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Article

Identification of adverse childhood experiences strongly predicting suicidal behaviour among emerging adults in Montenegro and Romania: a new way to targeted cost-effective prevention

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Abstract
Introduction. Aiming at generating evidence for cost-effective public health (PH) interventions for suicidal behaviour (SB) prevention in South Eastern Europe, the objective was to identify adverse childhood experiences (ACEs) most strongly predicting SB in emerging adults.
Methods. Survey data of 3283 students aged 18-29 from Montenegro and Romania were analysed by logistic regression. Based on estimation of risk-for-SB, the profiles with the highest values were identified.
Results. The SB odds were the highest in respondents, experienced a suicide attempt in the household (OR: 13.81; p < 0.001), and whose primary family was not complete, in particular in those with the foster family background (OR: 18.30; p = 0.001).
Conclusions. Magnitude of impact on emerging adults' mental health vulnerability tends to vary considerably with individual ACEs. This should be considered carefully when developing cost-effective response to SB burden through PH interventions in particular at the times of financial crises and in scarce resources settings.

INTRODUCTION

Suicide is ranked as one of the leading causes of death in adolescents and emerging adults. However, identification of individuals at risk-for-suicide remains a difficult task making prevention efforts challenging [1]. Many factors have been related to suicidal behaviour (SB) in the adulthood [1, 2], including adverse childhood experiences (ACEs) [3, 4].

Evidence shows that mental disorders in adults were directly related to childhood abuse [3, 5], and young adults who experienced early life trauma met the diagnostic criteria for at least one psychiatric disorder [6]. ACEs affect many human systems [7] impairing different competencies, which reduces prospects for successful learning, coping, and subsequent economic productivity [8]. Untreated ACEs impair physical and mental health [9, 10] due to practicing harmful health behaviours as coping mechanisms [11]. As shown elsewhere, the greater the number of ACEs, the poorer mental health outcomes [12] later in life. Complex interaction of socio-economic factors defines the heterogeneity of the ACEs short- and long-term consequences [13]. Importantly, ACEs appear to perpetuate intergenerational transmission of violence as victims tend to run higher risks to expose their children to traumatic events [14]. While responsible for some "biological memories" [15], ACEs make physiological systems already vulnerable in adolescence and emerging adulthood.

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An emerging adult is faced with many development tasks [16] including identity formation, taking over some new roles, instability, separation from the primary family and decreased parental support, increased choice and opportunities to try some new lifestyles. Underdeveloped coping mechanisms make these complex tasks grow into challenges with suicidal potential.

In some of South Eastern Europe (SEE) countries age-standardized suicide rates are above the annual global rate of 11.4 per 100 000 population (e.g. Croatia: 11.6; Montenegro: 15.3; Serbia: 12.4) [1]. However, the rate could be even higher as weak surveillance system (low coverage of vital registration) coupled with stigma surround the problem of SB in some of these countries [1]. According to our knowledge there exist only a few studies investigating association between SB and ACEs in SEE countries [17, 18]. Additionally, these studies only analysed the number of ACEs and didn't go into depth in terms of a nature of single ACE type.

Aiming at generating evidence for formulating cost-effective public health (PH) interventions for early identification and prevention of SB in the SEE region, the study objective was to identify ACEs most strongly predicting SB in population of emerging adults.

METHODS

Study design, study population/sampling and time frame

The data were collected in 2010-2012 in a cross-sectional studies conducted in Montenegro and Romania in the context of the recommendations made by the World Health Organization [13], launched to undertake scientifically informed programmes to prevent child maltreatment. In Montenegro 1600 (a sample stratified by faculty and gender), and in Romania 2500 university students (a sample weighted by regional population, random selection of institutions then students in regions) were invited to participate in the study, altogether 4100 students. In both countries, the sampling process ensured the representativeness of the samples [19, 20]. Those aged 18-29 (emerging adults) were intended to be included in the study.

