

## Low self-esteem and high psychological distress are common among depressed adolescents presenting to the Pediatric Emergency Department

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### Abstract

**Background:** Increasing psychiatric disorders and alcohol intoxication challenge the pediatric emergency departments (PEDs) to which adolescents are referred owing to acute alcohol intoxication.

**Objective:** This study examined the degree to which adolescents presenting to PED with alcohol intoxication or deliberate self-harm report symptoms of depression and how they differed from non-depressed patients in terms of alcohol use, perceived social support, psychological distress, self-esteem, and suicidal thoughts.

**Methods:** In a sample of 138 adolescents, 12- to 16-years old (62% females), we assessed the patients' psychiatric status using self-report scales and analyzed blood samples for alcohol. Before discharge, a consulting psychiatrist interviewed each patient to evaluate possible suicidality and organized aftercare when necessary. The mediating data-driven hypothesis was examined. Adolescents scoring  $\geq 10$  on the Beck Depression Inventory (BDI) were deemed as screening positive for depression.

**Results:** In 55% of participants, intoxication was by alcohol consumption. Deliberate self-harm was found in 17% of the participants. Of the 138 adolescents, 39% scored positive on the BDI for depressive symptoms, occurring more commonly in girls. Logistic regression showed that the most significant variables associated with depressive symptoms were female gender, high psychological distress, and low self-esteem. Symptoms of depression served as a mediator between gender and self-esteem and the blood alcohol level.

**Conclusions:** Our findings underscore the importance of identifying mood disorders, suicidality, and self-esteem among adolescents with acute alcohol intoxication at the PED. Intensive psychiatric evaluation in an emergency department is necessary in order to detect those adolescents requiring additional treatment and support.

**Keywords:** alcohol intoxication; adolescents; depressive symptoms; psychological distress; emergency department

### Background

Mood and behavior disorders begin to increase steadily in adolescence (1). As per the National Comorbidity Survey-Adolescent Supplement-A (NCS-A), the prevalence of all mood disorders increased almost twofold from the 13- to 14-year-old age group to the 17- to 18-year-old age group. Substance use disorders showed a steep increase after age 15 (1). Previous longitudinal studies have reported that the initiation of alcohol use increased at the ages 13 to 15 years (2) and drinking to intoxication increased throughout adolescence.

Heavy episodic drinking among Finnish youth has decreased in the past 15 years. Nevertheless, in the 2015 survey of the European School Survey Project on Alcohol and other Drugs, 37% of Finnish adolescents reported having been drunk at least once in their lifetime and about 7% reported getting drunk almost every week (3).

An early age of alcohol use in general and an early age of alcohol-related intoxication have been reported to be associated with several mental health problems among adolescents (4,5). A study by McCarty et al. (5) documented that, even in the

context of conduct disorders, depressive symptoms were associated with increased alcohol use across early adolescence. In a longitudinal study of twins, conduct disorder during childhood also seemed to increase the risk of early initiation of alcohol use by the age of 14 years (6), with major depression showing a weaker relationship with substance use. Several other studies have reported an association between symptoms of depression and initiation of alcohol use in early adolescence. For example, Crum et al. (7) reported that high levels of depressed mood during childhood are associated with a higher risk for starting alcohol use and for the first intoxication experience during early adolescence (8). A study of Norwegian adolescents (9) reported that, among girls, the symptoms of anxiety and depression increased the risk of alcohol intoxications. A Finnish study among adolescent twins also reported the association between depressive symptoms and alcohol use in girls, and that early-onset depressive disorders at age 14 were associated with frequent alcohol use and recurrent acute alcohol intoxications at age 17 (10). Another Finnish study reported that depressed adolescents with deliberate self-harm used more alcohol than non-suicidal depressed adolescents (11). Moreover, depression has been found to mediate the associations between anxiety and substance use among adolescents (12).

Pediatric hospital admissions owing to alcohol intoxication have increased in many countries (13-15). In Finland, the incidence of hospitalizations owing to alcohol-related poisoning increased 1.7-fold among boys and 2.4-fold among girls during a 35-year period from 1971 to 2005 (15). During 2002 to 2006, 48% of all visits were among adolescents, aged 10 to 15 years. Ethanol was the cause of poisonings in one-third of the cases (16).

Depressive symptoms among adolescent emergency department (ED) patients may often go unrecognized (17). Downey et al. reported that 45% of patients who presented to the ED with non-psychiatric complaints had undiagnosed mental illness (18). Detailed clinical characterization of adolescent patients presenting to the ED may help in assessing the need for psychiatric treatment and to organize appropriate aftercare (19,20). According to King et al. (21), adolescent ED patients, in particular patients with depressive symptoms or suicidal thoughts and harmful alcohol use, are likely to have suicidal behavior in the future. ED can be seen as an ideal place for early identification of psychiatric problems and has been found to be feasible and acceptable to patients, parents, and caregivers (20). Previous studies have supported screening for adolescent mental health disorders in EDs (5,19,20,22,23).

