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Association between childhood adversities and adulthood depressive symptoms in South Korea: results from a nationally representative longitudinal study

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ABSTRACT

Objective: To examine how childhood adversity (ie, parental death, parental divorce, suspension of school education due to financial strain or being raised in a relative's house due to financial strain) is associated with prevalence and incidence of adulthood depressive symptoms and whether this association differs by gender and by age in South Korea.

Design: Prospective cohort design.

Setting: Nationally representative longitudinal survey in South Korea.

Participants: 11 526 participants in South Korea.

Outcome measure: Prevalence and incidence of adulthood depressive symptoms were assessed as a dichotomous variable using the Centers for Epidemiologic Studies Depression (CES-D) Scale in 2006 and 2007.

Results: In the prevalence analysis, each of the four childhood adversities was significantly associated with a higher prevalence of adulthood depressive symptoms. The higher incidence of depressive symptoms was associated with suspension of school education (OR 1.55, 95% CI 1.32 to 1.82) and parental divorce (OR 1.65, 95% CI 1.00 to 2.71). In the age-stratified analyses, prevalence of depressive symptoms was associated with all CAs across different adulthoods, except for parental divorce and late adulthood depressive symptoms. After being stratified by gender, the association was significant for parental divorce (OR 3.76, 95% CI 2.34 to 6.03) in the prevalence analysis and for being raised in a relative's house (OR 1.89, 95% CI 1.21 to 2.94) in the incidence analysis only among women.

Conclusions: This study suggests that childhood adversity may increase prevalence and incidence of adulthood depressive symptoms, and the impact of parental divorce or being raised in a relative's house due to financial strain on adulthood depressive symptoms may differ by gender.

ARTICLE SUMMARY

Article focus

- A growing body of studies showed that adulthood depression is linked to early harmful exposures called childhood adversities (CAs), such as long-term financial strain, sexual abuse, separation from parents and parental death.
- The first goal of this study was to examine how CA (ie, parental death, parental divorce, suspension of school education due to financial strain or being raised in a relative's house due to financial strain) was associated with prevalence and incidence of adulthood depressive symptoms in South Korea.
- The second goal of this study was to investigate whether the association between CAs and adulthood depressive symptoms differs by gender and by age (early: 18–39, middle: 40–59 and late adulthood: 60–98 years old) in South Korea.

Key messages

- CAs were associated with higher prevalence and incidence of adulthood depressive symptoms after adjusting for covariates including adulthood as well as childhood socioeconomic status in South Korea.
- The impact of childhood experience of parental divorce or being raised in a relative's house due to financial strain on adulthood depressive symptoms may differ by gender in South Korea.

Strengths and limitations of this study

- The observed association between CAs and adulthood depressive symptoms would be robust against potential recall bias because of the longitudinal study design.
- Although we assessed four different CAs, other CAs such as physical abuse or emotional abuse that are known to be associated with adulthood depressive symptoms were not measured in this study.

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INTRODUCTION

Depression is one of the leading causes of disease burden and disability.[1] The contribution of depression to the burden of disease is on the rise and is expected to be the primary influence by 2030.[2] Recent studies with the life course perspective have added new insights to the aetiology of depression. A growing body of studies shows that adulthood depression is linked to early harmful exposures called childhood adversities (CAs), such as long-term financial strain, sexual abuse, separation from parents and parental death.[3–6]

However, prior studies contained several limitations. First, findings of association between CA and adulthood depression are inconsistent. For example, some studies reported positive associations between parental death during childhood and adulthood depression[7 8]; others found no association.[9–12] Second, although a previous study suggested that women could be more sensitive to the effects of CAs,[13] little is known about gender differences in the association between CAs and adulthood depression. Third, the role of adulthood socioeconomic status (SES) is not clear in the association between CA and adulthood depression although adulthood SES is often assumed to be an important pathway linking CA to adulthood depression. Harper *et al* reported no significant association between childhood SES and adulthood depression when they adjusted for adulthood SES,[13] but other studies reported that association between CA or childhood SES and adulthood depression remained significant after adjusting for adulthood SES.[4 6 14] Fourth, whether the effect of CAs extends to late adulthood is not clear. Ross and Mirowsky[14] reported no direct intrapsychic effects of parental divorce on adult depression, while Kessler *et al*[11] reported a weaker but significant association between CAs and later onset psychiatric disorders.

