

Relationship Between Communication, Behavioral and Cognitive Skills with Age and Gender in Preschool Children

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ABSTRACT

Background: Communication, behavioral-emotional regulation, and cognitive abilities develop rapidly during the preschool years and contribute to children's participation in social and educational environments. **Objective:** To describe communication, behavioral-emotional, and cognitive characteristics among preschool children and examine their relationship with age and gender. **Methods:** This observational cross-sectional study included 377 preschool children recruited through purposive sampling from private schools. Children underwent an approximately 30-minute individual observation using a 27-item checklist assessing pre-linguistic, communication, behavioral-emotional, and cognitive characteristics. Data were analysed using IBM SPSS Statistics version 27.0 and summarized as frequencies, percentages, and mean $\pm$ standard deviation. **Results:** Of the participants, 209 (55.4%) were boys, 317 (84.1%) were aged 3.0–4.0 years, and 340 (90.2%) demonstrated pre-linguistic skills. Across most behavioral-emotional, cognitive, and communication items, 77.5%–78.0% were rated as never experiencing the specified difficulty. Difficulties occurring at least sometimes were observed in peer relationships in 81 (21.5%), social withdrawal in 82 (21.8%), emotional regulation in 78 (20.7%), and reciprocal communication in 78 (20.7%) children. The overall checklist reliability was limited (Cronbach's $\alpha = 0.520$). **Conclusion:** Most children were not frequently rated as experiencing the assessed difficulties, although a meaningful minority showed concerns warranting further evaluation. The available analysis did not establish relationships with age or gender. **Keywords:** Preschool children; communication skills; emotional regulation; cognitive development; social communication; developmental surveillance.

INTRODUCTION

The preschool period represents a critical stage of rapid development in communication, cognition, behavioral regulation, and social-emotional functioning. During these years, children acquire foundational abilities that influence their participation in social interactions, adaptation to structured learning environments, and subsequent academic achievement. Early developmental competencies do not progress independently; communication, cognitive processing, emotional regulation, attention, and social behavior interact continuously and collectively influence children's readiness for formal education (1,2).

Communication competence in preschool children includes the ability to understand spoken language, express needs and ideas, participate in reciprocal interaction, and interpret verbal and nonverbal cues.

Receptive and expressive language skills support vocabulary acquisition, sentence formation, social participation, and the development of early literacy. Difficulties in these areas may restrict children's ability to communicate with peers and adults and may represent early indicators of broader developmental concerns (3–5). Communication competence also encompasses pragmatic abilities, including turn-taking, topic maintenance, eye contact, gesture use, facial-expression recognition, and the adjustment of language according to the social context. Growth in vocabulary and communication skills during the preschool years has been associated with later academic performance and self-regulation, highlighting the importance of identifying communication difficulties before children enter formal schooling (6).

Behavioral-emotional competence refers to children's ability to recognize, express, and regulate emotions, tolerate frustration, adapt to changes, and interact constructively with peers and adults. These abilities enable children to participate in classroom activities, establish relationships, manage challenging tasks, and respond appropriately to social expectations. Poor emotional regulation and behavioral difficulties may manifest as withdrawal, aggression, tantrums, inattentiveness, excessive dependence, or difficulty maintaining peer relationships. Conversely, stronger social-emotional competence has been associated with better prosocial behavior, learning engagement, academic self-confidence, and teacher–child relationships (7–9). Evidence also suggests that social competence may mediate the relationship between language difficulties and social participation, demonstrating the close interdependence of communication and behavioral-emotional development (4).

Cognitive skills encompass attention, memory, reasoning, problem-solving, cognitive flexibility, concept formation, and the ability to organize and use information. In preschool children, these skills support the acquisition of colours, shapes, numbers, letters, routines, and multi-step instructions. Executive functions, particularly working memory, inhibitory control, and cognitive flexibility, contribute to both academic learning and emotional regulation. Studies have demonstrated that self-regulation and executive functioning are associated with early literacy, mathematics, social-emotional competence, language performance, and emotion comprehension (2,10,11). Reasoning and problem-solving abilities also develop progressively during the preschool period and contribute to children's capacity to learn from previous experiences and respond to unfamiliar tasks (12,13).

Developmental performance may vary according to age because communication, cognitive, and behavioral-emotional abilities generally become more complex as children mature and gain greater exposure to structured learning and social environments. Gender-related variations have also been reported in selected aspects of executive functioning, language, emotional regulation, and behavioral presentation, although such patterns are not uniform across populations and may be influenced by family, cultural, educational, and socioeconomic conditions (10,11). Assessment of both age- and gender-related patterns may therefore help distinguish expected developmental variation from difficulties that warrant further evaluation.