Since the end of the 1990s, a psychiatric consultation for adolescents admitted because of alcohol intoxication or self-harm has been a routine practice at the Pediatric Emergency Department (PED) of the Hospital for Children and Adolescents in Helsinki. As part of the consultation a psychiatrist also organizes aftercare for the patient if necessary. The main purpose of this paper was to determine the extent to which adolescents admitted to PED owing to alcohol intoxication or self-harm reported depressive symptoms and whether depressed patients differed from non-depressed patients in terms of alcohol use habits, perceived social support, psychological distress, self-esteem, and suicidal thoughts. Second, we investigated the data-driven hypothetical question of whether depression can be viewed as a mediator between gender and self-esteem and blood alcohol level (BAL).

The aim of this paper was to determine whether depressed adolescents would more commonly use alcohol, perceive less social support, have more psychological distress, have lower self-esteem, and more commonly report suicidal thoughts.

## Method

This study was carried out at the PED at the Hospital for Children and Adolescents within the Helsinki University Central Hospital (HUCH). The study took place between 1 March 2006 and 28 February 2009. During the study period, the Hospital for Children and Adolescents, within HUCH, had a catchment area of 979,890 inhabitants, which included 56,648 (5.8%) adolescents aged 12 to 16 years. The hospital also serves as the main ambulatory care center and major tertiary treatment facility in the field of child and adolescent psychiatry for HUCH's large catchment area of the Hospital District of Helsinki and Uusimaa in southern Finland.

## Participants and procedure

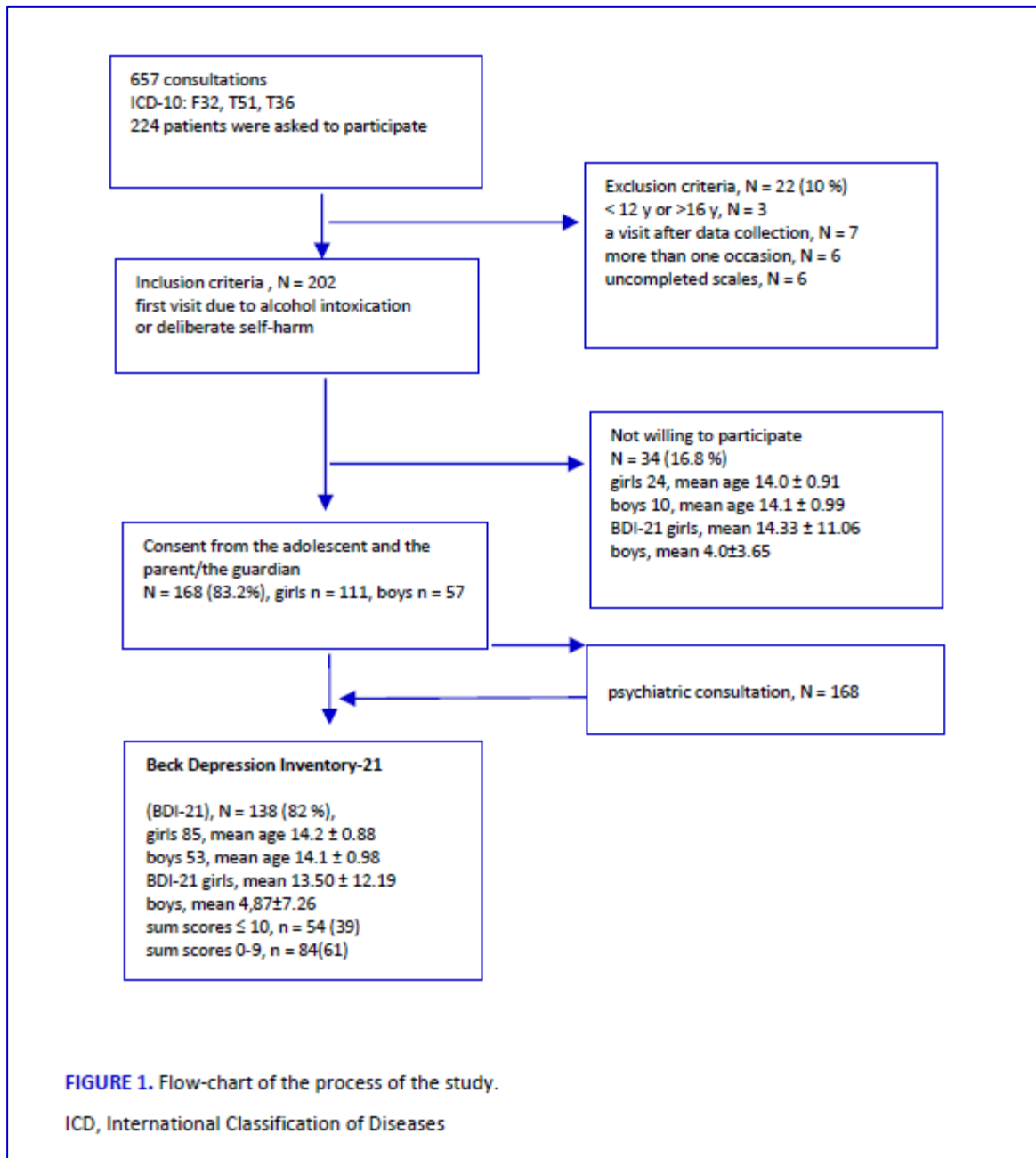
The study sample consisted of adolescents aged 12 to 16 years presenting to PED with alcohol intoxication or deliberate self-harm. The main criteria for referrals were that an adolescent was so heavily drunk or had harmed her/himself that she/he needs a clinical assessment or a treatment.

