Consanguinity and Nonsuicidal Self-Injury in Depressed Patients: New Risk Factors and Risk Prediction Models

ABSTRACT

Objective: The aim of the study was to identify the risk factors associated with nonsuicidal self-injurious (NSSI) behavior in patients with depressive disorders and develop predictive models utilizing these influencing factors as predictors, followed by validation of the constructed models for their efficacy.

Methods: Patients with depression disorders admitted to Wuhan Mental Health Center from 2020 to 2021 were included using retrospective analysis. Patients who exhibited one or more items on the NSSI behavior rating questionnaire were categorized into the NSSI group, while those without any such behaviors were assigned to the non-NSSI group. Patients in both groups were categorized separately based on gender, age, personality traits, and interpersonal relationships. The above data were analyzed using multiple logistic regression analysis. Prediction models were constructed, receiver operating characteristic (ROC) curves were produced and model accuracy was calculated.

Results: A total of 237 patients were included in this study, with 122 patients assigned to the NSSI group and 115 patients assigned to the non-NSSI group. By comparing the baseline data of the patients in the 2 groups, the results revealed statistically significant differences between the 2 groups in terms of age, grades at school, early childhood parenting style, Hamilton Depression Rating Scale (HAMD), Hamilton Anxiety Scale (HAMA), and Experiences in Close Relationships Scale (ECRS) ($P < .05$). However, no statistically significant differences were observed for the remaining indicators ($P > .05$). The results of the multiple logistic regression model showed that grades at school, early childhood parenting style, HAMD, HAMA, and ECRS scores were risk factors. The ROC model was constructed using school performance, childhood parenting style, HAMD, HAMA, and ECRS scores as predictors. The findings indicated that the ECRS score was the best predictor of NSSI, and it had a sensitivity of 91.8% and specificity of 70.5% for an area of 0.967.

Conclusion: ECRS was utilized as a predictor to evaluate the NSSI inclination of depressed patients with commendable sensitivity and specificity. Furthermore, early childhood parenting style, HAMD, HAMA, and ECRS scores were identified as risk factors for NSSI. For individuals at high risk who exhibit these aforementioned risk factors, clinical diagnosis and treatment should be approached with caution.

Keywords: Depressive disorder, nonsuicidal self-injurious behavior, risk factors

Jun Liu[1*] (ID)
Juan Guan[2*] (ID)
Jie Xiong[1] (ID)
Cong Zhou[3] (ID)
Yan Zhang[4] (ID)
Shufang Zhang[5] (ID)
Rui Mei[6] (ID)

[1]Psychosomatic Medicine Ward of Wuhan Psychological Hospital, Wuhan Mental Health Center, Hubei, China
[2]Early Intervention Ward of Wuhan Psychological Hospital, Wuhan Mental Health Center, Hubei, China
[3]Department of Judicial Appraisal, Wuhan Psychological Hospital, Wuhan Mental Health Center, Hubei, China
[4]Department of Child Psychology, Wuhan Psychological Hospital, Wuhan Mental Health Center, Hubei, China
[5]Clinical Psychology Center of Wuhan University People's Hospital, Hubei, China
[6]Division of Medical Administration, Wuhan Hospital for Psychotherapy, Wuhan Mental Health Center, Hubei, China

*Jun Liu and Juan Guan contributed are equally to this article.

Corresponding author:
Juan Guan
✉ whgj518@163.com

Introduction

Nonsuicidal self-injury (NSSI) refers to the intentional damage to bodily tissues by individuals with the intention of not committing suicide, which has a high incidence among countries around the world.[1] In the meantime, research has demonstrated that depressed patients with NSSI exhibit a greater propensity for suicide than other depressed patients.[2] Therefore, psychologists pay more attention to the depressed patients with NSSI behaviors.[3] Studies have shown that the occurrence of NSSI is associated with a variety of factors,

