

Suicidal behaviour and non-suicidal self-injury in children and adolescents seen at an Italian paediatric emergency department

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Abstract

Introduction. Increasing rates of non-fatal self-harm amongst adolescents represent growing concern. The objective of the study is to describe non-fatal self-harm – including suicidal behaviour (SB), suicidal ideation (SI) and non-suicidal self-injury (NSSI) – observed at an Italian paediatric emergency department (ED).

Methods. Retrospective analysis of the clinical records of patients admitted to ED from 2011 to 2016, who underwent child psychiatry consultation (CPC). We analyzed: rates of CPC for SB, SI and NSSI; risk factors for SB and SI in patients admitted to the hospital's Child Psychiatry Unit after a CPC; and, correlations between NSSI and SB/SI.

Results. The rate of CPC for SB, SI and NSSI switched from 7.7% in 2011 to 19% in 2016, with a statistically significant increase over the years ($p < 0.001$), a 2.2:1 female/male ratio, and an average age of 15.5 ± 1.8 years. SB consisted mainly in drug poisoning (53%), with a significant prevalence in female. Mood disorder was identified in 82.5% of patients hospitalized for SB or SI. Substance abuse was more frequently found in patients admitted for SB when compared to the SI group. Almost half (48%) of the patients admitted for SB or SI reported a current or lifelong history of NSSI. In patients admitted for SB or SI, 3 factors were significantly and independently associated with NSSI: being female, substance abuse, and more severe depressive symptoms.

Conclusions. Between 2011 and 2016, there was a significant growing need for CP consultations for suicidal behaviours, mainly in female adolescents. The subjects admitted for SI or SB, who also presented NSSI, were mainly substance abusers, and presented with more severe depressive symptoms.

Key words

- self-harm
- suicidal behaviour
- non-suicidal self-injury
- risk factor

INTRODUCTION

Suicide and self-harm are the main health issues during adolescence. According to the World Health Organization (WHO), suicide is the second leading cause of death amongst subjects aged between 15 and 29 years worldwide [1]. In Italy, the incidence of suicide amongst adolescents and young adults aged < 24 years amounts to 1.4/100 000 person-year, and is 4.4 times more prevalent in males than in females [2]. Suicide is considered to be the tip of the iceberg and is relatively uncommon if compared to non-fatal self-harm [3, 4], which is on

average reported by 27% of adolescents, with almost a 10% prevalence in community samples [3, 5] such as self-cutting, -burning, -biting, -hitting, and skin damage by other methods, in representative adolescent samples from 11 European countries. METHODS: Cross-sectional assessment of adolescents was performed within the European Union funded project, Saving and Empowering Young Lives in Europe (SEYLE), and a 50% prevalence in clinical samples [5, 6] such as self-cutting, -burning, -biting, -hitting, and skin damage by other methods, in representative adolescent samples from 11

European countries.

METHODS: Cross-sectional assessment of adolescents was performed within the European Union funded project, Saving and Empowering Young Lives in Europe (SEYLE). In a recent study involving eleven European countries [5] such as self-cutting, -burning, -biting, -hitting, and skin damage by other methods, in representative adolescent samples from 11 European countries.

METHODS: Cross-sectional assessment of adolescents was performed within the European Union funded project, Saving and Empowering Young Lives in Europe (SEYLE), the estimated prevalence of self-harm amongst Italian adolescents amounted to 21%, out of which, 16% concerned occasional self-harm and 5% repetitive self-harm.

Self-harm tends to occur at 12-14 years of age and is more common in female adolescents, with a girl/boy ratio of 5/6:1 [7] 95.8%. Presentation at a clinical service only involves one out of eight adolescents who self-harm in the community, and is more common amongst those who attempt self-poisoning [8, 9]. The estimated mortality index for non-fatal self-harm amounts to 1/370 adolescents who are admitted to hospital for self-harm, and to 1/3900 adolescents who report self-harm in the community [10].

These findings outline how massive the issue represented by community-occurring self-harm is, and highlight an urgent need for identifying the risk factors for progression from largely prevalent self-harm behaviours identified at the community level to suicide, and for developing appropriate protocols to monitor and treat the subjects presenting to clinical services after self-harm.

A first step towards identification of the risk factors for progression of self-harm to suicide is classifying self-injurious behaviours on the basis of the presence/absence of the intent to die. Following the growing need for suicidal risk stratification amongst self-injurious behaviours, the last edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [11] has proposed a distinction between: a) suicidal behaviour disorder, which includes all self-initiated suicidal behaviours; and b) non-suicidal self-injury (NSSI), described as intentionally repeated (≥ 5 times/year) self-inflicted destruction of body tissue without suicidal intent. Although in the DSM-5 they are classified as two separate diagnostic categories, the distinction between NSSI and suicidal behaviours (i.e. suicide attempt) is far from clear. These behaviours present with a continuum of symptoms' severity [12] and share the same distal and proximal risk factors [13]. Thus, the risk for progression from one to the other is one of the main clinical challenges for developmental psychiatrists working in emergency departments. Suicidal behaviour (SB) and NSSI have been differentiated in terms of prevalence (NSSI is more prevalent than SB in the community), intention (NSSI is carried out without the intent to die), frequency (NSSI occurs more frequently, particularly so in clinical samples), and lethality (NSSI often involves low lethality injuries, e.g., cutting, burning while SB tends to involve higher lethality injuries, e.g., self-poisoning, hanging, wrist cutting) [14] including nonsuicidal self-injury (NSSI). Longitudinal research studies [15-18] nonfatal self-poisoning or self-injury have shown how

a prior history of NSSI represents one of the strongest predictors of future suicide attempts. NSSI has been prospectively identified as a predictive factor of a new onset of suicidal ideation (SI) and a new suicide attempt at 12-24 months. In particular, later onset and repetitive NSSI are associated with a two-fold increased risk for SI and a three-fold increased risk for suicide attempts at 12-24 months. On the contrary, NSSI with onset during early adolescence and a short duration of self-harm behaviours seem to be linked to a smaller risk for SB and SI in the following years [19].

