Migrant parent-child separation in the first three years of life and mental health problems at preschool age: A cross-sectional study

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ABSTRACT

Background: Parent-child separation is one of the adverse childhood experiences, becoming more common due to economic migration worldwide today. However, there is a lack of understanding of the association between this separation during the critical first three years of life and the development of mental health issues in early childhood. This study aimed to determine the association of parent-child separation in the first three years and its specific patterns with mental health problems that emerged at preschool age.

Methods: We conducted a kindergarten-based parent-reported questionnaire survey in Nanling, Anhui Province, from October 30 to November 3, 2023. Data on parent-child separation in the first three years and its specific patterns concerning parental number, gender, accumulated separation period, and present separation status at preschool age were collected. The parent version of the Strengths and Difficulties Questionnaire (SDQ) was adopted to assess outcomes of interest, including children's total difficulties, internalizing problems, external- izing problems, and pro-social behaviors.

Results: A total of 7487 children from eighty-one kindergartens were included, with a mean (SD) age of 4.2 (0.92) years, and 52.3 % were male. After adjusting for socio-demographic characteristics, compared to non-separation, parent-child separation within the first three years was significantly and positively associated with preschool-aged children's internalizing problems ($\beta = 0.19$, [95 % CI, 0.10-0.28]), externalizing problems ($\beta = 0.24$, [95 % CI, 0.12- 0.35]), and total difficulties ($\beta = 0.42$, [95 % CI, 0.25-0.59]), but not with pro-social behavior. The associations were significant when separated from either one parent or both parents, whether the separation lasted for less than or more than three years in total, and whether the separation occurred previously or persisted into preschool age.

Conclusions: Our findings illustrated the association between early parent-child separation and developing mental health in early childhood, indicating potential opportunities for cost-efficient prevention and intervention for the health and development of vulnerable children separated in the highly mobile society to achieve sustainable development.

1. Introduction

Early childhood, spanning from infancy to age six, is a pivotal time for psychological development, as it presents a window for shaping sound social, emotional, and cognitive functioning throughout the life-span (Black et al., 2017a). Worldwide, an estimated 10 % of children and adolescents have mental health problems, accounting for an increasingly heavy disease burden (World Health Organization, 2021). Although the spotlight has been on school-age children and adolescents, the emerging mental health challenges faced by the younger population remain underappreciated. But as of yet, about 17 % of all children suffer from a mental disorder in early childhood (up to the age of 6 years) (von Klitzing et al., 2015). Regrettably, the majority of early mental health problems remain unrecognized and untreated (Centers for Disease

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Control and Prevention, 2023; Whitney and Peterson, 2019). Recent progress in early childhood development (ECD) research revealed, however, that significant mental health concerns emerged at a very early age and, if not addressed, endured well into later in life, causing a broad range of health and developmental issues (Finelli et al., 2023; Stein et al., 2022).

Pioneering advances in neuroscience and longitudinal research have enriched our knowledge of impairment in early mental health. In early childhood, especially the first three years, the brain features accelerated development and enhanced plasticity and thus is particularly susceptible to environmental life experiences that significantly shape its architecture (Black et al., 2017b; Shonkoff et al., 2012). Consequently, beyond genetic predispositions, early exposures to adverse childhood experiences stand as an important factor for mental health problems that emerge in childhood or adulthood (Nelson et al., 2020). Notably, those early adversities that persist without mitigation might cause sustained disruption to the developing brain, with lifelong implications (Shonkoff et al., 2012, 2021).

Parent-child separation has been acknowledged as a form of adverse childhood experiences due to early caregiving deprivation (Sheridan and McLaughlin, 2014). That said, although the causes for parent-child separation might differ, the impacts on a child's health, well-being, and development outcomes appeared consistently negative (Waddoups et al., 2019). In China today, economy-driven labor migration counts among the most prevalent causes of parent-child separation, in which typically rural low-income families pursue work or other opportunities not available at home and migrate to cities. In these cases, parents leave their child(ren) behind with other caregivers, usually grandparents, resulting in at least six months of parent-child separation (Huang et al., 2018; Liu et al., 2009). Over decades, China has seen a sharp upward migration trend, accompanied by up to 66.9 million children and adolescents left behind till 2020 (National Bureau of Statistics of China, 2020). Remarkably, nearly 78 % of left-behind children were separated before six years old (X. Zhang et al., 2019), and over one-third in their first three years of life (Shi et al., 2021).

