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Suicide attempts in adolescent inpatients with non-suicidal self-injury: a study of sociodemographic, clinical and psychopathological characteristics

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Abstract

Suicidal and non-suicidal self-injury are increasingly prevalent among youths. Suicide is the second leading cause of death in this population. Improving prevention requires accurate identification of suicide attempt risk in patients with NSSI. We conducted a retrospective observational study based on medical records of 232 inpatients (aged 9–17) with NSSI, admitted to the Child and Adolescent Neuropsychiatry Unit at the University Hospital of Padua from 2015 to 2023, comparing individuals with and without a suicide attempt. Our findings highlight the importance of a multidimensional assessment (clinical history, medical comorbidities, social functioning) in evaluating suicide risk, and emphasize the role of family environment in the onset and severity of self-injury behaviors and the impact of the Covid-19 pandemic in highlighting family vulnerabilities.

Keywords Suicidal attempt, Non-suicidal self-injury, Developmental age, Risk factors, Medical comorbidities, Social functioning

Introduction

Suicidal self-injury and Non-Suicidal self-injury (NSSI) are highly prevalent in adolescence. Suicidal attempts (SA) affect 4.6% to 15.8% of youth [1], while NSSI is reported by 18–22% of adolescents in community samples [2, 3] and about 35% of hospitalized youths [4]. Suicide is a major global public health issue and represents

the second leading cause of death among individuals aged 10 to 24 years [5–7]. Rates of both SA and NSSI have increased over the past decade, especially during and after the COVID-19 pandemic, with an increasing number of emergency department accesses [8–13]. The pandemic has significantly impacted young people and their families, leading to serious psychosocial issues (e.g., disrupted routines, increased loneliness, etc.), which in turn worsened family relationships and increased conflict [14]. Among adolescents with NSSI, those hospitalized show a stronger association with suicidality and severe psychopathological symptoms compared to outpatients [15]. NSSI is defined as intentional self-inflicted harm to the body's surface without suicidal intent [16]. It is most prevalent among girls aged 14–16 years [17] and tends to remit in young adulthood [18].

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Studies suggest that NSSI serves various functions, both intrapersonal and interpersonal [19, 20]. On the intrapersonal side, it may act as a strategy to regulate negative emotions. On the interpersonal side, it is often linked to poor social and communication skills, impulsivity [20, 21], and dysfunctional family environments [22].

NSSI is a transdiagnostic phenomenon linked to various psychiatric disorders, most commonly internalizing conditions such as depression, anxiety, and PTSD [23], in addition to the well-known association with borderline personality disorder. It is also one of the main risk factors for SA [24], especially when repeated over time.

Furthermore, high lethality of methods people use to harm themselves, even those with apparently no, or low suicidal intent, might end up dying by suicide.

Although an episode of self-harm might not be suicidal in intent, self-harm and suicide are strongly linked and the line between NSSI and SA can blur [25].

The link between NSSI and SA is particularly evident in hospitalized patients with more severe psychopathology [15, 26–28]. Some authors asserted that self-harm is a part of continuum and, in this context, SA and NSSI are overlapping constructs [25]. Joiner's theory "Acquired Capability for Suicide" [29] suggests that individuals with suicidal thoughts must develop the ability to overcome fear and pain of self-injury. NSSI may facilitate this desensitization, explaining its role in the progression to SA.

What is clear, however, is that motivations and intents are fluid, that the behaviours often overlap, and even that so-called non-suicidal behaviours are associated with current suicide ideation and future suicide [25].

Overall, suicide is a multidimensional issue resulting from the interaction of biological, psychological (e.g., personality traits), clinical (psychiatric disorders), and social-environmental factors [30]. Several theories have explored the progression from suicidal thoughts to SA, including the "Three-Step Theory" [27, 28], which is a part of the ideation-to-action framework. This model describes three stages leading from suicidal ideation to attempt, highlighting the key role of social withdrawal [26]. Previous research shows that psychiatric issues, such as impulsiveness, alexithymia, emotional dysregulation and externalizing behaviours [31] increase suicidal risk [32–34], however psycho-social and familiar/environmental problems are further relevant factors associated with SA, such as problems at school, poor relationships with peers and family members, troubles family background, family history of suicide [35, 36]. At the same time the relationship between these types of self-injurious behaviours and traumatic events is increasingly evident in developmental age [37, 38] and this is noticeable in one study conducted on hospitalized patients with self-injurious behaviours [39]. In fact, in accordance with

recent NICE guidelines, a multidimensional assessment, and in particular a psychosocial assessment, is recommended in the management of self-harm [40].

