ORIGINAL ARTICLE
https://doi.org/10.30773/pi.2021.0343
Print ISSN 1738-3684 / On-line ISSN 1976-3026
OPEN ACCESS

The Impact of Maternal Adverse Childhood Experiences on Offspring's Internalizing and Externalizing Problems

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Objective Adverse childhood experiences (ACEs) are associated with negative physical and mental health outcomes across the lifespan, but research on intergenerational transmission of maternal ACEs and its impact on the offspring's mental health problems are limited. The study examines the effects of maternal ACEs on the risk of internalizing or externalizing problems among offspring.

Methods There were 450 mother-child dyads. Mothers completed the Adverse Childhood Experiences Questionnaire. The child outcomes included internalizing and externalizing problems assessed by the Korean Child Behavior Checklist (K-CBCL) and Korean Youth Self-Report (K-YSR), depression assessed by the Center for Epidemiological Studies Depression Scale for Children (CES-DC) and anxiety assessed by the Screen for Child Anxiety Related Emotional Disorders (SCARED).

Results 36.1% of mothers experienced at least one ACE, and 11.1% experienced three or more ACEs. Cumulative maternal ACEs were associated with internalizing problems, externalizing problems, depression and anxiety in the offspring. Household dysfunction from maternal ACEs was significantly associated with delinquent behavior, anxiety/depression, and somatic complaints in the offspring.

Conclusion The findings support the hypothesis that maternal ACEs are related to mental health problems in the offspring. Further research is needed to determine the factors mediating intergenerational transmission as well as intervention strategies to prevent ACEs and mental health problems in the offspring.
Psychiatry Investig 2021;18(11):1050-1057

Keywords Intergeneration transmission; Adverse childhood experiences; Internalizing problem; Externalizing problem.

INTRODUCTION

Felitti et al.[1] labeled child abuse, neglect, and household dysfunctional family environment as adverse childhood experiences (ACEs). Furthermore, they reported that ACEs influence health and well-being throughout the lifespan, adding that there are several serial adverse mechanisms, such as disrupted neurodevelopment, social/emotional/cognitive impairment, adoption of health risk behavior, disease/disability/social problems, and early death.[2] Meta-analysis studies about ACEs also show that ACEs are associated with a wide variety of outcomes, including psychosocial/behavioral and medical problems, and ACEs are a major risk factor for many health conditions. In addition, multiple ACEs pose a risk for the next generation (e.g., violence, mental illness, and substance abuse).[3,4]

Previous studies have also shown that ACEs can affect multiple generations; individuals who experienced ACEs may have children who experience ACEs, such as inadequate housing and food insecurity, as well.[5-7] In a prospective study of 400 mothers and children, the mother's physical abuse experience predicted the child's abuse experience within two years of life,[8] and in a cohort study of 14,256 children and parents in the UK, parents with a history of childhood abuse were all more likely to be investigated for maltreatment or to have a child placed on the child protection register.[9] Mothers' experiences of child abuse predicted behavior problems of adolescent offspring.[10] It has been reported that the mother's experience of child maltreatment affects children's emotional

Received: September 10, 2020 **Revised:** November 27, 2020
Accepted: August 2, 2021

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behavior problems such as internalizing and externalizing problems.[11-13] McDonnell et al.[14] reported that maternal childhood maltreatment directly predicted higher levels of maladaptive infant socioemotional problems; furthermore, maternal household dysfunction was indirectly related to infant socioemotional problems. A recent meta-analysis about intergenerational effect of maternal ACEs reported that maternal childhood maltreatment had a significant effect on the offspring's depression and internalizing behaviors.[15]

However, most ACE studies focus on specific ACE experiences, such as physical abuse and neglect, and there are few studies on the cumulative risk of maternal ACEs on the mental health of the offspring. Additionally, few studies have reported the effects of maternal ACEs—child abuse, neglect, and household dysfunction—on internalizing and externalizing problems of the offspring.