Research in migration contexts has yielded a growing body of evidence regarding the detrimental impacts of parent-child separation on children's mental health. According to a systemic review, children of migrant parents relative to those of non-migrants had an increased risk of mental health issues, such as depression, anxiety, low self-esteem, self-injury and suicidality (Fellmeth et al., 2018; Ma et al., 2021; Tang et al., 2018). However, available studies were conducted largely in school-age children, with a limited examination of younger children's conditions. According to limited literature, children aged 3–6 years who separated from migrant parents fared worse in psychological development, psychological resilience, mental health than did never-separated children (Adhikari et al., 2014; Lu et al., 2021; J. Zhang et al., 2021). Likewise, another study reported increased anxiety symptoms among this age group separated from migrant parents (Ding et al., 2021). Similar findings were drawn from a longitudinal study in the Philippines, indicating the adverse impacts of migration-caused separation on the psychological well-being of children aged 3–5 years (Fu et al., 2023a). However, despite the growing recognition of mental health challenges among young children of migrants, the specific set of risk factors that pertain to their separation is yet to be well understood.

Growing empirical research suggested that the impacts of separation on the mental health of children of migrants might vary in its patterns—such as age at separation, overall duration, number of migrant parents, and gender (F. Wang et al., 2019; C. Zhao and Egger, 2020; X. Zhao et al., 2023). For instance, a study in rural areas of China found that, among children aged 10–17, as the separation from parents occurred earlier, their anxiety symptoms increased. Furthermore, the younger children were when separated from their mothers, the more symptoms they had, either anxiety or depression (Liu et al., 2009). Another study showed that children separated from migrant mothers, migrant fathers, or both parents, were at a higher risk of emotional and

behavioral problems than those never separated (Akezhuoli et al., 2022). However, despite these potential implications, studies on young children at preschool age remained limited to a narrow examination of their present separation status and in small samples. Thus, the nuances of various separation patterns in early life courses pertain to their impacts on preschool children's mental health, to our best knowledge, remain underexplored.

To this end, the present study focused on preschool-age young children of migrants in China to examine whether early parent-child separation was associated with their emerging mental health problems. Particular focus in this study was on the separation in the first three years of childhood, concerning its various patterns in migrant parental number, gender, and accumulated separation period, in addition to their present separation status.

2. Methods

2.1. Study population

Data were derived from a large-scale, kindergarten-based mental health census launched by Nanling County, Anhui province in China, from October 30 to November 3, 2023. Eighty-one kindergartens countywide effectively completed an online parent-reported questionnaire survey for the children screening, identifying a representative sample of 9371 participants. All participants provided informed consent prior to the survey.

2.2. Measures

2.2.1. Outcome variables

This study adopted the parent version of the Strengths and Difficulties Questionnaire (SDQ), a widely used screening tool for children aged 3–17 in both clinical and community settings (R. Goodman, 1997; A. Goodman et al., 2010). The SDQ consists of five subscales: emotional problems, peer problems, hyperactivity/inattention, conduct problems and pro-social behaviors. Each subscale is composed of five items scored on a scale of 0 (not true), 1(somewhat true), or 2(certainly true), generating a total score ranging from 0 to 10. The factor structure of the SDQ have consistently validated in previous studies, grouping the five subscales grouped into three domains: internalizing problems, externalizing problems and pro-social behavior (Goodman et al., 2010). These dimensions capture distinct aspects of mental health, with internalizing problems often associated with introverted or inhibited behaviors, and externalizing problems linked to external actions that disrupt or challenge social norms. The internalizing problems score is derived by summing the emotional problems and peer problems subscale scores, yielding a total score between 0 and 20. The externalizing problems score is calculated by summing the conduct problems and hyperactivity/inattention subscale scores, also yielding a total score between 0 and 20. The total difficulties score, which reflects the sum of the four problem subscales (internalizing + externalizing), ranges from 0 to 40, with a higher score indicates greater difficulties. The pro-social behavior subscale is independent and ranges from 0 to 10. In this study, we adopted the theoretical model of the SDQ, treating pro-social behavior as a distinct dimension, consistent with its empirical and conceptual uniqueness as highlighted in previous research (Aarø et al., 2022). The acceptable internal consistency of SDQ in this study, as indicated by the standardized Cronbach's Alpha (0.621), aligns with previous studies in China (Du, Y. et al., 2018; X. Wang et al., 2021).