Furthermore, some authors have found other clinical factors associated with a higher risk of suicidality were one or more previous hospitalizations, and chronic disease [41, 42].

Aims of the study

Given that NSSI is known in the literature to be a risk factor for SA (see Joiner's theory [29]) and that a series of socio-demographic and psychopathological factors contribute to the progression to suicidal behaviour (e.g., the three-step theory), the main objective of our study is to assess the association between these factors and SA in a population with NSSI, and therefore at risk of SA. In fact, current evidence regarding the interaction between the two different self-harming behaviours (suicidal and non-suicidal) in the adolescent population remains limited and unclear.

1. To describe socio-demographic and clinical features of a sample of inpatients with lifetime NSSI divided into two subgroups: without SA or with at least one lifetime SA.
2. To compare psychopathological variables between patients with NSSI and at least one lifetime SA and those with only NSSI. According to literature we suppose that patients with NSSI and SA have less social involvement and higher internalizing and externalizing disorders.
3. To identify the sociodemographic and clinical variables specifically associated with the occurrence of SA in inpatients with NSSI, among those previously identified as risk factors for SA during developmental age.

Materials and methods

The study is a retrospective observational study based on medical records of inpatients aged between 9 and 17 years who had at least one hospitalization (at least 24 h) in Child and Adolescent Neuropsychiatric Unit of the Department of Women's and Children's Health in University Hospital of Padua from January 2015 to December 2023.

Inclusion criterion for the study is presence of NSSI as the reason for admission to the hospital or as information obtained from the recent personal medical history.

Exclusion criteria for the study are age over 18, hospital stay of less than 24 h, moderate-to-severe intellectual disability or lack of consent to participate in the study. Only data from the first hospitalization were considered for the final database.

For each patient the following sociodemographic data were taken into account: age, gender, ethnicity, immigration history, parents' marital status, siblings, academic difficulties, intrafamilial problems, traumatic events, bullying and cyberbullying. The presence of traumatic life events was identified during the clinical interviews according to the Adverse Childhood Events (ACEs) classification proposed by Felitti [43]. Also these clinical variables were taken into account: primary diagnosis, family history of psychiatric disorders, health problems in family members, chronic disease, mode of admission, previous hospitalizations in other services, history of contacts with other territorial child and adolescent psychology and neuropsychiatry services, pharmacological treatment, presence of lifetime NSSI, presence of lifetime SA. The presence of lifetime NSSI, suicidal ideation and SA was identified during the clinical interviews according to the criteria proposed by the Columbia Suicide Severity Rating Scale [44]. Finally specific variables of NSSI behavior were taken into account: body site of injury, frequency of NSSI, age at NSSI onset. Informed consent for the use of clinical data for research purposes was obtained from all young patients and their parents at the start of hospitalization. The current study was conducted in accordance with the Declaration of Helsinki and was approved by the local Ethics Committee (CESC protocol code n° 0044914 of 13 July 2021).

Instruments/tools

Youth Self-Report 11–18 (YSR)

YSR 11–18 [45] is among the most commonly employed questionnaires for the evaluation of behavioral and emotional problems and developmental competencies in children and adolescents. It is a self-administered scale developed by Achenbach e Rescorla made of two parts. High scores indicate greater symptomatic and functional impairment.

The first section pertains to social skills and adaptive functioning and consists of 20 items rated on a 4-point ordinal scale. The second section, on the other hand, investigates emotional and behavioral problems through 118 items rated on a 3-point ordinal scale. From the responses in this section, a psychological/psychopathological profile is derived.

