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Association between maternal exposure to cumulative childhood trauma and offspring childhood trauma and depressive symptoms among Chinese adolescents

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Abstract

Background This study aimed to explore the effect of maternal exposure to cumulative childhood trauma (CT) on offspring CT and depressive symptoms.

Methods A total of 3672 mothers and their 3672 adolescent offspring who completed the questionnaires were included in this study. CT was assessed using the Childhood Trauma Questionnaire Short Form, while depressive symptoms in adolescents were assessed using the Center for Epidemiological Studies Depression Scale.

Results Among the 3672 maternal respondents, 1397 (38.04%) reported ever having experienced CT and 463 (12.61%) reported ≥ 2 types of CT. As shown by logistic regression analysis, having a mother who was exposed to 1 or ≥ 2 types of CT was a risk factor for offspring CT exposure in the overall sample of adolescents, as well as male and female adolescent subgroups, relative to those whose mothers were not exposed to CT. Offspring emotional neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms among male and female adolescents, while offspring physical neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms among male adolescent offspring, as the indirect paths did not include 0.

Conclusion Maternal exposure to cumulative CT may affect the severity of CT in their adolescent offspring, which indirectly impacts adolescents' depressive symptoms.

Keywords Childhood trauma, Depressive symptoms, Maternal, Offspring, Mediation model

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Background

Relationship between childhood trauma and mental health

Adolescence is a turbulent period of transition involving drastic physical, mental, and emotional changes [1]. These rapid changes may exacerbate adolescents'vulnerability to mental health difficulties [2]. Mental disorders account for 16% of the global burden of disease and injury among adolescents [3], with depression as one of the leading causes of disability among this group [4]. Among adolescents, depression is strongly associated with academic difficulties, self-injury, worse physical health, and suicidal behaviors, since ignoring depressive symptoms in adolescents may lead to tragic outcomes [5, 6], it is crucial to explore the influence mechanism of depressive symptoms and understand how to prevent them.

Childhood trauma (CT), which includes emotional abuse, physical abuse, sexual abuse, emotion neglect, and physical neglect, is an important environmental factor affecting an individual's physical and mental health [7]. Recent studies suggest that CT is not uncommon among the general population [8]. A systematic review and meta-analysis including 32 studies found that the total prevalence of CT among Chinese college students was 64.7% [8]. As an adverse experience, CT can have many serious consequences including increased risk of physical diseases and mental health conditions, including anxiety, depression, and suicide-related behavior [9–11]. The role of CT as an important risk factor for depression in adolescents has received particular attention in recent years [12]. In addition, most victims of CT often experience not just one, but multiple types of trauma [13]. The greater the number of different traumatic events experienced during childhood, the higher the risk of adverse physical and mental health outcomes in the future [14, 15].

Influence of maternal exposure to cumulative CT on offspring CT and offspring depressive symptoms

In addition to affecting the exposed individual, research has shown that the effects of CT can be transmitted to the next generation [16]. For example, mothers who experience CT may be more likely to exhibit unhealthy behavioral habits and maladaptive parenting styles, such as neglecting their children's psychological and physical needs and even acting violently toward their children; these behaviors are then experienced by their offspring as CT [17, 18]. Interestingly, previous studies suggest that the negative effects of CT are greater in offspring whose mothers experienced CT compared to offspring whose fathers experienced CT [19–21]. A study of 69 cohorts across the USA found that children whose mothers were exposed to CT had a higher risk of developing various psychiatric disorders [16]. Other studies support this association, showing that maternal CT increases the risk of neurodevelopmental disorders, internalizing problems (mainly depression and anxiety symptoms), and externalizing problems (behavior problems and hyperactivity) in children [19–22]. However, there is currently little research exploring the impact of maternal exposure to cumulative CT (refer to experience multiple types of CT [23]) on offspring CT and mental health. Notably, one study reported a dose–response relationship between maternal exposure to cumulative CT and offspring health outcomes, indicating that maternal exposure to cumulative CT patterns were generally associated with increased offspring health risks [16]. Based on these prior findings, we hypothesized that maternal exposure to cumulative CT may affect CT experience and depressive symptoms in their offspring.

Offspring CT may influence the relationship between maternal exposure to cumulative childhood trauma and offspring depressive symptoms

Previous studies have explored the pathologic development of mental illness in the children of mothers with CT. A study of 9397 mother–child dyads found that maternal prenatal depression and postnatal depression mediated the relationship between maternal CT and their offspring's internalization and externalization difficulties [24]. Several studies have shown that maternal psychological distress is a key mechanism by which vulnerability is passed from mother to child [25, 26]. Mothers with a history of CT are more likely to have maladaptive parenting styles, maladaptive parenting styles may be a mediating factor between maternal CT and mental health status in their offspring [24]. One study also reported that mothers who experience CT are more likely to engage in abusive behavior [27]. Given that CT is an important risk factor for depressive symptoms in adolescents [28], and based on the previous hypothesis, we further hypothesized that the severity of CT in offspring may influence the relationship between maternal exposure to cumulative CT and depressive symptoms in adolescent offspring.

