

Urban–rural Differences in Home Caregiving Environments Among Children Aged 0–3 Years in China: A Multi-region Cross-sectional Study

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Abstract

Background

The home caregiving environment plays an important role in early childhood health and development. In China, children younger than three years are primarily cared for within families, often with substantial involvement from grandparents. However, evidence describing multiple dimensions of the home caregiving environment and urban–rural differences among children aged 0–3 years remains limited. This study aimed to characterize caregiving arrangements, screen exposure, early learning resources, sources of parenting information, and access to parenting support among families recruited from multiple regions of China.

Methods

A multi-region cross-sectional survey was conducted from September to December 2023 among parents of children aged 0–3 years recruited using convenience sampling from selected regions of China. Data were collected through online and in-person questionnaires. Of 9,936 completed questionnaires, 9,699 were included in the final analysis. The questionnaire assessed sociodemographic characteristics, caregiving arrangements, mother–child co-sleeping, sunlight exposure, children's daily screen exposure, availability of children's books, sources of parenting information, parenting support needs, and access to community services. Categorical variables were summarized using frequencies and percentages, and differences between urban and rural household-registration groups were examined using chi-square tests.

Results

Among the 9,699 participating families, 6,264 (64.6%) had urban household registration and 3,435 (35.4%) had rural household registration. Grandparents were the primary caregivers in 54.9% of families, while parents were the primary caregivers in 39.7%. Daily screen exposure exceeding 2 h was reported for 5.2% of children in the urban group and 7.8% in the rural group ($P < 0.01$). More than 40 children's books were reported by 41.5% of urban families compared with 21.7% of rural families, whereas no children's books were reported by 3.2% and 7.3%, respectively ($P < 0.01$). Books and the internet were the most frequently reported sources of parenting information. Patterns of caregiving concerns and reported use of major community parenting support services were broadly similar between the two groups.

Conclusions

This large multi-region study identified descriptive urban–rural differences in several dimensions of the home caregiving environment among families with children aged 0–3 years in China, particularly children's screen exposure and access to early learning resources. The prominent role of grandparents in family caregiving also suggests that parenting and child-health support strategies may benefit from including older family caregivers. Because the findings were based on unadjusted cross-sectional comparisons, they should not be interpreted as causal effects of household-registration status. Further nationally representative and longitudinal studies incorporating age-specific measures and child developmental outcomes are needed.

1. Introduction

The first three years of life represent a critical period for physical, cognitive, language, and socio-emotional development [1]. During this period, young children depend heavily on their caregivers and immediate home environments for health, safety, responsive interactions, and opportunities for early learning. The World Health Organization (WHO), United Nations Children's Fund (UNICEF), and World Bank have incorporated these elements into the Nurturing Care Framework, which emphasizes good health, adequate nutrition, security and safety, responsive caregiving, and opportunities for early learning as essential conditions for children to reach their developmental potential [2, 3]. Because much of the care received by children younger than three years occurs within the family, the quality and resources of the home caregiving environment constitute an important component of early childhood health and development.

The home caregiving environment is multidimensional and may include the availability of developmentally appropriate learning materials, caregiver–child interactions, daily routines, exposure to digital media, and caregivers' access to reliable parenting information and support. Evidence from China suggests that these dimensions are relevant to early childhood development [4–6]. Studies among children younger than three years in rural China have reported associations between more supportive home environments and more favorable developmental outcomes [5], while recent research in Shanghai has similarly identified associations between the quality of the home nurturing environment and neurodevelopment [6]. Previous research among Chinese families has identified socioeconomic variation in home nurturing environments [7] and sociodemographic variation in non-parental caregiving arrangements and parenting needs [8], yet evidence examining multiple dimensions of the home caregiving environment simultaneously among children younger than three years remains comparatively limited.

Despite growing attention to early childhood development in China, much of the existing literature has focused on individual aspects of the caregiving environment or on specific populations and geographic settings. For example, studies have examined home nurturing environments among children in rural communities, left-behind children, or families in individual urban districts, while other research has focused on particular aspects such as childcare arrangements or early learning experiences [5, 6]. Urban–rural differences may be particularly relevant because families living in different settings can vary

in socioeconomic resources, access to information and services, and opportunities to provide learning materials and other forms of developmental stimulation. Previous research among Chinese families has identified rural–urban differences in parenting resources and socioeconomic variation in home nurturing environments [7, 8], yet evidence examining multiple dimensions of the home caregiving environment simultaneously among children younger than three years remains comparatively limited.