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however, the specific influencing factors are still not fully elucidated. Thus, the exploration of causative factors related to NSSI is crucial for the development of subsequent prediction models and interventions.[4,5] Exploring risk factors associated with NSSI is a prerequisite for the development of relevant interventions. What's more, research on risk factors for NSSI can only achieve post hoc intervention, whereas prior intervention can be achieved by constructing predictive models which can reduce the incidence of this behavior. However, the current research on the NSSI prediction model is still in the exploratory stage.[6,7] This study intends to analyze the related risk factors of NSSI in patients with depression, and builds a prediction model to provide effective methods for the prediction and intervention of clinical diseases in the future. However, as new influencing factors are constantly being explored and discovered, it makes the NSSI prediction model similarly under continuous exploration and improvement.[6,7] Therefore, this study aims to identify novel influencing factors that contribute to the occurrence of NSSI in patients with depressive disorders through multiple logistic regression analysis of relevant indicators among included patients. The findings will be used to develop a risk prediction model, which can effectively predict the likelihood of NSSI occurrence and facilitate future interventions for patients with depressive disorders.

Material and Methods

Patients

Patients with depression admitted to Wuhan Mental Health Center from 2020 to 2021 were selected, and those who met the inclusion and exclusion criteria were included in the study by reviewing the cases. Based on the NSSI behavior rating questionnaire recorded in the cases, patients who met 1 or more criteria were assigned to the NSSI group, while the rest were assigned to the non-NSSI group. The study was approved by Ethics Committee of Wuhan Mental Health Center (Approval No: KY201908.3). All procedures adhered to the tenets of the Declaration of Helsinki (as revised in 2013). Informed consent was obtained from all participants.

Inclusion and Exclusion Criteria

Inclusion criteria: 1. Patients who met the diagnostic criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (*DSM-5*). 2. Patients without intellectual deficits. 3. Patients who were not taking antidepressants within the last 2 weeks of admission.

Exclusion criteria: 1. Patients with other psychiatric disorders. 2. Patients with organic brain diseases, history of cranial trauma. 3. Patients with other serious physical diseases. 4. Patients with incomplete medical record data.

MAIN POINTS

- *Two ECRS (anxiety and avoidance dimensions) scores as risk factors for the occurrence of NSSI.*
- *Depressed patients with poor school performance have a higher risk of developing NSSI than depressed patients with good performance.*
- *Early childhood parenting style is a risk factor for NSSI.*

Evaluation Indicators

General Information: The data of gender, age, years of education, personality, interpersonal relationships, and grades at school (based on patients' self-report) were counted separately for the 2 groups.

Nonsuicidal Self-injury Behavior Assessment Questionnaire: The ANSAQ, prepared by Wan Yuhui, is a common scale to evaluate NSSI in patients. The questionnaire consists of 12 items designed to evaluate the self-injurious behavior of patients across 2 dimensions (presence or absence of significant tissue damage). The number of conforming items is used to evaluate the severity of NSSI, the more numbers of conforming items, the more serious the NSSI is. Cronbach α is 0.921, r (test-retest reliability) was 0.843.[8]

Hamilton Depression Rating Scale: HAMD is a common survey scale for current clinical assessment of patients' depressive status which developed by Hamilton in 1960.[9] Three versions are available for HAMD and the 24-item version is used in this study. The HAMD consists of 24 items, each scored from 0 to 4 or 0 to 2. Patients with a total score below 8 are classified as non-depressed, scores between 8 and 20 indicate mild depression, scores between 21 and 35 indicate moderate depression, while scores above 35 indicate severe depression. The Cronbach α is 0.90.

Hamilton Anxiety Scale (HAMA): The HAMA is a scale commonly used to assess patients' mental disorders which was developed by Hamilton in 1959.[10,11] The HAMA scale consists of 14 items, each rated on a scale from 0 to 4. Patients with a cumulative score below 7 are classified as non-anxious, while scores ranging from 8 to 13 indicate mild anxiety. Moderate anxiety is indicated by scores between 14 and 20, whereas severe anxiety is defined by scores exceeding 21. The Cronbach α is 0.90.