The present study thus aims to examine the frequency of maternal ACEs and analyze the effects of the cumulative impact of the maternal ACE level, as well as child abuse, neglect, and household dysfunction, on offspring's internalizing and externalizing problems.

METHODS

Participants and procedure

The present study was conducted in Jeju, Korea among mothers with offspring aged 6 to 18 who had been attending school for more than 6 months. Two elementary schools, middle schools, and high schools were selected with the cooperation of the Jeju Island Office of Education. All schools were public schools and evenly distributed in the downtown (Jeju-si) and suburban areas (Seogiposi). A guideline about the present study was distributed in the form of notices for parents from the school. Of 3,594 students, a total of 463 mother–child dyads voluntarily participated in the present study and completed questionnaires. Among the eligible participants, 450 (97.2%) had data for study outcomes (ACE questionnaires, CBCL or YSR). The socioeconomic status (SES, high/middle/low) and maternal education level were collected. Written informed consent was obtained from mothers and their offspring, respectively. Data were collected from September to December 2017. The current study procedures were approved by the Institutional Review Board of Jeju National University Hospital (No. 2018-08-004).

Measures

The ACE questionnaire asks retrospectively about child abuse, child neglect, and growing up with household dysfunction before the age of 18.[1,16] It includes 10 ACE items: emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, parental separation or divorce, mother treated violently, substance abuse in the household, mental illness in the household, and incarcerated household member.

If the answer to the ACE item is "Yes," it is given a score of 1 point, and the total score (range: 0−10 ACEs) is the sum of item scores. The total score was dichotomized at multiple cutoff values (1−3), like in previous research.[17,18] In the present study, the total scores were classified based on scores of 0, 1, 2, 3, or above considering the sample distribution. Child abuse (emotional, physical, and sexual abuse), child neglect (emotional and physical neglect), and household dysfunction (parental separation or divorce, mother treated violently, substance abuse in the household, mental illness in the household, and an incarcerated household member) scores were used to analyze the impact of ACE internalizing and externalizing problems of offspring. The Cronbach α of the present study was 0.692.

The Child Behavior Checklist and Youth Self-Report developed by Achenbach and Edelbrock[19] were used to evaluate mental health problems in children and adolescents respectively. The Korean Child Behavior Checklist (K-CBCL) and Korean Youth Self Report (K-YSR), which has been used in many studies,[20,21] was used in the present study. The scale is divided into competence and syndrome subscales. The syndrome subscale consists of eight empirically based symptoms (anxiety/depression, withdrawal/depression, somatic complaints, social problems, thought problems, attention problems, delinquent behavior, and aggressive behavior). There are two broad-band scales: internalizing and externalizing problems. Internalizing problems are represented as the sum of anxious/depressed, withdrawn/depressed, and somatic complaints scores. Externalizing problems combine delinquent behavior and aggressive behavior scores. T-scores are based on general population norms and defined as the conversion of a raw score to an age- and sex-standardized score in the general child and adolescent population. In the present study, mothers reported the K-CBCL of offspring aged 6−12 years, whereas middle and high school students over the age of 12 were evaluated by the K-YSR.

The Center for Epidemiological Studies Depression Scale for Children (CES-DC) is a depression inventory developed by the National Institute of Mental Health (NIMH) to measure the degree of depressive symptoms in children. It has excellent validity, specificity, and sensitivity for children and adolescents aged 6−17 years.[22] The CES-DC consists of 20 questions that measure the symptoms of depression over the past week and is scored on a 4-point scale: 0=not at all (less than 1 day); 1=little (1−2 days); 2=some (3−4 days); 3: a lot (5−7 days). The total score is obtained by totaling the scores, wherein higher total scores indicate more severe depressive symptoms. In

the present study, the CES-DC scale standardized for Korea was used.[23]

We used the Screen for Child Anxiety Related Emotional Disorders (SCARED), developed by Birmaher et al.,[24] to screen for signs of anxiety disorders in children. It is a self-report scale consisting of 41 questions. The items are scored from 0 to 2, representing not at all, sometimes, and often respectively. Higher scores were related to higher levels of anxiety. In the present study, the SCARED scale standardized for Korea was used.[25]