To address this gap, the present study used data from 9,699 families with children aged 0–3 years recruited from multiple regions of China to characterize key features of the home caregiving environment and examine descriptive differences between urban and rural household-registration groups. Specifically, we examined caregiving arrangements, children’s screen exposure, the availability of children’s books and other early learning resources, caregivers’ sources of parenting information, and access to community parenting support. By examining these dimensions within a large multi-region sample, this study aimed to provide a broader description of the environments in which young children are cared for and to identify areas in which urban and rural families may have different needs for early childhood and parenting support.

2. Methods

2.1 Study design and setting

A multi-region cross-sectional survey was conducted between September and December 2023 among parents of children aged 0–3 years in China. Participants were recruited from selected sites across multiple regions, including Shanghai, Guangzhou, Shaanxi, Guizhou, Hubei, Anhui, and Jiangxi. The study was designed to characterize the home caregiving environment of infants and toddlers and to examine differences between families with urban and rural household registration. Data were collected through both online and in-person questionnaires.

2.2 Participants and recruitment

Participants were recruited using convenience sampling. Eligible participants were parents of children aged 0–3 years who were able to understand and complete the questionnaire. According to the original study protocol, families were excluded if the child had a severe developmental disorder or congenital disease, or if the responding parent had a diagnosed major mental or physical illness or was unable to complete the questionnaire because of limited literacy.

Questionnaires were distributed by trained study personnel through community-based recruitment, printed posters, and parent WeChat groups. Region-specific QR codes were used for online questionnaire distribution. A total of 9,936 parents provided informed consent and completed the survey. Following data quality checks, 9,699 questionnaires were retained for analysis, corresponding to a valid-questionnaire rate of 97.6%. Of these participants, 6,264 (64.6%) were classified as urban and 3,435 (35.4%) as rural according to household registration status.

2.3 Questionnaire development and quality control

A study-specific questionnaire, the Questionnaire for Parents of Children Aged 0–3 Years, was developed based on a review of relevant literature and consultation with experts. Before formal data collection, the questionnaire underwent expert review for content validity and several rounds of revision and pilot testing.

The questionnaire collected information on family sociodemographic characteristics and multiple dimensions of the home caregiving environment. For the electronic version, predefined response ranges and mandatory items were incorporated to reduce implausible or incomplete responses. During data collection, submitted questionnaires were reviewed regularly by the research team. Duplicate submissions were removed, and responses containing apparent inconsistencies or implausible values were verified with participants by telephone when possible.

2.4 Measures

Sociodemographic information included household registration status, parental age, maternal and paternal educational attainment, monthly per-capita household income, employment interruption within the family, and the identity of the primary family caregiver.

Caregiving arrangements included the child's primary caregiver and caregiving arrangements during the first month after birth. Primary caregivers were categorized as grandparents, parents, or other caregivers. First-month caregiving arrangements included parental care, grandparental care, combined parental and grandparental care, and postpartum care center/nanny care.

Daily caregiving practices included reported mother–child co-sleeping and daily sunlight exposure. Co-sleeping was categorized as daytime only, nighttime only, both daytime and nighttime, or no co-sleeping. Sunlight exposure was categorized as < 1 h, 1–2 h, 2–3 h, or > 3 h per day.

Parents reported their child's average daily electronic screen exposure using six categories: rarely or never, 0–15 min, 15–30 min, 30–60 min, 1–2 h, and > 2 h per day.

The availability of early learning resources was assessed in part by the number of children's books or picture books available in the household, categorized as none, 1–10, 11–20, 21–30, 31–40, or > 40 books.

Respondents were also asked about their sources of parenting information, the types of parenting guidance they wished to receive, their primary caregiving concerns, the community parenting support services they had accessed, and the types of parenting seminars they would be interested in attending. The full questionnaire, including the items and response options used in the present study, is provided in Supplementary File 1.

2.5 Statistical analysis

Descriptive statistics were used to summarize participant characteristics and caregiving-related variables. Categorical variables were reported as frequencies and percentages. Differences between

urban and rural household-registration groups were examined using chi-square tests. Statistical analyses were performed using SPSS version 18.0. A P value < 0.05 was considered statistically significant.

Analyses were limited to descriptive statistics and bivariate comparisons, and no multivariable adjustment for potential socioeconomic or demographic confounders was performed. Urban–rural differences should therefore be interpreted as unadjusted group differences rather than independent associations.

