







Brief Report: The Association of Adverse Childhood Experiences and Suicide-Related Behaviors Among 10th-Grade Secondary School Students

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ABSTRACT

The association between adverse childhood experiences and suicide-related behaviors (SRB) of adolescents has been widely studied in Western high-income countries, but not yet in Latin America. The aim of this study was to determine this association and to explore a dose-response relationship between adverse childhood experiences and SRB in Chile. We conducted a cross-sectional survey to assess adverse childhood experiences up to 1 year prior to the survey and SRB (suicide ideation and attempts) in a sample of secondary school students. Multilevel and multivariable logistic regressions were run with SRB as dependent and adverse childhood experiences as independent variables, adjusted by self-esteem, general mental health, friend and parental support, and the age at onset of cannabis and alcohol use. We included 7,458 adolescents (48.7% girls), mean age = 16.0 (SD = 0.7), and found a prevalence of 78.1% for at least one adverse childhood experience. The 6-month prevalence of suicidal ideation was 18.1% (95% confidence interval [CI]: 17.2%–19.0%), and the prevalence of suicide attempts was 5.0% (95% CI: 4.6–5.6). Among all adverse childhood experiences, only sexual abuse was a risk factor for both SRB. We also found an independent effect of the total number of adverse childhood experiences on suicidal ideation ($p < .001$) and on suicide attempts ($p < .001$). Additionally, ages at onset of alcohol and cannabis use were associated with suicidal ideation and suicidal attempts, respectively. This is the first study exploring the influence of adverse childhood experiences on suicide-related behaviors in adolescents from Latin America.

KEYWORDS

Adolescents; adverse childhood experiences; suicide attempts; suicide ideation

HIGHLIGHTS

- Sexual abuse is associated with suicidal ideation and suicide attempts in 10th-grade secondary school students
- There is a dose-response effect between adverse childhood experiences and suicide-related behavior
- Ages at onset of alcohol and cannabis use were associated with suicidal ideation and suicidal attempts, respectively

INTRODUCTION

Suicide-related behaviors (SRB), including suicidal ideation (SI) and suicide attempts (SA), are common in adolescents (McKinnon, Gariépy, Sentenac, & Elgar, 2016). SRB have been consistently associated with adverse childhood experiences (ACEs), which,

among others, comprise emotional, physical, and sexual abuse; emotional and physical neglect; witnessing family violence; and exposure to other family dysfunctions (Ryttilä-Manninen, Haravuori, Fröjd, Marttunen, & Lindberg, 2018). Literature has shown that ACEs predict physical and mental health problems and SRB in adolescents (Hughes et al., 2017; Meeker et al., 2021), revealing a dose-response association between the number of ACEs and SRB in young people (Serafini et al., 2015; Thompson et al., 2012) and adults (Thompson, Kingree, & Lamis, 2019). For instance, the review by Pérez-González and Pereda (2015) showed that survivors of childhood sexual abuse have a 2- to 3-fold higher risk of SI and 3- to 4-fold higher risk of SA in adolescence than those who did not experience childhood sexual abuse. Most research analyzing the effect of ACEs relies on adult retrospective reports (Meeker et al., 2021), which also occurs with studies examining the associations between ACEs and SRB (Blum, Li, & Naranjo-Rivera, 2019). Moreover, there are no studies assessing this association in adolescents from Latin American countries, where SRB in young people are frequent (Elia et al., 2020). Because SRB in young people are of great concern in Chile (Bustamante et al., 2016), given the high rates of exposure to psychological, mild physical, and severe physical violence in this population (UNICEF, 2015) and the lack of recent evidence about the prevalence of ACEs in this country, the aim of the present study was to examine the associations between ACEs and SI and SA in a large sample of 10th-grade students. We controlled for the possible but yet entirely clear effect of some variables associated with both ACEs and SRB, such as gender (Isohookana, Riala, Hakko, & Räsänen, 2013), parental education (Kwok & Shek, 2010), friend and parental support (Wan et al., 2019), self-esteem (Wan et al., 2019a; Wong, Dirghangi, & Hart, 2019), alcohol and illicit drugs use (Dube et al., 2006; Wang & Yen, 2017), and perception of mental health (Kim et al., 2021). Additionally, we explored the dose-response association between ACEs and SRB.