Several theories have been developed to explain the transition from NSSI to SB. According to Joiner's interpersonal theory of suicide [20], repetitive self-harm may develop individuals' capability to commit suicide. This capability develops through individuals' habituation to fear and pain, which increases the likelihood that suicidal thoughts are turned into action. Based on this theory, a recent review highlighted how adolescent self-injurers who attempted suicide reported a higher number of NSSI and more dangerous behaviours (e.g. substance abuse, aggression) compared to adolescent self-injurers who did not show suicidal behaviours [19].

In 2014, WHO published *Preventing suicide. A global imperative* [21], highlighting the need to focus on the predictors of suicide, i.e. psychiatric illnesses, substance-abuse-related behaviours, traumatism, and prior self-injurious behaviours, which can help to identify subjects at risk at whom specific therapeutic interventions should be aimed. In that respect, WHO highlighted the need for epidemiological data collection strategies to estimate the population at risk and better plan economic resources, prevention strategies and treatment settings.

Answering this need for epidemiological data collection, our study aims at describing non-fatal self-harm – including SB, SI and NSSI – in the juvenile population seen at the emergency department (ED) of the largest children's hospital in Italy, at analyzing the risk factors for suicidal behaviours and evaluating the differences between SB/SI + NSSI vs the SB/SI without-NSSI in children and adolescents admitted to the child psychiatry unit (CPU).

METHODS

Study design and selection of subjects

This is an epidemiological study based on a chart review of patients admitted to the ED of Bambino Gesù Children's Hospital (Ospedale Pediatrico Bambino Gesù – OPBG) from January 1st, 2011 to December 31st, 2016, who required a child psychiatry consultation (CpC) (Figure 1).

The OPBG is a teaching and research institute in Lattium as well as the largest paediatric hospital in Italy. The ED provides free medical assistance to all children aged from 0 to 18 years, 24 hours a day, 7 days a week. In 2011-2016, the number of visits to the ED amounted to approximately 74 000 per average year. The hospital has a total of 607 beds, out of which 8 in the CPU. Most patients come from Rome and the surrounding areas, however, the hospital is also a main reference centre for patients coming from the South and the Centre of Italy, and, to some extent, from the North of Italy and from abroad.

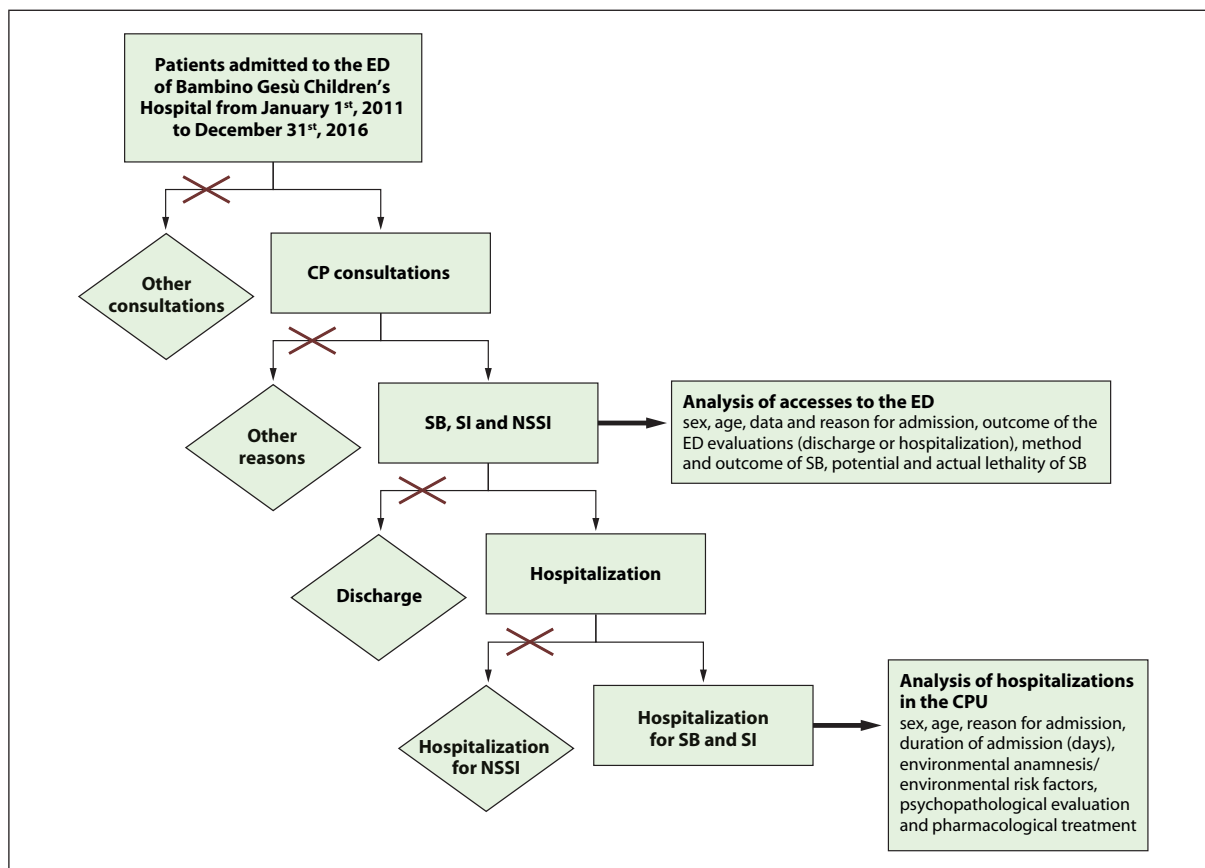


Figure 1

Study design and selection of subjects.