Study instruments

The Adverse Childhood Experiences Study Questionnaires [13] were used as a base for study instruments for collecting information on ACEs, health risk behaviours and social factors [19, 20]. Some variations have been introduced to the surveys to investigate more objectively the national contexts [19, 20]. The questionnaires contained separate questions for males and females. Piloting of self-administered questionnaire was conducted to check whether respondents understood questions consistently, including their ability to provide meaningful answers.

Observed outcome

The observed outcome was SB. It was assessed through a question "Have you ever attempted to commit a suicide?" (0 = no, 1 = yes).

Explanatory and background factors

As explanatory factors of SB different ACEs were con-

sidered. The child maltreatment group included five ACE types: physical neglect, physical abuse, emotional neglect, emotional abuse, sexual abuse, and within them thirteen ACEs *(Table 1)* (all of them 0 = no, 1 = yes). The household dysfunction group included five ACE types: experience of substances abuse in the household, experience of mental problems in the household, experience of violence against mother, held an incomplete family status in comparison to those coming from a complete family, experienced some kind of criminal behaviour in the household, and within them eleven ACEs *(Table 1)*, (all of them 0 = no, 1 = yes). "Frequently" was defined as very often or often. By summing-up the ACE types in respondents, a summary measure ACE-type-count (ACE-TC) was created.

As background factors socio-economic (country, participants' gender and age group, and participants' parents' education level and employment status) were considered *(Table 1)*.

Methods of analysis

In the process of analysis first univariate and multivariate analysis of relationship between SB and ACE-

Table 1

Socio-economic characteristics and selected adverse childhood experiences in students from Romania and Montenegro (n = 3283)

Characteristic	N	(%)
Socio-economic characteristics		
Gender: Females	1899	57.8
Males	1384	42.2
Age: Yrs 18-19	1167	35.5
Yrs 20-21	1084	33.0
Yrs 22-23	666	20.3
Yrs 24-29	366	11.1
Mother's education: No school or elementary/ some high school	620	19.0
Completed high school	1539	47.2
Some college or high school/university or more	1102	33.8
Father's education: No school or elementary/ some high school	653	20.0
Completed high school	1362	41.8
Some college or high school/university or more	1246	38.2
Mother's employment status: Employed	2363	73.2
Unemployed	865	26.8
Father's employment status: Employed	2688	85.5
Unemployed	457	14.5
Adverse childhood experiences		
Child maltreatment group experiences		
Physical neglect experiences		
Frequently[a] didn't have enough to eat	99	3.1
Frequently had to wear dirty clothes	50	1.5
Frequently no person present to take to the doctor if necessary	172	5.4

(Continues)

Table 1
(Continued)

Characteristic	N	(%)
Physical abuse experiences		
Frequently being pushed, grabbed, etc. by somebody	104	3.4
Frequently being hit so hard to have marks or being injured	419	13.7
Frequently being spanked	1120	34.6
Emotional neglect experiences		
Frequently felt not loved	163	5.1
Frequently parents wished had never been born	120	3.7
Frequently being hated by someone in the family	271	8.4
Emotional abuse experiences		
Frequently being swore at, insulted, or put down	180	5.8
Frequently being afraid that might be physically hurt	114	3.7
Frequently being called "lazy" or "ugly"	280	8.7
Sexual abuse experiences		
Experienced an attempt of or actual sexual intercourse	128	4.4
Household dysfunction group experiences		
Substance abuse by household member experiences		
Lived with a problematic drinker or alcoholic	556	17.2
Lived with someone who used street drugs	93	2.9
Mental health problems of household member experiences		
Lived with somebody depressed or mentally ill	257	7.9
Experienced an attempt of a suicide in the household	133	4.1
Violence against mother experiences		
Frequently experienced pushing, grabbing, slapping mother etc.	111	3.4
Frequently experienced kicking, biting, hitting mother	192	6.0
Frequently experienced repeated hitting of mother	236	7.4
Frequently experienced threatening mother	119	3.7
Family separation experiences		
Family status: Primary family complete	2763	85.6
Parents divorced, no new partners	286	8.9
Parents divorced, stepfather	118	3.7
Parents divorced, stepmother	26	0.8
Parents divorced, stepfather and stepmother	14	0.4
Foster family	20	0.6
Criminal behaviour by household member experiences		
Experienced an incarceration of household member	154	4.7
Experienced a commitment of a crime by household member	82	2.5

[a]very often or often.