METHODS

Participants

We conducted a cross-sectional study among 7,538 adolescents attending 10th grade (*Segundo Medio*) in 117 secondary schools in six municipalities of the metropolitan region of Santiago, Chile. Passive informed consent from caregivers and assent from students were obtained prior to participation. Data collection was carried out using a pencil-and-paper survey between June 11 and 15, 2018, within the substance use prevention initiative for adolescents Planet Youth, Chile.

Measurements

Outcomes

Dichotomous outcome variables were created reflecting SI in the last week and SA in the last 6 months. The time frame for both outcomes was different based on the available data from the survey.

Predictors

ACEs had occurred up to 1 year prior to the survey. We asked for 11 types of ACEs: serious accident, severe illness, parental divorce or separation, death of a close family member (parents or siblings), death of a friend, breaking up with a girlfriend/boyfriend, sexual abuse, witness of domestic violence, direct involvement in domestic violence, being rejected by your friends, and parental loss of job.

Covariates

First, we controlled for the effect of demographic variables such as gender and age. Second, to determine the independent effect of the ACEs in predicting SI and SA, we also controlled for other known risk factors available in the survey: mother's education, father's education, parental support, friend support, self-esteem, any tobacco use at an onset of 13 years old or younger (reference = 14 years or older and never), alcohol use onset at 13 years old or younger (reference = 14 years or older and never), marijuana use onset at 13 years old or younger (reference = 14 years or older and never), and general mental health perception.

Data Analysis

A descriptive analysis was performed calculating percentages, 95% confidence intervals, means, and standard deviations.

The survey provided a large number of variables, and we did a first selection of the variables based on clinical knowledge and previous research. However, there were still some variables that may have a negligible effect on outcome and following the recommendations by some authors (Chowdhury and Turin, 2020; Hosmer et al., 2013), we initially performed univariable logistic regression analyses for each ACE and all other known risk factors available in the survey. All those variables significantly associated with SI and SA in univariable models were entered in a multivariable logistic regression analyses. Finally, we assessed the dose-response effect of the number of ACEs on SI and SA using a multivariable logistic regression model adjusted by all significantly associated variables from univariable analyses. Following the evidence showing increased mental and physical health risks associated with 4 or more ACEs (Hughes et al., 2017), which is the cutoff most frequently used in similar studies, we arranged the number of ACEs according to the following categories: 0, 1, 2, 3, and 4 or more events.

All analyses described above were multilevel logistic regression analyses. Multilevel analysis is recommended when data come from hierarchical levels. In this study, the students were nested in schools; therefore, we expected the same degree of similarity between their behaviors within schools, so we took into account the school level. All statistical analyses were performed using Stata 15.

Ethical Aspects

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Review Board of the Hospital Clínico Universidad de Chile (OAIC 981/18 on June 18, 2018). The participation of the schools and students was voluntary.

We used a passive informed consent procedure for the parents and an assent form for the students. The questionnaires were anonymous, protecting the identity of the students. The anonymized data were managed and stored by the research team.

RESULTS

We included 7,458 (98.9%) adolescents (mean age: 16.03, $SD=0.68$; 48.7% girls). SI was reported by 18.1% of the participants, and 5% reported SA within the last 6 months (Table 1).

A large proportion of adolescents reported at least 1 ACE (78.1%). The most frequent event was having witnessed domestic violence (31.1%), followed by parental divorce or separation (27.9%) and having had a serious accident (27.2%). Furthermore, 1 in 4 adolescents had been directly involved in domestic violence. A history of sexual abuse was reported by 6.2% of the adolescents. Finally, 17.2% of participants have had 4 or more ACEs (Table 1).

Sexual abuse was strongly associated with SI (adjusted odds ratio [AOR] = 2.23) and SA (AOR = 4.01). We also found that self-esteem, general mental health, and parental support were associated with SI and SA. Ages at onset of alcohol and cannabis use were associated with SI and SA, respectively (Table 2).

Finally, having had 4 or more ACEs was associated with the highest risk of SI and SA (Table 3).

DISCUSSION

This study surveyed a large number of adolescents in Santiago, Chile. The prevalence of SI and SA was similar to other studies (Barroilhet et al., 2012; Donath, Bergmann, Kliem, Hillemacher, & Baier, 2019; McKinnon et al., 2016). We also found that ACEs were common, supporting that adolescents had frequently been exposed to multiple adverse experiences (Blum et al., 2019). The rate of at least 1 ACE in our sample (78.1%) was higher than in other studies (Bethell, Davis, Gombojav, Stumbo, & Powers, 2017; Meeker et al., 2021) but lower than the rate reported by Goncalves et al. (2016) for Brazilian adolescents. Especially high rates were observed for being witness of domestic violence, serious accident, and parental divorce, followed by being involved in domestic violence. Differences between countries may derive from environmental, social context, and cultural factors (McKinnon et al., 2016). The history of sexual abuse was prevalent in 6.2%, lower than the rate of 8.7% reported by the nationwide survey of UNICEF in eighth graders in 2012.