CP = child psychiatric; SB = suicidal behaviour; SI = suicidal ideation; NSSI = non-suicidal self-injury; ED = emergency department; CPU = Child Psychiatry Unit.

Data were collected from GIPSE (the regional software for the management of admissions to emergency departments) and from the hospital's online database where all patients are routinely registered. We selected, out of the patients requiring CPc, all the subjects who were admitted to the ED for SB, SI or NSSI. Information about the patients included sex, age, date and reason for admission, and the outcome of the ED evaluation including discharge or hospitalization in the CPU (please see flow chart of the study in *Figure 1*). For the subjects admitted to the ED for SB, the method and the outcome of the attempt, including potential or actual lethality, were also considered.

The subjects hospitalized in the CPU following CPc for SB or SI from January 2011 to December 2016 were extensively evaluated via standardized diagnostic interviews to assess psychiatric disorders; standardized rating scales for symptoms and risk factors for suicidal behaviour were also assessed. For subjects with repeated hospitalizations for SB or SI during the 6-year period being evaluated, only data regarding their first hospitalization were analyzed.

Assessment of subjects

Information about subjects was collected at the time of their first evaluation via the semi-structured assess-

ment used at the CPU of Bambino Gesù Children's Hospital. The data collected included sex, age, physiological, clinical and psychiatric anamnesis, including information about previous and current pharmacological treatment, history of substance abuse, reason for hospitalization, duration of hospital stay (days) and treatment course. In addition, details about potential environmental, family-related and clinical risk factors for suicidal behaviours, including family history of mood or other psychiatric disorders, family history of suicidal behaviours, previous suicidal or non-suicidal self-injury behaviours, history of child neglect/experience of loss, family conflicts, history of bullying and of sexual and/or physical abuse were also evaluated. Readmissions to CPU were also taken into account.

Structured psychopathological assessment

Inpatients and at least one of their parents or the carer (when neither parent was available) were interviewed via the semi-structured Schedule for Affective Disorders and Schizophrenia for School Age Children, Present and Lifetime version (K-SADS-PL) [22] to assess current and past psychopathological features and psychiatric disorders in children and adolescents according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), criteria.

Data were collected via the K-SADS-PL, including substance-abuse related problems and exposure to traumatic experiences (i.e. sexual/physical abuse and child neglect/experience of loss).

Symptoms of anxiety and depression were further evaluated on the Multidimensional Anxiety Scale for Children (MASC) [23] and the Children's Depression Inventory (CDI) [24] respectively. MASC is a 39-item self-rated scale for children and adolescents that evaluates anxiety symptoms and includes four subscales: physical symptoms, social anxiety, harm avoidance and separation anxiety. CDI is a 27-item self-rated scale used to assess depressive symptoms in children and adolescents aged 7-17 years. According to the Italian validation criteria, a 19-point cut-off suggests the presence of clinically significant depressive symptoms [25]. Children and adolescents completed both the CDI and the MASC with the support of trained psychologists. When needed, in accordance with the scales' standard instructions, questions were read and, if needed, explained to children.

The Italian version of the Child Behaviour Checklist for ages 6 to 18 years (CBCL/6-18) was completed by inpatients' parents/caregivers to rate behavioural and emotional problems in children and adolescents [26, 27]. The CBCL is an extensively used tool that provides scores for three broadband behaviour rating scales: internalizing symptoms, externalizing symptoms and total behavioural problems. Sub-items of these three broadband scales included the eight syndrome scales (withdrawn/depressed, somatic complaints, anxious/depression, social problems, thought problems, attention problems, rule-breaking behaviour, and aggressive behaviour). Scores were transformed into a T-score, based on age and gender norms: a clinical cut-point value for domain-specific syndrome scales and broadband scales was determined as the minimum raw score corresponding to T-score ≥ 65 . The psychometric properties of the CBCL and its validity and reliability for use amongst Italian population have been demonstrated [27, 28].

The Italian version of the Columbia-Suicide Severity Rating Scale (C-SSRS) was used to rate SB with relevant actual or potential lethality and SI. The psychometric properties and validity of the C-SSRS have been demonstrated [29]. In addition, information about current SB, SI and NSSI was asked in the K-SADS-PL interview's screening section for affective disorders.

We defined SB as any self-initiated suicidal behaviour, and NSSI as any intentionally repeated (≥ 5 times/year) self-inflicted damage to the surface of the body without suicidal intent [11]. SI was defined as any active thought about wanting to end one's life/commit suicide, including SI with/without method, intent to act or specific plan ("Yes" at C-SSRS items 2 to 5).

Statistical analysis

Categorical variables were summarized by absolute frequencies and percentages, continuous variables by mean and standard deviation. To determine statistical differences between the groups, the χ^2 test or Fisher exact test was used for categorical variables and χ^2 test for trends as appropriate, whereas the T-test or Mann-

Whitney test was used for continuous variables. We compared risk factors (family history of mood disorders, SB, substance abuse and/or other psychiatric disorders; previous SB, NSSI, substance abuse, experience of loss/child neglect, parental separation/divorce, conflict with parents, bullying, and sexual and/or physical abuse) amongst patients admitted to the hospital's CPU in terms of reasons for hospitalization (SB vs SI) and sex.

We also stratified the sample of subjects hospitalized at the CPU for SB/SI by the presence/absence of NSSI. Multivariate logistic regression models were developed to assess independent predictors of NSSI in the SB/SI + NSSI group vs the SB/SI without-NSSI group.