Figure 1 presents the process of the study. Of the 168 patients, 138 adolescents completed the 21-item Beck Depression Inventory (BDI-21) and were included in the present analyses.

The study was carried out during the normal workflow without research staff. The PED staff or a nurse asked an adolescent to participate and fill in the self-report scales before discharge from the hospital. Patients received standard somatic treatment. All alcohol-intoxicated patients received follow-up care in pediatric wards until at least the next day. At the

time of the study, routine practice dictated that a psychiatric consultation be completed following pediatrician request before a patient was discharged from the hospital. The psychiatric consultation took place most often on the following day in the pediatric ward. The psychiatrist organized aftercare for the patient if needed. Aftercare was coded as “yes” or

“no.” All adolescents and their parents or guardians received the written information outlining the nature of the study. We obtained written informed consent from the parent or legal guardian and from the adolescent. The Ethics Committee of the Hospital for Children and Adolescents at the Hospital district of Helsinki and Uusimaa approved the study plan.



## Measures

We assessed depressive symptoms using BDI-21 (24), a well-studied, reliable, and validated scale used also for adolescents (25-27). The score sum ranged from 0 to 63. Cutoff scores often served to categorize degrees of depression severity, where BDI scores of 10 to 16 represents mild depression and scores ranging from 17 or more indicate moderate or severe depression. We chose the cutoff point of 10, which has been reported to be a feasible cutoff point for differentiating depressed versus non-depressed individuals (28). Patients with a BDI sum score of 10 or more were considered the “depressive symptoms group” and those with a sum score 0 to 9 were considered the “no depressive symptoms group.” Cronbach’s alpha reliability coefficient in this sample was .93.

Alcohol use was evaluated using the BAL determined using serum assay and the Alcohol Use Disorders Identification Test (AUDIT) (29), which has shown good psychometric properties in adolescent samples (30-32). All AUDIT items were scored on a Likert-type scale ranging from 0 to 4, except for items 9 and 10, which were scored on a three-point Likert-type scale using 0, 2, and 4. AUDIT yields a maximum total score of 40, where higher scores indicate higher levels of alcohol use and alcohol-related problems. We used the AUDIT sum score to evaluate alcohol use status and its three consumption items to create an alcohol consumption score (AUDIT-3) (30-32). Cronbach’s alpha in this sample for both the total scale AUDIT and the alcohol consumption scale (AUDIT-3) was .80.

Perceived social support was assessed using the Perceived Social Support Scale-Revised (PSSS-R) (33), a self-report assessment tool consisting of 12 items rated on a five-point Likert-type scale ranging from strongly disagree (1) to strongly agree (5), with higher scores indicating higher levels of support. PSSS-R has been previously validated among adolescents (34) and achieved a Cronbach’s alpha reliability coefficient of .92 in this sample.

The consulting psychiatrist met the patient and interviewed him/her using the Scale for Suicidal Ideation (SSI) (35), used to measure the intensity, pervasiveness, and characteristics of an individual’s thoughts, plans, and wishes in terms of suicide. Consisting of 19 items, this scale evaluates three dimensions of suicide ideation: active suicidal desire, specific plans for suicide, and passive suicidal desire. Each item is rated on a point-point scale ranging from 0 to 2; the responses are summed to yield a total score. The higher the total score, the more severe the suicidal ideation. The first five items focus on the patient’s thoughts and feelings about living and dying (a wish to live, a wish to die, reasons for living/dying, a desire to actively attempt suicide, and passive

suicidal desire). If the total score for this section was 0, the interview was discontinued. Because of skewness and because most items were coded 0, the total scale was recoded into a dichotomous variable for statistical analyses, where 0 indicated no suicidal thoughts and 1 indicated suicidal thoughts. The SSI has been validated in Finnish adolescents and appears to be a reliable measure of suicidal ideation among young Finns (36).