As previously reported in several studies conducted mostly in high-income countries (Serafini et al., 2015; Sigfusdottir, Asgeirsdottir, Gudjonsson, & Sigurdsson, 2013), we found that the history of sexual abuse was strongly associated with both SI and SA in young individuals. Several mechanisms have been studied to understand these relationships. Sexual abuse has been related to higher risk of depression (Lindert et al., 2014), posttraumatic stress disorder (Panagioti, Gooding, Triantafyllou, & Tarrier, 2015), and substance use disorders (Tonmyr & Shields, 2017). Psychological vulnerability factors have also been proposed, such as higher stress reactivity (Shapero et al., 2014), poor

TABLE 1. Descriptive variables.

Variables	<i>n</i>	% or mean	95% CI or SD
Sex			
Boys	3,825	51.3	50.1–52.4
Girls	3,633	48.7	47.6–49.8
Age	7,458	16.03	0.68
Mother's education			
Primary school or less	463	6.9	6.3–7.5
Started high school but has not finished	682	10.2	9.5–10.9
Graduated from high school	1203	17.9	17.0–18.9
Started junior college or trade school but has not finished	191	2.9	2.5–3.3
Graduated from junior college or trade school	935	13.9	13.1–14–8
Started university but has not finished	346	5.2	4.7–5.7
Graduated from a university	2,893	43.1	41.9–44.3
Father's education			
Primary school or less	491	7.9	7.2–8.5
Started high school but has not finished	625	10.0	9.3–10.8
Graduated from high school	945	15.1	14.3–16.0
Started junior college or trade school but has not finished	150	2.4	2.0–2.8
Graduated from junior college or trade school	716	11.5	10.7–12.3
Started university but has not finished	285	4.6	4.1–5.1
Graduated from a university	3,039	48.6	47.4–49.9
Parental support	7,391	16.1	3.3
Friend support	7,376	15.7	3.2
Self-esteem	7,223	24.0	5.9
Age at onset of tobacco use			
13 years or younger	1,901	25.9	24.9–27.0
14 years older (or never)	5,429	74.1	73.0–75.1
Age at onset of alcohol use			
13 years or younger	1,979	27.0	26.0–28.0
14 years or older (or never)	5,349	73.0	72.0–74.0
Age at onset of cannabis use			
13 years or younger	483	6.7	6.1–7.3
14 years or older (or never)	6764	93.3	92.7–93.9
Suicidal ideation (past week)	7,358	18.1	17.2–19.0
Suicide attempts (past 6 months)	7,340	5.0	4.6–5.6
ACEs (experienced more than 12 months ago)			
Serious accident	7,502	27.2	26.2–28.2
Severe illness	7,504	18.0	17.1–18.9
Parental divorce or separation	7,504	27.9	26.9–28.9
Death of a parent or sibling	7,504	5.2	4.7–5.7
Death of a friend	7,503	8.5	7.9–9.1
Having broken up with boy-/girlfriend	7,496	14.2	13.5–15.0
Sexual abuse	7,510	6.2	5.6–6.7
Having witnessed domestic violence	7,511	31.1	30.1–32.2
Involvement in domestic violence	7,510	24.8	23.8–25.7
Being rejected by your friends	7,499	17.8	17.0–18.7
Job loss of a parent	7,499	14.3	13.5–15.1
Number of ACEs			
0	1,650	21.9	21.0–22.8
1	1,832	24.3	23.3–25.3
2	1,621	21.5	20.6–22.4
3	1,142	15.2	14.4–16.0
≥4	1,293	17.2	16.3–18.0

ACE = adverse childhood experience.

coping skills (Martin, Dykxhoorn, Afifi, & Colman, 2016), cognitive bias (Thompson et al., 2012), and impulsivity and maladaptive personality traits (Braquehais, Oquendo, Baca-García, & Sher, 2010; O'Brien & Sher, 2013). We did not find effects of other ACEs, previously reported as risk factor, such as parental divorce (Fuller-Thomson & Dalton, 2011), being a witness to domestic violence (Kim, 2021a; Martin et al., 2016),

TABLE 2. Unadjusted and adjusted* odds ratios and 95% confidence intervals for predicting suicidal ideation and attempts by predictors in multivariable logistic regression analyses.