The Beck Depression Inventory (BDI-II), a self-report scale developed by Beck et al.,[26] is based on the criteria for depressive disorder in the Diagnostic and Statistical Manual of Mental disorders-IV (DSM-IV). In addition, it consists of 21 questions about cognitive, emotional, and physiological symptoms of depression. It is scored on a Likert-type scale from 0 to 3 points, and the scores for the 21 questions are summarized; the total score thus ranges from 0 to 62 points, where the higher score indicates a more severe depression. In the present study, the BDI-II was used to evaluate the severity of maternal depression; we used the standarized scale for Korea (Cronbach's α= 0.91).[27]

Statistical analysis

Descriptive data were produced for the demographic characteristics of the study subjects. Descriptive analysis was performed for the frequency of each ACE item and the frequency of 0, 1, 2, 3, or above score for the total ACE score. For comparison between groups, the internalizing and externalizing T-scores were analyzed using an independent sample T-test. Analysis of variance (ANOVA) was conducted to compare the difference between the mean T-scores of internalizing and externalizing according to the total scores of ACEs, and Bonferroni correction was performed. Multiple linear regression analysis was used to evaluate the independent effects of the total ACE score (Model 1) and three ACE domains (Model 2) on the risk of offspring's internalizing and externalizing problems, while adjusting for demographic variables (socioeconomic status, maternal age, maternal education level, offspring's age and sex) and the BDI-II score. Statistics were significant when $p<0.05$. All statistical analyses were conducted using the Windows version of SPSS 18.0 (SPSS, Chicago, IL, USA).

RESULTS

Sociodemographic characteristics and prevalence of maternal ACEs

The mean age of the 450 mothers was 42.74±5.73 years, and 272 (62.5%) were more than high school graduates. The mean age of the offspring was 13.16±3.90 years, and 278 (61.8%) were female. There were 205 (45.6%) elementary school students and 245 (54.4%) children middle school aged and older. Mothers with ACEs had a significantly higher frequency of low SES, and their children were younger than those without ACEs (Table 1). A total of 163 (36.1%) mothers had more

Table 1. Demographic characteristics of study sample (N=450)

	Maternal ACE (-) N=287	Maternal ACE (+) N=163	p-value
Mother related variables			
Maternal age (mean±SD)	43.08±5.44	42.14±6.16	0.102
Maternal education level (N, %)			0.190
High (>high school)	165 (59.4)	107 (68.2)	
Middle (high school)	102 (36.7)	45 (28.7)	
Low (≤middle school)	11 (4.0)	5 (3.2)	
Socioeconomic status (N, %)			0.009
High	36 (13.0)	23 (14.2)	
Middle	174 (62.8)	79 (48.8)	
Low	67 (24.2)	60 (37.0)	
Children related variables			
Children's sex (N, %)	Male (113, 39.4), female (174, 60.6)	Male (59, 36.2), female (104, 63.8)	0.505
Children's age (mean±SD)	13.70±3.87	12.19±3.77	<0.001
Children's education level (N, %)			<0.001
Elementary school	111 (38.7)	94 (57.7)	
Middle school and above	176 (61.3)	69 (42.3)	

ACE, Adverse Childhood Experience; SD, standard deviation

than one ACE, and 50 (11.1%) had more than three ACEs. Of the three ACE domains, household dysfunction (n=124; 27.6%) was the most frequent. Among the 10 ACE items (Table 2), substance abuse in the household (n=63; 14.0%) was the most frequent maternal ACE item, followed by parental separation or divorce (n=55; 12.2%) and emotional neglect (n=51; 11.3%).