To test the aforementioned hypotheses, the research content of this study is as follows: (i) whether maternal exposure to cumulative CT influences the occurrence of CT and depressive symptoms in their adolescent offspring, both in the overall sample and within gender-specific adolescent subgroups; (ii) whether offspring CT mediates the relationship between maternal exposure to cumulative CT and depressive symptoms in their adolescent offspring, both in the overall sample and within gender-specific adolescent subgroups.

Methods

Procedure

This study adopted a cluster sampling method. A total of 9479 questionnaires were distributed to students at five high schools (n = 4679) and four junior high schools (n = 4800) between September and December 2019 in Shenzhen, Guangdong Province, China. The survey content included sections for students and parents to complete, and all responses were anonymous. As this study investigated the impact of maternal exposure to cumulative CT on adolescent offspring CT and depressive symptoms, our analysis required questionnaires completed by mothers as well as their adolescent offspring. Consequently, questionnaires were excluded if they were not completed by both mother and adolescent offspring, if there were obvious logical errors, or if they were incomplete. Ultimately, 3672 mothers and their 3672 adolescent offspring fully completed the questionnaires and were included in this study. The adolescent offspring included 1807 boys (49.2%) and 1865 girls (50.8%) with an average age of 13.98 ± 1.62 years. The mothers had an average age of 40.92 ± 4.26 years.

For adult participants, informed consent is obtained from the participants themselves, while for adolescent participants, informed consent is obtained from both the participants and their guardians. This study was approved by the ethics committee of Shenzhen Kangning Hospital.

Instruments

Childhood Trauma Questionnaire Short Form (CTQ-SF)

The CTQ-SF was developed by Bernstein et al. [29] with the Chinese version translated by Zhao et al. [30]. Cronbach's α coefficient for the Chinese version of the CTQ-SF is 0.77 and the reliability is 0.75 [30]. In this study, the Cronbach's alpha coefficient is 0.687 for mothers and 0.754 for their adolescent offspring. The questionnaire is suitable for adolescents aged 12–16 [31]. The CTQ-SF comprises 28 items with 5 subscales: emotional abuse, physical abuse, emotional neglect, physical neglect, and sexual abuse. Participants respond to each item with a score of 1–5 corresponding to the frequency they experienced the specific item (never, occasionally, sometimes, often, or always). In this study, a respondent is considered to have experienced CT if they have a score indicating moderate to severe levels of any of the following types of abuse or neglect: emotional abuse (score ≥ 13), physical abuse (score ≥ 10), sexual abuse (score ≥ 8), emotional neglect (score ≥ 15), or physical neglect (score ≥ 10) [29]. Maternal exposure to cumulative CT was calculated by summing the number of childhood trauma types experienced, given that the sample size of mothers exposed to 3–5 types of trauma is relatively limited, maternal exposure to cumulative CT was classified into"no trauma exposure,""exposure to one type of trauma,"and"exposure to two or more types of trauma (≥ 2).

Center for Epidemiological Studies Depression Scale (CES-D)

Depressive symptoms were assessed using the CES-D [32]. The Chinese version of the CES-D scale has been widely used to assess depression among Chinese adolescents [33, 34]. The CES-D comprises 20 items:16 items describe negative symptoms (e.g., 'I feel depressed') and 4 items relate to positive perceptions (e.g., 'I am happy'). Participants responded to the frequency of each symptom in the past week using a 4-point scale ranging from 0 to 3 indicating"little or less than 1 day"to "most of the time or every 5–7 days". The total CES-D score was the sum of all items, including four reverse scored items about positive perceptions. In line with previous studies, a score ≥ 16 was considered to indicate the presence of depressive symptoms [32, 35]. In this study, Cronbach's α coefficient of the CES-D was 0.904.

Statistical analysis

All statistical analyses were performed using SPSS version 21.0 (IBM). The different CT prevalence rates are reported as percentages (%) and 95% confidence interval (CI). Univariate logistic regression analysis was used to examine the relationship between maternal exposure to cumulative CT and exposure to CT and depressive symptoms in adolescent offspring. Correlation analysis was used to explore the relationship between offspring CT and depressive symptoms. Linear regression was used to explore the factors influencing depression in adolescent offspring. Process 3.2 was used to test the mediation model, model 4 was selected, with bootstrapping set to 5000 [36]. If the 95% CI of the bootstrapping method did not include 0, the result was considered statistically significant. In the mediation model, CT in adolescent offspring (continuous variable) served as the mediator variable, maternal exposure to cumulative CT (categorical variable) served as the independent variable, and depressive symptoms in adolescent offspring (continuous variable) served as the dependent variable. Tests are two-tailed. The significance level was set to $p < 0.05$ for all analyses except the mediation analysis.