TC was performed by using binary logistic regression, by which the relationship between observed outcome and explanatory factors was controlled for background factors as well. The direct method was used. The similar type of analysis was used to assess relationship between SB and individual ACEs. The stepwise method was used to define the best multivariate model. The dummy variables were created for all categorical explanatory and confounding factors with more than two values considered in the multivariate model. The simple method (one group was assigned as the reference group) was applied. Adjusted odds ratios (OR) are reported along with 95% confidence intervals (CI) and p-values. On the basis of the logistic regression model, the risk-score for each participant was calculated and converted to the risk-for-SB estimate. For comparing median values in respondents with and without ACEs Mann-Whitney test was employed. Afterwards, the receiver operating characteristic (ROC) analysis was performed. Two cut-points of risk estimate were predefined. The first was according to the Youden index (YI), selected for the assessment of model performance. The second was placed at value 0.5000 (the values above 0.5000 were considered as the values of high-risk-for-SB), arbitrary selected as appropriate for planning PH activities. The characteristics of the group of high-risk-for-SB participants were analysed. Different combinations of characteristics denoted different group profiles. P-value ≤ 0.05 was considered significant in all statistical tests. The SPSS statistical software for Windows (Version 21.0, SPSS Inc., Chicago, IL, USA) (License: University of Ljubljana, Slovenia) was used as a tool for analysis.

Ethical considerations

All participants were informed about the purpose and course of the study, and their anonymity was assured. The study protocols were approved by the responsible ethical bodies in the respective countries [19, 20].

RESULTS
Study group description

The overall response rate was 89.1% (3653/4100) (Montenegro 97.8%; Romania 83.5%). Among respondents there were 3283 (89.9%) aged 18-29 years (Montenegro: 1518, Romania: 1765), who were eligible for inclusion in the study, while majority of the rest were older than 29 years. Their characteristics are presented in *Table 1*.

In the child maltreatment group, 266/3164 (8.4%) respondents experienced some ACE of physical neglect type, 1177/3016 (39.0%) some ACE of physical abuse type, 392/3188 (12.3%) some ACE of emotional neglect type, 387/3022 (12.8%) some ACE of emotional abuse type, and 128/2928 (4.4%) sexual abuse. In the household dysfunction group, 604/3175 (19.0%) respondents experienced some ACE of substance abuse in the household type, 316/3248 (9.7%) some ACE of mental problems in the household type, 292/3163 (9.2%) some ACE of violence against mother type, 464/3227 (14.4%) held some kind of an incomplete family status, and 192/3239 (5.9%) some ACE of criminal behaviour

in the household type. Detailed results by individual ACEs are shown in *Table 1*. Furthermore, study results showed that only 971/2575 (37.7%) participants didn't experience any ACE type during their childhood, while 62.2% experienced at least one out of the ten in total (one ACE type: 29.3%, two ACE types: 15.8%, three ACE types 8.4%, four or more ACE types: 8.7%).

Univariate analysis results

The presence/absence of SB was possible to establish in all 3227/3283 (98.3%) respondents. Among them 123 (3.8%) reported on SB. The prevalence was slightly higher in Romania than in Montenegro *(Table 2)*.

The results showed that the increase in ACE-TC was followed by a remarkable increase in SB prevalence (ACE-TC 0: 0.2%; ACE-TC 1: 1.1%; ACE-TC 2: 4.9%; ACE-TC 3: 7.5%; ACE-TC ≥ 4: 19.7%). A significant graded association between SB and ACE-TC was observed (ACE-TC 1: OR = 5.15; ACE-TC 2: OR = 24.90; ACE-TC 3: OR = 39.03; ACE-TC ≥ 4: OR = 118.11). The power of this association almost didn't change after controlling for the background factors.