Previous research has established relationships among language, executive functions, emotional competence, social behavior, and early academic abilities in preschool populations from several countries (2,4,8–11). However, these domains have often been examined separately or through specialised standardized measures, and findings from international populations may not fully represent children attending local preschool settings. Evidence simultaneously examining communication, behavioral-emotional, and cognitive abilities among preschool children in the local educational context remains limited. A multidomain assessment may provide a broader understanding of developmental functioning and support early recognition of children who may require comprehensive professional evaluation. Therefore, the present study aimed to assess communication, behavioral-emotional, and cognitive skills among preschool children and to examine their relationship with age and gender.

MATERIALS AND METHODS

An observational cross-sectional study was conducted over six months following approval of the research synopsis by the relevant departmental research committee. The study population comprised preschool children enrolled in selected private schools. Children of both genders within the preschool age range represented in the study were considered eligible. The sample included children who were developing typically as well as those presenting with mild-to-moderate developmental difficulties. Children with severe developmental disabilities or neurological conditions that markedly affected communication, language, behavioral-emotional, or cognitive functioning were excluded.

A non-probability purposive sampling technique was used to recruit participants. The required sample size was calculated as 377 children using a 95% confidence level and a 5% margin of error, and all 377 recruited participants were included in the analysis. Permission to conduct the study was obtained from the participating school administrations. Written informed consent was obtained from the parents or legal guardians before assessment, and participation was voluntary. Children were allowed to discontinue the assessment at any stage without penalty.

Data were collected using a structured, investigator-administered checklist designed to assess communication, behavioral-emotional, and cognitive functioning in preschool children. The checklist comprised 27 items and included observations relating to pre-linguistic abilities, expressive communication, speech clarity, reciprocal social communication, interpretation and use of nonverbal cues, participation in group interaction, emotional regulation, frustration tolerance, self-confidence, social withdrawal, disruptive behavior, peer relationships, hyperactivity, separation anxiety, memory, problem-solving, organization, adaptability, attention, and acquisition of basic concepts. Pre-linguistic skills were recorded according to their presence or absence, whereas developmental difficulties were rated according to their observed frequency using ordered response categories ranging from never to very frequently.

Each child participated in an individual observational session lasting approximately 30 minutes. The assessment began with rapport-building activities, including simple play, storytelling, or age-appropriate interaction, to help the child become comfortable with the assessor and assessment environment. Communication abilities were observed through spontaneous conversation, picture-description activities, vocabulary use, speech production, and reciprocal interaction. Cognitive performance was assessed through age-appropriate activities involving recall, puzzles, sorting, matching, recognition of letters and numbers, and completion of simple instructions. Behavioral-emotional functioning was observed throughout the session, with particular attention to social engagement, confidence, frustration tolerance, attention, adaptability, emotional responses, and interaction with adults and peers. Observations were recorded systematically on the checklist immediately during or following each activity to reduce recall error.

Demographic and educational information included the child's age, gender, grade, father's occupation, and admission-test marks. Age and gender were treated as the principal explanatory characteristics, while the communication, behavioral-emotional, and cognitive checklist responses constituted the developmental outcomes of interest. Grade and admission-test performance were recorded to describe the educational characteristics of the participants.

The collected data were reviewed for completeness before entry and analysed using IBM SPSS Statistics version 27.0. Categorical variables were summarized as frequencies and percentages. Admission-test marks were presented using their observed frequency distribution. Internal consistency of the 27-item checklist was evaluated using Cronbach's alpha. All 377 participants had checklist data available for reliability analysis, and the overall Cronbach's alpha coefficient was 0.520. Because the checklist covered several conceptually distinct developmental domains, its findings were interpreted at the item and domain level rather than assuming that all items represented a single homogeneous construct.

The study was conducted in accordance with the ethical requirements of the University of Lahore. The privacy, dignity, and voluntary participation of the children and their families were protected throughout the research. Participant identities were not entered into the analytical dataset, and collected information was treated as confidential. Paper records were stored securely, while electronic data were maintained on a password-protected computer accessible only to the research team. The observational activities were non-invasive and age appropriate, and efforts were made to minimize discomfort, fatigue, anxiety, or stigmatization during assessment.