Results

Prevalence of different types of maternal CT and results of univariate analysis in the overall sample and gender-specific adolescent subgroups

Among the 3672 maternal respondents, 1397 (38.04%) reported ever having experienced CT, 934 (25.44%) reported 1 type of CT, and 463 (12.61%) reported ≥ 2 types of CT. Compared to offspring of mothers who were

not exposed to CT, offspring of mothers exposed to 1 or ≥ 2 types of CT had a higher incidence of CT and depressive symptoms (in the overall sample of adolescents, male and female adolescent subgroups) (Tables 1 and 2). As shown by the logistic regression, exposure to 1 or ≥ 2 types of CT in mothers was a risk factor for CT in their offspring (in the overall sample, male and female adolescent subgroups) relative to offspring whose mothers were not exposed to CT (Table 1). Notably, there were differences in the impact of offspring's exposure to CT when mothers were exposed to 1 or ≥ 2 types of CT compared to offspring whose mothers were not exposed to CT (see Supplementary Tables 1–5 for details).

In the overall sample of adolescents as well as the male and female adolescent subgroups, experiences of offspring emotional abuse, offspring physical abuse, offspring sexual abuse, offspring emotional neglect, and offspring physical neglect were positively correlated with offspring depressive symptoms ($p < 0.01$; Table 3).

Multivariate regression analysis for offspring depressive symptoms in the overall sample and gender-specific adolescent subgroups

In the overall sample, offspring emotional abuse ($\beta = 0.382$, $p < 0.001$) and offspring emotional neglect ($\beta = 0.280$, $p < 0.001$) positively predicted

Table 1 Comparison of offspring childhood trauma rates by maternal exposure to cumulative childhood trauma in the overall sample, male and female adolescent subgroups

Number of types of maternal CT	Any offspring CT n (%,95%CI)	Odds ratio (95%CI)
Overall sample (*n* = 3672)		
0 (*n* = 2275, 61.96%)	633(27.82,26.02–29.70)	Reference
1 (*n* = 934, 25.44%)	335(35.87,32.86–39.00)	1.451(1.234,1.706)
≥ 2 (*n* = 463, 12.61%)	185(39.96,35.60–44.48)	1.726(1.403,2.124)
Males (*n* = 1807)		
0(*n* = 1114, 61.65%)	310(27.83,25.28–30.53)	Reference
1(*n* = 458,25.35%)	155(33.84,29.66–38.29)	1.327(1.050,1.676)
≥ 2(*n* = 235,13.00%)	98(41.70,35.58–48.09)	1.855(1.387,2.481)
Females (*n* = 1865)		
0(*n* = 1161,62.25%)	323(27.82,25.32–30.47)	Reference
1(*n* = 476,25.52%)	180(37.82,33.57–42.25)	1.578(1.259,1.977)
≥ 2(*n* = 228,12.23%)	87(38.16,32.10–44.61)	1.601(1.190,2.153)

n: number of participants, *CT:* Childhood trauma, *CI:* Confident interval

Table 2 Comparison of offspring depressive rates by maternal exposure to cumulative childhood trauma in the overall sample, male and female adolescent subgroups

Number of types of maternal CT	Offspring with depressive symptoms n (%,95%CI)	Odds ratio (95%CI)
Overall sample (*n* = 3672)		
0 (*n* = 2275, 61.96%)	783(34.42,32.49–36.39)	Reference
1 (*n* = 934, 25.44%)	353(37.79,34.74–40.95)	1.158(0.988–1.356)
≥ 2 (*n* = 463, 12.61%)	189(40.82,36.44–45.36)	1.314(1.071–1.613)
Males(*n* = 1807)		
0(*n* = 1114, 61.65%)	323(28.99,26.41–31.73)	Reference
1(*n* = 458,25.35%)	146(31.88,27.78–36.28)	1.146(0.906–1.450)
≥ 2(*n* = 235,13.00%)	89(37.87,31.91–44.22)	1.493(1.113–2.002)
Females(*n* = 1865)		
0(*n* = 1161,62.25%)	460(39.62,36.82–42.46)	Reference
1(*n* = 476,25.52%)	207(43.49,39.10–47.98)	1.173(0.945–1.455)
≥ 2(*n* = 228,12.23%)	100(43.86,37.57–50.35)	1.191(0.894–1.586)

n: number of participants, *CT:* Childhood trauma, *CI:* Confident interval

Table 3 Correlation between offspring childhood trauma and offspring depressive symptoms in the overall sample, male and female adolescent subgroups

	Variables	Offspring EA	Offspring PA	Offspring SA	Offspring EN	Offspring PN
Overall sample($n = 3672$)	Offspring depressive symptom	0.549**	0.320**	0.136**	0.505**	0.339**
Males($n = 1807$)	Offspring depressive symptom	0.498**	0.319**	0.161**	0.474**	0.330**
Females($n = 1865$)	Offspring depressive symptom	0.568**	0.340**	0.140**	0.529**	0.368**

EA: Emotional abusem, *PA:* Physical abuse, *SA:* Sexual abuse, *EN:* Emotional neglect, *PN:* Physical neglect

** $p < 0.01$

offsprings depressive symptoms. In the male adolescent subgroup, offspring emotional abuse (β = 0.326, $p < 0.001$), offspring physical abuse (β = 0.045, $p = 0.048$), offspring emotional neglect (β = 0.281, $p < 0.001$), and offspring physical neglect (β = 0.051, $p = 0.029$) positively predicted offspring depressive symptoms. In the female adolescent subgroup, offspring emotional abuse (β = 0.387, $p < 0.001$), offspring sexual abuse (β = 0.043, $p = 0.02$), and offspring emotional neglect (β = 0.286, $p < 0.001$) positively predicted offspring depressive symptom (Table 4).