Experiences in Close Relationships Scale: Consanguinity refers to a closeness that the subject experiences and may be recognized by society. This subjective experience of closeness can be emotional and cognitive closeness, including feelings of love, empathy, and a sense that each person is special to the other; therefore, the Chinese version of ECRS revised by Tonggui Li and Kazuo Kato was used in this study.[12] In the previous literature, the scale was mostly used to assess the intimacy of subjects with their parents. The scale contains 36 entries, 13 entries are about the avoidance dimension, and the remaining entries are about the anxiety dimension. Each entry scored 1-7 points, the higher total score indicates, the higher level of intimacy. Cronbach α were 0.82 and 0.77, respectively.

Interpersonal Comprehensive Diagnostic Scale: In this study, the Interpersonal Comprehensive Diagnostic Scale was used to evaluate the interpersonal relationships of the subjects. The scale was designed and written by Jung, Il-Chang et al.[13] It consists of 28 test questions with a total score of 0-28. A score within the range of 0 to 8 is indicative of good functioning. If the total score falls between 9 and 14, it suggests mild distress and is categorized as fair in this study. Scores falling within the range of 15 to 28 indicate more severe interpersonal problems, which are classified as poor. The internal consistency Cronbach's α is 0.82, which has good reliability.

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Statistical Analysis

Statistical Package for Social Science Statistics version 25.0 (IBM SPSS Corp.; Armonk, NY, USA) was used for statistical analysis, and the measurement data were expressed according to the mean ± SD, and independent samples t-test was used for comparison between 2 groups. The categorical data were represented in form of percentages and frequencies, and the X^2 test was used for comparison between groups. A multiple logistic regression analysis was used to identify risk factors for depressed patients with NSSI, and the odds ratio (OR) was calculated. A prediction model for patients with NSSI in depression was constructed and model accuracy was calculated. The area under the ROC curve was calculated, and the results were copied to Excel. Youden's J statistic was then computed, followed by sorting the results and selecting the maximum value as the cutoff, $P < .05$ defined as statistically significant difference. Ninety-five percent confidence interval was calculated for all parameters, and hypothesis testing significance level $\alpha = 0.05$, with $P < .05$ defined as statistically significant difference.

Results

General Patient Data

According to the recommended diagnostic criteria for NSSI in the 5th edition of the Handbook of Mental Disorders and Statistics, meeting any one of these items was considered to have NSSI behavior, which was diagnosed by 2 attending and 2 physicians in conjunction with the actual onset of the patient's NSSI behavior. The 237 patients were categorized NSSI group and non-NSSI group according to the above diagnostic criteria.

In the NSSI group, there were 122 patients with 56 (45.90%) males and 66 (54.10%) females, mean age 38.41 (SD = 9.56) years. In the personality classification, 63（51.64%）were introverted, 24 (19.67%) were extroverted, 17 (13.93%) were mild and 18 (14.76%) were fickle. In general interpersonal relationship, 37 (30.33%) cases were good, 51 (41.80%) cases were general and 34 (27.87%) cases were poor. In school performance, 36 (27.87%) cases were good, 49 (40.16%) cases were common, 37 (30.34%) cases were bad. What's more, a total of 80 (65.57%) cases had a repetition experience, 42 (34.43%) cases had no repetition experience. A total of 68 (55.74%) cases were raised by parents in early childhood, and 54 (44.26%) cases were raised by other relatives. There were 78 (63.93%) cases with somatic diseases and 44 (36.07%) cases without somatic diseases, 57 (46.72%) cases with a family history of mental illness and 65 (53.28%) cases without a family history of mental illness, 63 (51.64%) cases with a family history of somatic diseases and 59 (48.63%) cases without a family history of mental diseases. In addition, there were 11 (9.02%) cases with a history of smoking and 111 (90.98%) cases without a history of smoking, 8 (6.56%) cases with a history of alcohol consumption and 114 (93.44%) cases without a history of alcohol consumption. The mean HAMD score in this group was 16.64 (SD = 5.53), the mean HAMA score was 16.32 (SD = 9.88), and the mean ECRS score was 66.77±11.16 and 63.34 (SD = 6.36).