Table 2. Prevalence of maternal ACEs (N=450)

ACE item by domain (N, %)	
Child abuse	
1. Emotional abuse	37 (8.2)
2. Physical abuse	38 (8.4)
3. Sexual abuse	46 (10.2)
Child neglect	
4. Emotional neglect	51 (11.3)
5. Physical neglect	10 (2.2)
Household dysfunction	
6. Parental separation or divorce	55 (12.2)
7. Mother treated violently	30 (6.7)
8. Substance abuse in the household	63 (14.0)
9. Mental illness in the household	28 (6.2)
10. Incarcerated household member	5 (1.1)
ACE domain experienced (N, %)	
Child abuse (0−3), ≥1	89 (19.7)
Child neglect (0−2), ≥1	56 (12.4)
Household dysfunction (0−5), ≥1	124 (27.6)
Total ACE score (0−10) (N, %)	
0	288 (63.9)
1	67 (14.9)
2	46 (10.2)
≥3 (3−8)	50 (11.1)

ACEs, Adverse Childhood Experiences

Relationship between maternal ACE and offspring's mental health

There were no gender differences in the children's CBCL and YSR subscales. Internalizing problems (p<0.001), externalizing problems (p<0.001), social problems (p<0.001), and thought problems (p<0.005) were significantly higher in elementary school students, whereas CES-DC scores were significantly higher in adolescents (p=0.015) (Table 3). When comparing children's emotional behavior problems according to maternal ACEs, increased maternal ACEs were related to increased internalizing (p<0.001), externalizing (p<0.001), social (p<0.001), attention (p=0.022), and thought problems (p<0.001), as well as CES-DC (p=0.019) and SCARED scores (p=0.002), compared to the group without maternal ACEs (Table 4).

Associations between maternal ACE and offspring's internalizing and externalizing problems

In the multiple linear regression analysis of externalizing problems of the offspring, higher maternal ACE total scores were positively associated with delinquent (p=0.003) and aggressive behavior (p=0.021), whereas maternal household dysfunction were positively associated with delinquent behavior (p=0.004) (Table 5). Similarly, maternal ACE total score were positively associated with offspring's anxiety/depression (p=0.006) and somatic complaints (p=0.012). Maternal child ne-

Table 3. Mean score of CBCL/YSR, CES-DC, SCARED

	Total (N=450)	Male (N=172)	Female (N=278)	p-value	Children (N=205)	Adolescent (N=245)	p-value
CBCL/YSR T score (mean±SD)							
Internalizing problems	49.60±11.47	48.40±10.87	50.32±11.62	0.081	52.67±9.55	47.03±12.29	<0.001**
Anxious/depressed	54.20±6.75	53.51±5.90	54.63±7.21	0.075	55.58±7.14	53.05±6.19	<0.001**
Withdrawn/depressed	54.58±7.01	54.23±6.02	54.80±7.55	0.406	54.78±6.74	54.42±7.23	0.583
Somatic complaints	53.54±5.70	53.11±4.71	53.81±6.22	0.178	53.66±4.92	53.44±6.28	0.686
Externalizing problems	47.44±11.43	46.20±12.33	48.22±10.79	0.064	51.39±9.52	44.13±11.87	<0.001**
Delinquent behavior	53.74±5.66	53.50±5.61	53.89±5.70	0.476	54.64±5.68	52.99±5.55	0.002**
Aggressive behavior	53.14±5.58	53.11±6.17	53.16±5.20	0.925	54.53±5.84	51.97±5.09	<0.001**
Social problems	53.72±5.65	53.46±5.36	53.88±5.82	0.438	55.07±5.98	52.59±5.10	<0.001**
Thought problems	54.31±6.13	53.81±5.57	54.62±6.44	0.174	55.20±6.17	53.57±6.00	<0.005**
Attention problems	52.98±6.20	52.48±4.86	53.29±6.89	0.146	53.82±5.52	52.28±6.64	0.008**
CES-DC (mean±SD)	14.19±9.88	13.62±9.31	14.54±10.22	0.340	12.95±9.65	15.22±9.97	0.015*
SCARED (mean±SD)	17.04±11.92	14.90±10.97	18.36±12.31	0.003	18.06±10.95	16.20±12.63	0.100

*p<0.05; **p<0.01. SD, standard deviation; Children, elementary school student; Adolescent, middle, high school student; CBCL, Child Behavior Checklist; YSR, Youth Self-Report; CES-DC, Center for Epidemiological Studies Depression Scale for Children; SCARED, Screen for Children Anxiety Related Emotional Disorders

glect experience was positively associated with offspring's anxiety/depression (p=0.028) and somatic complaints (p=0.013) (Table 6).