In this study sample, Cronbach’s alpha was .88 for both the first section and the total scale.

Psychological distress was measured using Kessler’s K10, a 10-question scale designed to measure the level of unspecified psychological distress. The scale has been used in clinical and population surveys (37,38) and also among adolescents (39,40). The 10 questions ask respondents how frequently they experienced symptoms of psychological distress during the past 30 days by rating each item on a five-point scale ranging from 1 to 5 (none of the time, a little of the time, some of the time, most of the time, and all of the time). The item scores are summed to yield a total score ranging from 10 to 50, resulting in four categories: low (10 to 15), moderate (16 to 21), high (22 to 29), and very high (30 to 50) levels of distress (41). Cronbach’s alpha coefficient for this sample was .93.

Finally, we assessed self-esteem using the 10-item Rosenberg Self-Esteem Scale (RSES) (42), a widely used unidimensional measure that captures the patients’ global perception of their own self-worth and self-acceptance. It was originally designed for high school adolescents and since then has been used in different countries (43,44). Half of the items rely on positively worded items and half are worded negatively requiring a reverse scoring. RSES uses a four-point Likert scale with response options ranging from strongly disagree (1) to strongly agree (4) for each item. Responses are summed to generate a total score ranging from a minimum of 10 to a maximum of 40. High values are considered to indicate good self-esteem. We used continuous sum scores of the RSES in our analyses. In this sample, Cronbach’s alpha reliability coefficient reached .91 for the scale.

## Statistical analysis

Statistical analyses were carried out using the SPSS 24.0 (45) and Mplus 7 software packages (46). We used chi-square tests for comparisons involving categorical variables. Independent group *t*-test was used to test the equality of means. We also applied non-parametric (distribution-free) methods to ensure the validity of statistical conclusions as the distributions of the variables diverged from normal. In path analysis, Bollen–Stine bootstrapping was performed. The original scores are presented in

Table 1. Cohen's  $d$  was used as an indicator of the effect size. The Cohen's effect size classes of .2 (small), .5 (medium), .8 (large), and 1.2 (very large) were used (47,48).

In total only 2% of the data points were missing. Variables (aftercare, SSI, K10, RSES, PSSS-R, AUDIT-3, and AUDIT-10) were imputed using the expectation-maximization method (49) to ensure that all 138 cases could be included in the regression analysis. Little's Missing Completely at Random test was not significant ( $p = .858$ ), indicating no relationship between the absence of the data and other variables. Binary logistic regression was used to sum up the total explanatory power of the set of independent variables on the dichotomous depression. In Table 2, the so-called zero-order associations are also presented. The strength of the association was expressed as odds ratios (ORs) and 95% confidence intervals with the corresponding  $p$  values. We carried out regression analysis also using the BDI as a continuous variable. The results were almost the same as using BDI as a dichotomous variable.

The mediating hypothesis was examined using manifest variable path analysis in the Mplus 7 program (46). As the distributions were not normal, and the sample size might be insufficient for straightforward statistical inference, bootstrapping with the maximum likelihood estimator was used in 1000 resamples. In addition, the significance of the path model was evaluated using Bollen–Stine bootstrap.

## Results

### Depressive symptoms

Fifty-five percent of adolescents were intoxicated by alcohol consumption and deliberate self-harm was found in 17% of the patients. The mean BDI total score was 13.50 (standard deviation  $\pm 12.19$ ) among the 85 girls and 4.87 (standard deviation  $\pm 7.26$ ) among boys ( $p \leq .001$ ). Nearly 4 in 10 ( $n = 54/138$ ) had a sum score  $\geq 10$  on the BDI. Of these, 54 patients (46 girls and 8 boys) formed the “depressive symptoms group” in our analyses (see Table 1). Among these, 44% ( $n = 24/54$ ) reported mild symptoms of depression (BDI 10 to 16) and 56% ( $n = 30/54$ ) reported moderate or severe symptoms of depression (BDI  $\geq 17$ ). The mean BAL was 166 mg/dL (standard deviation  $\pm 78$ ) among patients with mild depressive symptoms and 87 mg/dL (standard deviation  $\pm 79$ ) among patients with moderate or severe depressive symptoms ( $p = .023$ ). About half of the girls with depressive symptoms (48%,  $n = 22/46$ ) and a quarter of boys (25%,  $n = 2/8$ ) reported suicidal thoughts. All those with deliberate self-harm were girls. Overdose was the

most common method to self-harm (12%,  $n = 17/138$ ).

