ORIGINAL ARTICLE
Acta Pediatr Mex 2026; 47: e3112.

https://doi.org/10.18233/apm.v47i2.3112

Emotional and developmental problems in preterm children compared to full-term children in preschool ages.

Problemas emocıonales y de desarrollo en nıños prematuros en comparación con nıños a término en edad preescolar

Kiymet Celık,[1] Yagmur Gunduz,[2] Nilufer Okur,[3] Ozgur Onder Demırtas[4]

Abstract

OBJECTIVE: To identify emotional, behavioral, and developmental problems in the preschool years and compare them with full-term children.
MATERIALS AND METHODS: The study looked at preterm children who were born before 34 weeks and were of pre-school age. The control group included full-term children of the same age. Both groups were given the Child Behavior Checklist (CBCL) and Ankara Developmental Screening Inventory (ADSI) tests, and the resulting differences were evaluated.
RESULTS: The study included 30 preterm and 30 term children. The CBCL total problem score was high in 30% of the preterm children, and 26% had retardation on the ADSI. The preterm group had higher mean scores than the term group on the CBCL internalization, withdrawal, anxiety/depression, social problems, thought problems, and attention problems subscales. On the ADSI, the preterm group scored lower on the language-cognitive domain and the social skills/personal care domain.
CONCLUSİON: Behavioral, emotional, and developmental problems were more common in preterm infants than in term infants in the preschool years. These problems affected about a third of all preterm infants.

KEYWORDS: preterm birth, behavioral symptoms, preschool child, term birth.

Resumen

OBJETIVO: Identificar problemas emocionales, conductuales y de desarrollo en los años preescolares y compararlos con los niños nacidos a término.
MATERIALES Y MÉTODOS: El estudio examinó a niños prematuros que nacieron antes de las 34 semanas y estaban en edad preescolar. El grupo de control incluyó niños nacidos a término de la misma edad. A ambos grupos se les realizaron las pruebas *Child Behavior Checklist* (CBCL) y Ankara Developmental Screening Inventory (ADSI), y se evaluaron las diferencias resultantes.
RESULTADOS: El estudio incluyó 30 niños prematuros y 30 niños nacidos a término. La puntuación total de problemas en la CBCL fue alta en el 30% de los niños prematuros y el 26% presentó retraso en la ADSI. El grupo de prematuros tuvo puntuaciones medias más altas que el grupo de término en las subescalas de internalización, retraimiento, ansiedad/depresión, problemas sociales, problemas de pensamiento y problemas de atención de la CBCL. En el ADSI, el grupo de prematuros obtuvo una puntuación más baja en el dominio cognitivo-lingüístico y en el dominio de habilidades sociales/cuidado personal.

[1] Division of Neonatology, Department of Pediatrics, Akdeniz University, Faculty of Medicine, Antalya, Turkey.
[2] Department of Child and Adolescent Psychiatry, Ordu University, Training and Research. Hospital, Ordu, Turkey.
[3] Division of Neonatology, Gazi Yasargil Training and Research Hospital, Diyarbakir, Turkey.
[4] Department of Child and Adolescent Psychiatry, Gazi Yaşargil Training and Research. Hospital, Diyarbakır, Turkey.

ORCID
https://orcid.org/

Received: 14 de febrero 2025
Accepted: 19 de febrero 2026

Correspondence
Kiymet Celık
kiymetcelikmd@gmail.com

This article should be cited as: Celık K, Gunduz Y, Okur N, Onder-Demırtas O. Emotional and developmental problems in preterm children compared to full-term children in preschool ages. Acta Pediatr Méx 2026: 47: e3112.

CONCLUSIÓN: Los problemas conductuales, emocionales y de desarrollo fueron más comunes en los bebés prematuros que en los bebés nacidos a término en los años preescolares. Estos problemas afectaron a aproximadamente un tercio de todos los bebés prematuros.

PALABRAS CLAVE: parto prematuro, síntomas conductuales, desarrollo infantil, nacimiento a término.