Data analysis

Descriptive statistics (i.e., means, standard deviation, and percentage frequencies) were calculated in order to determine the socio-demographic and clinical features of the whole sample and the subgroups of NSSI patients divided according to the presence of SA. A Chi-square test was applied in order to investigate the differences between NSSI patients with SA and NSSI patients without SA in categorical variables in terms of socio-demographical

and clinical characteristics. To analyze the differences between the two groups (i.e., NSSI patients with SA vs. NSSI patients without SA) in the YSR's psychopathological features and impulsivity traits, multivariate analyses of variance (MANOVA) were performed. The dependent variables were the YSR scales for activities, affective problems, anxiety problems, attention deficit/hyperactivity, oppositional defiant problems, conduct problems; BIS-11 scales for attentional impulsiveness, motor impulsiveness, nonplanning impulsiveness and total score. These variables were selected according to scientific literature relating NSSI and SA. In the case of a significant main effect, pairwise comparisons across groups were conducted using Bonferroni-corrected post hoc tests. Moreover, multivariable binary logistic regression models were performed to investigate the association between sociodemographic, clinical and psychopathological variables and SA among adolescents with NSSI. Variables of interest were selected on the basis of literature regarding sociodemographic and clinical risk factors of SA in NSSI clinical samples, as described in the Introduction. The belonging group (i.e., SA vs. without SA) was the outcome variable of the model. The reference level was the group without SA. The first model included the following variables: previous hospitalizations (absence vs. presence; reference category: absence), intrafamily problems (absence vs. presence; reference category: absence), psychiatric familiarity (absence vs. presence; reference category: absence), and married parents (absence vs. presence; reference category: absence), with age at NSSI onset entered as a covariate. The second model added attention problems and rule-breaking behaviors scales of the YSR. The third model further included anxious-depressed and withdrawn-depressed problems scales of the YSR. We followed the conventional 'rule of thumb' of 1:10 ratio between independent variables and observations in order to choose the maximum number of variables according to our sample size. Receiver Operating Characteristics (ROC) curve analysis was performed to evaluate the discriminative performance of the models in distinguishing between subjects with and without the outcome (i.e., SA). To allow a balanced classification and facilitate comparison across models, a conventional critical point of 0.50 was applied, assigning equal weight to both outcome categories (i.e., SA vs. without SA). All statistical analyses were performed using the software Jamovi 2.3 (2025).

Results

The whole sample was composed of 232 NSSI hospitalized patients, of whom 95 (40.9%) attempted suicide at least once. The mean age was 14.9 (SD=1.69) for NSSI patients without SA and 14.8 (SD=1.52) for NSSI patients with SA. 86 (90.5%) NSSI patients with SA and

Table 1 Socio-demographic and clinical features

Socio-demographic variables	Whole Sample (N=232)	NSSI without SA (N=137)	NSSI with SA (N=95)	X2(df)	p
	N(%)	N(%)	N(%)		
Females	208(89.7)	122(89.1)	86(90.5)	0.132(1)	0.71
Caucasian	209(90.1)	125(91.2)	84(88.4)	0.49(1)	0.48
Married parents	146(63.8)	79(58.1)	67(72.0)	4.65(1)	0.031*
Immigration	28(12.1)	16(11.7)	12(12.6)	0.04(1)	0.82
Only child	49(21.4)	29(21.6)	20(21.3)	0.01(1)	0.94
Intra-family problems	130(56.3)	79(57.7)	51(54.3)	0.26(1)	0.60
School problems	136(59.1)	79(58.1)	57(60.6)	0.15(1)	0.69
Traumatic life events	121(53.5)	73(54.5)	48(52.2)	0.11(1)	0.73
Bullying/ Cyberbullying	85(37.3)	49(36.3)	36(38.7)	0.13(1)	0.71
Clinical variables					
Psychiatric familiarity	149(65.9)	82(61.7)	67(72.0)	2.63(1)	0.10
Family health problems	139(60.4)	83(61.0)	56(59.6)	0.04(1)	0.82
Chronic illness	82(35.7)	57(41.9)	25(26.6)	5.68(1)	0.01*
Presentation to the Emergency Room as a mode of access	160(71.1)	87(66.4)	73(77.7)	3.37(1)	0.06
Previous contact with mental health services	203(87.5)	118(86.1)	85(89.5)	0.573(1)	0.44
Previous hospitalizations	89(38.4)	57(41.6)	32(33.7)	1.49(1)	0.22
Pharmacological polytherapy	171(75.7)	94(70.7)	77(82.8)	4.37(1)	0.03*