### Differences between patients with depressive symptoms and no depressive symptoms

We explored the associations between depression groups and our dependent variables using a  $t$ -test for independent groups (see Table 1). Compared with the non-depressed group, patients in the depressed group were more commonly girls, had higher scores on suicidal ideation (SSI) and psychological distress (K10), and reported lower scores on self-esteem (RSES) and perceived social support (PSSS-R). They also presented with a lower BAL, but more commonly received referrals for aftercare. When using Levene's test, we found that assumptions of the homogeneity of variances were violated for K10, BAL, AUDIT-3, AUDIT-10, and SSI. In the robust test of the equality of means,  $P$ -values were significant for all variables, except for AUDIT-10 and AUDIT-3. On controlling for the variable of gender, significances of depression remained unchanged.

### Gender differences

There were a number of significant gender differences (see Table 1). However, when depression was held statistically controlled, the observed differences between girls and boys in Table 1 disappeared, except for the PSSS-R, which was unchanged  $t(136) = 2.56$ ,  $p = .031$ ,  $M = 51.27 \pm 10.45$  versus  $M = 46.39 \pm 11.69$ ,  $d = -.45$  (girls  $t(83) = 3.15$ ,  $M = 54.51 \pm 9.38$  versus  $M = 47.02 \pm 12.09$ ,  $p = .002$ ,  $d = -.69$ ; boys  $t(51) = 1.43$ ,  $p = .22$ ,  $M = 48.47 \pm 10.62$  versus  $M = 42.75 \pm 8.81$ ,  $d = -.55$ ).

### Logistic regression analyses

We carried out logistic regression analyses starting with one at the time models (zero-order) (see Table 2). The final logistic regression analysis was carried out using all predictor variables in the equation. Only AUDIT-10 was not associated with depressive symptoms taken separately (zero-order) and was removed from the final analysis. The three strongest predictors differentiated between depression groups in the total equation. Female gender, experiencing high psychological distress, and having low self-esteem were significantly associated with depressive symptoms (Hosmer–Lemeshow, Goodness-of-fit  $\chi^2 = 4.36$ ,  $DF = 8$ ,  $p = .823$ , omnibus  $\chi^2 = 93.34$ ,  $DF = 7$ ,  $p < .001$ ). The model correctly predicted depression for 86.2% of our patients. The model as a whole explained between 49.2% (Cox and Snell  $R^2$ ) and 67% (Nagelkerke  $R^2$ ) of the variance in depressive symptoms (see Table 2).