RESULTS

A total of 377 preschool children were included in the study. Of these, 194 (51.5%) were enrolled in nursery and 183 (48.5%) in play group. Most children were aged 3.0–4.0 years ($n = 317$, 84.1%), while 60 (15.9%) were aged 4.5–5.0 years. Boys constituted 55.4% ($n = 209$) of the sample and girls constituted 44.6% ($n = 168$). Father's occupation was most frequently classified as other employment ($n = 189$, 50.1%) or business ($n = 146$, 38.7%). Admission-test scores were available for 376 children and ranged from 4 to 23 out of 25, with a mean score of 16.52 ± 4.31 . The most frequently observed scores were 20 ($n = 56$, 14.9%), 15 ($n = 53$, 14.1%), and 18 ($n = 40$, 10.6%) (Table 1).

Table 1. Demographic and educational characteristics of the participants

Characteristic	Category	n (%)
Grade	Play group	183 (48.5)
	Nursery	194 (51.5)
Age group, years	3.0–4.0	317 (84.1)
	4.5–5.0	60 (15.9)
Gender	Male	209 (55.4)
	Female	168 (44.6)
Father's occupation	Doctor	7 (1.9)
	Teacher	16 (4.2)
	Lawyer	19 (5.0)
	Business	146 (38.7)
	Other	189 (50.1)
Admission-test score, mean $\pm$ SD		16.52 $\pm$ 4.31
Admission-test score, range		4–23
Admission-test score available		376 (99.7)
Admission-test score missing		1 (0.3)

Pre-linguistic skills were observed in 340 children (90.2%), while these skills were recorded as absent in 37 children (9.8%). Across the eight reported behavioral-emotional items, between 77.5% and 78.0% of children were rated as never exhibiting the assessed difficulty. Difficulty forming or maintaining peer relationships was reported at least sometimes in 81 children (21.5%), while emotional dysregulation was reported at least sometimes in 78 (20.7%). Frustration or giving up when tasks became difficult was observed at least sometimes in 77 children (20.4%), and social withdrawal was observed at least sometimes in 82 children (21.8%). Excessive clinginess or separation anxiety was less frequently rated as often, affecting 9 children (2.4%), and no child was recorded in the very-frequent category for this item (Table 2).

Table 2. Behavioral-emotional characteristics of preschool children

Behavioral-emotional characteristic	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Often, n (%)	Very frequently, n (%)
Becomes frustrated or gives up when tasks become difficult	292 (77.5)	8 (2.1)	33 (8.8)	26 (6.9)	18 (4.8)
Avoids new activities or social interaction because of low self-confidence	292 (77.5)	12 (3.2)	27 (7.2)	27 (7.2)	19 (5.0)
Withdraws from or avoids interaction with peers or adults	292 (77.5)	3 (0.8)	50 (13.3)	22 (5.8)	10 (2.7)
Has difficulty regulating emotions according to the context	292 (77.5)	7 (1.9)	53 (14.1)	21 (5.6)	4 (1.1)

Behavioral-emotional characteristic	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Often, n (%)	Very frequently, n (%)
Displays tantrums, aggression, or inattentiveness in group settings	292 (77.5)	10 (2.7)	49 (13.0)	15 (4.0)	10 (2.7)
Has difficulty forming or maintaining peer relationships	292 (77.5)	4 (1.1)	56 (14.9)	23 (6.1)	2 (0.5)
Exhibits restlessness or hyperactivity beyond expected age levels	293 (77.7)	17 (4.5)	55 (14.6)	11 (2.9)	1 (0.3)
Shows excessive clinginess or separation anxiety	294 (78.0)	37 (9.8)	37 (9.8)	9 (2.4)	0 (0.0)

Percentages were calculated using N = 377.

A similar response pattern was observed for the reported cognitive and communication characteristics. For cognitive items, 77.5%–78.0% of participants were rated as never experiencing the specified difficulty. Difficulty attending to developmentally appropriate tasks was rated as often or very frequently in 33 children (8.8%), while difficulty remembering multi-step instructions or routines was rated as often or very frequently in 32 (8.5%). Difficulty with age-appropriate problem-solving was rated as often or very frequently in 29 children (7.7%). Difficulty organizing materials or managing time was most commonly rated as sometimes, affecting 61 children (16.2%).

For communication items, difficulty expressing thoughts clearly was rated as often or very frequently in 30 children (8.0%), while frequent speech errors or unclear pronunciation were reported at these levels in 23 (6.1%). Difficulty maintaining reciprocal social communication was rated as sometimes in 57 children (15.1%) and as often or very frequently in 21 (5.6%). Reluctance to participate in group discussions or answer questions was rated as often or very frequently in 30 children (8.0%). Overall, 292 children (77.5%) were rated as never experiencing each of the six reported communication difficulties (Table 3).