As illustrated in *Table 2*, the prevalence of SB in those reporting ACEs ranged from 7.1% to 40.0%. In all observed ACEs the impact was statistically highly significant. However, it was the highest in respondents living with a household member who attempted suicide and those who were coming from a foster family *(Table 2)*.

Multivariate analysis results

All data necessary to perform multiple logistic regression analysis were present in 2455/3283 participants (74.8%). As shown in *Table 3*, odds for SB were the highest in those with history of being hit and those with experience of severe form of sexual abuse (attempted or completed sexual intercourse). Significantly higher odds for SB were also found among respondents with experience of certain type of household dysfunction: living with a household member who attempted suicide, not living in complete primary family, and/or an imprisonment of a household member *(Table 3)*. The gender moderated the relationship between ACEs and SB - male respondents were less likely to express SB than females.

High-risk profiles definition

It was possible to estimate the risk-score and afterwards a risk-for-SB in 2,731/3,283 participants with data on all factors considered in the multivariate analysis (83.2%). The median value of risk-for-SB in the total group was 0.00971 (0.00135-0.99932). It was significantly higher in respondents with ACEs (0.00455) than in those without (0.01887) (p < 0.001). The value of area under ROC curve was 0.907, indicating excellent predictive performance of the model. The best cut-point according to the YI was placed at risk estimate value 0.02486 (true positive rate: 0.832; false positive rate: 0.180; true negative rate: 0.820; false negative rate: 0.168; positive predictive value: 0.144; negative predictive value: 0.993).

In the high-risk-for-SB group 39/2,709 (1.4%) participants were classified. Among them were 31 (79.5%) females and 8 (20.5%) males, 32 (82.1%) were frequently being hit so hard to have marks or being injured, also 32 (82.1%) frequently being spanked, 16 (41.0%) frequently felt not loved, in 12 (30.8%) of them parents frequently wished had never been born, 14 (35.9%) experienced an attempt of or actual sexual intercourse, 36 (92.3%) experienced an attempt of a suicide in the household, and 16 (41.0%) experienced an incarceration of a household member. Only 9 (23.1%) grew up in complete primary family while all other experienced some kind of family dysfunction. In 8 (20.0%) parents divorced and got no new partner, in 14 (35.9%) participants got a stepfather, in 2 (5.1%) participants got a stepmother, and in 1 (2.6%) a participant got both, stepfather and stepmother, while 5 (12.8%) of them were growing up in a foster family. The profiles, along with the risk-for-SB and ACE-TC group are presented in *Table 4*.

DISCUSSION

The most important result of the present study, along the consistently higher SB prevalence among ACE victims compared to non-victims, is the notably higher impact of certain types of ACEs, indicating that they are relatively more important than others. Consequently, within each ACE-TC group, the risk-for-SB varies depending on the combination of ACEs. It may happen that a person with a lower number of ACEs may have a greater risk-for-SB than a person with a higher number of ACEs. The study therefore highlights that, along the quantity of early adversities [17, 21, 22], also the nature and combination of the individual ACEs plays an important role in increasing risk-for-SB. The study in this way builds on the results of previous studies in this field dealing only with the quantity of ACEs [17, 18].