3. Results

3.1 Participant characteristics

A total of 9,936 parents completed the questionnaire, of whom 9,699 were included in the final analysis, yielding a valid-questionnaire rate of 97.6%. Among the included participants, 6,264 (64.6%) had urban household registration and 3,435 (35.4%) had rural household registration. Most parents were aged 30–39 years (71.9%), while 21.4% were aged 20–29 years and 6.8% were aged > 40 years.

Regarding parental education, 59.1% of mothers and 54.5% of fathers had a university-level education, while 13.5% of mothers and 20.3% of fathers had a master's degree or higher. Monthly per-capita household income was ≤ 3,000 CNY in 20.0% of families, 3,000–5,000 CNY in 36.1%, 5,000–8,000 CNY in 25.4%, and > 8,000 CNY in 18.4%. Employment interruption within the family was reported by 53.3% of respondents (Table 1).

Table 1
Characteristics of participating families (N = 9,699)

Variable	Classification	Number(n)	Percentage(%)
Household registration status			
	Urban	6264	64.6
	Rural	3435	35.4
Age of parents			
	20–29	2070	21.4
	30–39	6969	71.9
	> 40	660	6.8
Mothers' Educational Level			
	Junior High School and Below	801	8.3
	High School	1854	19.1
	Bachelor's degree	5730	59.1
	Master's Degree and Above	1314	13.5
Fathers' Educational Level			
	Junior High School and Below	759	7.8
	High School	1689	17.4
	Bachelor's degree	5286	54.5
	Master's Degree and Above	1965	20.3
Monthly Per Capita Household Income			
	3000 and Below	1944	20.0
	3000–5000	3501	36.1
	5000–8000	2466	25.4
	Over 8000	1788	18.4
Family Employment Interruption Situation			
	Yes	5169	53.3
	No	4530	46.7

3.2 Caregiving arrangements and daily caregiving practices

Grandparents were the primary caregivers in 5,322 families (54.9%), followed by parents in 3,849 families (39.7%) and other caregivers in 528 families (5.4%). During the first month after birth, 37.3% of infants were cared for primarily by their parents, 3.9% by grandparents, and 25.6% jointly by parents and grandparents; 33.2% were reported as receiving care from a postpartum care center or nanny.

For reported mother–child co-sleeping, 45.8% of respondents reported co-sleeping during both daytime and nighttime, 11.6% during daytime only, 11.6% during nighttime only, and 31.0% reported no co-sleeping. Daily sunlight exposure was reported as < 1 h in 16.5% of children, 1–2 h in 42.9%, 2–3 h in 24.5%, and > 3 h in 16.0% (Table 2).

Table 2

Caregiving arrangements and daily caregiving practices among participating families (N = 9,699)

Variable	Content	Number	Percentage(%)
Household Caregivers			
	Grandparents	5322	54.9
	Parents	3849	39.7
	Others	528	5.4
Mother and Infant Co-sleeping Time			
	Daytime	1125	11.6
	Nighttime	1125	11.6
	Both daytime and nighttime	4442	45.8
	Not co-sleeping	3007	31
Infants' and Toddlers' Sunlight Exposure			
	< 1 h	1602	16.5
	1–2 h	4164	42.9
	2–3 h	2379	24.5
	> 3 h	1554	16.0
During the first month after birth			
	Grandparents	-	3.9
	Parents	-	37.3
	Parents + grandparents	-	25.6
	Postpartum care center or nanny	-	33.2

3.3 Urban–rural differences in screen exposure and home learning resources

Patterns of reported daily screen exposure were generally similar across the two household-registration groups, although differences were observed in some exposure categories. Screen exposure of 15–30 min/day was reported for 29.1% of children in the urban group and 28.5% in the rural group, while 30–60 min/day was reported for 23.7% and 22.1%, respectively. Exposure of 1–2 h/day was reported for 13.5% of urban children and 12.6% of rural children. The proportion of children reported to have > 2 h/day of

screen exposure was higher in the rural group than in the urban group (7.8% vs 5.2%, $P < 0.01$). The corresponding proportions reporting rarely or never screen exposure were 17.4% and 16.0%, respectively.

Marked urban–rural differences were also observed in the reported number of children's books or picture books available at home. Families reporting 1–10 books accounted for 18.6% of the urban group and 33.6% of the rural group ($P < 0.01$). In contrast, > 40 books were reported by 41.5% of urban families compared with 21.7% of rural families ($P < 0.01$). No children's books were reported by 3.2% of urban families and 7.3% of rural families ($P < 0.01$) (Table 3).