2.2.2. Exposure variables

As mentioned, we examined parent-child separation in the migration context, with a particular focus on the following variables: (1) separation within three years old (from either or both parents), identified as yes or no, (2) number of separated parents (within three years old), categorized as never, one parent or both parents,(3) parent-specific

separation (within three years old), categorized as never, father, mother or both parents,(4) accumulated separation period (since first separation within the age of three), categorized as never, <3 years, 3 years or longer and (5) current separation status (at preschool age), categorized as never, previously separated or remain separated. The above variables were measured based on separate questions on the father's and mother's migration situations. Firstly, respondents were asked, "Since the child was born, has the father/mother ever migrated outside for work or business for at least six months?" with the options of "currently migrating," "previously migrated," "never," or "don't know." Those in the first two cases were posed follow-up questions such as, "At what age did the father/mother first migrate outside?" and "For how long has the father/mother been migrating outside since then?".

2.2.3. Covariates

The following factors were considered as covariates and controlled in the analysis: (1) age, (2) gender, (3) paternal/maternal education attainment, classified as "middle school or below," "high school," "college or above,"; (4) family economic status, appraised with a self-rated question on a five-point scale and then categorized as "good or better," "average, " "bad or worse."

2.3. Statistical analysis

The analyses were performed using SPSS software version 25.0. In our analysis, SDQ scores were treated as continuous variables, consistent with common practices in the literature (e.g., Goodman et al., 1997; Du et al., 2018). Descriptive statistics were presented as mean (SD) for continuous variables such as SDQ scores and as frequencies (percentages) for categorical variables. A one-way ANOVA analysis or t-test was conducted to explore the difference in SDQ scores across groups by characteristics of parent-child separation and socio-demographics. Subsequently, we used multivariable linear regression to examine the association between SDQ scores and the parent-child separation variables of interest while controlling for covariates. To account for potential heteroskedasticity in the sample, we employed White's robust standard error estimation in our regression analyses. Two-tailed $p < 0.05$ denoted significance. In this study, the criterion for inclusion for analysis was that children were at least three years old (age-appropriate for SDQ) with available data on parent-child separation. We excluded children separated beyond three years old according to our variables of interest. Additionally, to minimize report bias in our study, we also excluded those respondent parents who were absent for migration at the time of the survey.

3. Results

As summarized in Table 1, a total of 7487 children were included in this study, with a mean (SD) age of 4.2(0.92) years, and 52.3 % were male. Of these children, 3018 (40.3 %) were separated within three years old. Specifically, 2465 (32.9 %) children were separated from one parent (31.6 % from the father, 1.4 % from the mother, respectively) and 553(7.4 %) from both parents. The accumulated separation period ranged from less than three years for 1164 children (15.5 %) to three years or longer for 1692 (22.6 %). Regarding present separation status, 1357 children were previously separated from parent(s) on the day of the survey, and 1661 remained separated from parent(s), accounting for 18.1 % and 22.2 % of samples, respectively.

The ANOVA or t-test analysis manifested a significant difference in scores of total difficulties, internalizing problems, externalizing problems, and pro-social behavior across parent-child separation characteristics. Notably, children separated from the parent(s) within three years old, particularly from their mothers and those who experienced accumulated separation period for three years or longer, scored highest on total difficulties among their counterparts, respectively (sTable 1 in Supplement 1).

Table 1

Study population characteristics ($N = 7487$).