INTRODUCTION

Prematurity is a medical condition that occurs when a baby is born before completing 37 weeks of gestation. The prevalence of this condition varies from 8.7% to 13.4% in different regions. However, it is a global issue and affects 10.6% of infants born worldwide.[1] Studies suggest that children who are born prematurely are more susceptible to emotional, behavioral, and developmental problems than those born at term.[2-4] It's been found that although some effects can be observed within the first few years, neuro behavioral and emotional problems tend to develop later in school age. These problems can have a significant impact on academic achievement, as executive deficits can affect academic performance as well as social and adaptive behaviour.[5-8] In addition, numerous studies have shown that preterm children are more likely to have emotional and behavioral problems than full-term children. Common behavioral problems in preterm infants include internalizing problems such as withdrawal, depression, and anxiety, as well as social problems, inattention and externalizing problems.[8-10]

Preterm birth is also a risk factor for developmental problems. At preschool age, 15-24% of early preterm infants (<32 weeks' GA) and 8-25% of moderate preterm infants (32 0/7-35 6/7 weeks' GA) have developmental problems, compared with 4-14% of term infants (38-41 weeks' GA).[11] The aim of the study was to assess the emotional, behavioral, and developmental problems of preterm infants during their preschool years and to compare them with those of full-term infants.

MATERIALS AND METHODS

Study Design, Participants, and Procedure

This study was designed as a prospective case-control study. Preterm infants (gestational age < 34 weeks) born between 1 January 2013 and 1 January 2014 and followed up in the neonatal intensive care unit (NICU) of Gazi Yasargil Research and Training Hospital were planned to be included in the study. Gazi Yasargil Research and Training Hospital ethics committee approval was obtained.

The criteria for inclusion in the study group were 1) to be born <34 gestational weeks, 2) hospitalized and followed up in the NICU, and 3) who had accessible medical records of hospital stay and whose parents or legal custodians agreed to participate in the study.

Criteria for inclusion in the control group were. 1) be born after 37 weeks' gestation, 2) have no history of neonatal hospitalization or chronic illness.

https://doi.org/10.18233/apm.v47i2.3112

The study excluded patients with a history of congenital and/or chromosomal anomalies, intrauterine infection, perinatal asphyxia, intracranial hemorrhage, periventricular leukomalacia, ventricular dilatation, hydrocephalus, microcephaly, and major neurodevelopmental impairment (cerebral palsy, hearing loss, blindness).

After obtaining ethics committee approval, patients meeting the criteria were identified from the hospital database and medical records were reviewed. Week of gestation, birth weight, sex, admission diagnosis and length of hospital stay were examined from the patient files. After reviewing the files, 30 patients who could be contacted and informed about the study were included in the study group. At the same time, 30 age and gender matched term infants who were admitted to the paediatric outpatient clinic for various reasons were to be included. Informed consent was obtained from the families. It was planned that all cases would be assessed by a child and adolescent psychiatrist.

Evaluation Tools

The demographic characteristics of the participating children were collected using the demographic data form developed by the researchers. The form recorded the child's age, gender, mother's, and father's demographic information.

Child Behavior Checklist

The Child Behavior Checklist (CBCL) was developed to evaluate emotional and behavioral problems in children aged between 4–18 years based on information obtained from parents. The questions in the scale are answered and rated by the parents using a 3-point Likert scale. Options are scored "Not true" as "0", "somewhat or sometimes true" as "1" and "very true or often true" as "2". The scale consists of eight subscales: somatic complaints, withdrawn, anxiety/depression, thought problems, social problems, attention problems, delinquent behavior, and aggression. "Internalizing problems" and "externalizing problems." scores are obtained in the scale as two distinct behavioral symptom scores. Internalizing narrow-band syndromes are anxiety/depression, somatic problems, and withdrawal. The externalizing narrow-band syndromes are aggression and delinquent behavior. Problems in the attentional, social, and thought domains are not classified as either externalizing or internalizing syndromes. "Total problem score" is obtained from the sum of subscale scores. The analyses were performed using CBCL T scores, which are standardized based on age- and sex-specific normative data. According to the CBCL manual, a T score of 65 or higher indicates the beginning of the clinical range.