Variables with $p < 0.20$ in univariate analysis were included in the multivariate logistic regression models. Final models were computed with a stepwise backward procedure (likelihood ratio test, $p < 0.05$). The Hosmer-Lemeshow test was used to measure the model performance (goodness-of-fit test). Statistical analysis was performed using Stata, version 13 (StataCorp).

RESULTS

Subjects admitted to the ED for SB, SI or NSSI

Overall, out of 2237 admissions to the ED that required CPc between 2011 and 2016, 13.1% ($n = 294$) were for SB, SI and NSSI, the female/male ratio was 2.2:1 (204 females and 90 males), and the average patients' age was 15.5 ± 1.8 years.

With regard to temporal trends, CPc percentage for SB, SI and NSSI switched from 7.7% in 2011 to 19% in 2016, with a statistically significant increase over the years (from 12 cases in 2011 to 118 in 2016, $p < 0.001$; see Figure 2). SB was the main reason for CPc at the ED during the period being evaluated, with a proportion of 46.3% ($n = 136$); the proportion of admissions to the ED for SI and NSSI amounted to 36.4% ($n = 107$) and 17.3% ($n = 51$) respectively.

The most common method for SB admitted to the ED was drug poisoning (53%), followed by attempted or completed jumping out of a window (25%), wrist cutting/stabbing (8.8%), ingestion of toxic substances (7.4%), and hanging/jumping in front of a train (5.9%). Females were more frequently admitted for drug poisoning compared to males (60% vs 40%, $c^2 = 5.3$; $p = 0.02$).

Out of all the patients admitted to the ED for SB, 67% presented with mild-to-severe physical injuries. In particular, 31% presented with moderate physical injuries, 14.7% with moderately severe physical injuries, and another 14% with minor physical injuries. Severe physical injuries requiring intensive care management concerned 7.4% of patients. Patients identified as having no physical injuries were most commonly males (44% vs 27%, $c^2 = 3.9$, $p = 0.04$). In most cases, the level of potential lethality was high (95.3% of patients with actual lethality = 0).

In 85% ($n = 249$) of CP consultations for SB, SI and NSSI, hospitalization at the CPU was recommended, this was also true for patients admitted more than once for the same reason. SB and SI more frequently resulted in hospitalization (90% and 93.5% respectively) compared to NSSI (52.9%). The average length of stay

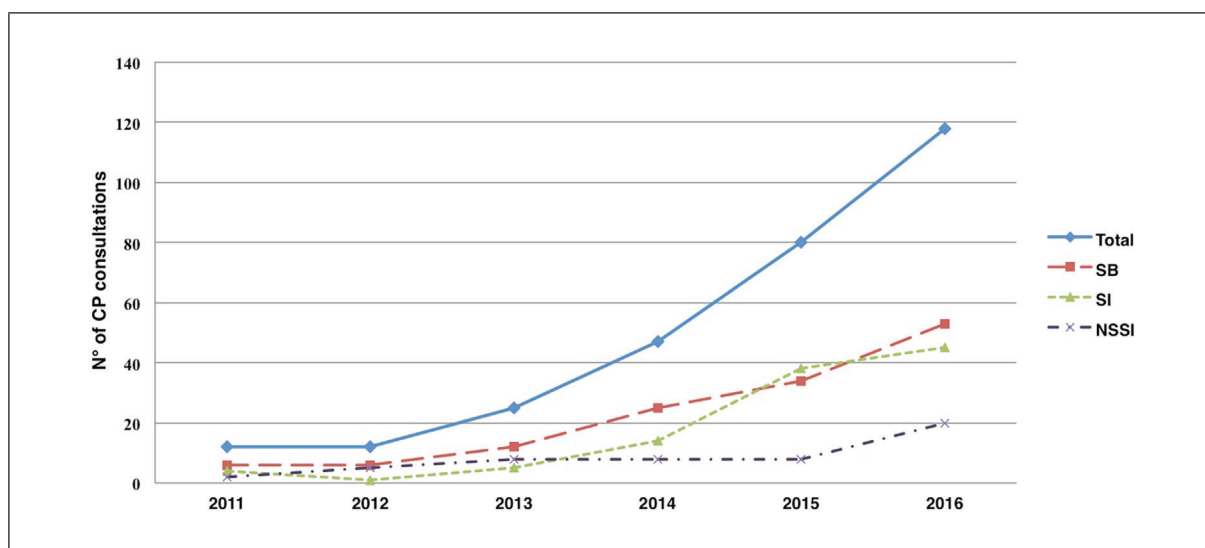


Figure 2

Number of CP consultations for SB, SI and NSSI observed at the ED of Bambino Gesù Children's Hospital in Rome from January 1st, 2011 to December 31st, 2016. Mean annual rate of CP consultations between 2011 and 2016 amounted to 373, with an increasing trend from 155 in 2011 to 614 in 2016. Over the same 6-year period, 294 adolescents aged between 11 and 17 years (average age: 15 years) accessed the ED for SB, SI and NSSI, with a statistically significant increase over the years (from 12 cases in 2011, to 118 in 2016; $p < 0.001$).

CP = child psychiatric; SB = suicidal behaviour; SI = suicidal ideation; NSSI = non-suicidal self-injury; ED = emergency department.

was 11.5 ± 9.2 days. Subjects admitted to the CPU for NSSI only (in absence of SB or SI, $n = 27$) were excluded from the analysis of hospitalized subjects as the number was too little to allow comparison with the SB and SI groups.

Subjects hospitalized in the CPU for SB or SI

One-hundred and seventy-one ($n = 171$) patients were hospitalized in the CPU at least once in 2011-2016 following CPc at the ED for SB or SI, with a female/male ratio of 2/1 (66.1% females). Seventy-nine patients were admitted for SI (46.2%), and 92 for SB (53.8%), with no female/male ratio difference in terms of hospitalization, and an average length of stay of 12.6 ± 10 days.