	Total n (%)
Age (Mean ± SD)	4.2 ± 0.92
Gender	
Male	3917(52.3)
Female	3570(47.7)
Kindergarten	
Nursery class	61(0.8)
Year 1	1976(26.4)
Year 2	2489(33.2)
Year 3	2961(39.5)
Family economic status	
Good/Better	735(9.8)
Average	5870(78.4)
Bad/Worse	882(11.8)
Paternal education level	
Middle school or below	3385(45.2)
High school	1746(23.3)
College and above	2291(30.6)
Maternal education level	
Middle school or below	3565(47.6)
High school	1618(21.6)
College and above	2264(30.2)
characteristics of parent-child separation	
Separation within three years old	
No	4469(59.7)
Yes	3018(40.3)
Number of separated parents (within three years old)	
Never	4469(59.7)
One parent	2465(32.9)
Both parents	553(7.4)
Parent-specific separation (within three years old)	
Never	4469(59.7)
Father	2363(31.6)
Mother	102(1.4)
Both	553(7.4)
Accumulated separation period	
Never	4469(59.7)
<3 years	1164(15.5)
≥3 years	1692(22.6)
Current separation status	
Never	4469(59.7)
Previously separated	1357(18.1)
Remain separated	1661(22.2)
SDQ scores (Mean ± SD)	
Total difficulties	8.47±3.74
Internalizing Problems	3.46±2.00
Externalizing Problems	5.01±2.44
Pro-social behavior	6.44±1.92

All regression models fit significantly. Tables 2-5 presented the results of regression coefficients between SDQ scores and parent-child separation characteristics after adjusting for covariates. Parent-child separation within three years old, compared to non-separation, was significantly and positively associated with children's internalizing problems (β=0.19, [95 %CI, 0.09–0.28]), externalizing problems (β=0.24, [95 %CI, 0.12–0.35]), and total difficulties (β=0.42, [95 %CI, 0.25–0.60]), but not pro-social behavior. Furthermore, children separated within three years old from either one parent or both parents showed a significantly higher likelihood of internalizing problems (β=0.13, [95 %CI, 0.03–0.23]; β=0.43, [95 %CI, 0.25–0.62], respectively), externalizing problems (β=0.21, [95 %CI, 0.09–0.33]; β=0.34, [95 %CI, 0.12–0.56], respectively), as well as total difficulties (β=0.35, [95 %CI, 0.16–0.53]; β=0.77, [95 %CI, 0.44–1.11], respectively). The results of the association of the parent-specific separation and children's SDQ scores concerning the above aspects remained significant (summarized in sTable 2 in Supplement 1).

Additionally, among children separated within three years old, those who experienced accumulated period for less or more than three years were more likely than never-separated children to have internalizing problems(β=0.16, [95 %CI, 0.03- 0.29]; β=0.21, [95 %CI, 0.10- 0.33],

Table 2
Regression coefficients for SDQ and separation in three years old with adjustment for sociodemographic characteristics ($n = 7401$).

	Total difficulties β (95 %CI)	Internalizing Problems β(95 %CI)	Externalizing Problems β(95 %CI)	Pro-social behavior β(95 %CI)
Separation in three years old				
No	Ref	Ref	Ref	Ref
Yes	0.42 (0.25, 0.60)***	0.19 (0.09, 0.28)***	0.24 (0.12, 0.35)***	−0.07 (−0.16, 0.01)
Age	−0.12 (−0.21, −0.03)**	−0.10 (−0.15, −0.05)***	−0.02 (−0.08, 0.04)	0.23 (0.18, 0.27)***
Gender				
Male	Ref	Ref	Ref	Ref
Female	−0.50 (−0.66, −0.33)***	−0.06 (−0.14, 0.03)	−0.44 (−0.55, −0.33)***	0.31 (0.22, 0.39)***
Family economic status				
Good/Better	Ref	Ref	Ref	Ref
Average	0.75 (0.45, 1.04)***	0.29 (0.13, 0.45)***	0.45 (0.26, 0.64)***	−0.46 (−0.62, −0.31)***
Bad/Worse	1.68 (1.29, 2.08)***	0.76 (0.55, 0.97)***	0.92 (0.67, 1.17)***	−0.74 (−0.94, −0.55)***
Paternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.21 (−0.04, 0.45)	0.05 (−0.09, 0.18)	0.16 (−0.002, 0.321)	0.04 (−0.09, 0.17)
Middle school or below	0.56 (0.31, 0.82)***	0.23 (0.09, 0.36)**	0.34 (0.17, 0.50)***	−0.13 (−0.26, −0.01)*
Maternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.37 (0.12, 0.62)**	0.20 (0.07, 0.33)**	0.17 (0.002, 0.333)*	−0.16 (−0.29, −0.03)*
Middle school or below	0.52 (0.27, 0.77)***	0.34 (0.21, 0.48)***	0.18 (0.01, 0.34)*	−0.29 (−0.42, −0.17)***