Finally, most studies were conducted in the USA[5 11 15 16] or in European countries[4 6 17 18]; relatively few studies have been conducted to examine the association between CAs and adulthood depression in an Asian country.[19 20]

To fill these knowledge gaps, this study explored the association between CA and adulthood depression using nationally representative data in South Korea. Specifically, this study sought to answer the following five research questions.

1. What is an association between CA (ie, parental death, parental divorce, suspension of school education due to financial strain or being raised in a relative's house due to financial strain) and prevalence and incidence of adulthood depressive symptoms in South Korea?
2. How does the association between CA and prevalence and incidence of adulthood depressive symptoms change when adulthood SES is adjusted?
3. Is there a dose–response relationship between the number of CAs and adulthood depressive symptoms?
4. How does the association between CA and prevalence and incidence of adulthood depressive symptoms differ by gender?
5. How does the association between CAs and prevalence and incidence of adulthood depressive symptoms differ by age groups?

METHODS

Study population

This study analysed data from the Korean Welfare Panel Study (KOWEPS), launched in 2006. This is a panel survey conducted annually by the Korean Institute of Social and Health Affairs with the Social Welfare Research Institute of Seoul National University. KOWEPS recruited 7072 households (18 856 respondents) from nationally representative 'Korean People's Life Status Survey', used two-stage stratified cluster sampling by region and income based on 'Korea Census (2005)' database. KOWEPS survey data were collected through person-to-person interview by visiting each household. These results are publicly available from the website (http://www.koweps.re.kr). We analysed data from the first (2006) and second (2007) waves of KOWEPS because the measurement of CA was only included in the first wave survey. The follow-up rate of second wave of KOWEPS was 91.3%. Among 18 856 respondents in the first wave, we excluded respondents who were less than 18 years old, did not participate in the second wave of KOWEPS or had missing values for depressive symptoms, CA or any covariates. As a result, 11 526 respondents were included to examine the association between CA and prevalence of adulthood depressive symptoms. After excluding 2963 respondents who had depressive symptoms at the first wave of KOWEPS (2006), 8563 respondents were included in the incidence analysis of adulthood depressive symptoms. This research received Institutional Review Board (IRB) exemption from the Office of Human Research Administration at the Harvard School of Public Health.

Measures

Depressive symptoms

A version of the 11-question Centers for Epidemiologic Studies Depression Scale (CES-D) was used to screen depressive symptoms at baseline (the first wave of KOWEPS in 2006) and at follow-up survey (the second wave of KOWEPS in 2007). CES-D has been validated in South Korea.[21] For each of 11 questions, respondents could answer from 0 to 3. The summed total score of 11 questions ranged from 0 to 33. A cut-off of nine points or more was used to define depressive symptoms.[22] To obtain more reliable estimates of the prevalence of adulthood depressive symptoms, we calculated an average of CES-D scores from the first and second waves of KOWEPS, and the resulting score was used to screen adulthood depressive symptoms. Incidence of

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adulthood depressive symptoms was defined when respondent has depressive symptoms at follow-up survey among the respondents without depressive symptoms at baseline survey.

Childhood adversities

Four different CAs were assessed in the first wave of KOWEPS using the following questions: "During your childhood (0–17 years old), did you ever experience (1) divorce of parents, (2) death of parent, (3) being raised in a relative's house due to financial strain in your family or (4) suspension of school education due to financial strain in your family?" Respondents could answer Yes (coded as 1) or No (coded as 0) for each of the four questions. In addition, we created the variable 'the number of CAs' by calculating the total number of CAs experienced by each respondent.