Ankara Developmental Screening Inventory

The Ankara Developmental Screening Inventory (ADSI) is a standardized assessment tool developed and normed for Turkish children aged 0–6 years. The inventory consists of items evaluating language-cognitive, fine motor, gross motor, social, and self-care domains. Each item is scored as "achieved" or "not yet achieved" based on parental responses. Raw item responses are converted into developmental age equivalents (in months) using age-based normative tables. Developmental delay is identified according to standardized cut-off points derived from the normative data. The ADSI has demonstrated good internal consistency (Cronbach's alpha = 0.88) and established concurrent and criterion validity in previous standardization studies.[12]

Statistical analysis

Statistical analysis was performed using SPSS version 22.0 (SPSS, Chicago, IL, USA). Kolmogorov–Smirnov and Shapiro–Wilk tests were used to determine data distribution. Mann–Whitney U-test was used to analyze the continuous nonparametric variables;

chi-squared or Fisher's exact test was used to compare categorical variables. Normally distributed variables are presented as mean SD, whereas nonparametric continuous variables are presented as median (IQR). Categorical variables are presented as n (%). A multivariable logistic regression analysis was performed to identify the factors associated with a CBCL total problem score greater than 65. The dependent variable was the presence of a CBCL total problem score >65 (dichotomous: yes/no). Independent variables included group (preterm/control), maternal age (continuous), maternal education level (2 categories), and breastfeeding duration (<6 months). $p < 0.05$ was considered statistically significant.

RESULTS

The study included 30 preterm patients (67.7±2.9 months) and 30 term patients (66.8±7.3 months). On average, the preterm infants were born at 302.1 weeks and weighed 1420±305 grams at birth. In the control group, the average gestational age of the term infants was 38.2±1.2, and their average birth weight was 3050245 grams The average length of hospital stay for the preterm infants was 31 days, with a range of 10-105 days. The two groups had similar demographic characteristics, except for the number of siblings and the duration of breastfeeding. The preterm group had more siblings, shorter breastfeeding duration and lower maternal age (respectively p= 0.005, p<0.001, p=0.015). However educational level were similar in both groups.

The patients included in the study were similar in age at enrolment and current body weight (**Table 1**).

It was observed that the preterm group had higher total problem scores when both groups were assessed based on CBCL scores (p=0.008).

The mean scores of the CBCL subscales were compared between the groups. The subscale means scores for internalizing, withdrawn, anxiety/depression, social problems, thought problems, and attention problems were all higher in the preterm group compared to the term group. Specifically, the preterm group had a mean score of 58.4±10.1 for internalizing (p=0.014), 58.3±9.2 for withdrawn (p=0.03), 60±7.7 for anxiety/depression (p=0.018), 59.4±9.5 for social problems (p=0.001), 60.4±8.3 for thought problems (p=0.004), and 58.5±10.2 for attention problems (p=0.044) (**Table 2**).

According to the logistic regression analysis, none of the variables included in the model significantly predicted a CBCL total problem score greater than 65. The odds ratio (OR) for the group variable was 3.875 (95% CI: 0.441–34.071), indicating that children in the preterm group had approximately 3.9 times higher risk of behavioral problems compared to the control group; however, this finding was not statistically significant (p=0.222). When maternal education level was examined, using mothers with higher education (college graduates) as the reference group, children of mothers without higher education were found to have a 1.4 times greater risk of behavioral problems (OR=1.4; p=0.74), though this difference was also not statistically significant. Regarding breastfeeding, children who received breast milk were found to be 2.2 times more likely to have behavioral problems; however, this association did not reach statistical significance either (p=0.40). In conclusion, none of the variables included in the model were found to be significant predictors of a CBCL total problem score >65. The limited sample size (30 participants per group) may have affected the statistical power of the model (**Table** 3).

The subscales and rates where the CBCL score is significantly higher in preterms are shown in **Table 4**. The total score was found to be high in 30% of the preterms.

https://doi.org/10.18233/apm.v47i2.3112

Table 1. Comparison of demographic characteristics preterm and term group

	Preterm group (n:30) n(%) or mean ± SD	Term group (n:30) n(%) or mean ± SD	p
Age (month)	67.7 ± 2.9	66.8 ± 7.3	0.54
Gender Male Female	 18 (60) 12 (40)	 18 (60) 12 (40)	 1
Weight (kg)	18.8 ± 3.1	19.8 ± 3.4	0.26
Weight Z score	-0.59 (-1.32-0.025)	0.20 (-0.08-0.80)	0.073
Maternal age (year)	31 ± 4.8	34.5 ± 5.6	0.015
Education status of the mother Pre-high school High school and beyond	 20 (66) 10 (34)	 14 (46.6) 16 (53.4)	 0.068
Paternal age (year)	35.4 ± 5.1	37 ± 6	0.17
Education status of the father Pre-high school High school and beyond	 14 (46) 16 (54)	 9 (30) 21(70)	 0.069
Number of siblings	3 (0-6)	2 (0-5)	0.005
Breastfeeding (< 6 month) (f)	22 (73.3%)	11 (36.6%)	<0.01