*< 0.05; **< 0.01; ***< 0.001.
SDQ, Strengths and Difficulties Questionnaire.

Table 3
Regression coefficients for SDQ and number of separated parents (in three years old) with adjustment for sociodemographic characteristics ($n = 7401$).

	Total difficulties β (95 %CI)	Internalizing Problems β(95 %CI)	Externalizing Problems β(95 %CI)	Pro-social behaviors β(95 %CI)
Number of separated parents (within three years old)				
Never	Ref	Ref	Ref	Ref
One parent	0.35 (0.16, 0.53)***	0.13 (0.03, 0.23)**	0.21 (0.09, 0.33)***	−0.07 (−0.16, 0.03)
Both parents	0.77 (0.44, 1.11)***	0.43 (0.25, 0.62)***	0.34 (0.12, 0.56)**	−0.10 (−0.27, 0.07)
Age	−0.12 (−0.21, −0.03)**	−0.10 (−0.15, −0.06)***	−0.02 (−0.08, 0.04)	0.23 (0.18, 0.28)***
Gender				
Male	Ref	Ref	Ref	Ref
Female	−0.50 (−0.66, −0.33)***	−0.06 (−0.15, 0.03)	−0.44 (−0.55, −0.33)***	0.31 (0.22, 0.39)***
Family economic status				
Good/Better	Ref	Ref	Ref	Ref
Average	0.75 (0.45, 1.05)***	0.30 (0.14, 0.46)***	0.45 (0.27, 0.64)***	−0.46 (−0.62, −0.31)***
Bad/Worse	1.68 (1.29, 2.07)***	0.76 (0.55, 0.97)***	0.92 (0.67, 1.17)***	−0.74 (−0.94, −0.55)***
Paternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.20 (−0.05, 0.44)	0.04 (−0.09, 0.17)	0.16 (−0.00, 0.32)	0.04 (−0.09, 0.17)
Middle school or below	0.56 (0.31, 0.81)***	0.22 (0.09, 0.36)**	0.33 (0.17, 0.50)***	−0.13 (−0.26, −0.01)*
Maternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.36 (0.11, 0.61)**	0.19 (0.06, 0.33)**	0.17 (−0.00, 0.33)	−0.16 (−0.29, −0.03)*
Middle school or below	0.52 (0.27, 0.77)***	0.34 (0.21, 0.48)***	0.18 (0.01, 0.34)*	−0.29 (−0.42, −0.17)***

*< 0.05; **< 0.01; ***< 0.001. SDQ, Strengths and Difficulties Questionnaire.

respectively), externalizing problems (β=0.16, [95 %CI, 0.01- 0.32]; β=0.28, [95 %CI, 0.14- 0.42], respectively), and total difficulties (β=0.32, [95 %CI, 0.09- 0.56]; β=0.49, [95 %CI, 0.28- 0.70], respectively), and the latter also to have significantly poorer pro-social behavior (β=−0.12, [95 %CI, −0.22- −0.01]). Surprisingly, these preschool-aged children previously separated, similar to those who remained separated, demonstrated a higher likelihood of internalizing problems (β=0.25, [95 %CI, 0.12- 0.37]; β=0.14, [95 %CI, 0.03- 0.25], respectively), externalizing problems (β=0.23, [95 %CI, 0.08- 0.38]; β=0.24, [95 %CI, 0.10- 0.38], respectively) as well as total difficulties (β=0.48, [95 %CI, 0.25- 0.71]; β=0.38, [95 %CI, 0.17- 0.59], respectively), as compared to never-separated children. Likewise, no significant association was observed towards pro-social behavior among children, either currently or previously separated, relative to never-separated children.