Covariates

As potential confounders, we considered six variables that may be associated with both CA as well as adulthood depressive symptoms based on prior literature: survey of respondent's age and sex, and four variables to assess childhood SES (ie, education of each parent[23] and occupation of each parent[23 24]). Education of each parent was classified into five categories using 'college graduate or more' as a reference: no formal education, elementary school graduate, middle school graduate, high school graduate and college graduate or more. Occupation of each parent was measured following a classification of International Standard Classification of Occupations[25] and was classified into three categories following a previous paper analysed KOWEPS[26]: non-manual labour (ie, managers (including government officials), professionals, technicians and associate professionals, and clerical support workers), manual labour (ie, service and sale workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators and assemblers, and elementary occupations), homemaker and others (ie, armed forces occupations). Each of six potential confounders was included as a categorical variable in the analyses.

In addition to these potential confounders, we evaluated how the associations changed when we additionally adjusted for adulthood SES of survey respondents because adulthood SES could be a mediator in the pathway linking CAs and adulthood depressive symptoms. Adulthood SES was assessed using three different measures of respondents: employment status, income and education level. Education was coded into four categories: junior high or less, high school graduate, college graduate and university graduate or more. An equivalised household income was calculated by dividing the sum of household income by the square root of the number of household members. A variable for income was then generated with four levels using the quartiles of the calculated equivalised income. Employment status was classified into seven categories: full-time permanent worker, precarious worker, employer, self-employed worker, full-time student, unpaid family worker and unemployed including housewives. A detailed explanation of this categorisation was provided in previous studies that analysed KOWEPS.[27 28] Each of the three measures for adulthood SES was included as a categorical variable in the analysis. All covariates included in the analysis were assessed in the first wave of KOWEPS.

Data analysis

Logistic regression was applied to investigate the association between CA and prevalence and incidence of adulthood depressive symptoms and to examine how the associations change when we additionally adjust for respondent's adulthood SES. Incidence analysis was conducted after excluding the people with depressive symptoms at first wave of KOWEPS. To evaluate whether the association differs by age, we examined the association between CA and prevalence and incidence of depressive symptoms after being stratified by early (18–39 years old), middle (40–59 years old) and late adulthood (60–98 years old). Finally, to examine whether the association differs by gender, we created interaction terms by multiplying gender and each of the four CAs in a fully adjusted model and checked p values of those interaction terms in both the prevalence and the incidence analysis. If the interaction term is statistically significant ($p<0.05$) we examined the association between CA and adulthood depressive symptoms after stratification by gender. Because depressive symptoms of respondents in the same family (5246 among 11 526 respondents in the prevalence analysis and 4875 among 8563 respondents in the incidence analysis had family members in the study population) were likely to be correlated to each other, the Huber-White sandwich estimator was used to calculate OR and 95% CI robust to within-family clustering.[29]

RESULTS

Table 1 presents the distribution of study population and the prevalence and incidence of depressive symptoms by age, sex and childhood SES (ie, education and occupation of each parent). The overall prevalence of depressive symptoms was significantly higher among women and the elderly. Depressive symptoms appeared to be more common among respondents whose parents had no formal education or whose parents were manual workers (table 2).

Table 3 displays the distribution of CAs and the association between CA and the prevalence of adulthood depressive symptoms. The highest prevalence of CA was for the parental death (18%) and the lowest prevalence was for the parental divorce (1.3%). We found strong associations between each of the four CAs and adulthood depressive symptoms (table 3). After adjusting for potential confounders, adulthood depressive symptoms were associated with childhood experience of parental death

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Table 1 Distribution of key covariates and prevalence and incidence of adulthood depressive symptoms in South Korea

