Prevalence of and risk factors for non-suicidal self-injury in rural China: results from a nationwide survey in China

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Introduction

Non-suicidal self-injury (NSSI) is generally defined as destruction of bodily tissues without suicidal intent and for not-socially-sanctioned purposes, which is different from suicidal self-injury in terms of intention, lethality and frequency (Guertin et al., 2001). In 2013, NSSI has been included in section III under conditions that 'need further study' in the Fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5), and criteria were proposed (American Psychiatric Association, 2013). The common forms of NSSI include hitting, cutting, burning, banging, and scratching, but usually exclude overdose and self-poisoning (Jessica & Marc, 2015). The onset of NSSI in community population is in early adolescent, with an approximate median age of 13 or 14 years (Muehlenkamp et al., 2012).

The epidemiology of NSSI has been extensively studied in some western country in their nationwide longitudinal studies (Plener et al., 2015; Tuisku et al., 2014; Christoffersen et al., 2015), and self-reported life-time history of NSSI ranged from 7% to 66% among adolescents, which depending on the definition and the assessment tools used (Somer et al., 2015; Zetterqvist et al., 2013a; Tang et al., 2016). Yet in China, evidence for the prevalence of NSSI remains sparse and heterogeneous in some studies with small sample sizes (Zhang et al., 2016; Wan et al., 2015). Moreover, some previous studies involved clinical populations, could not distinguish NSSI behaviors between participants with and without suicidal intent, or used inconsistent criteria to define NSSI(You et al., 2012a; Wong et al., 2007). Evidence from well-designed studies with large sample size are needed to help better understand the epidemiology of NSSI in general adolescents in China.

Adolescent NSSI is a serious public health concern worldwide (Grandclerc et al., 2016). Previous studies have shown that NSSI is associated with a variety of co-morbid difficulties and inclined to develop into a severe symptomatology, although it is not lethality or low lithality (Scott, et al., 2015; Tang et al., 2013). For example, a prospective cohort study conducted in England showed that the risk of suicide was 0.7% over the next year among adolescents who engaged in NSSI, which was about 66 times more than the general adolescents, and the risk of suicide increased to 1.7%, 2.4% and 3% over the next 5 years, 10 years and 10 years, respectively (Hawton et al., 2015). Other studies also showed that NSSI increased the risk of suicidal ideation, suicidal attempts and other mental disorders (Paul et al., 2015; Jeremy et al., 2016). The latest report even stated that self-injury is the eight leading cause of death in the United states (Rockett et al., 2015). Thus, it is urgent to investigate the risk factors and develop preventive measures for NSSI.

Several factors have been reported associated with NSSI, those factors cover the health system, community and individual level (Abebaw et al., 2016). Aspect for

health system, health literacy and the availability of health care (Zhang et al., 2016; Goldney& Fisher, 2008)have been reported associated with NSSI, for example, Zhang et al have reported that low health literacy and psychological symptoms potentially increase the risk of non-suicidal self-injury in Chinese middle school student(Zhang et al., 2016). Aspect for community level, child abuse, stigma, discrimination, school bullying have also been reported to associate with NSSI (Swannell et al., 2016; Fisher et al., 2012; Lang & Sharma-Patel,2011). Some researchers hold that NSSI is a way of emotional regulation (Halina etal., 2015), thus psychological traits and and psychological process were deemed as the most important factors of NSSI, and low mood, insecure peer attachment, self-esteem, depression, impulsivity, aggression and etc have been reported associated with NSSI(Andrews et al., 2013; Bjarehed et al., 2012; Marshall et al., 2013). However, due to methodological issues, the associations between above factors and NSSI have not always drawn consistent conclusion, sometimes even a contradictory conclusion(Stallard et al., 2013; You et al., 2012b). Therefore, in this study, we aimed to conduct a nationwide survey in rural China to estimate the prevalence of NSSI defined by DSM-5 criteria A and to explore associations for NSSI in adolescent students. We hypothesized that there will be a relative higher prevalence of NSSI compared to prior data, and NSSI may be associated with neglect, maltreatment, loneliness, social support, emotional ability, resilience, even after taking into account some potential variables.