4. Discussion

The current study captured a substantial number of young children affected by economic labor migration in China who suffered separation from their parents at a critical window for their early development. The findings suggested that such early exposure to parent-child separation due to migration, especially in the first three years of life, was significantly associated with emerging mental health difficulties at preschool age, either internalizing or externalizing problems, along with potential lasting impacts on children. In addition, these consequences appeared to be consistently pronounced for these children regardless of either, both, and which migrant parents.

In early childhood, the environment of experience and relationships in the family exerts a powerful influence on the health and development

Table 4

Regression coefficients for SDQ and cumulated separation period of children separated in three years old with adjustment for sociodemographic characteristics ($n = 7245$).

	Total difficulties β (95 %CI)	Internalizing Problems β(95 %CI)	Externalizing Problems β(95 %CI)	Pro-social behavior β(95 %CI)
Cumulated separation periods				
Never	Ref	Ref	Ref	Ref
<3 years	0.32 (0.09, 0.56)**	0.16 (0.03, 0.29)*	0.16 (0.01, 0.32)*	−0.01 (−0.13, 0.12)
≥3 years	0.49 (0.28, 0.70)***	0.21 (0.10, 0.33)***	0.28 (0.14, 0.42)***	−0.12 (−0.22, −0.01)*
Age	−0.13 (−0.22, −0.04)**	−0.11 (−0.15, −0.06)***	−0.02 (−0.08, 0.04)	0.23 (0.18, 0.28)***
Gender				
Male	Ref	Ref	Ref	Ref
Female	−0.51 (−0.67, −0.34)***	−0.06 (−0.15, 0.03)	−0.45 (−0.56, −0.34)***	0.30 (0.21, 0.39)***
Family economic status				
Good/Better	Ref	Ref	Ref	Ref
Average	0.77 (0.47, 1.07)***	0.30 (0.14, 0.46)***	0.47 (0.28, 0.66)***	−0.47 (−0.62, −0.31)***
Bad/Worse	1.69 (1.30, 2.09)***	0.76 (0.54, 0.97)***	0.93 (0.68, 1.19)***	−0.74 (−0.94, −0.53)***
Paternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.20 (−0.04, 0.45)	0.05 (−0.08, 0.18)	0.15 (−0.01, 0.31)	0.05 (−0.08, 0.18)
Middle school or below	0.55 (0.29, 0.81)***	0.23 (0.09, 0.36)**	0.32 (0.16, 0.49)***	−0.13 (−0.254, 0.001)
Maternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.36 (0.11, 0.61)**	0.20 (0.07, 0.34)**	0.16 (−0.01, 0.33)	−0.17 (−0.30, −0.04)*
Middle school or below	0.51 (0.25, 0.76)***	0.33 (0.19, 0.47)***	0.18 (0.01, 0.34)*	−0.30 (−0.42, −0.17)***

*< 0.05; **< 0.01; ***< 0.001. SDQ, Strengths and Difficulties Questionnaire.

Table 5

Regression coefficients for SDQ and current separation status of children separated in three years old with adjustment for sociodemographic characteristics ($n = 7401$).