122 (89.1%) NSSI patients without SA were females. 97 (70.8%) NSSI patients without SA and all NSSI patients with SA reported lifetime suicidal ideation. 75.0% NSSI patients with SA and 45.1% patients without SA had a diagnosis of mood disorder (ICD-10 code: F30-39). 12.5% NSSI patients with SA and 19.5% patients without SA had a diagnosis of anxiety, dissociative, stress-related, and somatoform disorders (ICD-10 code: F40-42). No NSSI patients with SA and 14.3% patients without SA had behavioural syndromes associated with physiological disturbances (ICD-10 code: F50-59). 8.0% NSSI patients with SA and 9.0% patients without SA had behavioral disorders (ICD-10 code: F90-98). 3.4% NSSI patients with SA and 9.0% patients without SA had a diagnosis of psychotic disorder (ICD-10 code: F20-29). Regarding NSSI-related characteristics, 114 patients reported repetitive NSSI frequency (more than 5 NSSI acts in the last year), of whom 57.1% were patients with SA and 46.3% were patients without SA. 92 patients (39.6%) reported multiple body sites of injury, of whom 47.5% were patients with SA and 47.8% were patients without SA. The mean NSSI age onset was 13.6 (SD=1.46), particularly 13.7 (SD=1.28) for the group with SA and 13.5 (SD=1.57) for

Table 2 Number of inpatients with SA stratified by parental marital status, COVID period and traumatic life events

Covid-19 period	Parents married	Traumatic life events	SA n (%)
pre-covid	Yes	Any	9 (36%)
pre-covid	No	Any	6 (25%)
pre-covid	Yes	None	14 (38%)
pre-covid	No	None	4 (40%)
post-covid	Yes	Any	22 (60%)
post-covid	No	Any	11 (31%)
post-covid	Yes	None	21 (47%)
post-covid	No	None	6 (36%)

the group without SA. 100 NSSI patients were hospitalized before the Covid-19 outbreak (in the period between January 2015 and February 2020), and 132 NSSI patients were hospitalized after the Covid-19 outbreak (between March 2020 and December 2023). Among NSSI patients with SA, 36.8% were hospitalized in the pre-covid period, whereas 63.1% were hospitalized in the post-covid period. Among NSSI patients without SA, 47.4% were hospitalized in the pre-covid period (of whom 69% reported lifetime suicidal ideation) and 52.5% were hospitalized in the post-covid period. Socio-demographic and clinical features of both the whole samples and the two subgroups of patients (i.e., NSSI + SA vs. NSSI without SA) are reported in Table 1.

Pre-post covid group comparison

We proceeded to perform stratified subgroup analysis, dividing the sample into pre-covid (patients admitted to the Hospital between 2015 and February 2020) and post-covid subgroups (patients admitted to the Hospital between March 2020 and 2023). In the pre-covid group, the abovementioned association between SA and married parents was no longer significant ($p=0.455$), whereas in the post-covid group, this association remained significant ($p=0.030$). We layered the groups according to the presence of traumatic life events. In the pre-covid group, we did not find any association between married parents and SA, both in the presence of traumatic life events ($p=0.404$) and the absence of any traumatic life event ($p=0.901$). In the post-covid group, we found that in the absence of any traumatic life event, the association between married parents and SA was no longer significant ($p=0.538$). On the contrary, in the presence of traumatic life events, the association between married parents and SA remained significant ($p=0.017$) (See Table 2 for details).

Psychopathological features: comparison between NSSI youths with SA and without SA

Multivariate analysis of variance (MANOVA) revealed an overall significant effect of group membership (i.e.,

NSSI + SA vs. NSSI without SA) on YSR scales (Wilks' $\Lambda = 0.921$; $F(6, 153) = 2.20$; $p = 0.046$). Subsequent univariate analysis showed significant differences between the NSSI + SA group and the NSSI without SA group on the following YSR scales: 'Activities' ($p = 0.017$) and 'Oppositional defiant problems' ($p = 0.050$) (see Table 3). In addition, results of MANOVA did not show an overall significant effect of group membership on BIS-11 scores (Wilks' $\Lambda = 0.942$; $F(4, 86) = 1.33$; $p = 0.264$).