METHODS

Participants and settings

This study was based on a nationwide survey among grade 7 to 12 students in public high schools in rural China. We used a similar sampling method that conducted in our previous study (Zhang et al., 2012), to generate a diverse sample (see Figure 1). First, we selected five representative provinces according to geographic locations: Heilongjiang (northern), Anhui (eastern), Guangdong (southern), Yunnan (Western) and Hubei (central), in which a total of fifteen rural areas were sampled to reflect cultural and economic representativeness (Socioeconomic Investigation Division of the National Bureau of Statistics of China, 2008). Then, from all public high schools in these areas, a total sample of 45 schools was randomly chosen using random-number generator, including 27 junior high schools and 18 senior high schools. All participating schools provided consent to enroll in this study. Third, in the selected schools, we also use random digits to select 2 to 3 classes stratified by grade. All the students in the selected classes were recruited except for those who had severe

mental disorders (including schizophrenia, paranoid psychosis, bipolar disorder, etc), because students with those conditions may not suitable for this survey and we screen them under the cooperation of the head teacher and the health care doctor. Finally, written informed consents were sent to a total of 15,797 students or their guardians from a list of 323 classes to ask for their participation. There were 99 students who refused to participate or absent from school on the day of survey, and 75 who submitted an incomplete questionnaire with missing data of > 15%. In the end, there were 15,623 students with age range from 12 to 18 years old included for analyses, leading to a response rate of 98.9% (15,623/15,797).

This survey was conducted from 2014 to 2015 by a group of trained and experienced teachers and postgraduates. Before the survey, all students were informed of the purpose and procedures of the study in detail. The anonymous questionnaire survey required about 30-35 minutes for completeness. All participants finished the questionnaire independently. Discussion between students was not allowed in answering the questionnaire to avoid the potential contamination; however, the teachers and/or postgraduates were available to clarify students' confusions and questions about the questionnaire. All the double-entry data were confidentially kept and could only be used for scientific research.

The Ethical Committee of the Medical Association of Guangzhou Medical University and Huazhong University of Science and Technology approved the study.

Instruments

NSSI. The Chinese version of Functional Assessment of Self-Mutilation (CH-FASM) was used to assess the methods, frequencies and purposes of self-reported NSSI for the participants over the previous 12 months (Tang et al, 2014). It was presented in a checklist format and consisted of 8 types of NSSI behaviors include hitting, pulling hair, head banging, pinching, scratching, biting, burning and cutting. If the participant purposefully engaged in any form of those behaviors, the frequency and the severity (whether it caused bleeding or bruising) of occurrence were asked. In order to distinguish between NSSI and suicidal behaviors, participants were also asked about whether any of those behaviors was accomplished with intent of suicide. The CH-FASM has been demonstrated satisfactory psychometric properties, yielding an acceptable internal consistency with a Cronbach's α ranged from 0.76 to 0.81 (Tang et al., 2016). According to the criterion A in DSM-5, subjects who engaged in self-injury for ≥ five times during the last year was classified as NSSI, 1-4 times as pre-NSSI, and no self-injury behavior during the last year as non-NSSI, respectively (Tang et al., 2016).

Suicidal behaviors. The presence of suicidal ideation, suicidal plan and suicidal

attempt were assessed by using three questions based on the Composite International Diagnostic Interview (CIDI) (Kessler et al., 2004) referring to the past 12 months: "Did you ever seriously thought to suicide?", "Did you make a suicide plan?", and "Did you actually attempt suicide?", response options were "yes" or "no". These questions have demonstrated substantial reliability. The 2-week test-retest was 83.8% for suicidal ideation, 77.9% for suicidal plan and 76.4% for suicide attempts (Brener et al. 2001).

Neglect and Maltreatment. The neglect and maltreatment scale was used for assessing levels of neglect and maltreatment (mild, moderate and severe levels) for the participants over the past12 months, which was initially supplemented to the Conflict Tactics Scale for Parent and Child (CTSPC) developed by Straus (Straus et al., 1998). Participants were asked about "how many times the behavior was happen to you during the last 12 months" with 3-point Likert scale responses ranging from 0 (never happen) to 2 (happen more than once). According to the operational definition of neglect and maltreatment, adolescents who experienced one or more items described by CTSPC were denoted as experienced related neglect and/or maltreatment. Both the original version and Chinese version of this scale had an acceptable reliability (Esmaeili et al., 2014; Cui & Liu, 2016). The Cronbach's α in the current study sample was 0.81.