In the non-NSSI group, there were 115 patients with 35 (39.13%) males and 80 (60.87%) females, mean age 40.57 (SD = 15.36) years. In the personality classification, 55 (47.82%) were introverted, 32 (27.82%) were extroverted, 16 (13.91%) were mild and 12 (10.45%) were fickle. In general interpersonal relationship, 28 (24.34%) cases were good, 65 (56.52%) cases were general and 22 (19.14%) cases were poor. In school performance, 48 (41.74%) cases were good, 55 (47.83%) cases were common, 12 (10.43%) cases were bad. What's more, a total of

60 (52.17%) cases had a repetition experience, 55 (47.83%) cases had no repetition experience. A total of 78 (67.83%) cases were raised by parents in early childhood, and 37 (32.17%) cases were raised by other relatives. There were 61 (53.04%) cases with somatic diseases and 54 (46.96%) cases without somatic diseases, 53 (46.09%) cases with a family history of mental illness and 62 (53.91%) cases without a family history of mental illness, 69 (60.00%) cases with a family history of somatic diseases and 46 (40.00%) cases without a family history of mental diseases. In addition, there were 5 (4.34%) cases with a history of smoking and 110 (95.66%) cases without a history of smoking, 5 (4.34%) cases with a history of alcohol consumption and 110 (95.66%) cases without a history of alcohol consumption. The mean HAMD score in this group was 12.13 (SD = 5.34), the mean HAMA

Table 1. Baseline Data Between the 2 Groups

Category		NSSI (n = 122)	Non-NSSI (n = 115)	P
Gender	Male	56 (45.90)	35 (39.13)	.014
	Female	66 (54.10)	80 (60.87)	
Age		38.41 (SD = 9.56)	40.57 (SD = 15.36)	.199
Character	Introversion	63 (51.64)	55 (47.82)	.438
	Extroversion	24 (19.67)	32 (27.82)	
	Mild	17 (13.93)	16 (13.91)	
	Fickle	18 (14.76)	12 (10.45)	
General interpersonal relationship	Good	37 (30.33)	28 (24.34)	.070
	Common	51 (41.80)	65 (56.52)	
	Poor	34 (27.87)	22 (19.14)	
School grades	Good	36 (29.50)	48 (41.74)	.001
	Common	49 (40.16)	55 (47.83)	
	Poor	37 (30.34)	12 (10.43)	
Whether to repeat a grade	Yes	80 (65.57)	60 (52.17)	.036
	No	42 (34.43)	55 (47.83)	
Early childhood parenting style	Parents	68 (55.74)	78 (67.83)	.056
	Others	54 (44.26)	37 (32.17)	
Somatic disease	Yes	78 (63.93)	61 (53.04)	.089
	No	44 (36.07)	54 (46.96)	
Family history of psychiatric disorders	Yes	57 (46.72)	53 (46.09)	.922
	No	65 (53.28)	62 (53.91)	
Family history of the somatic disease	Yes	63 (51.64)	69 (60.00)	.195
	No	59 (48.63)	46 (40.00)	
History of smoking	Yes	11 (9.02)	5 (4.34)	.152
	No	111 (90.98)	110 (95.66)	
History of drinking	Yes	8 (6.56)	5 (4.34)	.455
	No	114 (93.44)	110 (95.66)	
HAMD		16.64 (SD = 5.53)	12.13 (SD = 5.34)	<.001
HAMA		16.32 (SD = 9.88)	10.40 (SD = 4.12)	<.001
ECRS	Avoiding dimension	66.77 (SD = 11.16)	56.40 (SD = 4.81)	<.001
	Anxiety dimension	63.34 (SD = 6.36)	54.94 (SD = 2.563)	<.001

NSSI, Non-suicidal self-injury; HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Scale; ECRS, Experiences in Close Relationships Scale; SD, Standard Deviation.