Multivariable binary logistic regression

Model 1 included socio-demographic and clinical data (i.e., intrafamily problems, psychiatric familiarity, NSSI age onset, previous hospitalizations, and parents' marital status) as independent variables for analyses. The model was found to be significant ($\chi^2 = 11.5$; $p = 0.042$) with variances of 0.065 (Cox and Snell R2) and 0.087 (Nagelkerke R2). Particularly, previous hospitalizations ($p = 0.046$; OR = 0.50, 95% CI [0.25–0.98]) and married parents ($p = 0.042$; OR = 2.2, 95% CI [1.02–4.81]) were statistically significant as independent variables. Model 2 included two YSR continuous variables relating to externalizing psychopathology (i.e., attention problems and rule-breaking behavior problems) in addition to the variables in Model (1). The model 2 was found to be significant ($\chi^2 = 18.1$; $p = 0.011$) with variances of 0.128 (Cox and Snell R2) and 0.172 (Nagelkerke R2). Previous hospitalizations ($p = 0.033$; OR = 0.41, 95% CI [0.18–0.93]) and psychiatric familiarity ($p = 0.039$; OR = 2.45, 95% CI [1.04–5.75]) were found to be significantly associated with SA. Model 3 included other two YSR continuous variables relating to internalizing psychopathology (i.e., anxious-depressed problems and withdrawn-depressed problems) in addition to the variables in Model (2). The final logistic regression model was found to be significant ($\chi^2 = 34.3$; $p < 0.001$) and the variance increased to 0.228 (Cox and

Table 3 Univariate results regarding YSR scales

	NSSI with- out SA	NSSI with SA	F	p	ηp^2
	M (SD)	M (SD)			
YSR scales					
Activities	37.5 (10.4)	33.9 (7.37)	5.82	0.017*	0.040
Affective problems	76.7 (11.3)	79.9 (10.9)	3.40	0.067	0.020
Anxiety problems	65.8 (8.87)	65.3 (8.67)	0.14	0.705	0.001
Attention deficit/ hyperactivity	59.8 (6.95)	60.7 (8.75)	0.56	0.453	0.004
Oppositional defi- ant problems	59.5 (8.07)	61.9 (9.39)	3.89	0.050*	0.018
Conduct problems	58.0 (8.17)	60.4 (9.90)	3.61	0.059	0.017

* $p < 0.05$; ** $p < 0.01$. p -values < 0.05 are bold

Snell R2) and 0.305 (Nagelkerke R2). Previous hospitalizations ($p = 0.018$; OR = 0.33, 95% CI [0.13–0.82]), psychiatric familiarity ($p = 0.009$; OR = 3.54, 95% CI [1.36–9.16]), rule-breaking behavior problems ($p = 0.022$; OR = 1.06, 95% CI [1.00–1.12]), anxious-depressed problems ($p = 0.001$; OR = 0.92, 95% CI [0.88–0.97]) and withdrawn-depressed problems ($p = 0.001$; OR = 1.07, 95% CI [1.03–1.12]) were significantly associated with SA. The three models are fully described in Table 4.

ROC curves for SA models

Three ROC curves were plotted based on the abovementioned models. The area under the ROC curve plotted based on the Model 1 was 0.65 (SE = 0.04, 95% CI = 0.56–0.73, $p = 0.001$), with an optimal critical point of 0.50, corresponding to sensitivity = 42.9% and specificity = 82.2% (Fig. 1a). The area under the ROC curve plotted based on the Model 2 was 0.69 (SE = 0.04, 95% CI = 0.60–0.78, $p < 0.001$), with an optimal critical point of 0.50, corresponding to sensitivity = 59.0% and specificity = 69.0% (Fig. 1b). The area under the ROC curve plotted based on the Model 3 was 0.77 (SE = 0.04, 95% CI = 0.69–0.85,