Loneliness Scale. Loneliness was measured using the revised version of the Loneliness Scale developed by Zou, which contained 21 items in total (Lu et al., 2015). Each item was assessed on a 5-point Likert scale from "not meet at all" to "fully compliance". Higher total scores on the scale represent a greater loneliness. The Cronbach's α for the current study was 0.76.

The Resilience Scale for Chinese Adolescent (RSCA). This 27-item RSCA was used to evaluate resilience among adolescents (Hu &Gan, 2008). Each item was rated on 5-point Likert scale from "not meet at all" to "fully compliance", with higher total scores indicating better psychological resilience. The Cronbach's α within the present study sample was 0.87.

Social Support Scale. The social support scale contained 17 items that covered three dimensions: subjective support, objective support and availability of support (Ye & Dai, 2008). Each item is assessed on a 5-point Likert scale from "not meet at all" to "fully compliance", with higher total scores indicating better social support. This scale has been demonstrated good internal consistency (α=0.83~0.89) among adolescent samples (Hinz et al., 2016). The Cronbach's α for the current study was 0.85.

Emotional Management Ability. The emotional management ability was assessed by a subscale of the Emotional Intelligence Inventory (EII) (Goleman, 1995). It included 4 items with 4-point Likert scale responses ranging from 1 (always like this) to 4 (never like this). Higher total scores represented greater emotional management ability. The scale showed acceptable internal consistency in a previous

study (Tang et al. 2013) and in present study (α=0.83).

Other variables. We used an additional questionnaire to collect a wide range of social, family and school variables from the adolescents: family structure (extended or nuclear family, single-parent family, grandparent family, reconstituted family, joint family, or others), parents' education (junior high school degree or below, senior high school degree, or college degree and above), one-child family (yes, or no), parenting style (strict, democracy, spoiled, indifference, or brutal) , perceived family income (high, average, or low), perceived relationship with teachers and classmates (good, fair, or poor), academic performance (good, fair, or poor), our previous study have shown the test-retest reliability of the question is 0.83 (Zhang et al,. 2012).

Statistical analysis

Statistical analyses were conducted by using SPSS for windows 17.0 (SPSS Inc., Chicago, IL). The Chi-square test was applied to compare characteristics of study subjects who were categorized as NSSI, pre-NSSI and non-NSSI. The average scores of those scales across groups of NSSI, pre-NSSI and non-NSSI were compared using Analysis of Variance (ANOVA). Multinomial logistic regression analysis was conducted to examine the psychological factors associated with NSSI after adjusting for provinces, sociodemographic, economic, in which all the covariates in the multivariable model had a variance inflation factor of < 4 to avoid multicollinearity.

In order to better understanding of the effect size of those variables, we transferred the continuous variables into categorical variables in the multinomial logistic analysis. The scores of loneliness scale, RSCA, social support, emotional management ability were categorized into 3 levels: high (higher than mean + one standard deviation [SD]), average (between mean + one SD and mean – one SD), and low (lower than mean – one SD).

Odds Ratios (ORs) and 95% confidence intervals for all the risk factors were calculated to present the associations. No imputation was conducted for missing data because all the data were missing < 5%. The significance level was set at 0.05, and all the tests were two-sided.

Results

A total sample of 15,623 students (8043 boys and 7580 girls) were included for analyses, with a mean age of 15.2 (SD=1.8) years. About 90.7% of the participants were the Han nationality. There were 12.2% (n=1908) students who reported engaging in self-injury five times or more during the last year and therefore met the diagnoses of NSSI according to DSM-5 criteria A. 4559 (29.2%) participants reported engaging in self-injury at least once during the last year. Table 1 showed the prevalence rate of NSSI, pre-NSSI and non-NSSI by baseline characteristics. Gender

difference on prevalence rate of NSSI, pre-NSSI and non-NSSI were significantly ($P=0.002$), indicating a trend for higher risk of NSSI in girls. Significant differences were also found between the Han and minority ethnic ($P<0.001$), being the only child in the family or not ($P<0.001$), different family structure ($P=0.001$), parents' education levels (father: $P=0.001$; mother: $P=0.003$), and parenting styles ($P<0.001$).