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score was 10.40 (SD = 4.12), and the mean ECRS score was 56.40 ± 4.81 and 54.94 (SD = 2.56).

By comparing the general data of the 2 groups, the results showed that the differences between age, school grades, whether to repeat a grade, early childhood parenting style, HAMD, HAMA, and ECRS were statistically significant ($P < .05$), while the other indicators were not statistically significant ($P > .05$). (Table 1)

Variable Assignment for Risk Factor Analysis of NSSI Occurrence: The above indicators were assigned for univariate and multiple logistic regression analysis. Among the included variables, age, years of education, HAMD, HAMA, and ECRS (anxiety and avoidance dimensions) were entered into the analysis as continuous variables. Gender was assigned as 0 for females and 1 for males; marital status was assigned as 0 for unmarried, 1 for married, and 2 for divorced; personality was assigned as 0 for introversion, 1 for extraversion, 2 for mildness, and 3 for fickleness; general interpersonal relationships and school performance were assigned as 0 for good, 1 for fair, and 2 for poor; parenting was assigned as 0 for early childhood and 1 for others. For physical illness, family history of mental illness, family history of mental illness, history of smoking, and history of alcohol consumption, 0 was assigned as none and 1 as yes (Table 2).

Multiple Analysis of the Risk Factors for NSSI Occurrence: The NSSI behavior among the respondents was used as the dependent variable (1 for the NSSI group and 0 for the non-NSSI group). The risk factor analysis was conducted by introducing the above indicators as independent variables in a multiple logistic regression model. The results of the multiple logistic regression model showed that grades

Table 2. Variable Assignment

Variable	Assignment Description
Age	Continuous Variables
Gender	Female = 1, Male = 2
Character	Introversion = 1, Extroversion = 2, Mild = 3, Fickle = 4
General interpersonal relationship	Good = 0, Common = 1, Poor = 2
School grades	Good = 0, Common = 1, Poor = 2
Whether to repeat a grade	No = 0, Yes = 1
Early childhood parenting style	Parents = 0; Others = 1
Somatic disease	No = 0, Yes = 1
Family history of psychiatric disorders	No = 0, Yes = 1
Family history of the somatic disease	No = 0, Yes = 1
History of smoking	No = 0, Yes = 1
History of drinking	No = 0, Yes = 1
HAMD	Continuous Variables
HAMA	Continuous Variables
ECRS (Avoiding dimension)	Continuous Variables
ECRS (Anxiety dimension)	Continuous Variables

HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Scale; ECRS, Experiences in Close Relationships Scale; SD, Standard Deviation.

at school ($P = .004$, $P = .012$), early childhood parenting style ($P = .037$), HAMD ($P = 0.015$), HAMA ($P = .003$), and ECRS scores ($P = .004$, $P < .001$) were risk factors (Table 3).

Prediction Model: The ROC models were constructed using grades at school, early childhood parenting style, HAMD, HAMA, and ECRS scores as predictors, respectively. The results showed that the ECRS