Table 2. The Child Behavior Checklist mean score of the preterm and term groups

	Preterm group (n:30) mean ± SD	Term group (n:30) mean ± SD	p
Total problems	58.3±10.7	50.3 ±1.1	0.008
Internalizing scale	58.4±10.1	51.3±10.8	0.014
Externalizing scale	53.4±11.4	49.5±10.4	0.18
Withdrawn	58.3±9.2	53.9±5.2	0.03
Somatic complaints	55.5±7.5	55±6.2	0.81
Anxiosus/Depressed	60±7.7	55.3±6.6	0.018
Social Problems	59.4±9.5	52.3±3.9	0.001
Thought Problems	60.4±8.3	54.6±6.0	0.004
Attention Problems	58.5±10.2	54.1±4.8	0.044
Delinquent Behaviour	56±9.3	54.3±6.6	0.43
Aggressive Behaviour	56.4±9.5	53.2±5.5	0.13

The Ankara Developmental Screening Inventory evaluation did not identify any developmental delays in babies born at term. However, it was observed that 26% (n=8) of preterm babies experienced developmental delays, which appeared to be a statistically significant difference (**Table 5**).

A comparison of the average scores of the preterm and term groups revealed that the preterm group scored lower in the language cognitive domain and the social skills/personal care domain when compared to the control group (p=0.032 and p=0.006, respectively).

Table 3. The factors affecting the Child Behavior Checklist total problem score (< 65)

	Odds ratio (OR)	95% CI	p
Prematurity	3,88	0,44-34	0.22
Maternal age (year)	0.97	0.84-1.1	0.77
Maternal education level	1.4	0.18-10.7	0.74
Breastfeeding (< 6 month)	2.2	0.33-15.7	0.40

Table 4. The Child Behavior Checklist scores in the clinical range in preterms

	n (%)
Total problems	9 (30%)
Internalizing problems	8 (27%)
Withdrawn	6 (20%)
Anxiosus/Depressed	7 (23%)
Social Problems	10 (33%)
Thought Problems	3 (10%)
Attention Problems	7 (23%)

DISCUSSION

In the study conducted to compare the emotional and behavioral aspects of preschool age who were born preterm and term, the results showed that preterm babies had higher mean scores on the CBCL total score, internalization, withdrawal, anxiety/depression, social problems, thinking problems and attention problems subscales compared to term babies. The study also found that preterm infants had lower developmental scores compared to term infants, and approximately 26% of preterm infants were diagnosed with developmental delay according to the ADSI. Developmental delay differed in the areas of language-cognitive and social skills/self-care, and those born preterm had lower scores in these areas.

Studies show that children who are born prematurely are more likely to experience emotional, behavioral and developmental problems compared to those who are born full-term.[2-4] Therefore, the term "preterm behavioral phenotype" has been defined to include cognitive impairments, attention deficits, socioemotional difficulties, and internalizing problems associated with preterm birth.[13,14] Loe *et al*. examined measures of white matter integrity to determine potential underlying neurobiology of the preterm behavioral phenotype. Findings showed that mean inattention and internalizing scores were higher in those born preterm compared to full-term, with no significant group differences for externalizing behavior. Results of the analyses

Table 5. Ankara Developmental Screening Inventory mean scores of preterm and term groups

	Preterm group (n:30) mean ± SD	Term group (n:30) mean ± SD	p
Language-cognitive	57.8±13.3	65.5±11.3	0.032
Fine motor	61.9±10.4	64.1±12.3	0.50
Gross motor	53.7±7.7	59.6±13.3	0.57
Social skills/Self-Care	52.6±7.4	60.3±11.5	0.006
General development	60±10	66.5±10.2	0.062
Total score, n(%) (developmental delay)	8 (26)	0	0.002

https://doi.org/10.18233/apm.v47i2.3112

indicated that there was a significant negative correlation between fractional anisotropy measures obtained from diffusion tensor imaging and attention as well as internalizing problems in the preterm group only.[15] Similarly, in our study, internalizing problems, attention problems and social problems were significantly high, consistent with the preterm behavior phenotype.