Tables 2 and 3 showed the prevalence and frequencies of the eight NSSI behaviors in the study participants, respectively. The top three NSSI behaviors among adolescents with NSSI experience were hitting self, pinching, and pulling hair, with a prevalence rate of 16.7%, 14.1% and 11.2%, respectively. Gender differences were found in prevalence rates of pulling hair ($P<0.001$), head banging ($P<0.001$), cutting ($P<0.001$), but not hitting self ($P=0.069$). Among the students who were diagnosed with NSSI, 84.4% of the self-injuries reported engaging in one to five different forms of NSSI, with the mean number of 3.7 (SD=1.8).

Table 4 showed the associations between NSSI and neglect, maltreatment, loneliness, resilience, social support and emotional management ability. Participants who reported NSSI or pre-NSSI during the past 12 months before the survey were more likely to experience neglect and/or maltreatment. Compared with non-NSSI, the ORs for NSSI were 2.58 (95% CI: 2.29~2.91) with neglect and 2.66 (95% CI: 2.40~2.94) with maltreatment, and for pre-NSSI 2.20 (95% CI: 1.99~2.43) with neglect and 1.97 (95% CI: 1.81~2.15) with maltreatment, respectively. Similarly, participants who reported NSSI or pre-NSSI had significantly higher scores on loneliness, resilience, social support and emotional management ability than non-NSSI, with a significant trend of dose-response relationship between scores and frequencies of NSSI (P < 0.001).

Table 5 presented results of multivariable logistic regression analyses for risk factors for NSSI. In Model A where NSSI and Pre-NSSI were regressed on only sociodemographic and economic factors, results showed that sex, being the only child in the family, father's education level and parenting were significantly associated with risks of NSSI and pre-NSSI, while no significant differences were found in PEI, grade and mothers' education level. In Model B where only psychological factors were included, neglect, maltreatment, loneliness, social support, and emotional management ability were significantly associated with NSSI and pre-NSSI, in which loneliness (for NSSI, OR=3.13 for high vs. low; OR = 1.86 for average vs. low) and emotional management ability (for NSSI, OR =0.29 for high vs. low; OR = 0.50 for average vs. low) presented the strongest associations. However, no significant relationship was found between resilience and NSSI and pre-NSSI. In Model C, NSSI and Pre-NSSI were regressed on socio-demographic, economic and psychological factors, and the results are consistent with those in Models A and B.

Discussion

To our best knowledge, this study was the first to assess the prevalence of NSSI defined by DSM-5 criteria A among rural adolescents in China. We found that 12.2% of the adolescent students met the criteria A, and 29.2% reported having engaged in self-injury at least once during the last year. Female, minor ethnicity, being the only one child in the family, father's education, neglect, maltreatment, loneliness, social support and emotional management ability were found to be significantly related with NSSI.

So far, no uniform definition of NSSI was used by most researches, which would obstacle to assess the prevalence of NSSI in a uniform or accepted way. Previous studies reported prevalence of NSSI varying from 5%~37% among adolescent (Plener et al., 2015). In the current study, we used Criterion A to assess NSSI and observed the NSSI prevalence rate of 12.2% among rural adolescents in China, which was lower than a previous study conducted in Sweden (Zetterqvist&Lundh et al., 2013), higher than a Poland study (Halina et al., 2015), and similar to a study conducted in Hong Kong (Cheung et al., 2013). Compared with studies that assessed with criteria proposed by DSM-5, for example, Halina et al reported a prevalence range from 4~9% for adolescents, the prevalence in current study was slighter higher (Plener et al., 2014). Anyhow, NSSI is becoming a rising serious public health problem for adolescents, thus more efforts and interventions were needed urgently to prevent and manage NSSI (Skegg K, 2005).