Mediation model of the relationship between maternal exposure to cumulative CT and offspring depressive symptoms in the overall sample and gender-specific adolescent subgroups

Based on the above analysis, mediation models were constructed. As shown by the mediation model, offspring emotional neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms in the total sample, as the indirect paths of the 95% CI of the bootstrapping method did not include 0 (Table 5). In the subgroup analyses by sex, offspring emotional neglect and physical neglect mediated the relationship between maternal exposure

Table 4 Regression analysis predicting offspring depressive symptoms in the overall sample, male and female adolescent subgroups

Variables	Unstandardized Coefficients		Standardized Coefficients	t	*P*
	B	Std. Error	Beta		
Overall sample($n = 3672$)					
Maternal exposure to cumulative CT	0.193	0.198	0.013	0.974	0.330
Offspring EA	1.268	0.057	0.382	22.361	< 0.001
Offspring PA	0.051	0.074	0.011	0.686	0.493
Offspring SA	0.145	0.119	0.016	1.218	0.223
Offspring EN	0.660	0.042	0.280	15.817	< 0.001
Offspring PN	0.123	0.066	0.031	1.870	0.062
Males($n = 1807$)					
Maternal exposure to cumulative CT	0.231	0.266	0.017	0.870	0.384
Offspring EA	1.129	0.086	0.326	13.072	< 0.001
Offspring PA	0.194	0.098	0.045	1.979	0.048
Offspring SA	0.070	0.140	0.010	0.498	0.618
Offspring EN	0.625	0.055	0.281	11.463	< 0.001
Offspring PN	0.183	0.084	0.051	2.191	0.029
Females($n = 1865$)					
Maternal exposure to cumulative CT	0.146	0.291	0.009	0.502	0.616
Offspring EA	1.250	0.079	0.387	15.750	< 0.001
Offspring PA	− 0.007	0.113	− 0.001	− 0.066	0.947
Offspring SA	0.509	0.219	0.043	2.322	0.020
Offspring EN	0.696	0.064	0.286	10.965	< 0.001
Offspring PN	0.106	0.103	0.024	1.023	0.306

CT: Childhood trauma, *EA:* Emotional abuse, *PA:* Physical abuse, *SA:* Sexual abuse, *EN:* Emotional neglect, *PN:* Physical neglect

Table 5 Mediation analysis for the relationship between maternal exposure to cumulative childhood trauma and offspring depressive symptoms in the overall sample, male and female adolescent subgroups

Paths	Effect	Bootstrapping, 95%CI	95%CI
Overall population			
Indirect paths: Maternal exposure to cumulative CT → Offspring EA → Offspring depressive symptoms	0.0768	(– 0.0836, 0.2393)	
Indirect paths: Maternal exposure to cumulative CT → Offspring EN → Offspring depressive symptoms	0.1427	(0.0272, 0.2529)	
Direct path: Maternal exposure to cumulative CT → Offspring depressive symptoms	0.1927		(– 0.1952,0.5807)
Males(n = 1807)			
Indirect paths: Maternal exposure to cumulative CT → Offspring EA → Offspring depressive symptoms	0.1898	(– 0.0116, 0.3984)	
Indirect paths: Maternal exposure to cumulative CT → Offspring PA → Offspring depressive symptoms	0.0287	(– 0.0090, 0.0805)	
Indirect paths: Maternal exposure to cumulative CT → Offspring EN → Offspring depressive symptoms	0.3509	(0.1621,0.5506)	
Indirect paths: Maternal exposure to cumulative CT → Offspring PN → Offspring depressive symptoms	0.0812	(0.0011,0.1758)	
Direct path: Maternal exposure to cumulative CT → Offspring depressive symptoms	0.2314		(– 0.2902,0.7530)
Females(n = 1865)			
Indirect paths: Maternal exposure to cumulative CT → Offspring EA → Offspring depressive symptoms	0.1907	(– 0.0318, 0.4255)	
Indirect paths: Maternal exposure to cumulative CT → Offspring SA → Offspring depressive symptoms	0.0255	(– 0.0062,0.0944)	
Indirect paths: Maternal exposure to cumulative CT → Offspring EN → Offspring depressive symptoms	0.1977	(0.0332, 0.3648)	
Direct path: Maternal exposure to cumulative CT → Offspring depressive symptoms	0.1459		(– 0.4247, 0.7165)

Offspring PA, offspring SA and offspring PN were adjusted in a mediation analysis model for the overall sample; offspring SA was adjusted in the mediation analysis model for males; offspring PA and offspring PN were adjusted in the mediation analysis model for females

CT: Childhood trauma, *EA:* Emotional abuse, *PA:* Physical abuse, *SA:* Sexual abuse, *EN* Emotional neglect, *PN:* Physical neglect, *CI:* Confident interval

to cumulative CT and offspring depressive symptoms in the male adolescent subgroup, as the indirect paths did not include 0. However, only offspring emotional neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms in the female adolescent subgroup, as the indirect paths did not include 0 (Table 5).