Table 3
Selected urban–rural differences in home caregiving environment indicators among participating families

Domain	Indicator/category	Urban household registration (%)	Rural household registration (%)	Statistical comparison
Screen exposure	> 2 h/day	5.2	7.8	P < 0.01
Children's books/picture books at home	None	3.2	7.3	P < 0.01
	1–10 books	18.6	33.6	P < 0.01
	> 40 books	41.5	21.7	P < 0.01
Sources of parenting information	Books	31.1	28.5	P < 0.01
	Internet	31.7	29.8	P < 0.01
	Medical services	14.4	14.1	-
	Community-based sources	10.3	12.5	-
Desired parenting guidance	Communication skills	17.4	17.8	NS overall
	Scientific parenting concepts	16.4	16.0	NS overall
	Play demonstrations	15.2	14.5	NS overall
Preferred parenting seminar topics	Emotional management and guidance	15.0	13.4	P < 0.01
	Cognitive development and training	14.2	14.6	NS
Family caregiving concerns	Health	22.4	22.8	NS
	Growth and development	20.2	20.4	NS
Abbreviations: NS, not statistically significant. Urban and rural groups were defined according to household registration status. Values are presented as percentages. Statistical comparisons were based on chi-square tests. P values are reported only where they were available from the original analysis.				
– indicates that a category-specific P value was not available from the original analysis.				

Domain	Indicator/category	Urban household registration (%)	Rural household registration (%)	Statistical comparison
Community parenting support received	Family parenting lectures	23.2	22.3	NS
	In-home guidance	25.2	26.6	NS
Abbreviations: NS, not statistically significant. Urban and rural groups were defined according to household registration status. Values are presented as percentages. Statistical comparisons were based on chi-square tests. P values are reported only where they were available from the original analysis.				
– indicates that a category-specific P value was not available from the original analysis.				

3.4 Parenting information, support needs, and community services

Books and the internet were the most frequently reported sources of parenting information. Books were reported by 31.1% of urban families and 28.5% of rural families, while the internet was reported by 31.7% and 29.8%, respectively. The proportions for both sources were higher in the urban group ($P < 0.01$). Medical services accounted for 14.4% and 14.1% of reported information sources in the urban and rural groups, respectively, while community-based sources accounted for 10.3% and 12.5% (Table 3).

The types of parenting guidance desired by families were broadly similar between the two groups. Communication skills were reported by 17.4% of urban families and 17.8% of rural families, scientific parenting concepts by 16.4% and 16.0%, and play demonstrations by 15.2% and 14.5%, respectively. No statistically significant overall urban–rural difference was reported for the content of desired parenting guidance.

Among preferred parenting seminar topics, emotional management and guidance were reported by 15.0% of urban families and 13.4% of rural families, with a statistically significant difference between groups ($P < 0.01$). Interest in infant cognitive development and training was reported by 14.2% and 14.6%, respectively, while no statistically significant urban–rural differences were reported for the other major seminar topics.

Health and growth and development were the most commonly reported family caregiving concerns. Health was reported by 22.4% of urban families and 22.8% of rural families, while growth and development were reported by 20.2% and 20.4%, respectively. No statistically significant urban–rural differences were reported for these concerns. Family parenting lectures were reported as community support received by 23.2% of urban families and 22.3% of rural families, while in-home guidance was reported by 25.2% and 26.6%, respectively; no statistically significant differences between groups were reported.

4. Discussion

In this large multi-region cross-sectional study of 9,699 families with children aged 0–3 years, we identified several notable features of the home caregiving environment and observed descriptive differences between families with urban and rural household registration. Grandparents were the most commonly reported primary caregivers, accounting for more than half of participating families. Urban–rural differences were particularly evident in children's screen exposure and the availability of books and picture books at home. A greater proportion of children in the rural group were reported to have more than 2 h of daily screen exposure, whereas urban families were more likely to report a larger number of children's books. Books and the internet were the most frequently reported sources of parenting information, while patterns of caregiving concerns and use of community parenting support services were broadly similar between the two groups. These findings provide a descriptive overview of multiple dimensions of the home caregiving environment during the first three years of life in families recruited from several regions of China.