A systematic review of studies on the association between prematurity, neonatal health outcomes and behavioral and emotional problems in school-age children confirmed that prematurity combined with neonatal risk factors increases the risk of behavioral and/or emotional problems in children.[16] The results of this study showed that emotional and/or behavioral problems in children at different ages were related to the degree of prematurity and birth weight.[16] A study of 68 late preterm babies found that all had at least one neurodevelopmental disorder. The study used different scales and assessments, and the CBCL assessment found internal problems (affective problems and social skills) in 30% of these babies.[17] In a recent study, 248 moderately-late preterm infants with an average gestational age of 34 weeks were assessed using the CBCL. The study found that internal problems were observed in 22.2% of all patients. The study also looked at the association between emotional and behavioral problems and growth. The results showed that there was no association between growth and emotional/behavioral problems.[18] Our study, which focused on preterm patients with an average gestational age of 30 ± 2.1, found that 30% of patients had a high internal problem score. Additionally, this study also found that preterm and term-born children exhibited similar weight gain at assessment age.

A meta-analysis of 74 studies comparing the cognitive, motor, behavioral and school performance of preterm and term babies found that preterm babies had higher scores and more problems than term babies on behavioral assessments in primary and secondary school. The study suggests that preterm babies had lower scores than term babies in motor skills, behavior, reading, mathematics, and spelling at primary school age, and this continued to secondary school age, except for mathematics. The authors recommend that these children's problems should be identified early, and their additional needs met in order to address them effectively.[5] In our study, preterm babies had higher rates of developmental, behavioral and emotional problems than term babies.

Early life experiences, including stress, can impact the development of behavior and emotions. These experiences are shaped by biological, social, and environmental factors, which can affect neurodevelopmental pathways.[16,19] One such factor is infant feeding practices, particularly the **duration and continuation of breastfeeding**, which has been shown to be associated with fewer behavioral and emotional problems in preterm infants.[20]

In the preterm population, there is evidence that both low socioeconomic status and specific biologic variables are risk factors for poor developmental outcomes.[21] Preterm infants are at higher risk of neonatal complications such as respiratory distress syndrome, intraventricular hemorrhage and other health problems that can affect their cognitive development. In preterms, language development is delayed more than motor or cognitive abilities in early childhood.[22] In a study of risk factors for speech and language delay/disorder, preterm birth, low birth weight, need for neonatal intensive care, low maternal education and having two or more siblings were identified as risk factors when assessed using the ADSI and The Peabody Picture Vocabulary Test.[23] We found that, despite similar maternal education levels between the groups, preterm infants scored significantly lower on language cognitive assessments compared to term infants in our study.

This study has several limitations. First, our sample size was small, and the sample was based on a single hospital. Second, the design of the study was cross-sectional. These weaknesses prevent the generalization of our results. Therefore, future longitudinal studies with large sample sizes including multiple centers will be substantially valuable. Despite these limitations, our findings provide considerable information about the importance of preschool assessment for various behavioral and developmental disorders in preterm children.

CONCLUSIONS

Preterm birth can increase the likelihood of behavioral, emotional, and developmental issues during preschool age. These problems can affect around one-third of preterm children. To ensure better outcomes for these children later in life, it's essential to conduct a comprehensive evaluation of their neurodevelopmental, behavioral, and emotional health during their preschool years.