Discussion

Prevalence and types of maternal CT

This study found that approximately 38% of mothers had experienced at least 1 type of CT while 12.61% experienced ≥ 2 types of CT. These CT rates are similar to those reported for adult females in other regions. For example, in North America, 20–40% of females have experienced at least one type of CT [37]. A systematic review of global studies showed that the overall weighted average rate of maternal CT was 30% [38]. At present, there are few epidemiological studies of the prevalence of types of CT in the Chinese female population. Notably, the rate of CT in our study is higher than that reported in a previous survey of Chinese college students, which found that 11.5% had experienced 1 type of CT and 7.6% had experienced ≥ 2 types of CT [39]. Considering the particular impact of maternal CT on offspring outcomes, this study examined maternal exposure to cumulative CT in a Chinese sample and the effect of this burden of maternal CT on subsequent CT and depressive symptoms in their adolescent offspring.

Association between maternal exposure to cumulative CT and offspring CT

This study found a dose–response relationship between maternal exposure to cumulative CT and offspring CT, with similar relationships found when male and female adolescents were analyzed separately. The relationship between maternal CT and offspring CT may be mediated by maternal social isolation [40]. Females who experience CT are at risk of lower social support and higher social isolation in the future [41, 42]. As a result, mothers who experience CT may struggle to obtain comprehensive social support and thus not provide healthy social relationships for their offspring, which is a risk factor for CT in their offspring [43]. Furthermore, individuals who experience abuse may develop biased information processing patterns, such as a tendency to interpret

others' intentions as hostile and respond with retaliatory aggression. This aggressive response bias is a potential mediating factor for CT among offspring [40] and predicts aggressive behavior [44]. Moreover, mothers who experience CT are more likely to be involved in conflict and violent partnerships [45, 46], and violent family environments are known to increase the risk of CT among offspring.

Association between offspring CT and depressive symptoms

Our findings show that offspring emotional neglect and emotional abuse predicted depressive symptoms in both male and female adolescent offspring, which is consistent with previous studies [7, 47]. Individuals whose emotions are neglected may develop negative cognitions and feelings, such as insecurity or feeling unworthy of love from others [48], that increase the risk of depression [49]. Furthermore, long-term emotional abuse may result in a lack of security, comfort, and self-esteem, further increasing the risk of depression among offspring by hindering the development of emotional regulation and interpersonal skills [7].

Among male adolescent offspring, physical abuse and physical neglect all positively predicted depressive symptoms. A recent study found that immune system dysregulation is more pronounced in adopted male adolescents, suggesting they may be more susceptible to physical neglect [50]. Some clinical studies have reported that neglect is more harmful to males than females, whereas females are more sensitive to abuse than males [51, 52]. In addition, sexual abuse positively predicted depressive symptoms among female adolescents, but not among male adolescents, in this study. A prospective study found that sexually abused males and females have similar risks in terms of mental health outcomes [53]. However, we did not find a predictive relationship between sexual assault and depression among males, which may be because childhood sexual abuse is experienced more often by females than males. It is estimated that the ratio of female to male sexual assault victims in the Asian population is as high as 11:4 [54]. As the role of sex in the relationship between CT and depressive symptoms remains unclear, future studies considering biopsychological mechanisms are needed to explain these mixed results.

Mediation analysis

This study found that emotional neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms in both male and female offspring. Neglect was by far the most common type of trauma [55]. Previous studies have examined the relationship between maternal CT and neglect of offspring [56], namely, multiple types of maternal CT predicted poor parenting behavior in the future, including neglect, rejection, and low enthusiasm. As offspring reach school age, the mother–child relationship becomes more complex, often manifesting as less companionship and childcare [57]. A negative parenting style can increase the risk of depression in offspring. Notably, we found that physical neglect mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms in male offspring only. Male offspring may be more likely than female offspring to be physically ignored [58], suggesting the need to especially consider the adverse consequences of negative parenting on male offspring.

Interestingly, the results of the mediation analysis in this study showed, for the first time, that offspring emotional neglect completely mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms. These findings suggest that the effect of maternal exposure to cumulative CT on depression in offspring may be mitigated by breaking the intergenerational cycle of trauma. Addressing mothers' adverse environments, promoting maternal mental health, helping mothers establish secure attachment with their baby during early development, reducing parenting stress, and promoting positive parenting practices are thus important steps to promote the health and well-being of future generations [60].