Table 4 Multivariable binary logistic regression models

	Model 1			Model 2			Model 3		
	β	SE	p	β	SE	p	β	SE	p
(Intercept)	-2.63	1.72	0.12	-4.82	2.41	0.04	-5.33	-1.88	0.06
Previous hospitalizations	-0.68	0.34	0.04	-0.88	0.41	0.03	-1.08	0.45	0.01
Intrafamily problems	0.01	0.36	0.97	-0.37	0.43	0.39	-0.63	0.48	0.18
Psychiatric familiarity	0.53	0.36	0.14	0.89	0.43	0.03	1.26	0.48	< 0.01
Married parents	0.80	0.39	0.04	0.65	0.45	0.14	0.72	0.49	0.14
NSSI age onset	0.11	0.11	0.31	0.07	0.13	0.56	0.08	0.14	0.56
Attention problems	-	-	-	0.01	0.01	0.91	-0.01	0.02	0.92
Rule-breaking behavior problems	-	-	-	0.04	0.02	0.05	0.06	0.02	0.02
Anxious-depressed problems	-	-	-	-	-	-	-0.07	0.02	< 0.01
Withdrawn-depressed problems	-	-	-	-	-	-	0.07	0.02	< 0.01
R2 CS		0.06			0.12			0.22	
R2N		0.08			0.17			0.30	

(SE = Standard Error; R2 CS = Cox and Snell R2; R2 N = Nagelkerke R2)