DISCUSSION

In the present study, maternal ACEs showed a positive correlation with the offspring's internalizing and externalizing problems, with three or more ACE experiences being related to internalizing and externalizing problems in the offspring. Among them, maternal child neglect was related to anxiety/depression and somatic complaints in the offspring. Finally, maternal household dysfunction was a significant factor related to delinquent behavior in the offspring.

The results of this study are corroborated by previous research. The ALSPAC cohort study of 9,397 mother-child dyad found that maternal ACEs, both directly and indirectly, predict preschool offspring's internalizing and externalizing problems.[12] This is consistent with previous studies showing that maternal childhood maltreatment mediates abuse in the offspring and internalizing and externalizing problems in children aged 12 and older.[28,29]

Our results showed that externalizing problems and internalizing problems were significantly related to higher maternal ACE scores. Recent cohort study shows that mothers with three or more ACEs had three-year-old children with many

Table 4. Differences on the offspring's mental health by the level of maternal ACEs

	ACE score				p-value, post-hoc*
	0[a] (N=287)	1[b] (N=67)	2[c] (N=46)	3[d] (N=50)	
CBCL/YSR T score (mean±SD)					
Internalizing problems	47.70±11.01	51.37±11.90	52.00±11.37	55.88±10.81	<0.001, d>a
Anxious/depressed	53.15±5.69	55.06±7.80	55.35±7.56	58.04±8.41	<0.001, d>a
Withdrawn/depressed	53.99±6.25	55.54±9.65	54.93±6.87	56.40±6.81	0.078
Somatic complaints	52.81±5.04	54.48±6.89	54.37±5.53	55.72±6.87	0.002, d>a
Externalizing problems	45.75±11.17	47.73±10.96	49.24±9.93	55.02±11.80	<0.001, d>a, b
Delinquent behavior	53.02±5.30	53.87±4.94	54.07±5.09	57.44±7.50	<0.001, d>a, b, c
Aggressive behavior	52.49±4.81	53.16±5.90	53.46±4.87	56.56±8.21	<0.001, d>a, b, c
Social problems	52.95±4.80	53.84±5.96	55.48±7.69	56.38±6.48	<0.001, c, d>a
Thought problems	53.51±5.57	55.31±6.60	54.65±5.94	57.30±7.60	<0.001, d>a
Attention problems	52.37±5.86	53.27±6.66	54.63±6.32	54.60±6.92	0.022, d>a
CES-DC (mean±SD)	13.53±9.52	13.42±9.29	15.11±10.34	18.10±11.47	0.019, d>a
SCARED (mean±SD)	16.09±11.37	16.16±12.23	17.65±10.92	23.06±13.89	0.002, d>a, b

One-way ANOVA was carried out to determine whether the averages differ in any groups. *bonferroni's post-hoc test. ACE, Adverse Childhood Experience; SD, standard deviation; CBCL, Child Behavior Checklist; YSR, Youth Self-Report; CES-DC, Center for Epidemiological Studies Depression Scale for Children; SCARED, Screen for Children Anxiety Related Emotional Disorders

Table 5. Multiple linear regression for the offspring's externalizing problems by maternal ACEs