**TABLE 1.** The mean scores and unadjusted ORs between the “depressed” group and the “non-depressed” group in the PED

N = 138 (100%)	BDI < 10, N = 84 (61%)	BDI ≥ 10, N = 54 (39%)	Total, N = 138 (100%)	Chi-squared t-test, p-value two-tailed	Effect size, Cohen’s d	OR (95% CI), depressed vs. non-depressed
Sex, N=138			138 (100%)	$\chi^2(1)=20.87^{***}$		6.64 (2.80–15.75)***
Girls, n=85	39 (46%)	46 (85%)				
Boys, n=53	45 (54%)	8 (15%)				
Age			138 (100%)			
Mean (standard deviation)	14.21 (0.88)	14.07 (0.99)		$t(136)=0.87$ NS	–0.15	0.85 (–0.58–1.23) NS
Girls	14.03 (0.74)	14.13 (0.91)		$t(83)=–0.58$ NS	0.12	1.16 (0.69–1.95) NS
Boys	14.38 (0.96)	13.75 (1.39)		$t(51)=1.59$ NS	–0.61 <sup>†</sup>	0.58 (0.29–1.17) NS
Aftercare			138 (100%)	$\chi^2(1)=17.93^{***}$	NA	13.71(3.11–60.36)***
Yes, n=107	55 (65%)	52 (96%)				
No, n=31	29 (35%)	2 (4%)				
SI						
SSI, mean (standard deviation)	0.38 (1.43)	6.84 (9.98)	119 (86%)	$t(117)=–5.28^{***}$	1.04 <sup>‡</sup>	1.31 (1.11–1.54)***
Girls, n=75	0.63 (1.88)	7.30 (10.26)		$t(73)=–3.79^{***}$	0.88 <sup>‡</sup>	1.25 (1.05–1.47)***
Boys, n=44	0.15 (0.82)	3.20 (7.16)		$t(42)=–2.74^{**}$	1.20 <sup>§</sup>	1.33 (0.91–1.95) NS
SSI dichotomous, n (%)						
SI no vs. SI yes	67 (91) vs. 8 (9)	25 (56) vs. 20 (44)		$\chi^2(1)=19.53^{***}$	NA	7.66 (2.89–20.31)***
Girls	30 (86) vs. 5 (14)	21 (53) vs. 19 (47)		$\chi^2(1)=9.46^{**}$	NA	5.43 (1.75–16.84)**
Boys	37 (95) vs. 2 (5)	4 (80) vs. 1 (20)		$\chi^2(1)=1.54$ NS	NA	4.63 (0.34–63.07) NS
Psychological distress						
K10, mean (standard deviation)	13.67 (4.47)	23.31 (8.39)	138 (100%)	$t(136)=8.78^{***}$	1.53 <sup>§</sup>	1.27 (1.17–1.38)***
Girls, n=85	13.56 (4.15)	23.51 (8.44)		$t(83)=6.70^{***}$	1.46 <sup>§</sup>	1.33 (1.17–1.51)***
Boys, n=53	13.76 (4.77)	22.13 (8.54)		$t(51)=4.01^{***}$	1.52 <sup>§</sup>	1.19 (1.05–1.34)**
Self-esteem						
RSES, mean (standard deviation)	30.88 (5.19)	23.00 (4.84)	135 (99%)	$t(133)=8.87^{***}$	–1.56 <sup>§</sup>	0.71 (0.62–0.80)***
Girls, n=83	30.89 (5.15)	22.96 (5.02)		$t(81)=7.13^{***}$	–1.30 <sup>§</sup>	0.77 (0.67–0.87)***
Boys, n=52	31.65 (4.34)	23.25 (3.96)		$t(50)=5.11^{***}$	–1.96 <sup>§</sup>	0.56 (0.38–0.83)**
Perceived social support						
PSSS-R, mean (standard deviation)	52.82 (7.38)	47.07 (10.01)	138 (100%)	$t(136)=3.88^{***}$	–0.68 <sup>#</sup>	0.93 (0.89–0.97)***
Girls, n=85	56.51 (4.73)	47.84 (10.02)		$t(83)=4.69^{***}$	–1.02 <sup>‡</sup>	0.83 (0.76–0.91)***
Boys, n=53	50.02 (8.14)	42.63 (9.33)		$t(51)=2.32$ NS	–0.89 <sup>‡</sup>	0.90 (0.82–0.99)*
Alcohol consumption						
AUDIT-3, mean (standard deviation)	2.98 (2.49)	3.52 (3.02)	137 (99%)	$t(135)=1.45$ NS	0.20	1.08 (0.95–1.22) NS
Girls, n=84	2.96 (2.41)	3.54 (3.03)		$t(82)=0.96$ NS	0.21	1.08 (0.92–1.27) NS
Boys, n=53	2.99 (2.58)	3.38 (3.11)		$t(51)=0.38$ NS	0.15	1.06 (0.80–1.39) NS
Alcohol use						
AUDIT-10, mean (standard deviation)	6.85 (5.94)	8.01 (7.77)	137 (99%)	$t(135)=0.99$ NS	0.17	1.03 (0.98–1.08) NS
Girls, n=84	7.18 (5.95)	8.21 (7.84)		$t(82)=0.67$ NS	0.15	1.02 (0.96–1.09) NS
Boys, n=53	6.57 (5.99)	6.91 (7.69)		$t(51)=0.14$ NS	0.05	1.01 (0.90–1.14) NS
BAL						
BAL, mean (standard deviation) (mg/dL)	170 (74)	116 (90)	135 (98%)	$t(133)=3.84^{***}$	–0.67 <sup>†</sup>	0.45 (0.28–0.70)***
Girls, n=83	160 (80)	116 (90)		$t(82)=2.30^*$	–0.51 <sup>†</sup>	0.59 (0.35–0.99)*
Boys, n=52	180 (68)	112 (93)		$t(51)=2.35^*$	–0.95 <sup>‡</sup>	0.32 (0.11–0.92)*

Note. OR, odds ratio; BDI, Beck Depression Inventory; CI, confidence interval; PED, pediatric emergency department; SS, Scale for Suicidal Ideation; SI, suicidal ideation; K10; Kessler Psychological Distress Scale; RSES, Rosenberg Self-Esteem Scale; PSSS-R, Perceived Social Support Scale-Revised; AUDIT, Alcohol Use Disorders Identification Test; BAL, blood alcohol level; NS, not significant; NA, not applicable.