	Study population for prevalence analysis			Study population for incidence analysis		
		Prevalence of depressive symptoms			Incidence of depressive symptoms	
Key covariates	Total N	N (%)	p Value*	Total N	N (%)	p Value*
Sex			<0.001			<0.001
Male	5143	879 (17.1)		4118	585 (14.2)	
Female	6383	1795 (28.1)		4445	902 (20.3)	
Age (years)			<0.001			<0.001
18–29	1584	185 (11.7)		1350	184 (13.6)	
30–39	2393	315 (13.2)		2004	274 (13.7)	
40–49	2068	399 (19.3)		1605	230 (14.3)	
50–59	1682	413 (24.6)		1258	222 (17.7)	
60 or more	3799	1362 (35.9)		2346	577 (24.6)	
Education			<0.001			<0.001
Junior high school or less	5101	1806 (35.4)		2423	778 (24.3)	
Junior high school graduate	3508	590 (16.8)		2398	414 (14.7)	
College graduate	1177	133 (11.3)		861	134 (13.5)	
University graduate or more	1740	15 (8.3)		1394	161 (10.4)	
Employment status			<0.001			<0.001
Unemployed	4744	1586 (33.2)		2422	520 (20.4)	
Precarious employment	2010	445 (22.1)		1230	296 (19.4)	
Unpaid family worker	742	143 (19.3)		475	128 (21.2)	
Self-employed	1635	323 (20.0)		1045	236 (18.4)	
Permanent employment	1870	133 (7.1)		118	165 (9.8)	
Business owner	142	14 (9.9)		104	18 (14.8)	
Full-time student	353	30 (8.5)		282	24 (7.8)	
Household income			<0.001			<0.001
Less than 1Q	2879	1267 (44.0)		1135	444 (28.1)	
1Q–2Q	2882	774 (26.9)		1615	409 (20.2)	
2Q–3Q	2879	402 (14.0)		2028	355 (14.9)	
3Q+	2886	231 (8.0)		2298	279 (10.8)	

*p Value of the χ^2 test comparing prevalence and incidence of adulthood depressive symptoms across different groups.
Q, quartile.

(OR 1.42, 95% CI 1.27 to 1.59), parental divorce (OR 2.52, 95% CI 1.75 to 3.61), suspension of school education due to financial strain (OR 1.87, 95% CI 1.66 to 2.09) and being raised in a relative's house due to financial strain (OR 2.01, 95% CI 1.59 to 2.53). The observed associations were attenuated but remained significant when we additionally adjusted for adulthood SES for each of the four CAs. The ORs for having adulthood depressive symptoms for respondents who had one, two, three and four CAs were 1.59 (95% CI 1.43 to 1.77), 2.52 (95% CI 1.81 to 2.57), 2.81 (95% CI 1.98 to 4.00) and 4.52 (95% CI 1.53 to 16.10), respectively (table 3).

The incidence of adulthood depressive symptoms was associated with childhood experience of parental divorce (OR 1.65, 95% CI 1.00 to 2.71) and suspension of school education due to financial strain (OR 1.55, 95% CI 1.32 to 1.82). When adulthood SES was adjusted for, in addition to other confounders, the relationship of adulthood depressive symptoms with childhood experience of suspension of school education due to financial strain was attenuated but remained significant (OR 1.38, 95% CI 1.17 to 1.63), whereas the relationship with childhood experience parental divorce was attenuated and became non-significant (OR 1.51, 95% CI 0.91 to 2.50). The ORs for incidence of adulthood depressive symptoms for respondents who had one, two and three CAs were 1.15 (95% CI 1.00 to 1.33), 1.69 (95% CI 1.33 to 2.15) and 1.64 (95% CI 0.96 to 2.79), respectively (table 4). Because none of the respondents with four CAs developed depressive symptoms, we could not estimate the associated OR among them.

In the age-stratified analyses, prevalence of depressive symptoms was strongly associated with all CAs across all three adulthoods, except for parental divorce and late adulthood depressive symptoms (table 5). In the late adulthood, the prevalence of adulthood depressive symptoms was associated with childhood experience of parental death (OR 1.40, 95% CI 1.20 to 1.64), suspension of school education due to financial strain (OR 1.87, 95% CI 1.61 to 2.17) and being raised in a relative's house due to financial strain (OR 1.58, 95% CI 1.15 to 2.17). In addition, suspension of school education due to financial strain was associated with incidence of depressive symptoms in late adulthood (OR 1.53,

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Table 2 Distribution of childhood socioeconomic status (SES) and prevalence and incidence of adulthood depressive symptoms in South Korea (2006–2007)