Table 3. Cognitive and communication characteristics of preschool children

Domain and characteristic	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Often, n (%)	Very frequently, n (%)
Cognitive characteristics					
Difficulty remembering multi-step instructions or routines	292 (77.5)	6 (1.6)	47 (12.5)	29 (7.7)	3 (0.8)
Poor problem-solving skills for age-appropriate tasks	292 (77.5)	9 (2.4)	47 (12.5)	26 (6.9)	3 (0.8)
Difficulty organizing materials or managing time	294 (78.0)	11 (2.9)	61 (16.2)	7 (1.9)	4 (1.1)
Difficulty adapting to changes in routines or learning environments*	292 (77.7)	9 (2.4)	53 (14.1)	19 (5.1)	3 (0.8)
Difficulty attending to tasks for developmentally appropriate periods	292 (77.5)	1 (0.3)	51 (13.5)	32 (8.5)	1 (0.3)
Difficulty acquiring basic concepts, including colours, shapes, numbers, and letters	292 (77.5)	13 (3.4)	54 (14.3)	13 (3.4)	5 (1.3)
Communication characteristics					
Difficulty expressing thoughts clearly using complete sentences	292 (77.5)	5 (1.3)	50 (13.3)	25 (6.6)	5 (1.3)
Frequent speech errors or unclear pronunciation	292 (77.5)	7 (1.9)	55 (14.6)	18 (4.8)	5 (1.3)
Difficulty maintaining reciprocal social communication	292 (77.5)	7 (1.9)	57 (15.1)	19 (5.0)	2 (0.5)
Difficulty understanding or using facial expressions and gestures	292 (77.5)	15 (4.0)	47 (12.5)	18 (4.8)	5 (1.3)
Reluctance to participate in group discussions or answer questions	292 (77.5)	3 (0.8)	52 (13.8)	19 (5.0)	11 (2.9)
Limited ability to ask questions or clarify misunderstandings	292 (77.5)	0 (0.0)	53 (14.1)	22 (5.8)	10 (2.7)

The internal consistency coefficient reported for the complete 27-item checklist was Cronbach's alpha = 0.520. This coefficient indicated limited internal consistency when all checklist items were treated as a single scale. Given that the instrument assessed several distinct areas of development, the reported item-level findings were retained without combining them into an overall developmental score.