	Total difficulties β (95 %CI)	Internalizing Problems β(95 %CI)	Externalizing Problems β(95 %CI)	Pro-social behavior β(95 %CI)
Current separation status				
Never	Ref	Ref	Ref	Ref
Previously separated	0.48 (0.25, 0.71)***	0.25 (0.12, 0.37)***	0.23 (0.08, 0.38)**	−0.08 (−0.19, 0.03)
Remain separated	0.38 (0.17, 0.59)***	0.14 (0.03, 0.25)*	0.24 (0.10, 0.38)***	−0.07 (−0.18, 0.04)
Age	−0.12 (−0.21, −0.03)**	−0.10 (−0.15, −0.06)***	−0.02 (−0.08, 0.04)	0.23 (0.18, 0.28)***
Gender				
Male	Ref	Ref	Ref	Ref
Female	−0.50 (−0.66, −0.33)***	−0.06 (−0.15, 0.03)	−0.44 (−0.55, −0.33)***	0.31 (0.22, 0.39)***
Family economic status				
Good/Better	Ref	Ref	Ref	Ref
Average	0.75 (0.45, 1.04)***	0.29 (0.14, 0.45)***	0.45 (0.26, 0.64)***	−0.46 (−0.62, −0.31)***
Bad/Worse	1.68 (1.29, 2.08)***	0.76 (0.55, 0.98)***	0.92 (0.67, 1.17)***	−0.74 (−0.94, −0.55)***
Paternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.20 (−0.04, 0.45)	0.04 (−0.09, 0.17)	0.16 (−0.002, 0.322)	0.04 (−0.005, 0.166)
Middle school or below	0.56 (0.31, 0.81)***	0.22 (0.09, 0.36)**	0.34 (0.17, 0.50)***	−0.13 (−0.26, −0.00)*
Maternal education level				
College and above	Ref	Ref	Ref	Ref
High school	0.37 (0.12, 0.62)**	0.20 (0.07, 0.33)**	0.17 (0.002, 0.333)*	−0.16 (−0.29, −0.03)*
Middle school or below	0.52 (0.27, 0.78)***	0.34 (0.21, 0.48)***	0.18 (0.01, 0.34)*	−0.29 (−0.42, −0.17)***

*< 0.05; **< 0.01; ***< 0.001.
SDQ, Strengths and Difficulties Questionnaire.

of children (Britto et al., 2017; Bradley, 2019). Parent-child separation, in this light, generates an adverse stress-inducing experience for children and can damage their developing brain, laying an unstable foundation for psychological development (Nelson et al., 2020). Particularly in the migrant families, according to the theory of family stress, parental migration typically causes family transition and disruption and, therefore, serves as chronic and stressful experiences for both children and their caregivers (Fu et al., 2023b; Patterson, 1988). Supported by current well-established recognitions, our findings suggested the potential disruption of early parent-child separation in the migration context on mental health development, calling for a focus on young children at critical stages and moving intervention forward.

More specifically, our study highlighted that separation from either or both parents, when it occurred within three years old, was consistently linked to children's increased internalizing and externalizing problems. These findings might well be interpreted with the attachment theory (Bowlby, 1982; Thompson, 2024). In infancy and the toddler years, the repeated experiences of perceiving and responsive interaction with parents could shape children's attachment security and contribute to their social-emotional development and behaviors (Black et al., 2021). Conversely, the lack of early interactive parenting, as most migrant parents do, might lead to insecure attachment and thus put the child at a higher risk of emotional and behavioral difficulties. Consistent with these theoretical expectations, our study extended evidence in the context of demographic shifts in families that changed the roles of mothers and fathers, accentuating the impacts of father-child and mother-child separation on early mental health matters.

Furthermore, the findings indicated the extent to which the duration of separation might impact. We found that for preschool-aged children, either an accumulated short (≤3 year) or long (≥ 3 years) period since separation within the age of three was significantly associated with their increased mental health problems (compared to never-separated children). While we did not measure the separation length within the age of three, our results found that children who remain separated have increased mental health difficulties in both internalizing and externalizing aspects. Of even more concern, those previously separated

children, even when reunited with migrant parents at preschool age, were at higher risk of mental health problems likewise. Altogether, these findings indicated the lasting adverse impact of early parent-child separation sustained on mental health among preschool-aged children, which was surprisingly similar to adolescents (M. Li et al., 2024; C. Zhao et al., 2017; X. Li et al., 2021). Beyond this, our study suggested that pro-social behaviors of preschool-aged children showed a negative correlation to a long period of separation since the first three years of life. Based on previous evidence, this may partially be attributed to the long-term lack of parent-child interaction that plays a critical role in childhood prosociality for early morality development (Deneault et al., 2023).