The most frequent diagnosis was mood disorder, in 82.5% of patients, with a significant prevalence in females ($c^2 = 17.4$, $p < 0.001$, not shown in the Table 1). Out of these patients, 59.6% were affected by additional disorders, such as anxiety disorder (21.3%), behavioural disorder (19.1%), eating disorders (18.4%), personality disorders (7.8%), or autism spectrum disorders/intellectual disability (5.7%).

Most patients ($n = 146$; 84.4%) were discharged from hospital with the prescription of a drug therapy, atypical antipsychotics mainly (66.7%), followed by mood stabilizers (28.1%) and antidepressants (14.4%). The percentage of each psychiatric diagnosis did not differ significantly in subjects admitted to the CPU for SB vs SI, except for substance abuse that was more frequently identified in the subjects hospitalized for SB ($c^2 = 4.2$, $p = 0.04$) compared to the SI group.

Twenty-one percent ($n = 35$) of patients were referred to a post-acute care centre; 25.7% of patients required at least one or more hospitalization for SB or SI in the six-year period being evaluated.

Risk factors for SB and SI

Figure 3 shows the most frequent risk factors for SB and SI identified in our sample, with a distribution by sex and reason for hospitalization (SB vs SI).

The most frequent risk factors were NSSI (47.9%) and conflicts between patients and their parents (43.3%), with a significantly higher prevalence in females versus males ($c^2 = 19.9$, $p < 0.0001$ and $c^2 = 4.6$, $p = 0.032$ respectively), followed by parental separation or divorce (33.7%), family history of mood disorders (31.8%) or other psychiatric disorders (24.3%), previous suicidal behaviours (27.5%), experience of loss/child neglect (24.6%), substance abuse (16.4%) and bullying (15.9%). Substance abuse was more frequently identified in the subjects hospitalized for SB ($c^2 = 4.2$, $p = 0.04$) compared to the SI group. A history of sexual and/or physical abuse was present in 7.8% of the subjects, mostly females ($c^2 = 3.7$, $p = 0.046$).

SB/SI+NSSI group vs SB/SI without-NSSI group, bivariate analysis

Eighty-two patients (48%) hospitalized for SB or SI reported a current or lifelong history of NSSI. Amongst inpatients admitted for SB or SI, those with additional NSSI were: mostly female, more likely to be diagnosed with a mood disorder, more frequently presenting with a comorbid eating disorder, and more likely to be identified as substance abusers compared to subjects without NSSI. NSSI patients also had higher scores on the CBCL scales (internalizing symptoms and total behavioural problems), higher depressive and suicidal score on the CDI, and were more frequently discharged from hospital with a prescription of second-generation antipsychotics (Table 1).

Furthermore, comparing SB methods, suicide attempts by jumping out of a window were more frequent

Table 1
Factors associated with NSSI in juvenile subjects admitted for SB or SI: bivariate analysis

Factor	Group, % or mean \pm SD			p-value
	Total N = 71	NSSI N = 82	w/o-NSSI N = 89	
Female	66.1	82.9	50.6	< 0.001*
Age	15.6 \pm 1.6	15.4 \pm 1.8	15.8 \pm 1.4	0.123
Hospital stay (days)	12.6	14.3	11.1	0.038*
Family history of mood disorders	31.8	28.2	35.7	0.327
Family history of suicide	8.1	5.1	11.4	0.229
Family history of substance abuse	9.4	11.5	7.0	0.347
Family history of other psychiatric disorder	24.3	22.1	26.8	0.507
Substance abuse	16.4	23.2	10.1	0.021*
Previous SB	27.5	26.8	28.1	0.854
Experience of loss/child neglect	24.7	18.5	30.3	0.075
Parental separation/divorce	33.7	37.8	29.9	0.276
Conflict with parents	43.8	46.3	41.4	0.516
Bullying	15.9	17.1	14.8	0.682
Sexual and/or physical abuse	7.8	9.8	6.0	0.362
Mood disorder diagnosis	82.5	90.2	75.3	0.01*
Eating disorder diagnosis	16.4	25.6	7.9	0.002
Psychosis diagnosis	5.9	4.9	6.7	0.749
Anxiety disorder diagnosis	22.8	17.1	28.1	0.086
Behavioural disorder diagnosis	19.9	19.5	20.2	0.907
Disability diagnosis				
ASD/ID diagnosis	7.0	6.1	7.9	0.651
MD prescription	28.9	25.6	30.3	0.492
AD prescription	14.0	12.2	15.7	0.506
BDZ prescription	20.5	25.6	15.7	0.110
SGA prescription	66.7	75.6	58.4	0.017*
MASC total score	57.6 \pm 12.7	58.9 \pm 13.1	56.3 \pm 12.2	0.190
CBCL externalizing symptoms	62.7 \pm 10.7	63.3 \pm 9.8	62.2 \pm 11.6	0.542
CBCL internalizing symptoms	72.2 \pm 8.4	74.2 \pm 7.5	70.2 \pm 8.9	0.004*
CBCL total symptoms	68.8 \pm 8.6	70.4 \pm 8.3	67.1 \pm 8.7	0.013*
CDI total score	24.4 \pm 10.6	27.8 \pm 10.1	20.9 \pm 9.9	< 0.001*
CDI item 9 score	1.3 \pm 0.7	1.5 \pm 0.6	1.1 \pm 0.7	0.001*

SB = suicidal behaviour; SI = suicidal ideation; NSSI = non-suicidal self-injury; w/o = without; ASD = Autism Spectrum Disorders ID = intellectual disability; MS = mood stabilizers; AD = antidepressants; BDZ = benzodiazepines; CDI = Children's Depression Inventory; CBCL = Child Behavioral Checklist; MASC = Multidimensional Anxiety Scale for Children; SGA = second generation antipsychotic. * Variables significantly associated with NSSI ($p < 0.05$).

in the group without NSSI, while cutting and drug poisoning were more frequent in the NSSI group (33.3% vs 10.5%, $c^2 = 6.4$, $p = 0.012$; 1.8% vs 23.7%, $c^2 = 11$, $p = 0.001$ respectively, not shown in the table).