p -values < 0.05 are bold

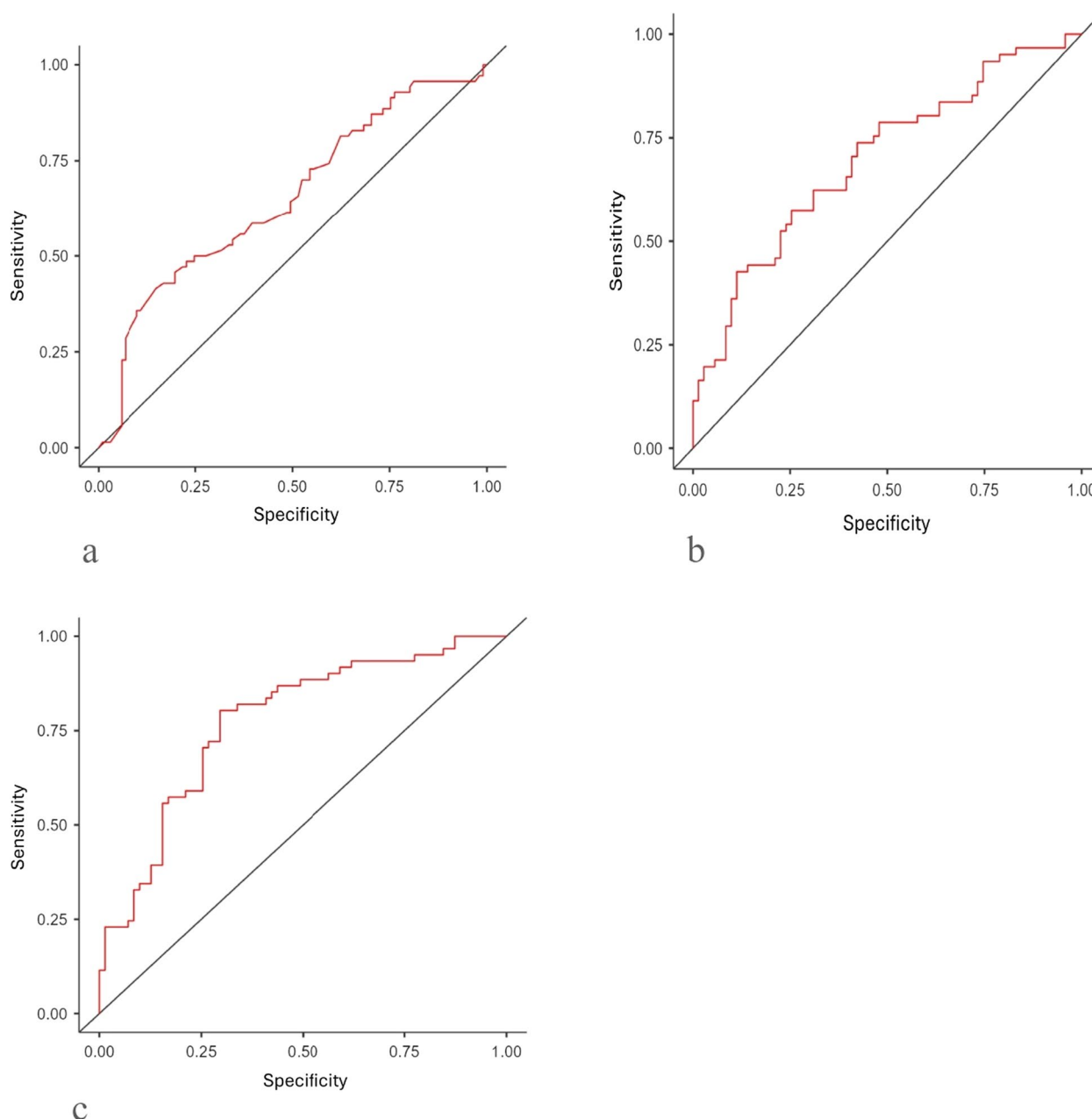


Fig. 1 Models for adolescents with non-suicidal self injury (NSSI) with and without suicidal attempt (SA) ROC curves ($n = 232$). **a** ROC curve plotted based on model 1. **b** ROC curve plotted based on model 2. **c** ROC curve plotted on model 3

$p < 0.001$), with an optimal critical point of 0.50, corresponding to sensitivity = 67.2% and specificity = 74.6% (Fig. 1c).

Discussion

The primary aim of this study was to better characterize the sample of NSSI patients hospitalized in a Child and Adolescent Neuropsychiatry Unit, by comparing the subgroup exhibiting SA with the subgroup without any lifetime history of SA.

The NSSI group with SA reported a higher frequency of pharmacological polytherapy compared to those without a lifetime SA, suggesting greater psychopathological severity in the former group [15].

In our sample, having a chronic illness appeared to reduce the likelihood of SA. This may be due to multi-disciplinary care and regular clinical monitoring, which allow early detection of mental health issues and prevent severe outcomes like suicidal behavior. A recent systematic review also highlighted inconsistent findings on the association between chronic illness and suicidality [46].

From a sociodemographic perspective, the two groups differed in parental marital status. At first glance, this interesting finding seems to contrast with existing literature, which identifies single-parent families and parental separation as risk factors for SA [47]. However, it is well established that factors such as dysfunctional family dynamics [48], dysfunctional attachment [49], maladaptive functioning, and conflictual environments contribute to adolescents' emotional and behavioral difficulties, increasing the risk for both non-suicidal and suicidal self-injury. These risk factors can occur regardless of parental marital status, including within married couples, and were further exacerbated during the COVID-19 pandemic [50–52]. To explore this further, a comparison of NSSI patients hospitalized before and after the pandemic showed that the association between SA and having married parents remained significant only among those admitted during or after the pandemic who also reported lifetime traumatic experiences. Indeed, the role of adverse childhood experiences in emotion regulation difficulties is well-established [32]. Moreover, the COVID-19 pandemic may have represented a traumatic event in itself. Recent studies highlight the cumulative effect of trauma, showing an exponential worsening of mental health problems, depressive symptom levels, and suicidality in patients exposed to multiple ACEs, particularly in the interpersonal and family domains [53, 54]. Consequently, we hypothesized that increased parental stress and greater social withdrawal of the whole family unit during the post-COVID period may have served as further precipitating factors for more severe presentations of self-injurious behavior, taking into account the increased psychological vulnerability of relatives of individuals engaging in self-injury, as documented in the literature [55, 56]. Although effect sizes were small, our results also showed a lower engagement in social activities and greater oppositional-defiant problems in the subgroup with NSSI and SA, in accordance with previous studies [27, 28, 31, 57].

It's interesting to observe that the two subgroups (NSSI with SA and NSSI without SA) didn't differ with respect to internalizing symptoms, attention and conduct problems as assessed by the YSR, and impulsivity as measured by BIS-11. These clinical features appear to be associated with NSSI, regardless of the presence or absence of SA; Moreover, our sample consists of hospitalized patients and therefore it reflects greater clinical severity.