Variables	Suicidal ideation				Suicide attempts				
	OR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value
ACEs experienced >12 months ago									
Serious accident	1.08	0.93–1.26	.289	–	–	–	1.35	1.07–1.70	.011
Severe illness	1.10	0.93–1.31	.255	–	–	–	1.68	1.31–2.16	<.001
Separation or divorce of parents	1.22	1.06–1.42	.007	0.94	0.76–1.16	.536	1.53	1.22–1.92	<.001
Death of a parent or sibling	1.30	0.98–1.73	.067	–	–	–	2.34	1.63–3.36	<.001
Death of a friend	1.52	1.22–1.90	<.001	1.18	0.86–1.62	.293	2.38	1.77–3.19	<.001
Break up with girlfriend/boyfriend	1.07	0.89–1.29	.495	–	–	–	1.12	0.84–1.50	.442
History of sexual abuse	3.84	3.06–4.83	<.001	2.23	1.60–3.11	<.001	7.44	5.56–9.96	<.001
Witness of domestic violence	1.36	1.18–1.57	<.001	1.10	0.89–1.35	.371	1.51	1.20–1.89	<.001
Involvement in domestic violence	1.20	1.03–1.39	.019	0.90	0.72–1.12	.352	1.38	1.09–1.75	.007
Being rejected by your friends	1.54	1.31–1.82	<.001	1.12	0.89–1.39	.333	1.29	0.97–1.71	.080
Father or mother lost a job	1.10	0.91–1.33	.313	–	–	–	1.34	1.00–1.80	.048
Other variables									
Gender (1 = male; 2 = female)	1.78	1.55–2.06	<.001	0.94	0.77–1.14	.519	2.86	2.24–3.66	<.001
Age	1.05	0.95–1.16	.325	–	–	–	1.03	0.89–1.20	.678
Mother's education	0.91	0.87–0.95	<.001	0.96	0.90–1.02	.200	0.88	0.81–0.94	<.001
Father's education	0.92	0.88–0.96	<.001	1.03	0.98–1.10	.259	0.90	0.83–0.97	.005
Parental support	0.83	0.81–0.84	<.001	0.96	0.93–0.98	.002	0.77	0.75–0.80	<.001
Friend support	0.92	0.90–0.94	<.001	0.97	0.95–1.00	.073	0.92	0.89–0.95	<.001
Self-esteem	0.81	0.80–0.83	<.001	0.86	0.85–0.88	<.001	0.78	0.76–0.80	<.001
Any tobacco use <14 years old	1.50	1.29–1.75	<.001	1.14	0.91–1.43	.260	2.56	2.04–3.20	<.001
Alcohol use <14 years old	1.44	1.24–1.67	<.001	1.27	1.03–1.57	.026	2.43	1.95–3.05	<.001
Marijuana use <14 years old	1.58	1.22–2.03	<.001	1.14	0.79–1.65	.485	3.87	2.88–5.20	<.001
General mental health perception	0.39	0.36–0.42	<.001	0.57	0.52–0.63	<.001	0.31	0.27–0.34	<.001

Note: *Adjusted by gender (1 = male; 2 = female), mother's education, father's education, parental support, friend support, and self-esteem. ACE = adverse childhood experience; AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio. Bold values = $p < .05$.

TABLE 3. Multivariate analysis adjusted* odds ratios and 95% confidence intervals for predicting suicidal ideation and attempts by number of ACEs.

Number of ACEs	OR SI	95% CI	<i>p</i> value	OR SA	95% CI	<i>p</i> value
			.004**			.05*
0	1			1		
1	1.57	1.17–2.11		1.78	1.00 – 3.17	
2	1.39	1.03–1.87		1.71	0.97–3.02	
3	1.15	0.83–1.60		1.78	0.98–3.24	
≥4	1.67	1.23–2.27		2.36	1.35–4.13	

Note: *Adjusted by gender (1 = male; 2 = female), mother's education, father's education, parental support, friend support, and self-esteem.

Any tobacco use <14 years old, alcohol use <14 years old, marijuana use <14 years old, general mental health perception. **Post-estimation Wald test.