Multivariate logistic regression model

The 3 factors that were significantly and independently associated with NSSI through a multivariate logistic regression model were: a) being female [OR = 5.1 (95% CI = 1.9-13.6), $p = 0.001$]; b) substance abuse [OR = 6.0 (95% CI = 1.8-19.7), $p = 0.003$]; and c) more severe depressive symptoms [OR = 1.07 (95% CI = 1.02-1.1), $p = 0.003$; Table 2].

DISCUSSION

The present study investigates the frequency of non-fatal self-harm in children and adolescents observed at the ED of the largest Italian children's hospital highlighting a growing demand for CP consultations for suicidal and non-suicidal behaviours amongst adolescents in the six-year period being evaluated. It contributes to the data collection that is aimed at improving the monitoring, the management and the prevention of this severe public health problem as recommended by WHO [21].

The study showed a 10-fold increase in CP consultations for SB, SI and NSSI at the ED involving ado-

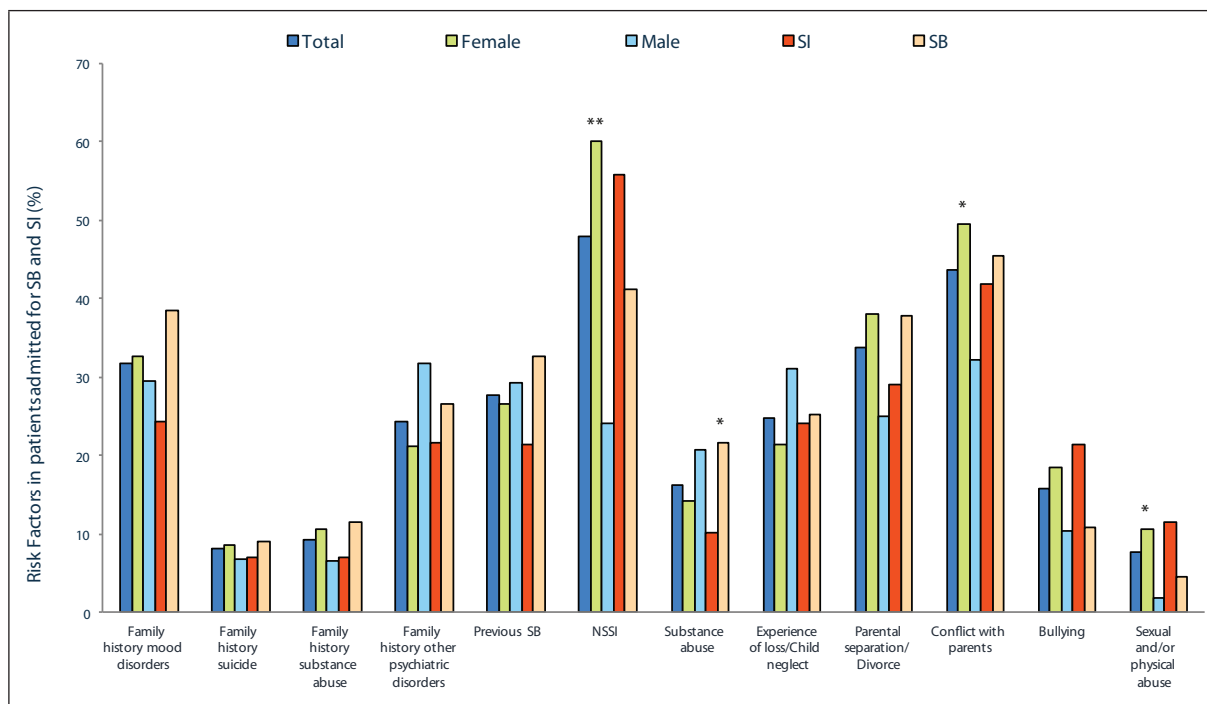


Figure 3 Risk factors for SB and SI amongst patients admitted to the hospital's CPU after a CPC at the ED, with a distribution by sex and reason for admission (SB vs SI). NSSI and conflicts between patients and their parents were significantly more prevalent in females vs males. Substance abuse was more frequently found in patients admitted for SB when compared to the SI group. SB = suicidal behaviour; SI = suicidal ideation; NSSI = non-suicidal self-injury; ED = emergency department; CPU = Child Psychiatry Unit; CPC = child psychiatric consultation; *p < 0.01; **p < 0.001.

lescents aged between 11 and 17 years (average age: 15 years), with a statistically significant increase over the years (from 12 cases in 2011 to 118 in 2016, $p < 0.001$; see *Figure 2*). These findings, in line with results from published epidemiological research studies run in other European countries [5, 10] such as self-cutting, -burning, -biting, -hitting, and skin damage by other methods, in representative adolescent samples from 11 European countries.