Limitations

Several limitations of this study should be noted. First, this was a cross-sectional study. Although the chronological order of offspring CT and depressive symptoms is assumed, an inverse order cannot be ruled out. For example, self-reported CT by offspring may be influenced by the severity of depressive symptoms during adolescence. Thus, caution is warranted when drawing conclusions about causality and more longitudinal studies are needed to address this relationship. Second, as variables were measured by self-report, there is a possibility of recall bias. Third, this study did not account for the frequency, duration, or severity of maternal CT, or other characteristics associated with trauma, such as the closeness of the abusive caregiver, family socioeconomic status, maternal education, or family parenting patterns, all of which may have varying effects on trauma and depressive symptoms in offspring. Fourth, the limited number of fathers who completed the survey prevented us from investigating the association between paternal CT and offspring depression, nor did we assess the role of other primary caregivers who might have cushioned or exacerbated

the effects of maternal CT on the offspring [60]. Finally, due to the relatively limited sample size of mothers exposed to 3–5 trauma types, exposure to two or more trauma types (≥ 2) was set as a group without a more detailed analysis. Future research should investigate the combined and independent intergenerational effects of maternal/paternal/other primary caregiver exposure to CT.

Conclusion

This study identified a high prevalence of CT in mothers in China and revealed a dose–response relationship between maternal exposure to cumulative CT and offspring CT. In addition, we demonstrated that offspring CT completely mediated the relationship between maternal exposure to cumulative CT and offspring depressive symptoms. These findings highlight the need to consider the effects of maternal CT on children and provide support and parenting instruction during early child-rearing to disrupt the cycle of intergenerational transmission of CT, which may help prevent depression when children reach adolescence.

Abbreviations

CT	Childhood trauma
CTQ-SF	The Childhood Trauma Questionnaire Short Form
CES-D	Center for Epidemiological Studies Depression Scale
CI	Confidence interval

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

JBL, XRL and JPL had the original idea for the study, designed the survey and revised the manuscript. YRZ and YQH analyzed the data and wrote the manuscript. ZPX and JCX revised the survey and the design. YMS, LL and SQS contributed to data collection. All authors read and approved the final version of the manuscript.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The ethics committee of Shenzhen Kangning Hospital approved all procedures. For adult participants, informed consent is obtained from the participants themselves, while for adolescent participants, informed consent is obtained from both the participants and their guardians.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. St. John-Larkin C : Normal child and adolescent development: a psychodynamic primer. The American journal of psychiatry. 2014.
2. Fazel M, Soneson E. Current evidence and opportunities in child and adolescent public mental health: a research review. J Child Psychol Psychiatry. 2023;64(12):1699–719.
3. Shorey S, Ng ED, Wong CHJ. Global prevalence of depression and elevated depressive symptoms among adolescents: a systematic review and meta-analysis. Br J Clin Psychol. 2022;61(2):287–305.
4. Thapar A, Collishaw S, Pine DS, Thapar AK. Depression in adolescence. Lancet (London, England). 2012;379(9820):1056–67.
5. Clayborne ZM, Varin M, Colman I. Systematic review and meta-analysis: adolescent depression and long-term psychosocial outcomes. J Am Acad Child Adolesc Psychiatry. 2019;58(1):72–9.
6. Liu YH, Chen L, Su YA, Fang YR, Srisurapanont M, Hong JP, Hatim A, Chua HC, Bautista D, Si TM. Is early-onset in major depression a predictor of specific clinical features with more impaired social function? Chin Med J. 2015;128(6):811–5.
7. Zhang Y, Liu J, Chen L, Yang T, Luo X, Cui X, Wu S, He Y, Lu J. Prevalence of co-occurring severe depression and psychotic symptoms in college students and its relationship with childhood maltreatment. Child Abuse Negl. 2023;146: 106470.
8. Fu H, Feng T, Qin J, Wang T, Wu X, Cai Y, Lan L, Yang T. Reported prevalence of childhood maltreatment among Chinese college students: a systematic review and meta-analysis. PLoS ONE. 2018;13(10): e0205808.
9. Humphreys KL, LeMoult J, Wear JG, Piersiak HA, Lee A, Gotlib IH. Child maltreatment and depression: a meta-analysis of studies using the Childhood Trauma Questionnaire. Child Abuse Negl. 2020;102:104361.
10. Javakhishvili M, Spatz Widom C. Childhood maltreatment, sleep disturbances, and anxiety and depression: a prospective longitudinal investigation. J Appl Dev Psychol. 2021;77:101351.
11. Angelakis I, Austin JL, Gooding P. Childhood maltreatment and suicide attempts in prisoners: a systematic meta-analytic review. Psychol Med. 2020;50(1):1–10.
12. Paul E, Eckenrode J. Childhood psychological maltreatment subtypes and adolescent depressive symptoms. Child Abuse Negl. 2015;47:38–47.
13. Edwards VJ, Holden GW, Felitti VJ, Anda RF. Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: results from the adverse childhood experiences study. Am J Psychiatry. 2003;160(8):1453–60.
14. Schilling EA, Aseltine RH, Gore S. The impact of cumulative childhood adversity on young adult mental health: measures, models, and interpretations. Soc Sci Med. 2008;66(5):1140–51.