ACE = adverse childhood experience; CI = confidence interval; OR = odds ratio; SA = suicide attempt; SI = suicidal ideation.

or being rejected by friends on SRB (King & Merchant, 2008). These results may be due to cultural differences, which highlighted the importance of reporting findings from Latin American countries.

Female gender was a risk factor for SA but not for SI, after controlling for several sociodemographic variables and psychological factors, which was in accordance with the literature (Lewinsohn, Rohde, Seeley, & Baldwin, 2001; Miranda-Mendizabal et al., 2019; Orri et al., 2020). However, this differed from other research revealing higher SI in females and no gender differences in SA in 90 low- and middle- income countries (Campisi et al., 2020), supporting that risk factors of SRB vary across countries, which could be explained by contextual and cultural factors (McKinnon et al., 2016).

Perceived parental support reduced the risk for both SRB, which has also been reported elsewhere (Kang et al., 2017; Macalli et al., 2018; Mackin, Perlman, Davila, Kotov, & Klein, 2017), but peer support was not associated with SRB in our sample. Several studies had reported that parental support could be more important than peer support to understand suicidal thoughts and history of suicidal behavior in clinical studies (Miller, Esposito-Smythers, & Leichtweis, 2015). On the other side, self-esteem reduced the risk for SRB. This is in line with research revealing that self-esteem mediates the relationship between negative life events and SI in female adolescents (Wan et al., 2019) and that low self-esteem is one of the long-term consequences of sexual abuse associated with both SI and SA in young people regardless of gender (Pérez-González & Pereda, 2015).

We additionally found that early onset of alcohol use increased the risk of SI, while early onset of cannabis use was linked to SA. Regarding early alcohol use, several studies found an association with both SI and SA in 9th- to 12th-grade students (Swahn & Bossarte, 2007) or only with SA but in younger adolescents (seventh grade) (Swahn, Bossarte, & Sullivent, 2008). Only a few studies have examined the relationship between early cannabis use and SRB. For instance, Cho, Hallfors, and Iritani (2007) did not find any association with suicide risk, while Pedersen (2008) observed that the onset of cannabis use at the end of adolescence was related to later SI and SA. Even though potential mechanisms underlying these associations have been explored (Borges, Walters, & Kessler, 2000; Chabrol, Ducongé, Casas, Roura, & Carey, 2005; Crean, Crane, & Mason, 2011) and there might be differential effects of alcohol and cannabis on SRB, further research is needed (Mars et al., 2019; Schmidt et al., 2020). Finally, in accordance with

prior research (Kim et al., 2021), poorer mental health perception was associated with both higher SI and SA.

This study showed that higher numbers of ACEs had a higher risk of SRB, as previously shown in other studies (Choi, DiNitto, Marti, & Segal, 2017; Cluver, Orkin, Boyes, & Sherr, 2015; Kappel, Livingston, Patel, Villaveces, & Massetti, 2021; Serafini et al., 2015; Thompson et al., 2019). Other neurodevelopmental, social, emotional, physical, mental, and behavioral health impairments have also been linked with SRB (Kaplow, Gipson, Horwitz, Burch, & King, 2014; Park et al., 2020; Pérez et al., 2016; Ports et al., 2017; Zarei, Xu, Zimmerman, Giannotti, & Strathearn, 2021).

The cross-sectional study design was a limitation for causal inferences. Furthermore, we used self-report questionnaires for events that happened in the past, and therefore, responses can be affected by memory bias. The available data did not measure the outcomes (SRB) using the same time frame, and there were some relevant variables that were not available to control the association between ACEs and SRB. Therefore, some confounding effects might be still in place in this association. Finally, the ACEs assessed in our study had occurred up to 1 year prior to the survey, but we did not establish the precise age at which adolescents had actually been exposed.

CONCLUSIONS

We found that sexual abuse was a strong risk factor for SI and SA. No other ACEs were associated with SRB. Self-esteem, parental support, and a general mental health perception were protective factors. The ages at onset of alcohol and cannabis use were differentially associated with SI and SA. The higher the number of ACEs, the higher the risk of SRB. Some of these findings could be used to develop suicide preventive strategies, for instance, implementing evidence-based interventions to reduce the risk of maltreatment and sexual abuse and to help victims to deal with negative outcomes associated with trauma. On the other hand, delaying the onset of alcohol and cannabis use might be included in the public education and health systems to reduce SRB. Finally, further research examining the role of mediating factors between sexual abuse and SRB in adolescents is needed.

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