METHODS: Cross-sectional assessment of adolescents was performed within the European Union funded project, Saving and Empowering Young Lives in Europe (SEYLE), suggest that self-harm (including both suicidal behaviour and non-suicidal self-injury) is a relevant phenomenon amongst adolescents presenting to the ED. This may be due to different reasons: increased sensibility and attention amongst the general population and within clinical services [30]; an earlier onset of mood and other psychiatric disorders [31]; an earlier use of substances and sexual practices [32] 332 students in grades 7 and 9 provided complete data on episodes of deliberate self-harm in the previous 12 months and pubertal stage. Pubertal stage was assessed with the Pubertal Development Scale. **RESULTS:** The prevalence of deliberate self-harm was 3.7% with a more than twofold higher rate in females. Late puberty was associated with a more than fourfold higher rate of self-harm (odds ratio 4.6, 95% confidence interval 1.5-14. However, it should be noticed that this increase of the number of self-harm cases presenting to clinical services apparently does not correlate with an

increased rate of suicide in Italian juvenile population. Indeed, suicide rate has decreased in the last 20 years from 2.6/100 000 person-year in 1994 to 1.4/100 000 person-year in 2015 [2].

SB was the main reason for CPC at the ED, followed by SI. Additionally, our study showed how SI and SB shared the same risk factors, with no significant differences. This confirms how suicidal phenomena are to be regarded as a psychopathological *continuum* that goes from SI to suicidal behaviours and completed suicide [33] accurate estimation of suicidal risk remains one of the most difficult and most important tasks that clinicians face – especially considering recently collected data showing increase in suicide prevalence in Poland. More thorough estimation of suicidal risk in patients with SI requires taking under consideration not only suicidal risk factors but also factors that are more specific for progression of SI to suicidal behaviors (SB).

In line with previous findings [10, 34, 35] 62.9% were female and 37.1% male. Overdoses (90.5% of DSH episodes, more females than males accessed the ED for suicidal and non-suicidal behaviours, as highlighted by the much higher female/male ratio (2.2:1). For instance, females, more often than males, engage in intentional self-harm as a way to deal with relational issues and emotional distress, and seem to be more inclined to turn to clinical services before and after deliberate self-harm [36, 37].

We found that drug poisoning was the most frequent method used by the adolescents admitted to the ED for

Table 2

Multivariable logistic regression model of factors associated with NSSI in adolescent subjects admitted for suicidal behaviour or suicidal ideation

Variable	Univariate logistic regression model			Multivariable logistic regression model		
	OR	(95% CI)	<i>p</i>	OR Adj	(95% CI)	<i>p</i>
Sex						
M	1 [Ref]			1 [Ref]		
F	4.8	(2.3-9.7)	<0.001	5.1	(1.9-13.6)	0.001*
Age	1.6	(1-1.4)	0.125	N.I.		
Substance abuse						
No	1 [Ref]			1 [Ref]		
Yes	2.7	(1.4-6.3)	0.024	6.0	(1.8-19.7)	0.003*
Hospital stay (days)	1.0	(1.0-1.1)	0.050			
Experience of loss/child neglect	0.5	(0.3-1.1)	0.077			
Mood disorder diagnosis				N.I.		
No	1 [Ref]					
Yes	3.0	(1.3-7.3)	0.013			
Eating disorder diagnosis				N.I.		
No	1 [Ref]					
Yes	4	(1.6-10.1)	0.003			
Anxiety disorder diagnosis	0.5	(0.3-1.10)	0.089	N.I.		
MASC total score	1.0	(0.9-1.0)	0.190	N.I.		
CBCL Internalizing symptoms	1.06	(1.02-1.1)	0.006	N.I.		
CBCL Total symptoms	1.04	(1.01-1.1)	0.025	N.I.		
CDI Total score	1.07	(1.03-1.1)	0.000	1.07	(1.02-1.1)	0.002*
CDI Item 9 score	2.4	(1.5-3.9)	<0.001	N.I.		
SGA prescription						
No	1 [Ref]					
Yes	2.2	(1.1-4.3)	0.018			
BDZ prescription				N.I.		
No	1 [Ref]					
Yes	1.8	(0.9-3.9)	0.113			

Variables with $p < 0.20$ in univariate analysis were included in multivariate models. Final models were computed via a stepwise backward procedure (likelihood ratio test, $p < 0.05$). OR = Odds Ratio crude; OR Adj = Odds Ratio Adjusted for all variable; N.I. not included in the final model with a stepwise backward procedure. *Variables significantly and independently associated with NSSI.

^aNot included in the logistic regression model because directly linked to selected outcome.

SB, especially by females. Several different studies show that females tend to use less lethal methods such as self-poisoning [10, 38], whilst males tend to use more lethal methods such as hanging or asphyxiation, which are reported to be the most common method for completed suicide [10, 39].

Most of the attempters (67%) suffered from a mild-to-severe physical injury; hospitalization or intensive care management was required in 22% of cases. Potential lethality was observed to be high in 95.3% of the patients who did not suffer from any physical injury after SB (e.g., attempted jumping out of a window). This suggests how, beyond the degree of the severity of injuries, all potentially lethal behaviours engaged with the intention to die should be carefully evaluated by clinicians.

Most of the patients (85%) were considered to be enough severe to require acute psychiatric hospitalization due to either a high risk of suicide or serious clinical diagnosis, with more than 90% of the ED visits for SB and SI resulting in hospitalization in the CPU, as NICE guidelines on the management of self-harm behaviour in juvenile populations recommend [40]. From this perspective, hospitalization represents a first step to prevent suicide, as it restricts the subjects' access to lethal methods [41-43] and allows for a specialist evaluation of self-harming adolescents who may have never accessed clinical care [44].

Our study showed that more than a quarter of patients (26%) underwent one or more readmissions in CPU for SI or SB during the period being evaluated. According to published studies [45, 46], rehospitaliza-

tion of children and adolescents with psychiatric disorders is common within one year from first admission, and self-injury is a strong predictor of readmission. Hospital readmission may be due to poor social welfare services and politics, inadequate inpatient-outpatient treatment continuity and/or the severity of mental disorders [46-48].