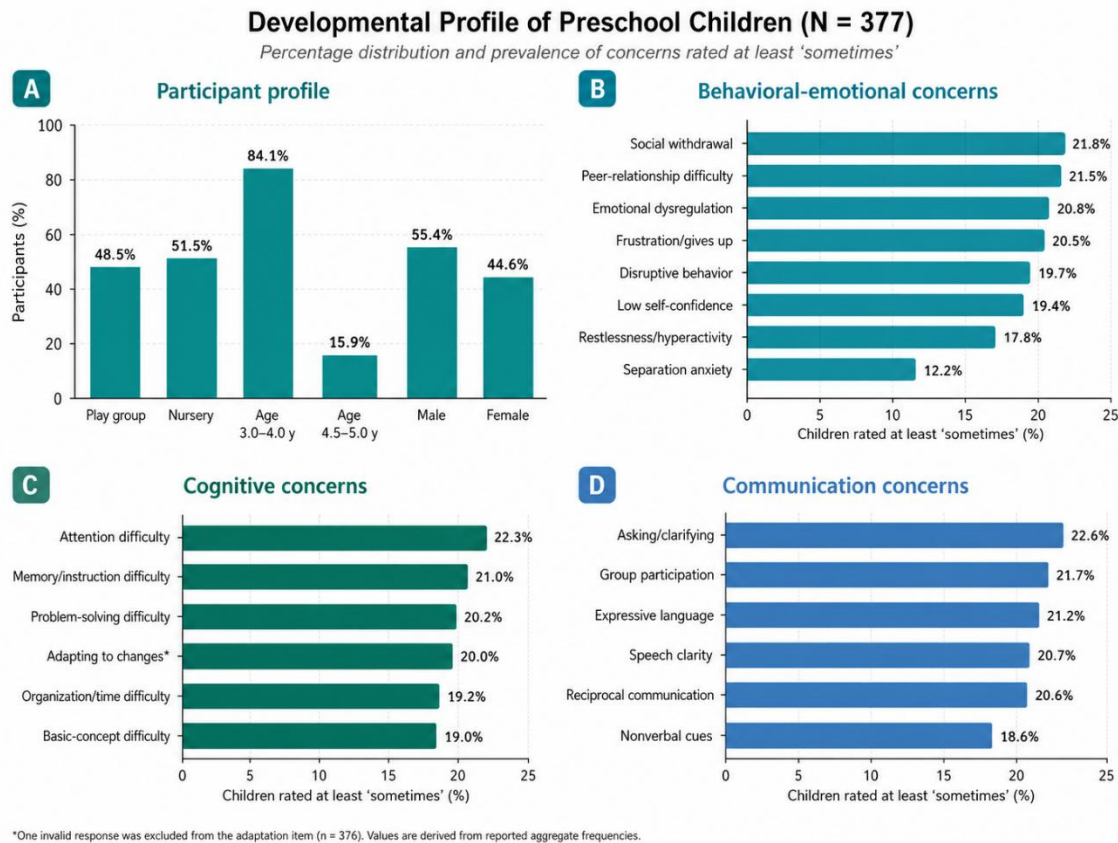


Figure 1 Developmental profile and reported concerns among preschool children. Panel A presents the demographic and educational composition of the 377 participants. Panels B–D show the proportions of children rated as experiencing each behavioral-emotional, cognitive, or communication difficulty at least sometimes, calculated by combining the “sometimes,” “often,” and “very frequently” categories. Social withdrawal was reported in 21.8% of children, peer-relationship difficulty in 21.5%, emotional dysregulation in 20.7%, and frustration during difficult tasks in 20.5%. Cognitive concerns ranged from 19.0% for basic-concept acquisition to 22.3% for difficulty attending to developmentally appropriate tasks. Communication concerns ranged from 18.6% for interpreting or using nonverbal cues to 22.6% for limited ability to ask questions or clarify misunderstandings. One invalid response was excluded from the adaptation item, giving a denominator of 376 for that variable.

DISCUSSION

The present study described communication, behavioral-emotional, and cognitive characteristics among 377 preschool children attending private educational settings. Most participants were aged 3.0–4.0 years, with a moderately balanced distribution of boys and girls. Pre-linguistic skills were observed in 90.2% of the children. Across the reported behavioral-emotional, cognitive, and communication items, approximately three-quarters of the participants were rated as never experiencing the specified difficulty. Nevertheless, a clinically and educationally relevant minority was reported to experience difficulties at least sometimes, particularly in peer relationships, social withdrawal, emotional regulation, attention, reciprocal communication, speech clarity, and adaptation to learning demands. These findings should be interpreted as descriptive observations rather than evidence of normal development, developmental diagnosis, or causal relationships.

The generally favourable communication profile observed in the sample was consistent with the expectation that most children enrolled in mainstream preschool settings would demonstrate basic pre-linguistic and social-communication abilities. However, pre-linguistic skills were absent in 37 children, and approximately one-fifth of the sample was reported to experience at least occasional difficulty with expressive communication, reciprocal interaction, or interpretation of nonverbal cues. Communication competence during the preschool years extends beyond speech production and includes receptive language, vocabulary, pragmatic language, turn-taking, topic maintenance, gestures, and the interpretation of facial expressions. Previous research has shown that early communication concerns

may be associated with restricted social participation and that social competence may partly explain how language difficulties affect children's engagement with others (4). Growth in vocabulary and communication abilities has also been associated with subsequent academic achievement and self-regulation (6). The present findings therefore support careful observation of communication functioning in preschool environments, although the checklist used in this study cannot substitute for standardized speech and language assessment.

A notable proportion of children was reported to experience behavioral-emotional difficulties at least sometimes. Difficulty forming or maintaining peer relationships was identified at this level in 21.5% of participants, while social withdrawal affected 21.8%, emotional dysregulation affected 20.7%, and frustration during difficult tasks affected 20.4%. These characteristics may influence participation in classroom routines, engagement with peers, and persistence during learning activities. Previous research has demonstrated that stronger social-emotional competence is associated with fewer behavioral difficulties and better educational engagement (8). Social skills may also contribute to academic self-confidence and more constructive teacher-child relationships, which in turn may be associated with fewer problem behaviors (9). The cross-sectional and descriptive nature of the present study does not permit testing of these pathways, but the observed frequency of occasional behavioral-emotional difficulties indicates that preschool surveillance should include both social strengths and behavioral concerns.