	Delinquent behavior					Aggressive behavior				
	B	SE (b)	β	t	p-value	B	SE (b)	β	t	p-value
Model 1										
Total sum of ACE	0.613	0.207	0.153	2.967	0.003**	0.463	0.199	0.117	2.321	0.021*
BDI total score	0.105	0.045	0.120	2.335	0.020*	0.127	0.044	0.148	2.927	0.004**
R^2	0.083					0.118				
Model 2										
Child abuse	-0.185	0.523	-0.020	-0.353	0.724	0.374	0.506	0.042	0.739	0.461
Child neglect	0.759	0.805	0.051	0.943	0.346	1.153	0.779	0.079	1.481	0.139
Household dysfunction	1.171	0.400	0.162	2.925	0.004**	0.275	0.387	0.039	0.709	0.479
BDI total score	0.105	0.045	0.120	2.327	0.020*	0.130	0.044	0.151	2.979	0.003**
R^2	0.093					0.122				

Adjusted socioeconomic status, maternal age, maternal education level, offspring's age and sex. *p<0.05; **p<0.01. ACE, Adverse Childhood Experience; BDI, Beck Depression Inventory; B, regression coefficient; SE (b), standard error of B; β, standardized regression coefficient

Table 6. Multiple linear regression for the offspring's internalizing problems by maternal ACEs

	Anxious/depressed					Withdrawn/depressed					Somatic complaints				
	B	SE (b)	β	t	p-value	B	SE (b)	β	t	p-value	B	SE (b)	β	t	p-value
Model 1															
Total sum of ACE	0.692	0.250	0.139	2.765	0.006**	0.294	0.266	0.058	1.104	0.270	0.542	0.215	0.132	2.515	0.012*
BDI total score	0.194	0.055	0.179	3.548	<0.001**	0.124	0.058	0.113	2.126	0.034*	0.079	0.047	0.089	1.680	0.094
R^2	0.122					0.026					0.043				
Model 2															
Child abuse	0.358	0.636	0.032	0.564	0.573	0.189	0.676	0.017	0.279	0.780	-0.058	0.546	-0.006	-0.105	0.916
Child neglect	2.153	0.978	0.118	2.201	0.028*	1.409	1.039	0.076	1.356	0.176	2.104	0.840	0.140	2.505	0.013*
Household dysfunction	0.396	0.486	0.044	0.815	0.416	-0.043	0.517	-0.005	-0.083	0.934	0.402	0.418	0.055	0.961	0.337
BDI total score	0.195	0.055	0.180	3.567	<0.001**	0.126	0.058	0.116	2.171	0.031*	0.077	0.047	0.086	1.633	0.103
R^2	0.128					0.030					0.051				

Adjusted socioeconomic status, maternal age, maternal education level, offspring's age and sex. *p<0.05; **p<0.01. ACE, Adverse Childhood Experience; BDI, Beck Depression Inventory; B, regression coefficient; SE (b), standard error of B; β, standardized regression coefficient

internalizing and externalizing problems.[30] Similarly, the results of present study on school-aged children and adolescents suggested that the influence of maternal ACEs may lead to internalizing and externalizing problems of the offspring from early childhood to adolescence.

The impact of parental child abuse and neglect experience on offspring psychopathology is relatively well known. In the present study, maternal household dysfunction, in particular, was significantly related to offspring's delinquent behavior. Previous cohort studies identified chronic family stress—defined as negative life events, marital dissatisfaction, and maternal depressive symptoms—as a risk factor for externalizing problems among children four to nine years old.[31] Separation/divorce affects high maternal emotional expression and is a vulnerability factor of externalizing behavior.[32] A recent study found a relationship between experiencing household dysfunction and trauma symptoms and anxiety in adolescence.[33] And, in cohort study of 8,773 children and adolescents, parental subclinical drinking problems, mental health problems, and low educational backgrounds were risk factors for mental health problems such as depression and anxiety.[34] Bearing in mind that experiencing household dysfunction is a risk factor for psychopathology, maternal household dysfunction can indirectly translate into mental health problems for the offspring through maternal psychopathology such as depression and anxiety. Additionally, ACEs—including household dysfunction, increased economic poverty, divorce, and alcohol problems in family members—allow offspring to experience household dysfunction again, and offspring's household dysfunction experience is a risk factor for externalizing problems.[35,36] Household dysfunction—parental divorce, alcoholism, and mental illness in childhood—continue to affect the child into adulthood, leading to child maltreatment or involvement with child welfare. The results of this study show that household dysfunction are important risk factors for intergenerational transmission of mental health problems. There is a need for future studies that evaluate the impact of household dysfunction and the mechanisms of intergenerational transmission.