Due to methodological differences, only a partial comparison with other studies was possible. On general, our findings are consistent with previous findings that ACE victims and more likely to engage in self-destructive behaviour, including suicide, due to childhood adversities [23, 24]. In the child maltreatment group of ACEs the results are consistent with previous investigation on early trauma and SB of Jeon *et al.* [25], suggesting that physical abuse was more strongly associated with new-onset SB than childhood neglect and sexual abuse. Contrary to Miller *et al.* [26] we found that only some types of ACEs in this group remain associated with SB in multivariate model and are relatively more important than others. Additionally, victims of physical abuse who were hit so hard to have marks or injuries exhibited in our study the highest odds for SB, which is consistent with findings of Silverman *et al.* [27]. Consistent with studies of Lopez-Castroman *et al.*, Bridge *et al.* and Bebbington *et al.* [28-30], our results also suggest with certainty that odds of SB are elevated among those reporting severe sexual abuse. At the same time, our results contradict previous evidence of Lopez-Castroman *et al.* [28] that only sexual, but not physical, abuse was associated with SB. Finally, our results on association between emotional neglect type of ACEs and SB are not compliant with findings of Brown *et al.* that childhood neglect is not likely to be responsible for SB as its effects cannot

Table 2
Results of univariate analysis of relationship of suicidal behaviour and adverse childhood experiences, along with the prevalence of suicidal behaviour (as %), in students from Romania and Montenegro (n = 3283)

Factor		Prevalence (%)	OR	95% CI limits for OR		p
				Lower	Upper	
Adverse childhood experiences						
Child maltreatment group						
Physical neglect experiences						
Frequently[a] didn't have enough to eat	No	3.4	1.00			
	Yes	17.0	5.81	3.28	10.29	< 0.001
Frequently had to wear dirty clothes	No	3.5	1.00			
	Yes	23.4	8.35	4.14	16.85	< 0.001
Frequently no person present to take to the doctor if necessary	No	3.3	1.00			
	Yes	12.9	4.32	2.65	7.06	< 0.001
Physical abuse experiences						
Frequently being pushed, grabbed, etc. by somebody	No	2.8	1.00			
	Yes	29.1	14.06	8.72	22.67	< 0.001
Frequently being hit so hard to have marks or being injured	No	2.0	1.00			
	Yes	14.4	8.10	5.51	11.92	< 0.001
Frequently being spanked	No	2.1	1.00			
	Yes	7.1	3.57	2.45	5.20	< 0.001
Emotional neglect experiences						
Frequently felt not loved	No	3.1	1.00			
	Yes	18.5	7.14	4.54	11.22	< 0.001
Frequently parents wished had never been born	No	3.0	1.00			
	Yes	23.9	10.19	6.35	16.35	< 0.001
Frequently being hated by someone in the family	No	2.4	1.00			
	Yes	19.5	10.03	6.81	14.79	< 0.001
Emotional abuse experiences						
Frequently being swore at, insulted, or put down	No	2.6	1.00			
	Yes	23.0	11.06	7.29	16.78	< 0.001
Frequently being afraid that might be physically hurt	No	2.8	1.00			
	Yes	29.5	14.73	9.27	23.41	< 0.001
Frequently being called "lazy" or "ugly"	No	2.8	1.00			
	Yes	14.4	5.90	3.952	8.818	< 0.001
Sexual abuse experiences						
Experienced an attempt of or actual sexual intercourse	No	3.0	1.00			
	Yes	14.8	5.57	3.27	9.50	< 0.001
Household dysfunction group						
Substance abuse by household member experiences						
Lived with a problematic drinker or alcoholic	No	2.7	1.00			
	Yes	9.3	3.73	2.57	5.41	< 0.001
Lived with someone who used street drugs	No	3.5	1.00			
	Yes	15.6	5.03	2.76	9.18	< 0.001
Mental health problems of household member experiences						
Lived with somebody depressed or mentally ill	No	2.8	1.00			
	Yes	15.4	6.41	4.27	9.62	< 0.001
Experienced an attempt of a suicide in the household	No	2.3	1.00			
	Yes	40.0	28.78	18.85	43.95	< 0.001

(Continues)

Table 2
(Continued)