The high proportion of grandparental caregiving is an important feature of the family caregiving structure observed in this study. More than half of participating families identified grandparents as the primary caregivers, while parents were the primary caregivers in approximately two-fifths of families. Intergenerational caregiving is common in Chinese families, particularly in some rural settings [8, 9]. Importantly, the present study did not directly assess caregiving quality, caregiver responsiveness, parenting competence, or child developmental outcomes. Therefore, the predominance of grandparental caregiving should not be interpreted as inherently beneficial or detrimental. Instead, these findings suggest that parenting and early-childhood support programs in China may need to consider grandparents, as well as parents, as important recipients of health information and caregiving guidance.

Screen exposure represented another important dimension of the home caregiving environment. Current international recommendations emphasize limiting sedentary screen time during the early years of life [10]. Previous studies have reported associations between screen exposure in early childhood and multiple developmental domains, including sleep, language, motor, cognitive, and socio-emotional outcomes, although findings vary according to study design, screen content, and context of use [11, 12]. However, the present findings should be interpreted cautiously. Screen exposure was reported by caregivers rather than measured objectively, and the study combined children across the 0–3 year age range despite age-specific recommendations for screen use. Furthermore, because the analysis was unadjusted, the observed urban–rural difference may partly reflect variation in child age, parental education, household income, caregiver characteristics, or other family factors.

One of the clearest urban–rural differences in this study concerned the availability of children's books and picture books in the home. More than 40 books were reported by 41.5% of urban families compared with 21.7% of rural families, whereas the proportion of households reporting no children's books was more than twice as high in the rural group. The availability of books represents one component of the broader home learning environment and may reflect families' access to material resources and

opportunities for early shared learning activities. Previous research has highlighted associations between shared book reading and early developmental outcomes, particularly children's language development [13, 14]. However, because the present study did not assess reading frequency, parent–child reading quality, or child developmental outcomes, the number of books should be interpreted as an indicator of resource availability rather than as a direct measure of the quality of the home learning environment.

The observed urban–rural difference nevertheless has potential public health relevance. Early-childhood programs, community services, libraries, and primary care settings may provide opportunities to improve access to age-appropriate books and promote shared reading, particularly among families with fewer material learning resources. Such strategies should be considered as resource-support approaches rather than as evidence that rural families provide lower-quality parenting.

Caregivers' access to parenting information and support is another potentially modifiable aspect of the home caregiving environment. In this study, books and the internet were the most frequently reported sources of parenting information in both urban and rural groups. Medical and community-based sources accounted for smaller proportions of reported information sources. At the same time, families in both groups expressed interest in guidance on communication skills, parenting concepts, play, emotional management, cognitive development, and physical development. Health and child growth and development were also among the most frequently reported caregiving concerns. Together, these findings suggest an ongoing demand for accessible and trustworthy parenting information across both urban and rural families.

Community health services and digital platforms may therefore provide complementary channels for delivering evidence-based early-childhood guidance. Because the internet was already a major reported source of parenting information, improving the quality and accessibility of online information may be as important as expanding face-to-face services. At the same time, the relatively similar patterns of community service use and parenting concerns between urban and rural groups indicate that not all aspects of caregiving support differed substantially by household-registration status.

The study also documented variation in other caregiving practices, including mother–child co-sleeping, sunlight exposure, and caregiving arrangements during the first month after birth. These findings provide additional descriptive information about daily caregiving practices but require cautious interpretation. In particular, the questionnaire did not distinguish clearly between room-sharing and bed-sharing, limiting interpretation of the co-sleeping variable in relation to infant sleep safety or mother–infant interaction. Similarly, sunlight exposure was measured only as reported duration and was not accompanied by information on outdoor physical activity, vitamin D status, season, or developmental outcomes. The combined category of postpartum care centers and nannies also prevents separate evaluation of these distinct caregiving arrangements. These variables should therefore be viewed primarily as descriptive characteristics rather than indicators of beneficial or harmful caregiving.

From a public health perspective, the findings highlight several potential areas for early-childhood family support. First, because grandparents constituted a substantial proportion of primary caregivers, parenting education and child-health communication may benefit from explicitly including older family caregivers rather than focusing exclusively on mothers and fathers[9, 15, 16]. Second, the urban–rural differences observed in screen exposure and access to children's books suggest that family-level resources and caregiving environments may vary across population groups even before children enter preschool. Third, the widespread use of books and digital media as sources of parenting information indicates an opportunity to strengthen the dissemination of clear, evidence-based guidance through channels already used by families. Community health services, maternal and child health services, early-childhood programs, and digital platforms may all have complementary roles in supporting responsive caregiving and early learning.