Nevertheless, we note the following concerns as potential limitations. First, this cross-sectional study cannot explain the causal relationships of variables, and thus, future research adopting a longitudinal design is encouraged. Second, the assessment of children's mental health was based on reports from caregivers, which might introduce some bias due to their answers to retrospective questions and possible social desirability. Coupled with the nature of difficulty to recognize in young children, their mental health problems might remain underestimated (Brauner and Stephens, 2006). For future research, incorporating teacher-reported tools and observation-based methods needs to be considered as well. Third, given the small sample size of children separated from their mothers, some of the results may not be able to reach statistical significance, and caution is needed when interpreting these results. While treating SDQ scores as continuous variables is consistent with established practices in similar studies, future research could explore alternative methods to better account for the bounded nature of the scores. Additionally, although we did not apply a mixed-effects model in this analysis, we acknowledge that including a kindergarten-level random effect could provide more insight into the data's hierarchical structure. Future studies could benefit from such an approach to better account for variation between kindergartens, which could refine the estimates and help to clarify the role of kindergarten-level factors on children's mental health outcomes. Lastly, this study was only conducted in the second-largest province in the migrant population of China and thus remains limited to generalizability. Research across different regions and cultures is needed to add weight to current findings.

Despite these limitations, this study added to the growing research on early mental health in children and extended evidence on the impact of adverse experiences at critical periods, specifying the parent-child separation due to migration as a significant risk factor. Early prevention and intervention of disruption in the early developmental process shed light on a promise of improving their health, well-being, and human development across the life course. Our findings contributed to tailoring cost-efficient strategies for the children of migrants at early stages.

Potential opportunities for interventions were illuminated. First, it is required to enhance the knowledge and capacity of parents and other caregivers in supportive care in early childhood. As one step, authorities would need to support parents and caregivers in improving responsive caregiving and relationships with children. Second, although recent years have seen an increasing number of Chinese migrant parents, mainly mothers, come back when children are of school age, these parents should further attach importance to early childhood. Accordingly, support for parents in their optimal arrangement of migration and childcare remains in need. Furthermore, immediate identification and interventions need to be valued to strengthen early mental health in preschool-aged children within the context of their families, schools, and communities.

Reducing inequities in early childhood health and development to enable each child to achieve full developmental potential is the requisite for meeting Sustainable Development Goals (Daelmans et al., 2017). Nowadays, the global population movement has rebounded after the COVID-19 pandemic and is now seeing a remarkable surge, which might impact more migrant families in the decades ahead (World Migration Report 2024, 2024). Hence, public attention should be given to parent-child separation in the context of such a highly mobile society and its adverse implications for early childhood health and development that impact human capital, which is a matter of sustainable development.

5. Conclusion

Overall, this study revealed that early parent-child separation in the context of labor migration, especially within three years of life, was significantly associated with emerging mental health difficulties, both internalizing and externalizing problems in children at preschool age, regardless of either, both, and which migrant parents. In addition, a significant association was observed in children separated for a longer period since then and those currently or previously separated, indicating lasting adverse impacts of separation at the critical stage of childhood. These findings illuminated potential opportunities for cost-efficient prevention and intervention of early childhood mental health for children of migrants. Given today's highly mobile society, further efforts toward adverse impacts of parent-child separation in early childhood may be warranted to optimize human capital and achieve sustainable development.

CRediT authorship contribution statement

Hailati Akezhuoli: Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Minghui Tan:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Yuyin Ma:** Writing – review & editing, Investigation, Formal analysis. **Xintian Liu:** Writing – review & editing, Investigation, Formal analysis. **Jiayao Xu:** Writing – review & editing, Methodology, Formal analysis. **Jingjing Lu:** Writing – review & editing, Methodology, Data curation. **Xudong Zhou:** Writing – review & editing, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

All authors have nothing to declare.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmh.2025.100310.

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