Means and standard deviations, effect sizes and unadjusted ORs

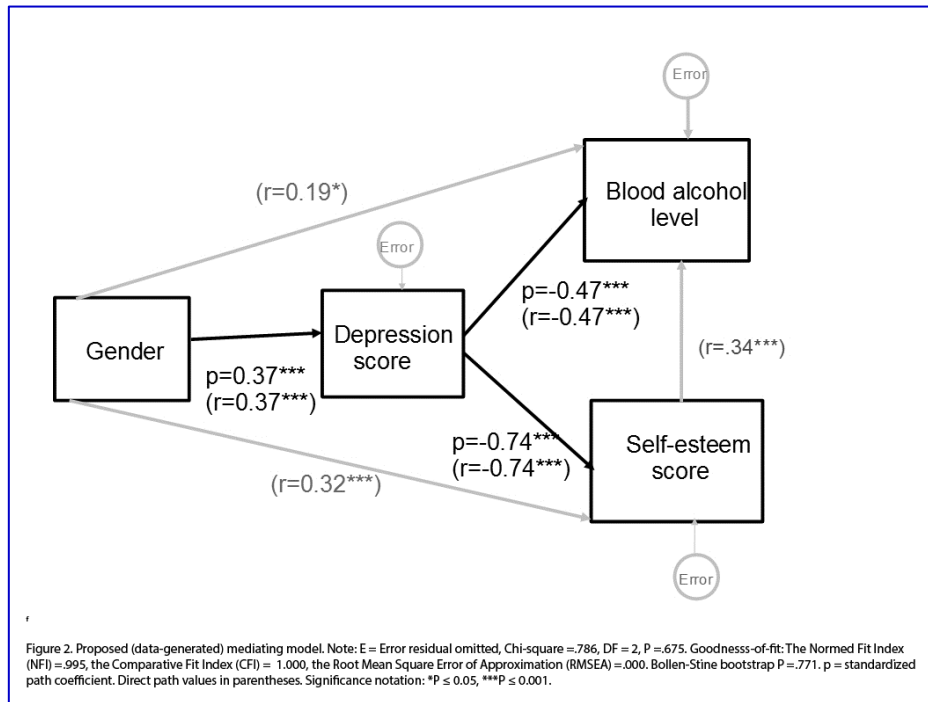
<sup>†</sup>Cohen’s d=medium; <sup>‡</sup>Cohen’s d=large; <sup>§</sup>Cohen’s d=very large; \*p < .05; \*\*p < .01; \*\*\*p < .001.

**TABLE 2.** Explanatory variables in the logistic model with the dichotomous BDI as the dependent variable

Explanatory variable	Zero-order analysis			All variables in equation		
	<i>p</i>	OR	95% CI for OR (lower to upper)	<i>p</i>	OR	95% CI for OR (lower to upper)
Sex	<b>.000</b>	6.64	2.80-15.75	<b>.004</b>	9.04	1.95-33.18
Aftercare	<b>.000</b>	13.71	3.11-60.36	.226	2.86	0.49-16.53
SSI	<b>.000</b>	1.34	1.17-1.54	.406	1.08	0.90-1.29
K10	<b>.000</b>	1.27	1.17-1.38	<b>.006</b>	1.16	1.04-1.28
RSES	<b>.000</b>	0.71	0.62-0.80	<b>.018</b>	0.84	0.73-0.97
PSSS-R	<b>.001</b>	0.93	0.89-0.97	.101	0.94	0.87-1.01
BAL	<b>.000</b>	0.42	0.27-0.66	.907	1.04	0.53-2.06

*Note.* BDI, Beck Depression Inventory; SSI, Scale for suicidal Ideation; K10, Kessler’s Psychological Distress Scale; RSES, Rosenberg Self-esteem Scale; PSSS-R, Perceived Social support Scale-Revised; BAL, blood alcohol level; OR, odds ration; CI, confidence interval-  
Cox and Snell  $R^2 = .492$ , Nagelkerke  $R^2 = .666$ .

Bold values indicate significant *p*-values.



We controlled confounding by doing and comparing one at the time and all variables in equation. We used the imputed data matrix to determine the maximum number of cases in Table 2. Zero-order OR-values are shown in Table 2 to help compare the initial and the final values and to determine the effect of multicollinearity in the model.

### Multicollinearity

Owing to multicollinearity, some variables that were significant in the zero-order logistic regression models did not reach significance in the final (all variables in equation) logistic regression analysis. When we investigated correlations between the exploratory variables, some of them correlated with other stronger predictors; these correlations did not

provide additional information in the model. Some examples of multicollinearity include aftercare correlated positively with K10 and negatively with PSSS-R. SSI had a negative correlation with RSES and a positive correlation with K10. PSSS-R correlated positively with RSES and negatively with SSI and K10. Multicollinearity had a strong effect on the coefficients of predictors (in this case OR) and on the statistical significance ( $p$ ). Therefore, some variables with high OR in the univariate analyses (zero-order) lost significance in multivariate analyses.

### **Symptoms of depression as a mediating variable of the association between gender and self-esteem and gender and blood alcohol level**

We tested a mediating model using the manifest variable path analysis. The BDI was used as a continuous variable in this analysis. Figure 2 shows the standardized coefficients for each path within the model. The model describes that the association of gender and self-esteem and BAL is statistically mediated through symptoms of depression. The direct effects between gender and RSES ( $r = -.31, p < .001$ ) and between gender and BAL ( $r = -.20, p = .022$ ) were no longer significant when we incorporated depression into the model. There was a significant association between RSES and BAL ( $r = .33, p \leq .001$ ). When we included depression in the model, the association was partially mediated and depression differentiated the hypothetical path from self-esteem and BAL. The model without the direct effect of gender on RSES and on BAL remained relatively strong and the model fit the data well.