We found a higher prevalence rate of NSSI among females than males, which was consistent with some previous studies (Plener, 2016; Zetterqvistet al., 2013). For example, Zetterqvist et al also reported that the prevalence of NSSI among males was 31.4%, which is significantly lower than females (39.8%) (Zetterqvistet al., 2013). However, other studies showed no gender differences existed (Goldney., 2008). Differences in the reported findings may be partly due to the limited range of behaviors measured, and some NSSI behaviors were easy to perform by females (Hawton et al., 2006). In the present study, we also found that cutting, biting, scratching, pinching were more common forms of self-injury among females, while burning, head banging and pulling hair were more likely in males. In order to drawn a generally accepted conclusion, the types of NSSI behaviors should be unified in different studies, and/or each type of NSSI behaviors should be studied separately in future study. Some other epidemiologic features of NSSI in the present study including ethnicity (Kuentzel et al., 2012), religion and being the only one child (Turner et al. 2015), were also inconsistent with previous studies, which may also, at least partly due to heterogeneity of samples and measurement tools of NSSI used

(Tang et al., 2013).

Results from our survey were in agreement with previous studies regarding most of risk factors for NSSI among adolescent population (Grandclerc et al., 2016; Scott et al., 2015; Tuisku et al., Wan et al., 2015). For example, Plener et al drew a conclusion based on 32 longitudinal studies, that predictor cited most often was previous NSSI, followed by depression, female gender, and psychological distress (Plener et al.,2015). Wan et al also reported that experiencing any forms of childhood abuse should be considered a risk factor for NSSI during adolescence (Wan et al., 2015). Besides, our previous studies found that emotional management ability, coping style and suicidal behaviors may impact the risk of NSSI (Tang et al., 2016; Tang et al, 2011). This is potentially consistent with the models of NSSI for which psychological or self-regulatory factors are considered as proximal and central to self-injury, while social or environmental factors are deemed as more distal factors (Chapman et al., 2006; Nock & Cha, 2009).

It is general to believe that family relationship is a very important factor associated with NSSI. Parental conflict and parent-child conflict were a typical negative factor to cause psychological problems of teenagers, such as internet addictive, aggression behaviors and sleep problems. Neglect and maltreatment as common parent child conflict, has also been reported to associate with risky behaviors (Kelly & EI-Sheikh, 2011; Sarah et al., 2012). Sarah et al reported that the association between NSSI with physical abuse was even stronger than that with sexual abuse (Messer &Fremouw, 2008). Similarly, in our study, we found that the association between NSSI with severe maltreatment was stronger than that with moderate and mild maltreatment in risk of NSSI (see Supplementary Table 1).

In present study, adolescents with higher levels of loneliness were found to be more likely to engage in NSSI. Moreover, after adjusting for the effects of loneliness and other demographic variables, adolescents with higher levels of social support were less likely to experience NSSI than those with lower levels of social support. However, the relationship between loneliness or social support and NSSI was complex and remained further explored. Some longitudinal study was also mixed on whether loneliness or other distress were predictive of NSSI over time, because those variables may change over time or they may concur with NSSI (Stallard et al., 2013).

Unlike previous studies (Jessica et al., 2015), our results showed that in Chinese adolescents, the level of resilience was not significantly associated with NSSI, several reasons may contribute for this. First, resilience was the ability of an individual to withstand stressors and not to manifest psychological dysfunction (Herrman et al., 2011), thus poor resilience may increase the risk of psychological disorders. Second, theoretically, engaging in NSSI lowers personal coping resources as the behavior

becomes habitual, while resilience is a developmental ability with environment change (Rutter, 2006). It is important to note that, although the effects of resilience did not reach the significance level in a multivariate context, the effect on emotional regulation and loneliness of resilience may be substantial (Xi et al., 2013).

In line with our previous study (Tang et al., 2013), the results in the current study indicated that emotional management ability was significantly associated with NSSI. In fact, most of the abnormal behaviors among adolescents could partly be interpreted by low level of emotional management ability, such as internet addictive, aggression, and NSSI (Gomes et al., 2009; Weding& Nock 2007). However, the effectiveness of different behaviors is not the same; when one abnormal behavior cannot be effectively regulated by one's emotion, the other behavior may appear and repeat frequently. Therefore, adolescents who engaged in NSSI as a way of emotional regulation will give it up, when their emotional regulation ability enhanced. Nevertheless, more evidence for further understanding of context of the NSSI occurrence, improving access to healthcare utilization, and clarifying the role of psychosocial factors and family relationship, is warranted for the prevention and management of NSSI.