REFERENCES

1. Chawanpaiboon S, Vogel JP, Moller AB, et al. Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *Lancet Glob Health*. 2019;7(1):e37–46.
2. den Haan PJ, de Kroo MLA, van Dokkum NH, et al. Risk factors for emotional and behavioral problems in moderately-late preterms. *PLoS One*. 2019;14(5):e0216468.
3. McGowan EC, Hofheimer JA, O'Shea TM, et al. Analysis of Neonatal Neurobehavior and Developmental Outcomes Among Preterm Infants. *JAMA Netw Open*. 2022;5(7):e2222249.
4. Polic B, Bubic A, Mestrovic J, et al. Emotional and behavioral outcomes and quality of life in school-age children born as late preterm: retrospective cohort study. *Croat Med J*. 2017;58(5):332–41.
5. Allotey J, Zamora J, Cheong-See F, et al. Cognitive, motor, behavioural and academic performances of children born preterm: a meta-analysis and systematic review involving 64 061 children. *BJOG*. 2018;125(1):16–25.
6. Blencowe H, Lee AC, Cousens S, et al. Preterm birth-associated neurodevelopmental impairment estimates at regional and global levels for 2010. *Pediatr Res*. 2013;74 Suppl 1:17–34.
7. Joo JW, Choi JY, Rha D, et al. Neuropsychological Outcomes of Preterm Birth in Children With No Major Neurodevelopmental Impairments in Early Life. *Ann Rehabil Med*. 2015;39(5):676–85.
8. Loe IM, Heller NA, Chatav M. Behavior problems and executive function impairments in preterm compared to full term preschoolers. *Early Hum Dev*. 2019;130:87–95.
9. Ahn DH, Min A, Kim K, et al. Cognitive Function, Emotional and Behavioral Problems, and Temperament of Premature Children. *Soa Chongsonyon Chongsin Uihak*. 2019;30(1):34–41.
10. Hornman J, de Winter AF, Kerstjens JM, et al. Emotional and Behavioral Problems of Preterm and Full-Term Children at School Entry. *Pediatrics*. 2016;137(5):e20152255.
11. Hornman J, de Winter AF, Kerstjens JM, et al. Stability of Developmental Problems after School Entry of Moderately-Late Preterm and Early Preterm-Born Children. *J Pediatr*. 2017;187:73–9.
12. Erol N, Sezgin N, Savasir I. Validity studies for development-screening inventory [in Turkish]. *Turk J Psychol*. 1993;8:16–22.
13. Fitzallen GC, Taylor HG, Bora S. What Do We Know About the Preterm Behavioral Phenotype? A Narrative Review. *Front Psychiatry*. 2020;11:154.
14. Johnson S, Marlow N. Preterm birth and childhood psychiatric disorders. *Pediatr Res*. 2011;69(5 Pt 2):11R–18R.
15. Loe IM, Lee ES, Feldman HM. Attention and internalising behaviors in relation to white matter in children born preterm. *J Dev Behav Pediatr*. 2013;34(3):156–64.
16. Cassiano RG, Gaspardo CM, Linhares MB. Prematurity, Neonatal Health Status, and Later Child Behavioral/Emotional Problems: A Systematic Review. *Infant Ment Health J*. 2016;37(3):274–88.
17. Palumbi R, Peschechera A, Margari M, et al. Neurodevelopmental and emotional-behavioral outcomes in late-preterm infants: an observational descriptive case study. *BMC Pediatr*. 2018;18(1):318.
18. Dotinga BM, de Winter AF, Bocca-Tjeertes IF, et al. Longitudinal growth and emotional and behavioral problems at age 7 in moderate and late preterms. *PLoS One*. 2018;14(1):e0211427.
19. Montirosso R, Casini E, Del Prete A, et al. Neonatal developmental care in infant pain management and internalising behaviours at 18 months in prematurely born children. *Eur J Pain*. 2016;20(6):1010–21.
20. Rodrigues C, Zeitlin J, Carvalho AR. Behavioral and emotional outcomes at preschool age in children born very preterm: The role of breast milk feeding practices. *Early Hum Dev*. 2022;165:105535.
21. Pierrat V, Marchand-Martin L, Marret S, et al. Neurodevelopmental outcomes at age 5 among children born preterm: EPIPAGE-2 cohort study. *BMJ*. 2021;373:n741.
22. Synnes A, Luu TM, Moddemann D, et al. Determinants of developmental outcomes in a very preterm Canadian cohort. *Arch Dis Child Fetal Neonatal Ed*. 2017;102(3):F235–44.
23. Uzun Cicek A, Akdag E, Celebi Erdivanli O. Sociodemographic Characteristics Associated With Speech and Language Delay and Disorders. *J Nerv Ment Dis*. 2020;208(2):143–6.

https://doi.org/10.18233/apm.v47i2.3112