### **Discussion**

The current study compared patients with or without symptoms of depression in a sample of adolescents referred to the PED because of alcohol intoxication or deliberate self-harm in terms of suicidality, psychological distress, perceived social support, and alcohol use.

Comparisons between depressed and non-depressed patients revealed many significant differences. However, in the final logistic regression analysis, only gender, self-esteem, and psychological distress remained significant. Consistent with previous studies, we found that girls more commonly reported symptoms of depression and low self-esteem compared with boys (1;50-54). Studies on self-esteem development have found that self-esteem increases during adolescence and continues to increase in young adulthood (55). Previous studies have also found that low self-esteem and depression are strongly related (56,57). Accumulating research seems to support the vulnerability model, where low self-esteem is typically considered a risk for depression (56-58).

In a Finnish twin study (43), one interesting finding was that genetic factors, for example physical maturation, seemed to influence boys' self-esteem development. In girls, on the other hand, environmental factors (e.g. home and peers) influenced self-esteem development.

Our finding that adolescents with symptoms of depression experienced higher psychological distress is in accordance with previous studies reporting an association between psychological distress and mental disorders, including depression, somatic complaints, and adverse life experiences (39,59,60). Low self-esteem has also been found to be a risk factor for psychological distress (61). An epidemiological survey of an Australian adult population found that K10 scores were generally higher in women than men and in those with a mental disorder (39). A large age-period-cohort study in USA and Canada found that psychological distress was the highest in late adolescence and early adulthood (62).

Our finding that the association of gender and self-esteem and BAL was mediated through symptoms of depression seems to contrast the vulnerability model. We decided to carry out these analyses when we observed the central role of the depression score in the correlation matrix. According to our findings, self-esteem seemed not to be a protective factor for use of alcohol and depressive symptoms seemed to correlate negatively on BAL and self-esteem. The finding that adolescents without symptoms of depression had higher BALs (suggesting a heavy drinking episode before admission) could be because of, for example, externalizing symptoms or disorders (6), which unfortunately were not assessed.

Depressed mood closely associates with suicidal ideation and suicidal acts (63,64). In our study, about half of all girls with symptoms of depression reported suicidal thoughts and all those with deliberate self-harm were girls. Overdose of drugs was the most common method of self-harm, as reported also previously by Giraud et al. (65). Although the number of suicidal adolescents was small, suicidal thoughts warrant intensive evaluation to recognize risk for future suicidal behavior in EDs.

### **Strengths and limitations**

This clinical sample represents adolescents younger than 17 years old presenting to the ED in this catchment area because of alcohol intoxication or deliberate self-harm. The strengths of the study include the use of widely used and well-validated instruments measuring alcohol use, depressive symptoms, psychological distress, suicidal ideation, self-esteem, and perceived social support and serum assay measurement of the BAL. Furthermore, performing a psychiatric consultation for adolescent



patients with acute intoxication was routine clinical practice before discharging a young person from the pediatric hospital in HUCH. Accordingly, all patients underwent an interview with a consulting psychiatrist.

However, the study has a number of limitations. One limitation hampering the generalizability of our findings lies in the somewhat narrow age range of our sample. Our results cannot be generalized to preadolescents or adolescents older than 16 years. The justification for focusing on this age group was that experimenting with alcohol tends to begin before the age of 16 years (2). Another limitation is that we collected the data in only one clinic, which limits generalization to other catchment areas. On the other hand, the pediatric hospital in HUCH represents the primary ambulatory care facility and major tertiary treatment center in child and adolescent psychiatry for the very large catchment area of HUCH. As our assessment focused on internalizing symptoms, such as depression, anxiety, and suicidal thoughts, we may have missed externalizing symptoms experienced by some patients. It is possible that younger adolescents who experimented with alcohol viewed questionnaires such as BDI-21 or AUDIT-10 as too lengthy and items related to drinking behavior and alcohol-related issues as difficult to answer. Finally, the temporal proximity of alcohol intoxication, potential withdrawal symptoms, anxiety, or embarrassment may have resulted in an underestimation or overestimation of self-reported alcohol use.

### Clinical significance

Our findings underscore the importance of identifying clinically relevant depressive symptoms, psychological distress, and low self-esteem among adolescents with alcohol intoxication in the PED. All expressions of suicidality warrant intensive evaluation to identify adolescents at risk for future suicidal behavior.

### Conflict of interests

The authors declare that they have no competing or potential conflicts of interest.

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