	Prevalence analysis			Incidence analysis		
	Total	Depressive symptoms		Total	Depressive symptoms	
Childhood SES	N	N (%)	p Value*	N	N (%)	p Value*
Education of father			<0.001			<0.001
No education	3958	1313 (33.2)		2603	622 (23.9)	
Elementary school graduate	3903	808 (20.7)		2944	441 (15.0)	
Junior high school graduate	1402	224 (16.0)		1136	166 (14.6)	
High school graduate	1611	236 (14.7)		1329	173 (13.0)	
University graduate or more	652	93 (14.3)		551	85 (15.4)	
Education of mother			<0.001			<0.001
No education	5600	1732 (30.9)		3760	825 (21.9)	
Elementary school graduate	3612	654 (18.1)		2851	412 (14.5)	
Junior high school graduate	1170	149 (12.7)		967	124 (12.8)	
High school graduate	979	120 (12.3)		841	107 (12.7)	
University graduate or more	165	20 (12.1)		144	19 (13.2)	
Occupation of father			<0.001			0.003
Non-manual	1524	250 (16.4)		1232	177 (14.4)	
Manual	9639	2320 (24.1)		7096	1277 (18.0)	
Others	363	105 (28.9)		235	33 (14.0)	
Occupation of mother			<0.001			<0.001
Non-manual	104	17 (16.4)		84	14 (16.7)	
Manual	8108	2049 (25.3)		5875	1097 (18.7)	
Others	109	34 (31.2)		70	10 (14.3)	
Homemaker	3205	575 (17.9)		2534	266 (14.4)	

*p Value of the χ^2 test comparing prevalence and incidence of adulthood depressive symptoms across different childhood SES.

95% CI 1.23 to 1.90) as well as early adulthood (OR 2.50, 95% CI 1.31 to 4.78) and middle adulthood (OR 1.57, 95% CI 1.21 to 2.03; table 6).

Finally, we assessed whether the association between CA and adulthood depressive symptoms is affected by gender for each of the four CAs after adjusting for age, sex and childhood SES. The gender interaction term was only significant in the association with childhood experience of parental divorce in the prevalence analysis ($p = 0.02$) and in the association with childhood experience of being raised in a relative's house due to financial strain in the incidence analysis ($p = 0.018$). When we examined the gender-specific association after adjusting for age, sex and childhood SES as a post hoc analysis (results are not shown in the table), the association between childhood experience of parental divorce and

Table 3 Association between childhood adversities and prevalence of adulthood depressive symptoms in South Korea (2006–2007, N=11 526)

	Distribution		Model I		Model II	
Childhood adversities	N	Per cent	OR	95% CI	OR	95% CI
Parental death	2072	18.0	1.42***	(1.27 to 1.59)	1.34***	(1.19 to 1.50)
Parental divorce	152	1.3	2.52***	(1.75 to 3.61)	2.07***	(1.40 to 3.05)
Suspension of school education due to financial strain	1842	16.0	1.87***	(1.66 to 2.09)	1.59***	(1.41 to 1.80)
Being raised in a relative's house due to financial strain	352	3.1	2.01***	(1.59 to 2.53)	1.64***	(1.28 to 2.04)
Number of childhood adversities						
0	8102	70.3	1	Referent	1	Referent
1	2594	22.5	1.59***	(1.43 to 1.77)	1.44***	(1.29 to 1.61)
2	678	0.9	2.52***	(1.81 to 2.57)	1.83***	(1.52 to 2.19)
3	140	1.2	2.81***	(1.98 to 4.00)	2.05***	(1.41 to 2.97)
4	12	0.1	4.52**	(1.53 to 16.10)	4.50*	(1.34 to 15.20)

*p<0.05.
**p<0.01.
***p<0.001.
Model I: model adjusted for age, sex and four indicators for childhood socioeconomic status (SES, ie, education and occupation of each parent).
Model II: model adjusted for age, sex, four indicators for childhood SES (ie, education and occupation of each parent) and three indicators of adulthood SES (ie, respondent's education, employment status and household income).