More than 80% of the adolescents hospitalized in the CPU for SB or SI were diagnosed with a mood disorder (bipolar or major depressive disorder), often associated with comorbid anxiety, behaviour, and/or eating disorders. This finding is consistent with previous psychological autopsy studies that have shown a higher than 90-95% prevalence of psychiatric disorders amongst the people who committed suicide [49]. Additionally, affective disorders are the most frequent cause of suicide and have also been shown to be prevalent in adolescents and adults with SB [3, 50].

However, the absence of long-term prospective data did not allow us to differentiate between a bipolar disorder and a major depressive disorder. For instance, most patients were hospitalized following a first major depressive episode; it is well known that most early onset depressions develop into a bipolar disorder at a later stage [51, 52]. Indeed, most patients were discharged from hospital with the prescription atypical antipsychotics (66.7%). In particular, NSSI patients were more frequently discharged with the prescription of second-generation antipsychotics (SGA) compared to patients without NSSI. For instance, SGA seem to have short-term effectiveness in reducing suicidal risk by improving mixed manic-depressive symptoms that are typical of depression in adolescence and reducing anxiety and emotional dysregulation associated with NSSI [53].

Family conflicts were observed in almost half of the patients hospitalized for SB or SI, mainly in females. This may suggest how the quality of the relationships within family environments and a likely gender-specific vulnerability to conflicts with parents play an important role in suicidal behaviours as shown in previous reports [5, 35].

Almost half (48%) of the patients hospitalized for SB or SI reported a current or lifelong history of NSSI (Figure 3). These patients presented with higher psychopathological symptoms, in particular, more severe depressive symptoms and more intense SI, compared to patients without NSSI (Table 2). In line with our results, previous research studies [18, 19, 54-56] factors that contribute to the transition from NSSI to suicide ideation and suicide attempts are unclear. To address this gap, we investigated whether demographic characteristics, child maltreatment, and psychiatric factors are associated with the level suicidality among adolescents with a history of self-injury. Participants were three groups of adolescent inpatient self-injurers ($n = 397$, 317 female have shown in adolescents with both NSSI and suicide attempts higher rates of psychiatric disorders, in particular major depression and PTSD, greater severity of symptoms (e.g., SI, depression, hopelessness), and greater impulsivity. Moreover, NSSI patients were more frequently diagnosed with a mood disorder, in most cases with a comorbid eating disorder. As re-

ported in a systematic review [57] clinical and taxonomic attention in non-suicidal self-injury (NSSI) about one third of female adolescents with eating disorders present with NSSI which, in some cases, occurs after the eating problem has been overcome; on the other hand, NSSI increases the risk for eating disorders to become chronic. Emotional distancing and harming one's own body, with coexistence of severe impulsivity and emotional dysregulation, seem to play a major role in the pathogenesis of these two conditions.

In line with findings from a recent study [19], we found that substance abuse was more frequently reported by adolescents hospitalized for SB than for SI. Additionally, substance abuse was significantly and independently associated with NSSI. For instance, frequent use of substances in adolescence has been associated with NSSI [58, 59] $S.D.=0.87$, and this relationship has been linked to the psychopathological mechanism of craving NSSI shares with abuse-related pathologies. NSSI can be interpreted as a coercive behaviour carried out with need and urgency. Indeed, self-injurious behaviours artificially stimulate the opioid system and share with addictive disorders pathologic coping strategies to manage stressors, the development of tolerance, and psychological strain when a self-injurious attempt is not achieved [60]. Some evidence suggests that substance abuse is linked to SB and to impulsivity [59].

The main limitation of the present study lies in the absence of long-term prospective data and the cross-sectional/retrospective nature of the data collected. However, patients' data collection was accurate and the quality of the data high thanks to the hospital online system and the involvement of trained psychiatrists in CP consultations at the ED.

Another potential limitation lies in the fact that the study only considered visits at the ED. These account for a minority of self-harm episodes in adolescents at the community level [9, 10], hence these data cannot be generalized. However, since accesses to the ED are the main route by which children and adolescents are seen at clinical services [44], our findings may be relevant to highlight those cases that otherwise would never be observed, to whom aftercare interventions could be provided. On the other hand, the high number of readmissions we observed highlight poor social welfare services and inadequate inpatient-outpatient treatment continuity, suggesting the need to invest more resources in this area.

CONCLUSIONS

The present study showed a statistically significant increase in accesses to the ED for SB, SI and NSSI, mainly in adolescent females, over the last few years. In addition, there was a high prevalence of psychiatric disorders, mainly depression, in this patient population. As shown in the study, a much lower number of ED accesses was required for NSSI compared to SB, although almost half of the patients hospitalized for SB or SI reported a current or lifelong history of NSSI. The subjects hospitalized for SI or SB, who also presented NSSI, were mainly substance abusers, and presented with more severe depressive symptoms.

In order to improve current treatment and intervention strategies, future studies should focus on distinguishing between self-harming adolescents and adolescents who are at risk for suicidal behaviours. In addition, actions should be taken to guarantee that proper screening is provided to patients presenting for mental disorders and/or substance use.

As healthcare professionals working in emergency departments are often the first who provide primary health care to these patients, they need to be able to recognize the factors that can increase the risk for attempted or completed suicide. According to WHO [21], adequate prevention and the treatment of depression and of substance abuse, as well as the follow-up of patients who attempted suicide, can reduce suicide rates. Increasing awareness of the epidemiological trends of suicide attempts and self-inflicted injuries is a first and important step towards the development of effective strategies for preventing repeated or fatal suicidal behaviours.

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Conflict of interest

The Authors declare that they have no conflict of interest.

Authors' contribution

GS and LC designed the study. LC managed the literature searches and analyses. GS and SP undertook the statistical analysis, and LC wrote the first draft of the manuscript. SV supervised the work. All authors contributed to and have approved the final manuscript.

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