In addition, in this study, a history of maternal child neglect was associated with offspring's internalizing problems. A previous study reported that mothers with a high potential to neglect had children who exhibited fewer adaptive behaviors.[37] Children of maltreated mothers were at an increased risk for clinically significant emotional problems.[38] Considering results of a systematic review that suggested that there was a relationship between maternal childhood emotionally neglectful experiences and adverse parenting outcomes,[39] the history of maternal child neglect affects the parenting and is likely to lead to emotional problems in children.

In a previous study on the mediating factors of the intergenerational transmission of ACEs, insecure attachment indirectly mediated the effects of maternal ACEs on internalizing and externalizing problems in the offspring.[40] Heleniak et al.[41] suggested that there was an association between childhood maltreatment exposure and elevated emotional reactivity, as maladaptive responses to distress. And maternal maltreatment history was associated with parenting hostility, maternal emotional unavailability, and decreased maternal sensitivity.[42] Maternal emotional unavailability and negative parenting maybe a important mediating factor. In a recent study, three or more ACE experiences were associated with postpartum smoking, binge drinking, depressive and anxious symptoms in the mother and associated with internalizing and externalizing difficulties in children,[30] and Letourneau et al.[43] showed that maternal ACEs indirectly influenced children' s behavior at age two through prenatal and postpartum depression and anxiety. Therefore, in the future, it may be necessary to investigate various mediating factors—such as attachment, maternal psychopathology, low socio-economic status, and prenatal medical risk factor—that lead to internalizing and externalizing problems in offspring.

There are some limitations to interpreting the results of the present study. First, the study was conducted in a local area, thus it is difficult to generalize findings to the entire Korean population. Second, there may have been recall bias or underestimation by self-report, since maternal ACEs were recalled retrospectively. Third, the present study is a cross-sectional study, and it is difficult to establish causality. Fourth, the ACE questionnaire is not a screening scale for clinical symptoms according to the cutoff score, and it has not been standardized in Korea. Fifth, among the voluntary participants, there may be a sample bias since the subjects concerned about the mental health problems of their children may be included. On the other hand, mother's cooperation of study is essential, and considering the relatively low voluntary participation rate, there may be a possibility of underestimation due to the absence of a subject with a offspring's mental health problem in this study.

Nevertheless, compared to previous studies that mostly focused on single adversities—such as child abuse—or studies on offspring's mental health from infancy to early childhood, the present study explores the dose-response relations of the maternal ACEs and offspring's mental health problems as a cumulative score. We also evaluated how maternal household dysfunction experiences affect internalizing or externalizing problems in school-age and adolescent offspring. Our findings suggest that intergeneration transmission of maternal ACEs can have lasting impacts not only on maternal health but also on the offspring's mental health. In the future, it is necessary to conduct a prospective longitudinal study about the intergenerational transmission of ACEs. To prevent the deterioration of a child's mental health, previous studies suggest the effect of parents' ACEs and mental health screening, as well as local practical interventions around adversity, trauma, and resiliency.[44,45] Studies on interventions and policies to prevent ACEs are needed.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Young Sook Kwack, Bung-Nyun Kim. Data curation: Na Ri Kang. Formal analysis: Jeong-Kook Song, Na Ri Kang. Investigation: all authors. Methodology: all authors. Supervision: Joon Hyuk Park, Moon-Doo Kim. Writing—original draft: Na Ri Kang. Writing—review & editing: Duk-Soo Moon, Young Sook Kwack.

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Funding Statement

None

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