4.1 Strengths and limitations

This study has several strengths. The large sample size of 9,699 families and the inclusion of participants from multiple regions of China allowed us to describe several dimensions of the home caregiving environment within the same study population. The survey captured caregiving arrangements, daily caregiving practices, children's screen exposure, availability of children's books, sources of parenting information, and access to parenting support, providing a broad overview of family caregiving during the first three years of life.

Several limitations should also be considered. First, participants were recruited using convenience sampling from selected regions rather than through a probability-based national sampling framework. The findings therefore should not be interpreted as nationally representative estimates of caregiving practices among all families with children aged 0–3 years in China. Second, the cross-sectional design does not permit conclusions regarding temporal or causal relationships between family characteristics, caregiving practices, and children's developmental outcomes. Third, most caregiving measures were based on parent-reported questionnaire responses and may therefore be subject to recall and social-desirability bias. Screen exposure, sunlight exposure, and other daily practices were assessed using broad categorical responses rather than objective measurements.

Fourth, the analyses were descriptive and based primarily on bivariate urban–rural comparisons. Potential confounding by socioeconomic, demographic, caregiver, and regional characteristics was not accounted for; therefore, the observed differences should be interpreted as unadjusted group differences rather than effects attributable to household-registration status itself. Fifth, children across the 0–3-year age range were analyzed together. Because caregiving practices and age-specific recommendations, particularly for screen exposure, may differ substantially across infancy and toddlerhood, the absence of age-stratified analyses limits interpretation of some findings.

Sixth, several questionnaire variables had limited specificity. The co-sleeping item did not clearly distinguish room-sharing from bed-sharing, and postpartum care centers and nannies were combined

within a single response category, preventing separate interpretation of these caregiving arrangements. The number of children's books reflected only one component of the home learning environment and did not capture shared-reading frequency, caregiver–child interaction, or the quality of learning activities. Finally, the study did not directly assess children's cognitive, language, motor, social-emotional, or behavioral outcomes. Consequently, the present findings describe caregiving environments and support needs but cannot establish their developmental consequences. Future longitudinal studies using representative sampling, age-specific measures, validated caregiving assessments, and direct developmental outcomes are needed to examine these relationships more comprehensively.

5. Conclusion

In this multi-region cross-sectional study of 9,699 families with children aged 0–3 years in China, grandparents were the most commonly reported primary caregivers, highlighting the prominent role of intergenerational caregiving during early childhood. Descriptive urban–rural differences were observed in several dimensions of the home caregiving environment, particularly children's screen exposure and the availability of books and picture books. A higher proportion of children in the rural household-registration group were reported to have more than 2 h of daily screen exposure, while urban families were more likely to report greater availability of children's books. Books and the internet were the most frequently reported sources of parenting information in both groups. These findings suggest that early-childhood and parenting support strategies may benefit from addressing differences in family resources and caregiving contexts and from including grandparents as important recipients of caregiving guidance. Future nationally representative and longitudinal studies incorporating age-specific measures and child developmental outcomes are needed to clarify the implications of these caregiving environments for early childhood development.

Declarations

Ethics approval and consent to participate

Ethics approval for this study was obtained from the Ethics Committee of the First Affiliated Hospital of Xi'an Jiaotong University (XJTU1AF2020LSK-217) and the First People's Hospital of Foshan (2020 No. 18). The approval issued by the First People's Hospital of Foshan covered the present 2023 multi-region survey. The study was conducted in accordance with the principles of the Declaration of Helsinki and applicable institutional ethical requirements. The study protocol was registered with the Chinese Clinical Trial Registry (ChiCTR2100044016). All participating parents provided informed consent before completing the questionnaire. Participation was voluntary, and participant information was treated confidentially throughout the study.

Consent for publication

Not applicable.

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Author Contribution

YS conceptualized the study, developed the methodology, performed the formal analysis and interpretation of the data, curated the data, prepared tables 1-3 and drafted and substantially revised the manuscript. CH contributed to data collection, data curation, and manuscript editing and revision. HL supervised the study, provided overall guidance on the study design and manuscript development, acquired funding, administered the project, and critically revised the manuscript. YT and JJ contributed to data collection, data organization, and manuscript review and editing. ZZ contributed to methodological support, validation of the results, and critical review of the manuscript. All authors reviewed and approved the final manuscript.

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Data Availability

The datasets generated and/or analysed during the current study are not publicly available due to participant confidentiality and institutional data-governance requirements, but may be available from the corresponding author on reasonable request and subject to approval by the relevant institution(s).

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