Table 3. Logistic Analysis of Risk Factors for NSSI Occurrence

Category	β	SE	Wald χ^2	OR (95% CI)	P
Age	−0.014	0.023	0.380	0.986 (0.942-1.031)	.538
Gender	−0.964	0.693	1.931	0.382 (0.098-1.458)	.165
Character	–	–	1.600	–	.457
Introversion	0.857	1.021	0.705	2.356 (0.319-17.416)	.401
Extroversion	−0.212	1.056	0.040	0.809 (0.102-6.406)	.841
Mild	0.255	1.198	0.045	1.290 (0.123-13.501)	.832
General interpersonal relationship	–	–	4.247	–	.120
Good	−0.506	0.833	0.369	0.603 (0.118-3.088)	.544
Common	−1.422	0.720	3.899	0.241 (0.059-0.990)	.048
School grades	–	–	9.000	–	.011
Good	−2.500	0.864	8.373	0.082 (0.015-0.446)	.004
Common	−2.019	0.803	6.319	0.133 (0.028-0.641)	.012
Whether to repeat a grade	1.136	0.656	2.999	3.115 (0.861-11.267)	.083
Early childhood parenting style	1.235	0.593	4.329	3.438 (1.074-11.001)	.037
Somatic disease	0.185	0.740	0.063	1.203 (0.282-5.133)	.802
Family history of psychiatric disorders	−0.651	0.731	0.793	0.521 (0.124-2.186)	.373
Family history of the somatic disease	−0.276	0.591	0.219	0.759 (0.238-2.414)	.640
History of smoking	1.188	1.174	1.024	3.282 (0.329-32.768)	.311
History of drinking	−0.668	1.386	0.233	0.513 (0.034-7.756)	.630
HAMD	0.144	0.059	5.912	1.155 (1.028-1.297)	.015
HAMA	0.146	0.049	8.882	1.157 (1.051-1.273)	.003
ECRS (Avoiding dimension)	0.130	0.045	8.458	1.139 (1.043-1.243)	.004
ECRS (Anxiety dimension)	0.674	0.148	20.670	1.962 (1.467-2.623)	<.001
Constant	−46.750	8.894	27.629	–	<.001

NSSI, Non-suicidal self-injury; HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Scale; ECRS, Experiences in Close Relationships Scale; OR, Odds ration; CI, Confidence Interval; SE, Standard Error.
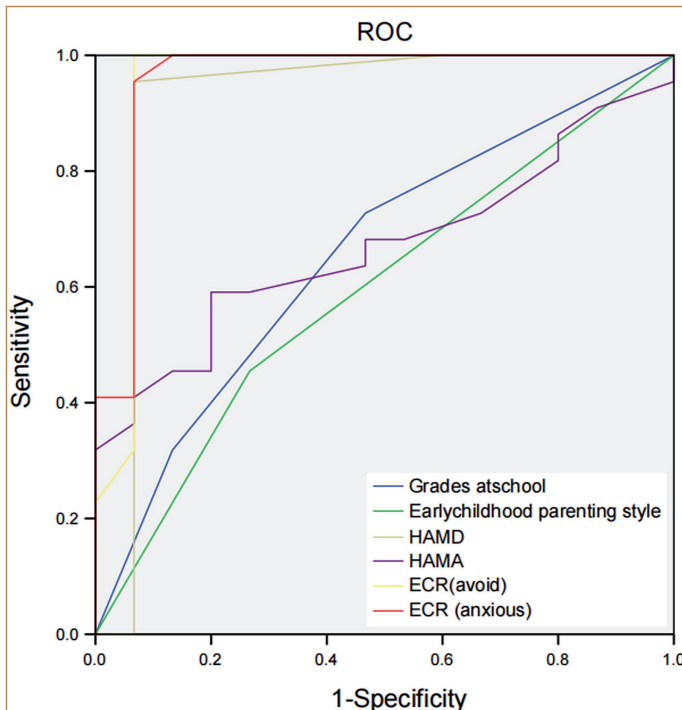
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Figure 1. ROC curve in patients with depressive disorder associated with NSSI. NSSI, Non-suicidal self-injury; HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Scale; ECR, Experiences in Close Relationships; ROC, Receiver Operating Characteristic.

score was the best predictor of NSSI, and the ROC curve constructed by it had a sensitivity of 91.8% for area of 0.967 and a specificity of 70.5% (Figure 1, Table 4).

