias. Future studies should use broader community-based probability sampling, locally validated instruments, continuous-score and multivariable analyses, and qualitative methods to explore barriers to maternal developmental knowledge.

CONCLUSION

A substantial proportion of mothers attending healthcare centres in Mirpurkhas had limited knowledge of childhood developmental milestones, particularly early developmental stimulation, fine-motor, communication, and interactive activities. Independent walking was widely recognized, whereas the appropriate timing of introducing colourful objects, supported sitting, reaching, responsive communication, and shared book-viewing was less frequently identified. Maternal education and number of children were significantly associated with knowledge level, while age and employment status were not. These findings support the integration of accessible, culturally appropriate developmental counselling into maternal, paediatric, vaccination, and primary-care services, with particular attention to mothers with lower educational attainment and limited previous parenting experience.

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