Restlessness or hyperactivity beyond expected age levels was reported at least sometimes in 17.8% of children, while disruptive behavior in group settings was reported at least sometimes in 19.6%. These observations require cautious interpretation because activity level, attention, and emotional expression vary according to developmental stage, classroom context, familiarity with the observer, and the expectations of caregivers or teachers. Previous evidence has shown that executive-function ratings may differ between parents and teachers and that teacher-rated executive-function difficulties can be associated with emotional comprehension, language, and nonverbal reasoning (10). The absence of clearly identified informants and inter-rater assessment in the present study limited the ability to determine whether the reported behavior represented stable child characteristics or context-specific observations.

Cognitive difficulties were also reported in a minority of participants. Approximately one-fifth of the children experienced at least occasional difficulty remembering multi-step instructions, solving age-appropriate problems, adapting to changes, attending to tasks, or acquiring basic concepts. Working memory, inhibitory control, cognitive flexibility, and attention contribute to children's ability to follow instructions, remain engaged, regulate behavior, and acquire early academic concepts. Previous research has shown that self-regulation and executive functions are related to early literacy, mathematics, and social-emotional competence (2). Executive functioning has also been associated with language and emotional competence, suggesting that cognitive, communicative, and behavioral domains develop through interconnected processes rather than as isolated abilities (10,11). The present item-level results were compatible with this multidomain perspective, although correlations among domains could not be established from the available analysis.

The admission-test score averaged 16.52 ± 4.31 out of 25 among the 376 children with available data. These scores described performance on the school admission measure but could not be interpreted as evidence of academic readiness because the manuscript did not provide information regarding the test's development, validity, normative thresholds, or diagnostic purpose. Similarly, admission-test performance could not be related to developmental characteristics because no participant-level association analysis was reported. Referral for speech-language, developmental, psychological, or educational assessment should therefore not be based solely on admission-test performance.

The study included a relatively large sample and considered multiple aspects of preschool functioning within a single assessment framework. The individual observational sessions may also have allowed the

assessor to observe behaviors that are not readily identified through demographic questionnaires alone. Combining communication, behavioral-emotional, and cognitive observations reflects the interconnected nature of early childhood development and may support a broader approach to developmental surveillance.

Several limitations substantially affected interpretation. The cross-sectional design prevented assessment of developmental change or causal relationships. Participants were selected purposively from private schools, limiting generalizability to public schools, rural communities, children not attending preschool, and socioeconomically diverse populations. Most participants were concentrated in the younger age category, which further restricted age-based interpretation. The study included both typically developing children and children with possible mild-to-moderate developmental difficulties, but the method used to classify these groups and their respective numbers were not reported.

The checklist's source, validation status, scoring structure, and domain-specific psychometric properties were not established. The overall Cronbach's alpha of 0.520 indicated limited internal consistency when all items were treated as one scale. Because the checklist contained conceptually different communication, behavioral-emotional, and cognitive items, a single reliability coefficient may not appropriately represent its multidimensional structure. The absence of domain-specific reliability, inter-rater reliability, assessor blinding, and standardized diagnostic thresholds increased the possibility of measurement and observer bias. The repeated response patterns across several items and the presence of an invalid coded value also indicated the need for stronger data-entry verification and quality-control procedures.

Most importantly, the reported analysis did not test the stated relationships of communication, behavioral-emotional, and cognitive characteristics with age and gender. No domain scores, cross-tabulations, correlations, regression models, effect estimates, confidence intervals, or inferential p-values were available. The findings should therefore be regarded as a descriptive profile of the participating children. Future research should use validated developmental instruments, clearly defined domain scores, representative sampling, multiple informants, assessor training, inter-rater evaluation, and age- and gender-stratified analyses. Longitudinal studies would be valuable for determining whether early communication, behavioral-emotional, and cognitive characteristics predict later participation and educational outcomes.

CONCLUSION

Most preschool children in the participating private-school sample were rated as having pre-linguistic skills and as not frequently experiencing the communication, behavioral-emotional, or cognitive difficulties assessed by the study checklist. However, a meaningful minority experienced occasional or more frequent difficulties involving peer relationships, emotional regulation, attention, problem-solving, speech clarity, and reciprocal communication. These descriptive findings support multidomain developmental surveillance in preschool settings but do not establish typical development, academic readiness, or relationships with age and gender. Children with persistent concerns should undergo assessment using validated developmental measures and appropriate professional referral pathways.

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