Discussion

The severity of NSSI has attracted the attention of scholars worldwide, making it a prominent research topic. NSSI can be occurred in all age patients and is most prevalent in adolescents with depression. In the present study, the incidence of NSSI in depressed patients is 59.46%, which is more consistent with the incidence reported in previous literature.[14] In addition, it has been suggested that the occurrence of NSSI shows a "female dominance" phenomenon.[15] This, however, was not reflected in this study due to the the small sample size. The effects of grades at school, early childhood parenting style, HAMD, and HAMA on the occurrence of NSSI in depressed patients have been reported in previous literature, and the findings of this study

are in greater alignment with prior research. While 2 ECRS scores as risk factors for the occurrence of NSSI have been rarely reported in previous studies.

The ECRS is commonly used for assessing adult attachment.[16-19] The findings of this investigation revealed a significant association between higher scores on both dimensions of ECR and an elevated risk of NSSI in individuals with depression. The concept of adult attachment introduced by Bowlby. It refers to the internalized representations of self and others that people develop in adulthood, which guide the daily behavior of self and others.[20] Poorer adult attachment not only leads to increased depression, but also makes depressed patients accompanied by more severe feelings of loneliness and low self-esteem which make patients have higher tendency to NSSI and even suicidal ideation.

In this study, the risk of NSSI in depressed patients with poor grades in school was 1.45 times higher than in those with good grades, while the risk of NSSI in those with poor grades could be increased to 1.73 times. School grades partially reflect the patient's understanding of objective matters and learning ability. Patients with higher academic achievement may have more positive coping attitude and more effective solutions when facing difficulties, which makes them better able to relieve their stress and reduce their bad mood. On the contrary, depressed patients with low education level, can only complain about themselves when facing difficulties or in difficult situations. However, complaining does not solve the problems they face, so they release their stress through self-harm.

In addition to the above factors, early childhood parenting style is also a risk factor for NSSI. The risk of NSSI is significantly lower in patients with parenting during early childhood than in those with parenting by others, which may be related to the fact that the presence of parents may give more care to individuals during their development.[21]

The investigation of risk factors associated with NSSI in depressed patients can only serve the purpose of retrospective intervention, whereas the development of prediction models for such patients can ascertain the propensity for NSSI in depressed individuals at an early stage. This enables effective interventions to be formulated by analyzing the risk factors possessed by these patients, thereby facilitating proactive intervention. The present study aimed to develop a predictive model for NSSI in individuals with depression, utilizing academic performance, early childhood parenting style, HAMD, HAMA, and 2 ECRS scores as independent variables. The results showed that the ECRS had the best sensitivity and specificity in predicting NSSI tendency in depressed patients, and it had

Table 4. Predictive Value of the Different Indicators for the NSSI

Category	Mean (SD)	AUC	P	Cutoff Value	Sensitivity (%)	Specificity (%)	95% CI
Grades at school	0.321 (SD = 0.05)	0.656	.011	0.26	72.8	46.7	0.163-0.524
Early childhood parenting style	0.284 (SD = 0.12)	0.594	.038	0.18	45.5	26.7	0.176-0.685
HAMD	0.428 (SD = 0.03)	0.826	.001	0.75	95.5	20.0	0.245-0.995
HAMA	0.266 (SD = 0.11)	0.670	.043	0.39	59.1	20.0	0.435-0.869
ECRS (Avoiding dimension)	0.539 (SD = 0.08)	0.967	<.001	0.82	91.8	70.5	0.532-0.998
ECRS (Anxiety dimension)	0.638 (SD = 0.07)	0.959	<.001	0.75	92.3	69.4	0.515-0.992

NSSI, Non-suicidal self-injury; HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Scale; ECRS, Experiences in Close Relationships Scale; SD, Standard Deviation; CI, Confidence Interval; AUC, Area Under Curve.

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some advantages compared to the models constructed in other literature.[22]

In conclusion, both adult attachment and parent–child attachment factors were used to assess the NSSI tendency in depression patients with good sensitivity and specificity. In addition, patient age and attachment relationship are risk factors for the occurrence of NSSI in depressed patients, and should be taken into account in clinical practice for high-risk groups with these risk factors. However, there are some limitations in this study, such as the limited number of participants and the inclusion of select impact factors, which need to be further improved in future studies.

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