Factor		Prevalence (%)	OR	95% CI limits for OR		p
				Lower	Upper	
Violence against mother experiences						
Frequently experienced pushing, grabbing, slapping mother etc.	No	3.0	1.00			
	Yes	27.8	12.46	7.79	19.93	< 0.001
Frequently experienced kicking, biting, hitting mother	No	2.9	1.00			
	Yes	18.5	7.63	4.99	11.67	< 0.001
Frequently experienced repeated hitting of mother	No	2.8	1.00			
	Yes	17.2	7.25	4.83	10.88	< 0.001
Frequently experienced threatening mother	No	3.0	1.00			
	Yes	25.4	11.03	6.89	17.66	< 0.001
Family separation experiences						
Family status	Primary family complete	2.5	1.00			
	Parents divorced, no new partners	7.4	3.13	1.89	5.20	< 0.001
	Parents divorced, stepfather	16.2	7.61	4.40	13.16	< .001
	Parents divorced, stepmother	7.7	3.27	0.76	14.12	0.112
	Parents divorced, stepfather and stepmother	15.4	7.14	1.55	32.83	0.012
	Foster family	35.0	21.14	8.18	54.66	< 0.001
Criminal behaviour by household member experiences						
Experienced an incarceration of a household member	No	3.1	1.00			
	Yes	18.1	6.93	4.36	11.02	< 0.001
Experienced a commitment of a crime by a household member	No	3.2	1.00			
	Yes	26.9	11.07	6.47	18.97	< 0.001
Background factors						
Country	Romania	4.5	1.00			
	Montenegro	3.0	0.67	0.46	0.97	0.036
Gender	Female	4.7	1.00			
	Male	2.6	0.54	0.36	0.80	0.002
Age	Yrs 18-19	2.5	1.00			
	Yrs 20-21	4.8	2.00	1.25	3.19	0.004
	Yrs 22-23	5.0	2.10	1.26	3.51	0.004
	Yrs 24-29	3.0	1.25	0.61	2.53	0.541
Mother's education	No school or elementary/some high school	6.1	1.00			
	Completed high school	3.1	1.79	1.12	2.84	0.014
	Some college or high school/ university or more	3.5	0.89	0.58	1.38	0.607
Father's education	No school or elementary/some high school	5.1	1.00			
	Completed high school	3.9	1.79	1.11	2.90	0.018
	Some college or high school/ university or more	2.9	1.35	0.88	2.08	0.167
Mother's employment status	Employed	3.6	1.00			
	Unemployed	4.1	1.17	0.78	1.75	0.450
Father's employment status	Employed	3.2	1.00			
	Unemployed	6.2	1.97	1.27	3.06	0.002

OR: odds ratio; CI: confidence interval; [a]very often or often.

Table 3
Results of multivariate analysis of relationship of suicidal behaviour and adverse childhood experiences in students from Romania and Montenegro (n = 2455)

Factor		b	OR	95% CI limits for OR		p
				Lower	Upper	
Adverse childhood experiences						
Child maltreatment group						
Frequently[a] being hit so hard to have marks or being injured	No		1.00			
	Yes	1.297	3.66	2.04	6.57	< 0.001
Frequently being spanked	No		1.00			
	Yes	0.764	2.15	1.20	3,82	0.010
Frequently felt not loved	No		1.00			
	Yes	0.821	2.27	0.97	5.33	0.059
Frequently parents wished had never been born	No		1.00			
	Yes	0.818	2.27	1.01	5.10	0.048
Experienced an attempt of or actual sexual intercourse	No		1.00			
	Yes	1.034	2.81	1.19	6.65	0.018
Household dysfunction group						
Experienced an attempt of a suicide in the household	No		1.00			
	Yes	2.625	13.81	7.47	25.52	< 0.001
Experienced an incarceration of a household member	No		1.00			
	Yes	1.521	4.58	2.07	10.13	< 0.001
Family status	Primary family complete		1.00			
	Parents divorced, no partner	0.393	1.48	0.71	3.08	0.294
	Parents divorced, stepfather	0.838	2.31	0.99	5.37	0.051
	Parents divorced, stepmother	-0.048	0.95	0.05	17.84	0.975
	Parents divorced, stepfather and stepmother	1.767	5.85	0.49	70.32	0.164
	Foster family	2.907	18.30	3.24	103.41	0.001
Background factors						
Gender	Males		1.00			
	Females	1.169	3.22	1.71	6.07	< 0.001
Age	Yrs 18-19		1.00			
	Yrs 20-21	0.887	2.43	1.06	5.53	0.035
	Yrs 22-23	1.105	3.02	1.26	7.20	0.013
	Yrs 24-29	0.180	1.20	0.39	3.69	0.753
Constant		-6.557				