Several limitations exist in the current study. Firstly, although this survey was conducted using a larger sample size, the participant only includes rural adolescent, which may limit the generalizability of our findings. Secondly, Some of the behaviors in CH-FASM would perhaps not result in bleeding, bruising which is stated in criterion A, therefore we did not assess bleeding or bruising of all the NSSI behavior, besides, we only assess 8 types of NSSI mentioned in FASM, both of which could result in different rates compared to another questionnaire. Using other criteria and other questionnaire to assess NSSI for further investigation would be a worthwhile endeavor in future studies. Thirdly, the present study did not incorporate all the factors when assessing the correlates of NSSI, such as depression, thus may lead to spurious associations and/or underestimate of strength of those association. Moreover, the cross-sectional design in this survey cannot fully prevent potential biases including confounding, resulting in the uncertain causal relationship between risk factors and NSSI.

Conclusion

Our study reported a substantial prevalence of NSSI in rural Chinese adolescents. More evidence for further understanding of context of the occurrence, improving access to healthcare utilization, and identifying the role of psychosocial factors and family relationship, is needed for the prevention and management of NSSI.

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Table 1. Characteristics of study population by NSSI, pre-NSSI and non-NSSI (N=15,623)

Variables		NSSI			Total Sample	χ^2/F	P
		NSSI (≥5) (N=1908)	Pre-NSSI (1~4) (N=2651)	Non-NSSI (N=11064)			
Age		15.1±1.8	15.0±1.9	15.2±1.8	15.1±1.8	8.368	<0.001
Gender	male	951(49.8)	1296(48.9)	5796(52.4)	8043(51.5)	12.819	0.002
	female	957(50.2)	1355(51.1)	5268(47.6)	7580(48.5)		
Grade	Junior high school	1048(54.9)	1416(53.4)	5872(53.1)	8336(53.4)	2.251	0.325
	Senior high school	860(45.1)	1235(46.6)	5192(46.9)	7287(46.6)		
Ethnicity	Han	1644(86.2)	2444(92.2)	10075(91.1)	14163(90.7)	54.976	<0.001
	Minority	264(13.8)	207(7.8)	989(8.9)	1460(9.3)		
Being the only child in the family	yes	599(31.4)	854(32.2)	3958(35.8)	5411(34.6)	22.051	<0.001
	no	1309(68.6)	1797(67.8)	7106(64.2)	10212(65.4)		
Family Structure	nuclear family	1165(61.1)	1682(63.4)	7240(65.4)	10087(64.6)	22.754	0.001
	Single-parent family	120(6.3)	117(4.4)	531(4.8)	4464(28.6)		
	Reconstituted family	44(2.3)	58(2.2)	202(1.8)	304(1.9)		
	Joint family	579(13.0)	794(30.0)	3091(27.9)	4464(28.6)		
Father's educational level	High school degree or below	1704(89.3)	2426(91.5)	10176(92.0)	14306(91.6)	14.995	0.001
	College degree or above	204(10.7)	225(8.5)	888(8.0)	1317(8.4)		
Mother's educational level	High school degree or below	1766(92.6)	2515(94.9)	10425(94.2)	14706(94.1)	11.343	0.003
	College degree or above	142(7.4)	136(5.1)	639(5.8)	917(5.9)		
Parenting Style	strict	594(31.1)	786(29.6)	3427(31.0)	4807(30.8)	54.917	<0.001
	democracy	890(46.6)	1320(49.8)	5805(52.5)	8015(51.3)		
	spoiled	424(22.2)	545(20.6)	1832(16.5)	2801(17.9)		

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Perceived family income	High	274(14.4)	369(13.9)	1606(16.6)	2249(14.4)		
	average	1319(69.1)	1890(71.3)	7895(71.4)	11104(71.1)	8.195	0.085
	low	315(16.5)	392(14.8)	1563(14.1)	2270(14.5)		

Table 2 The prevalence rates of the eight forms of NSSI behaviors in the study population （N=15623）

Forms of NSSI	Total prevalence	Male prevalence	Female prevalence	χ^2	P
Hitting self	2604(16.7)	1384(17.2)	1222(16.1)	3.312	0.069
Pulling hair*	1747(11.2)	1008(12.5)	739(9.7)	31.078	<0.001
Head banging*	1290(8.3)	728(9.1)	562(7.4)	13.806	<0.001
Pinching*	2210(14.1)	896(11.1)	1314(17.3)	123.313	<0.001
Scratching*	938(6.0)	436(5.4)	502(6.6)	9.988	0.002
Biting*	1091(7.0)	416(5.2)	675(8.9)	83.709	<0.001
Burning*	246(1.6)	150(1.9)	96(1.3)	9.019	0.003
Cutting*	917(5.9)	392(4.9)	525(6.9)	29.749	<0.001