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Table 4 Age-stratified association between childhood adversities and prevalence of adulthood depressive symptoms in South Korea (2006–2007, N=11 526)

Childhood adversities	Early adulthood (age 18–39 years)		Middle adulthood (age 40–59 years)		Late adulthood (age 60–98 years)	
	OR†	95% CI†	OR†	95% CI†	OR†	95% CI†
Parental death	1.46**	(1.11 to 1.93)	1.46***	(1.21 to 1.78)	1.40***	(1.20 to 1.64)
Parental divorce	2.25***	(1.44 to 3.51)	3.53**	(1.62 to 7.66)	5.50	(0.72 to 41.99)
Suspension of school education due to financial strain	3.08***	(1.85 to 5.12)	1.91***	(1.57 to 2.32)	1.87***	(1.61 to 2.17)
Being raised in a relative's house due to financial strain	2.54**	(1.45 to 4.45)	2.66***	(1.82 to 3.88)	1.58**	(1.15 to 2.17)
Number of childhood adversities						
0	1	Referent	1	Referent	1	Referent
1	1.36*	(1.05 to 1.77)	1.6***	(1.33 to 1.92)	1.7***	(1.46 to 1.99)
2	2.92**	(1.55 to 5.51)	2.74***	(2.01 to 3.75)	2.01***	(1.61 to 2.51)
3	11.33**	(2.87 to 44.7)	2.77***	(1.59 to 4.80)	2.47***	(1.57 to 3.91)
4	5.53*	(1.45 to 21.06)	2.72	(0.27 to 27.34)	–	–

*p<0.05.
**p<0.01.
***p<0.001.
†Adjusted for age, sex and four indicators for childhood socioeconomic status (ie, education and occupation of each parent).

the prevalence of adulthood depressive symptoms was observed among women (OR 3.76, 95% CI 2.34 to 6.03), but not among men (OR 1.31, 95% CI 0.69 to 2.49) and the strong association between childhood experience of being raised in a relative's house due to financial strain and incidence of adulthood depressive symptoms was also observed only among women (OR 1.89, 95% CI 1.21 to 2.94), but not among men (OR 0.81, 95% CI 0.44 to 1.48).

DISCUSSION

Our findings suggest that CA is associated with the higher incidence of adulthood depressive symptoms as well as the higher prevalence. Strong associations were observed between each of the four CAs and prevalence of adulthood depressive symptoms after adjusting for covariates, including childhood SES as well as adulthood SES. Childhood experience of suspension of school education due to financial strain was strongly associated with incidence of adulthood depressive symptoms. We also found a dose–response relationship between the number of CAs and the prevalence of adulthood depressive symptoms, indicating that respondents with a greater number of CAs were more likely to have adulthood depressive symptoms.

The strong association between CAs and adulthood depressive symptoms is consistent with previous findings

Table 5 Association between childhood adversities and incidence of adulthood depressive symptoms in South Korea (2007, N=8563)

Childhood adversities	Distribution		Model I		Model II	
	N	Per cent	OR	95% CI	OR	95% CI
Parental death	1370	16.0	1.07	(0.92 to 1.24)	1.02	(0.88 to 1.19)
Parental divorce	106	1.3	1.65*	(1.00 to 2.71)	1.51	(0.91 to 2.50)
Suspension of school education due to financial strain	1068	12.5	1.55***	(1.32 to 1.82)	1.38***	(1.17 to 1.63)
Being raised in a relative's house due to financial strain	189	2.2	1.35	(0.96 to 1.89)	1.20	(0.85 to 1.69)
Number of childhood adversities						
0	6378	74.5	1	Referent	1	Referent
1	1716	20.0	1.15*	(1.00 to 1.33)	1.07	(0.93 to 1.24)
2	395	4.6	1.69***	(1.33 to 2.15)	1.48**	(1.16 to 1.88)
3	69	0.8	1.64	(0.96 to 2.79)	1.44	(0.83 to 2.51)
4	5	0.1	–	–	–	–

*p<0.05.
**p<0.01.
***p<0.001.
Model I: model adjusted for age, sex and four indicators for childhood socioeconomic status (SES, ie, education and occupation of each parent).
Model II: model adjusted for age, sex, four indicators for childhood SES (ie, education and occupation of each parent) and three indicators of adulthood SES (ie, respondent's education, employment status and household income).