OR: odds ratio; CI: confidence inervak; [a]very often or often.

be separated from those of other risk factors [24]. In the household dysfunction group of ACEs the results are consistent with the results of studies of Felitti *et al.* [22] and Thompson *et al.* [31], indicating the household dysfunction is associated with SB. For example, similarly to our study, Felitti *et al.* [22] have found that living with a household member who attempted suicide or was incarcerated contributes greatly to the odds of SB. Unfortunately, we were not able to compare the findings that SB is influenced by living in a foster family. To our knowledge, this association has not been described elsewhere. However, these findings need to be

interpreted with caution as the confidence interval was wide suggesting a larger study is needed to generate a more precise estimate of effect.

There exist some potential limitations of this study. First, only students from two SEE countries were included in the study. It was intended to include also data from Albania and FYR Macedonia. Unfortunately, this was impossible due to data collection discrepancies. However, these two countries could be seen as representatives of two groups of SEE countries from historical (Romania was belonging to the influence zone of the USSR, while Montenegro was a former

Table 4
Profiles of students with the high-risk-for-suicidal-behaviour (risk estimate exceeding value of 0.50000) in student s from Romania and Montenegro (N = 44)

Gender/ Age group[a]	Risk-for-SB	Frequently[b] being hit so hard to have marks or being injured	Frequently being spanked	Frequently felt not loved	Frequently parents wished had never been born	Experienced an attempt of or actual sexual intercourse	Experienced an attempt of a suicide in the household	Experienced an incarceration of a household member	Family status	Individual ACEs Count
Females										
2	0.99932	yes	yes	yes	yes	yes	yes	yes	Foster family	8
1	0.99534	yes	yes	yes	yes	no	yes	yes	Foster family	7
3	0.98043	yes	yes	yes	yes	yes	yes	no	Parents divorced, stepfather	7
2	0.97578	yes	yes	yes	yes	yes	yes	no	Parents divorced, stepfather	7
2	0.94867	yes	yes	no	yes	no	yes	yes	Parents divorced, no new partners	6
1	0.90432	yes	yes	no	no	yes	yes	yes	Parents divorced, no new partners	6
2	0.88663	yes	yes	no	no	yes	yes	no	Parents divorced, stepfather	5
2	0.88489	yes	yes	yes	no	yes	yes	no	Primary family complete	5
2	0.86100	yes	yes	yes	yes	no	yes	no	Primary family complete	5
4	0.86032	yes	yes	no	yes	no	yes	yes	Primary family complete	5
1	0.84093	no	no	no	no	no	yes	yes	Foster family	3
1	0.82427	yes	yes	yes	no	yes	yes	no	Parents divorced, no new partners	6
3	0.77564	yes	yes	no	no	no	yes	no	Parents divorced, stepfather	4
1	0.77062	yes	yes	no	no	no	yes	yes	Parents divorced, no new partners	5
4	0.75714	yes	yes	yes	no	no	yes	no	Parents divorced, stepfather	5
2	0.73545	yes	yes	no	no	no	yes	no	Parents divorced, stepfather	4
2	0.72215	yes	yes	no	yes	no	yes	no	Parents divorced, stepmother	4
2	0.72177	yes	yes	no	no	yes	no	yes	Parents divorced, stepfather	5
2	0.69023	no	yes	no	no	no	yes	yes	Parents divorced, no new partners	4
2	0.68125	no	yes	no	no	yes	yes	no	Parents divorced, stepfather	4
2	0.62796	yes	no	yes	no	no	no	no	Foster family	3
3	0.61702	yes	no	no	no	no	yes	no	Parents divorced, stepfather	3
2	0.60076	no	yes	no	no	no	yes	yes	Primary family complete	3
3	0.58779	yes	yes	no	no	no	yes	no	Parents divorced, stepmother	3
1	0.58227	yes	yes	no	no	yes	yes	no	Primary family complete	4
2	0.56437	yes	no	no	no	no	yes	no	Parents divorced, stepfather	3
3	0.55328	no	no	no	no	yes	yes	no	Parents divorced, stepfather	3
2	0.54598	yes	yes	no	no	no	yes	no	Primary family complete	3
1	0.52899	yes	yes	no	yes	no	yes	no	Primary family complete	4
2	0.50915	yes	yes	yes	yes	no	no	no	Parents divorced, stepfather	5
4	0.50133	no	no	yes	no	no	yes	no	Parents divorced, stepfather and stepmother	3
Males										
2	0.96224	no	no	yes	no	yes	yes	yes	Foster family	5
3	0.96203	yes	yes	yes	yes	no	yes	yes	Parents divorced, stepfather	7
2	0.94184	yes	yes	yes	no	yes	yes	yes	Parents divorced, no new partners	7
2	0.79819	yes	yes	no	no	no	yes	yes	Parents divorced, stepfather	5
1	0.70345	yes	yes	yes	no	yes	yes	no	Parents divorced, no new partners	6
3	0.65935	yes	yes	no	no	yes	yes	no	Parents divorced, no new partners	5
2	0.65806	yes	yes	yes	yes	no	yes	no	Primary family complete	5
2	0.63111	yes	yes	no	no	no	yes	yes	Primary family complete	4