Note: * p<0.05

Table 3 The frequencies distribution of the eight NSSI behaviors among the study participants

Forms of NSSI	Non-NSSI* (n, %)	NSSI (n, %)	
		pre-NSSI (1-4)	NSSI (≥5)
Hitting self	13017(83.3)	2203(14.1)	401(2.6)
Pulling hair	13876(88.8)	1449(9.3)	298(1.9)
Head banging	14333(91.7)	1141(7.4)	148(0.9)
Pinching	13412(85.8)	1810(11.6)	401(2.6)
Scratching	14685(94.0)	812(5.2)	126(0.8)
Biting	14531(93.0)	941(6.1)	151(0.9)
Burning	15377(98.4)	240(1.6)	6(0.04)
Cutting	14706(94.1)	806(5.2)	110(0.7)

*Non-NSSI defined as with a frequency of 0 for all the behaviors

Table 4 Association between NSSI and psychological factors in univariate analysis (N=15623)

Psychological factors		Frequencies of NSSI			χ^2/F	P
		NSSI (≥5)	Pre-NSSI (1~4)	Non-NSSI		
Neglect (n,%)	Yes	1543(80.9)	2075(78.3)	6871(62.1)	439.211	<0.001
	No	365(19.1)	576(21.7)	4193(37.9)		
Maltreatment(n,%)	Yes	1240(65.0)	1537(58.0)	4552(41.1)	528.601	<0.001
	No	668(35.0)	1114(42.0)	6512(58.9)		
Suicidal ideation	Yes	865(45.3)	653(24.6)	972(8.8)	1082.73	<0.001
	No	1043(54.7)	1998(75.4)	10092(91.2)		
Suicidal Plan	Yes	526(27.6)	300(11.3)	427(3.9)	1287.0	<0.001

	No	1382(72.4)	2351(88.7)	10637(96.1)	3	
Suicidal attempts	Yes	204(1.8)	157(5.9)	331(17.3)	940.91	<0.001
	No	10860(98.2)	2494(94.1)	1577(82.7)		
Loneliness(M±SD)		54.4±10.9	51.2±9.8	48.4±9.6	334.884	<0.001
Resilience(M±SD)		87.5±12.1	90.4±12.3	93.1±13.0	181.552	<0.001
Social support(M±SD)		57.6±14.6	60.9±13.8	64.6±14.0	239.666	<0.001
Emotional Management ability(M±SD)		10.2±2.8	10.9±2.7	11.8±2.6	409.426	<0.001

Table 5 Association between NSSI and psychological factors in multinomial logistic regression
(N=15623)