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Table 6 Age-stratified association between childhood adversities and incidence of adulthood depressive symptoms in South Korea (2007, N=8563)

	Early adulthood (age 18–39 years)		Middle adulthood (age 40–59 years)		Late adulthood (age 60–98 years)	
Childhood adversities	**OR†**	**95% CI†**	**OR†**	**95% CI†**	**OR†**	**95% CI†**
Parental death	0.77	(0.54 to 1.12)	1.18	(0.91 to 1.54)	1.13	(0.91 to 1.42)
Parental divorce	1.89*	(1.13 to 3.14)	0.52	(0.07 to 4.15)	–	–
Suspension of school education due to financial strain	2.50**	(1.31 to 4.78)	1.57**	(1.21 to 2.03)	1.53***	(1.23 to 1.90)
Being raised in a relative's house due to financial strain	1.39	(0.68 to 2.86)	1.39	(0.77 to 2.51)	1.31	(0.79 to 2.16)
Number of childhood adversities						
0	1	Referent	1	Referent	1	Referent
1	0.99	(0.73 to 1.35)	1.23	(0.97 to 1.56)	1.20	(0.96 to 1.50)
2	1.76	(0.77 to 4.04)	1.82**	(1.18 to 2.81)	1.68**	(1.23 to 2.29)
3	5.63*	(1.09 to 29.08)	1.69	(0.73 to 3.92)	1.28	(0.62 to 2.65)
4	–	–	–	–	–	–

*p<0.05.
**p<0.01.
***p<0.001.
†Adjusted for age, sex and four indicators for childhood socioeconomic status (ie, education and occupation of each parent).

that CAs such as parental death or divorce may be associated with a higher risk of adulthood depressive symptoms.[3 5 30 31] Korkeila *et al*[6] reported a dose-response relationship between the number of CAs and depressive symptoms and antidepressant purchase using the Finnish survey data. Similarly, Chapman *et al*[16] reported an association between parental separation or divorce during childhood and lifetime prevalence of depressive disorder, and found that the number of CAs had a dose-response relationship with both lifetime and recent depressive disorders.

In the age-stratified analysis, we found the significant relationships between CAs and the prevalence of adult depressive symptoms maintained in the middle and late adulthood, at least 22 and 42 years after occurrence of the childhood adversities, respectively. CAs had stronger associations with early adulthood prevalence of depressive symptoms than middle or late adulthood, similar to Kessler *et al*'s[11] study. However, it should be noted that parental divorce, unlike other childhood adversities, showed increase in the magnitude of association with increased age. Although this should not be interpreted as trajectory as it may be due to cohort effect, it suggests that parental divorce may have a unique effect on psychological functioning.

Childhood experience of parental divorce was strongly related to higher prevalence of adulthood depressive symptoms among women, but not among men. This is consistent with a previous finding reporting the significant association between parental divorce and adult depressive symptoms among women, but not among men.[15 32] Other studies of the childhood aetiology of suicide also support this finding. Several reports indicate that parental divorce during childhood is associated with lifetime suicide attempt[33] or suicidal ideation in the past 12 months[34] only among women. Our findings is also partially supported by the reporting of previous study that women may be more sensitive to CA compared with men.[13] However, prevalence of parental divorce was lowest among the four CAs (1.4% for men and 1.3% for women), so the estimation of its impact on adulthood depressive symptoms could be relatively unstable. More research with larger sample size is needed to understand whether there is gender difference in the association between childhood parental divorce and mental health outcome and why the difference occurs.