[a]age group; 1: yrs 18-19; 2: yrs 20-21; 3: yrs 22-23; 4: yrs 24-29; [b]very often or often; ACE: adverse childhood experience; SB: suicidal-behaviour.

Yugoslav Republic) as well as contemporary perspective (Romania is an EU member, while Montenegro is a candidate). Second, one could argue the observed outcome was measured only as a self-reported previous suicide attempt, what makes, in combination with a cross-sectional design, the study results less informative about mechanisms predicting SB. However, as this is true for the individual level of coping with the problem, we believe they are sufficiently informative to be useful for planning the interventions at the population level. Despite limitations, presented study has important strengths. It makes a step forward relative to what has been published so far on this topic by providing more detailed scientific information, indicating additional attention to be paid not only to the quantitative, but also to the qualitative aspect of ACEs experienced. Additionally, it offers a methodology for developing more targeted and consequently more cost-effective interventions relevant for countries with socio-economic and political situation similar to Romania and Montenegro.

The survey findings can be used to help policy makers in designing evidence-based responses to child maltreatment in SEE countries and prioritizing selective interventions to work with those at an increased risk of maltreatment [14], while ensuring efficient use of scarce resources intended for prevention purposes. Presented evidence offers important messages. First, when screening for individuals at-risk-for-SB special attention should be paid to victims of certain ACE groups as they increase more individual's vulnerability to SB, and second, working should be done to increase the stability and protective role of the family [32, 33].

As some uncertainties to what degree association between the SB and ACEs reflects the social and family context within which they occur, further research is needed. For example, based on the study results, life in a foster family seems to be a very strong predictor of a SB. However, qualitative in-depth analysis is required to understand clearly this relationship.

CONCLUSION

In conclusion we can stress that the study results showed that, while ACEs are common in the observed SEE countries, magnitude of their impact on mental vulnerability of emerging adults tends to vary with individual ACEs. This should be considered carefully when developing cost-effective response to SB burden through population and/or targeted interventions, aimed at early detection and prevention of ACEs identified as the strongest predictors of SB. This is so in particular at the times of financial crises and in scarce resources setting. Future suicide prevention measures should focus on ACE high-risk profiles, in particular when implemented in scarce resource settings.

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