15. Hodges M, Godbout N, Briere J, Lanktree C, Gilbert A, Kletzka NT. Cumulative trauma and symptom complexity in children: a path analysis. Child Abuse Negl. 2013;37(11):891–8.
16. Moog NK, Cummings PD, Jackson KL, Aschner JL, Barrett ES, Bastain TM, Blackwell CK, Bosquet Enlow M, Breton CV, Bush NR, et al. Intergenerational transmission of the effects of maternal exposure to childhood maltreatment in the USA: a retrospective cohort study. Lancet Public health. 2023;8(3):e226–37.
17. Bosquet Enlow M, Englund MM, Egeland B. Maternal childhood maltreatment history and child mental health: mechanisms in intergenerational effects. J Clin Child Adolesc Psychol. 2018;47(sup1):S47-s62.
18. Lomanowska AM, Boivin M, Hertzman C, Fleming AS. Parenting begets parenting: a neurobiological perspective on early adversity and the transmission of parenting styles across generations. Neuroscience. 2017;342:120–39.
19. Buss C, Entringer S, Moog NK, Toepfer P, Fair DA, Simhan HN, Heim CM, Wadhwa PD. Intergenerational transmission of maternal childhood maltreatment exposure: implications for fetal brain development. J Am Acad Child Adolesc Psychiatry. 2017;56(5):373–82.
20. Moog NK, Heim CM, Entringer S, Simhan HN, Wadhwa PD, Buss C. Transmission of the adverse consequences of childhood maltreatment across generations: focus on gestational biology. Pharmacol Biochem Behav. 2022;215:173372.
21. Pereira J, Ludmer JA, Gonzalez A, Atkinson L. Mothers' personal and interpersonal function as potential mediators between maternal maltreatment history and child behavior problems. Child Maltreat. 2018;23(2):147–56.
22. Sierau S, Warmingham J, White LO, Klein AM, von Klitzing K. Childhood emotional and conduct problems in childhood and adolescence differentially associated with intergenerational maltreatment continuity and parental internalizing symptoms. J Abnorm Child Psychol. 2020;48(1):29–42.
23. Zheng Q, Feng Y, Du J, Xu S, Ma Z, Wang Y. Specific effects of cumulative childhood trauma on suicidality among youths. J Affect Disord. 2024;358:260–9.
24. Plant DT, Jones FW, Pariante CM, Pawlby S. Association between maternal childhood trauma and offspring childhood psychopathology: mediation analysis from the ALSPAC cohort. Brit J Psychiatry : J Mental Sci. 2017;211(3):144–50.
25. Miranda JK, de la Osa N, Granero R, Ezpeleta L. Maternal childhood abuse, intimate partner violence, and child psychopathology: the mediator role of mothers' mental health. Violence Against Women. 2013;19(1):50–68.
26. Roberts R, O'Connor T, Dunn J, Golding J. The effects of child sexual abuse in later family life; mental health, parenting and adjustment of offspring. Child Abuse Negl. 2004;28(5):525–45.
27. Buffarini R, Hammerton G, Coll CVN, Cruz S, da Silveira MF, Murray J. Maternal adverse childhood experiences (ACEs) and their associations with intimate partner violence and child maltreatment: Results from a Brazilian birth cohort. Prev Med. 2022;155:106928.
28. Li M, Gao T, Su Y, Zhang Y, Yang G, D'Arcy C, Meng X. The timing effect of childhood maltreatment in depression: a systematic review and meta-analysis. Trauma Viol Abuse. 2023;24(4):2560–80.
29. Bernstein DP, Stein JA, Newcomb MD, Walker E, Pogge D, Ahluvalia T, Stokes J, Handelsman L, Medrano M, Desmond D, et al. Development and validation of a brief screening version of the childhood trauma questionnaire. Child Abuse Negl. 2003;27(2):169–90.
30. Zhao XF, Zhang YL, Li LF, Zhou YF. Evaluation on reliability and validity of Chinese version of childhood trauma questionnaire. Chin J Clin Rehab. 2005;16:209–11.
31. Bernstein DP, Ahluvalia T, Pogge D, Handelsman L. Validity of the childhood trauma questionnaire in an adolescent psychiatric population. J Am Acad Child Adolesc Psychiatry. 1997;36(3):340–8.
32. Radloff LS. The CES-D scale a self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1(3):385–401.
33. Wang M, Armour C, Wu Y, Ren F, Zhu X, Yao S. Factor structure of the CES-D and measurement invariance across gender in Mainland Chinese adolescents. J Clin Psychol. 2013;69(9):966–79.
34. Niu L, He J, Cheng C, Yi J, Wang X, Yao S. Factor structure and measurement invariance of the Chinese version of the Center for Epidemiological Studies Depression (CES-D) scale among undergraduates and clinical patients. BMC Psychiatry. 2021;21(1):463.
35. Chi X, Huang L, Wang J, Zhang P. The prevalence and socio-demographic correlates of depressive symptoms in early adolescents in China: differences in only child and non-only child groups. Int J Environ Res Public Health. 2020;17(2):438.
36. Hayes AF: Introduction to mediation, moderation, and conditional process analysis: a regression-based approach: 2nd ed., Guilford Press;2013.https://psycnet.apa.org/record/2013-21121-000