In addition, the model which included both socio-demographic factors, internalizing and externalizing problems explained the greatest proportion of variance in the risk of SA in the NSSI sample. This result was consistent with the biopsychosocial model of mental health and self-injury behavior in particular, suggesting the need of a multidimensional assessment of the inpatient, by using

a multi-informant approach, according to NICE guidelines and to recent literature [25, 40]. In particular, the model showed that exhibiting higher anxious-depressed level was associated with a lower likelihood of having SA, consistent with Joiner's Theory (2005) that sustained the buffer effect of anxiety on capability of suicide [58]. On the contrary, having higher withdrawal-depressed level was associated with a greater likelihood to commit SA, according to the three steps theory (2015) [27], which highlighted the social isolation as a key factor in the progression from suicidal ideation to action. The role of social isolation in the progression of self-injury and the importance of social involvement and family environment during assessment and therapeutic interventions are also highlighted in the recent recommendation of the Lancet Commission on self-harm [25].

In the context of self-harm, it is increasingly important to understand the behaviour, deepen our understanding of the state of suffering, meanings and resilience, supporting physical, psychological and social health and improving quality of life, rather than focusing on predicting and preventing suicide.

In fact, within the field of self-harm, there is a growing need to shift the clinical focus toward understanding the enacted behavior and its underlying functions, exploring the individual suffering, resilience and meanings, rather than prioritizing a purely predictive and preventive approach to suicide. In this context, the professionals have the role to support physical, psychological, social health promoting holistic recovery and improving quality of life [59].

This study has several limitations that should be noted.

First, the use of self report instrument, which may be influenced by individual biases such as social desirability or failure to understand questions. Second, data were collected only from one Child Neuropsychiatric Unit in Northern Italy and most of our patient are female, thus predominantly reflecting a female adolescent profile and limiting generalizability of our results to the whole Italian adolescent population. Third, as this is a retrospective chart review, the study may be subject to information bias and missing data. Fourth, the lifetime assessment of suicide attempts does not allow conclusions about the temporal sequence between NSSI and SA. Finally, the findings cannot be generalized to outpatient or community samples. Hence research involving multisite sampling across different areas of Italy and including male self-harmers are needed. Further longitudinal studies are required to corroborate our findings, in order to deepen the process underlying the transition from NSSI to SA. Despite these limitations, the study has also several important strengths. It includes a hospitalized, high-risk adolescent population, providing insights that are often unavailable in community samples. It clearly

differentiates between NSSI with and without suicide attempts, a distinction frequently overlooked in the literature. In addition, the separate evaluation of pre- and post-COVID periods addresses an important and under-explored issue, further enhancing the relevance of our findings.

Conclusion

Our study highlights the relevance to consider a multi-dimensional evaluation of inpatient with NSSI also to assess suicidal risk including clinical and medical history and social functioning. These findings seem to be consistent with previous theories of suicide and particularly relevant in the light of the developmental age of the sample. Our results particularly recall the importance of social involvement and family environment as a core point during adolescence for the cognitive and emotional growth. Especially, the family environment plays a crucial role in emotion regulation, in the onset and in the increasing severity of self-injury behaviors and the Covid-19 pandemic seems to have exposed the vulnerability of family environment. The quality of family functioning appears to be a key factor, as it may potentially buffer or exacerbate the impact of stressful events. Therefore family context is another factor that needs to be considered during the evaluation and the treatment of inpatients with self-injurious behaviors during developmental age. Interventions targeting family functioning could be beneficial in supporting emotional regulation and reducing self-injurious behaviors.

Abbreviations

NSSI	Non Suicidal Self-Injury
SA	Suicidal Attempt
PTSD	Post-Traumatic Stress Disorder
ED	Emergency Department
YSR	Youth Self Report
MANOVA	Multivariate Analysis of Variance
BIS-11	Barrett Impulsiveness Scale
ROC	Receiver Operating Characteristics
ACE	Adverse Childhood Experience

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Authors' contributions

AR, RF, SF conceived of the study, participated in its design and coordination and drafted the manuscript; AR, RF, MG participated in the design and interpretation of the data; AR, RF participated in the design and coordination of the study and performed the measurement; RF participated in the design of the study and performed the statistical analysis; MG conceived of the study, and participated in its design and coordination. All authors read and approved the final manuscript.

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Data availability

The corresponding author upon reasonable request will provide data supporting the findings of this study.

Declarations

Ethics approval and consent to participate

The current study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee for Clinical Research of the Province of Padua (protocol code n° 0044914 of 13 July 2021) located at the University Hospital of Padua. Both the young patients and their parents provided informed consent for research participation.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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