Group [a]	Variables	Model A	Model B OR(95%CI)	Model C OR(95%CI)
NSSI (≥5)	Gender (male Vs. female)	0.84(0.73~0.95)[#]	----	0.87(0.79~0.97)[#]
	Grade(junior vs. senior)	1.09(0.98~1.20)	----	1.05(0.95~1.17)
	Nationality (Han vs. Minority)	0.63(0.54~0.73)[#]	----	0.64(0.55~0.75)[#]
	One-child family (yes vs. no)	0.77(0.69~0.86)[#]	----	0.83(0.74~0.94)[#]
	PFI(good vs. poor)	0.87(0.73~1.05)	----	0.83(0.68~1.01)
	PFI(fair vs. poor)	0.90(0.78~1.03)	----	0.91(0.78~1.06)
	Father's education(high school vs. college)	0.70(0.57~0.86)[#]	----	0.62(0.49~0.77)[#]
	Mother's education (high school vs. college)	0.88(0.69~1.12)	----	0.93(0.71~1.20)
	Parenting (strict vs. spoiled)	0.70(0.61~0.81)[#]	----	0.86(0.67~1.11)
	Parenting (democracy vs. spoiled)	0.64(0.57~0.73)[#]	----	0.96(0.80~1.05)
	Neglect (Yes vs.no)	----	1.54(1.35~1.75)[#]	1.54(1.35~1.76)[#]
	Maltreatment (yes vs. no)	----	1.94(1.73~2.17)[#]	1.99(1.78~2.23)[#]
	Loneliness (high vs. low)	----	2.48(1.97~3.12)[#]	2.45(1.94~3.08)[#]
	Loneliness (average vs. low)	----	1.74(1.42~2.14)[#]	1.73(1.41~2.13)[#]
	Resilience (high vs. low)	----	1.06(0.85~1.32)	1.04(0.93~1.29)[#]
	Resilience (average vs. low)	----	1.13(0.97~1.29)	1.11(0.96~1.28)
	Social support(high vs. low)	----	0.51(0.41~0.64)[#]	0.50(0.40~0.63)
	Social support(average vs. low)	----	0.80(0.67~0.93)[#]	0.79(0.67~0.92)[#]
	EMA(high vs. low)	----	0.35(0.27~0.45)[#]	0.35(0.27~0.46)[#]
	EMA(average vs. low)	----	0.59(0.52~0.68)[#]	0.59(0.52~0.68)[#]
	Suicidal ideation (yes vs. no)	----	3.96(3.41~4.61)[#]	3.91(3.36~4.55)[#]
	Suicidal plan (yes vs. no)	----	1.61(1.31~1.99)[#]	1.62(1.31~2.01)[#]
	Suicidal attempt (yes vs. no)	----	2.33(1.81~3.02)	2.33(1.80~3.01)[#]
	Intercept	-0.41	-2.78	-2.02
Pre-NSSI (1~4)	Gender (male Vs. female)	0.88(0.80~0.95)[#]	----	0.85(0.77~0.93)
	Grade(junior vs. senior)	1.02(0.93~1.11)	----	1.00(0.92~1.10)
	Nationality (Han vs. Minority)	1.16(0.99~1.36)	----	1.19(1.01~1.40)
	One child (yes vs. no)	0.86(0.78~0.95)[#]	----	092(0.83~1.01)
	PFI(good vs. poor)	0.93(0.79~1.09)	----	0.94(0.80~1.11)
	PFI(fair vs. poor)	0.97(0.86~1.10)	----	0.99(0.87~1.13)
	Father's education(high school vs. college	0.78(0.65~0.94)[#]	----	0.74(0.61~0.90)[#]
	Mother's education (collegevs. high school)	1.22(0.97~1.53)	----	1.24(0.98~1.56)
	Parenting (strict vs. spoiled)	0.76(0.67~0.86)[#]	----	0.85(0.75~0.96)[#]
	Parenting (democracy vs. spoiled)	0.75(0.67~0.84)[#]	----	0.82(0.81~1.03)
	Neglect (Yes vs.no)	----	1.63(1.47~1.81)[#]	1.61(1.45~1.79)[#]
	Maltreatment (yes vs. no)	----	1.58(1.44~1.73)[#]	1.62(1.47~1.77)[#]
	Loneliness (high vs. low)	----	1.46(1.23~1.75)[#]	1.66(1.39~1.97)[#]

Loneliness (average vs. low)	----	1.36(1.17~1.57)#	1.47(1.23~1.76) #
Resilience (high vs. low)	----	1.09(0.96~1.24)	1.08(0.91~1.29)
Resilience (average vs. low)	----	1.10(0.92~1.31)	1.08(0.95~1.22)
Social support(high vs. low)	----	0.66(0.55~0.80)#	0.65(0.54~0.79) #
Social support(average vs. low)	----	0.93(0.81~1.09)	0.93(0.80~1.08)
EMA(high vs. low)	----	0.43(0.35~0.53)#	0.45(0.36~0.55) #
EMA(average vs. low)	----	0.78(0.68~0.88)#	0.78(0.69~0.89) #
Suicidal ideation (yes vs. no)	----	2.52(2.19~2.90) #	2.50(2.17~2.88) #
Suicidal plan (yes vs. no)	----	1.21(0.97~1.49)	1.21(0.97~1.50)
Suicidal attempt (yes vs. no)	----	1.67(1.27~2.20) #	1.68(1.27~2.21) #
Intercept	-1.15	-2.13	-1.92

Note: a= the reference category is: no NSSI; EMA=Emotional Management ability; PFI=perceived family income, # $p<0.05$