37. Moody G, Cannings-John R, Hood K, Kemp A, Robling M. Establishing the international prevalence of self-reported child maltreatment: a systematic review by maltreatment type and gender. BMC Public Health. 2018;18(1):1164.
38. Choi KW, Sikkema KJ. Childhood maltreatment and perinatal mood and anxiety disorders: a systematic review. Trauma Violence Abuse. 2016;17(5):427–53.
39. Chen X, Zhang S, Huang G, Xu Y, Li Q, Shi J, Li W, Wang W, Guo L, Lu C. Associations between child maltreatment and depressive symptoms among chinese college students: an analysis of sex differences. Front Psych. 2021;12: 656646.
40. Berlin LJ, Appleyard K, Dodge KA. Intergenerational continuity in child maltreatment: mediating mechanisms and implications for prevention. Child Dev. 2011;82(1):162–76.
41. Weisbart CE, Thompson R, Pelaez-Merrick M, Kim J, Wike T, Briggs E, English DJ, Dubowitz H. Child and adult victimization: sequelae for female caregivers of high-risk children. Child Maltreat. 2008;13(3):235–44.
42. Steketee M, Aussems C, Marshall IH. Exploring the impact of child maltreatment and interparental violence on violent delinquency in an international sample. J Interpers Violence. 2021;36(13–14):Np7319-np7349.
43. Savage L, Tarabulsy GM, Pearson J, Collin-Vézina D, Gagné LM. Maternal history of childhood maltreatment and later parenting behavior: a meta-analysis. Dev Psychopathol. 2019;31(1):9–21.
44. Gibb BE, Schofield CA, Coles ME. Reported history of childhood abuse and young adults' information-processing biases for facial displays of emotion. Child Maltreat. 2009;14(2):148–56.
45. Smith LS, Stover CS. The moderating role of attachment on the relationship between history of trauma and intimate partner violence victimization. Violence Against Women. 2016;22(6):745–64.
46. Madigan S, Wade M, Plamondon A, Jenkins JM. Neighborhood collective efficacy moderates the association between maternal adverse childhood experiences and marital conflict. Am J Community Psychol. 2016;57(3–4):437–47.
47. Yu X, He T, Tan Y, Chi P, Lin X. Intergenerational effects of childhood maltreatment: the relationships among parental childhood emotional neglect, emotional expressiveness and children's problem behaviors. Child Abuse Negl. 2023;140:106147.
48. Fung HW, Chung HM, Ross CA. Demographic and mental health correlates of childhood emotional abuse and neglect in a Hong Kong sample. Child Abuse Negl. 2020;99: 104288.
49. Baldwin JR, Reuben A, Newbury JB, Danese A. Agreement between prospective and retrospective measures of childhood maltreatment: a systematic review and meta-analysis. JAMA Psychiat. 2019;76(6):584–93.
50. Reid BM, Coe CL, Doyle CM, Sheerar D, Slukvina A, Donzella B, Gunnar MR. Persistent skewing of the T-cell profile in adolescents adopted internationally from institutional care. Brain Behav Immun. 2019;77:168–77.
51. Teicher MH, Dumont NL, Ito Y, Vaituzis C, Giedd JN, Andersen SL. Childhood neglect is associated with reduced corpus callosum area. Biol Psychiat. 2004;56(2):80–5.
52. Rogeness GA, Amrung SA, Macedo CA, Harris WR, Fisher C. Psychopathology in abused or neglected children. J Am Acad Child Psychiatry. 1986;25(5):659–65.
53. Banyard VL, Williams LM, Siegel JA. Childhood sexual abuse: A gender perspective on context and consequences. Child Maltreat. 2004;9(3):223–38.
54. Stoltenborgh M, Van Ijzendoorn MH, Euser EM, Bakermans-Kranenburg MJ. A global perspective on child sexual abuse: meta-analysis of prevalence around the world. Child Maltreat. 2011;16(2):79–101.
55. Thornberry TP, Knight KE, Lovegrove PJ. Does maltreatment beget maltreatment? A systematic review of the intergenerational literature. Trauma Violence Abuse. 2012;13(3):135–52.
56. Libby AM, Orton HD, Beals J, Buchwald D, Manson SM. Childhood abuse and later parenting outcomes in two American Indian tribes. Child Abuse Negl. 2008;32(2):195–211.

57. Greene CA, Haisley L, Wallace C, Ford JD. Intergenerational effects of childhood maltreatment: a systematic review of the parenting practices of adult survivors of childhood abuse, neglect, and violence. Clin Psychol Rev. 2020;80: 101891.
58. Chung MC, Chen ZS. Gender differences in child abuse, emotional processing difficulties, alexithymia, psychological symptoms and behavioural problems among chinese adolescents. Psychiatry Q. 2020;91(2):321–32.
59. Guild DJ, Alto ME, Toth SL: Preventing the intergenerational transmission of child maltreatment through relational interventions. Springer International Publishing. 2017. https://link.springer.com/chapter/10.1007/978-3-319-40920-7_8
60. Dietz LJ, Jennings KD, Kelley SA, Marshal M. Maternal depression, paternal psychopathology, and toddlers' behavior problems. J Clin Child Adolesc Psychol. 2009;38(1):48–61.

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