In this study, we assessed two specific childhood experiences related to financial strain as CAs (ie, suspension of school education due to financial strain and being raised in a relative's house due to financial strain) and found their significant associations with adulthood depressive symptoms. These findings are consistent with the previous findings, which reported the association between childhood experience of financial difficulties and adulthood mental health.[6 35] Particularly, childhood experience of suspension of school education due to financial strain was significantly associated with both the prevalence and incidence of adulthood depressive symptoms across all three adulthoods, even after being adjusted for childhood and adulthood SES. These findings are supported by the previous studies which reported that educational attainment has significant impact on risk of late-life depression.[36] This is particularly plausible considering that education level plays a critical role in shaping people's life opportunities in South Korea as we can see that education attainment is the strong determinant of mortality[37] and is also the most commonly cited reason that people experience discrimination for men and the second common reason for women, following after their sex.[38]

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As a post hoc analysis, we conducted data analysis for prevalence and incidence of adulthood depressive symptoms by including four different CAs simultaneously because different CAs were correlated to each other. After adjusting for potential confounders (ie, age, sex and four indicators for childhood SES), prevalence of adulthood depressive symptoms was associated with childhood experience of parental death (OR 1.23, 95% CI 1.09 to 1.39), parental divorce (OR 1.92, 95% CI 1.30 to 2.84), suspension of school education due to financial strain (OR 1.50, 95% CI 1.33 to 1.70) and being raised in a relative's house due to financial strain (OR 1.26, 95% CI 0.96 to 1.63). In the incidence analysis, only the association between suspension of school education due to financial strain and adulthood depressive symptoms (OR 1.38, 95% CI 1.16 to 1.63) was significant whereas the other three associations turned out to be non-significant. However, these results should be interpreted cautiously because some CAs could be located in the pathway linking other CAs to adulthood depressive symptoms. For example, the people who experienced parental divorce or parental death during their childhood are more likely to be raised in a relative's house due to financial burden. In this case, adjustment of being raised in a relative's house could lead to over-adjustment because the variable could be an intermediate variable between childhood parental divorce or death and adulthood depressive symptoms.

Several explanations can support a pathway linking CA to adulthood depressive symptoms. People who experienced hardship in childhood may develop a learned helplessness or difficulty in establishing attachments, making them more vulnerable to stressful life events, which could lead to depressive symptoms.[3 4 24] Ross and Mirowsky[14] reported that adults with childhood experience of parental divorce exhibit problems in interpersonal relationships, such as finding themselves in unhappy relationships or mistrusting people in general and reflecting difficulties in establishing secure attachment. Finally, biologically speaking, previous studies suggest that CAs could sensitise the neuroendocrine stress responses of the hypothalamic–pituitary–adrenal axis over the course of lifetime, leading to depressive symptoms.[39]

This study has several limitations. First, although we assessed four different CAs, other CAs such as physical abuse or emotional abuse that are known to be associated with adulthood depressive symptoms,[16–18] were not measured in this study. Future studies in South Korea need to investigate the association between CA and adulthood depressive symptoms with more comprehensive measures of CA. Second, adulthood depressive symptoms may influence CA reporting. But, the incidence analysis, which analysed the subpopulation that were not-depressed when they reported their CAs at first wave of KOWEP, still revealed a significant association between CAs and adulthood depressive symptoms. Furthermore, CAs such as parent death or parental divorce are less prone to recall bias because it designates a definite life event, whereas a report on childhood abuse is more likely to be over-reported among depressed. Therefore, we do not think that the observed strong association could be fully explained by potential recall bias.

The present study has several strengths. First, because of the longitudinal study design, we could examine the association between CA and incidence of adulthood depressive symptoms at second wave of KOWEPS (2007) after excluding the people with depressive symptoms at first wave of KOWEPS (2006). Second, we found a gender difference in the association between childhood experience of parental divorce and being raised in a relative's house due to financial strain during childhood and adulthood depressive symptoms. Third, this study found a strong association between CA and adulthood depressive symptoms after adjusting for adulthood SES as well as potential confounders including childhood SES. Finally, this is, to our knowledge, the first study identifying the childhood aetiology of adulthood depressive symptoms in South Korea.

CONCLUSIONS

This study suggests that CA may increase the likelihood of having adulthood depressive symptoms after adjusting for adulthood SES as well as potential confounders including childhood SES, and that the associations between childhood experience of parental divorce and adulthood depressive symptoms may be different by gender. These findings imply that early intervention during childhood to reduce CA may be an important strategy to improve mental health throughout the life course.

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