Alpha Psychiatry

SYSTEMATIC REVIEW
Alpha Psychiatry 2024;25(2):150-164
DOI: 10.5152/alphapsychiatry.2024.231139

# Understanding the Impact of Adverse Childhood Experiences on Non-suicidal Self-Injury in Youth: A Systematic Review

## ABSTRACT

**Objective:** Non-suicidal self-injury (NSSI), defined as a deliberate destruction of one's own body without a suicidal intent, is a global public health issue. Adverse childhood events (ACEs) have been shown to be associated with various mental illnesses; however, to date the impact of such events on NSSI in youth has not been reviewed.

**Methods:** We conducted a systematic review, searched 5 databases for published articles evaluating ACE and NSSI in youth less than or equal to 21 years of age. After screening 247 articles, we included 21 unique articles in this systematic review.

**Results:** Increasing ACE score, physical, sexual or emotional abuse, parental neglect and substance use, parental separation or dysfunctional family, and death of a close family member had statistically significant correlation with NSSI.

**Conclusion:** Non-suicidal self-injury is an impairing diagnosis with far reaching psychiatric manifestations and repercussions. Practitioners having high clinical suspicion for ACEs in youth with NSSI must intervene early by administering the ACEs questionnaire. Effective treatment of NSSI in those with ACEs with psychotherapy significantly improves outcomes and prevents suicide in youth.

**Keywords:** Adverse childhood experiences, non-suicidal self-injury, systematic review, youth

Sadia Suhail Usmani[1,*]
Meghana Mehendale[2,*]
Mahnoor Yousif Shaikh[3]
Sourav Sudan[4]
Prathima Guntipalli[5]
Lara Ouellette[6]
Anem Sajid Malik[7]
Naila Siddiqi[8]
Namrata Walia[9]
Kaushal Shah[10,11,12]
Fahimeh Saeed[13]
Domenico De Berardis[14]
Sheikh Shoib[15,16,17]

[1]*Department of Internal Medicine, Insight Hospital and Medical Center, Chicago, IL, USA*
[2]*Department of Psychiatry, Smolensk State Medical University, Smolensk Oblast, Russia*
[3]*Department of Psychiatry, Dow University of Health Sciences, Karachi, Sindh, Pakistan*
[4]*Department of Internal Medicine, Government Medical College, Baskshi Nagar, Jammu, Jammu and Kashmir, India*
[5]*Department of Internal Medicine, Texas Woman's University, Southwestern Medical Ave., Dallas, TX, USA*
[6]*Department of Psychiatry, Texas Medical Center Library, Houston, TX, USA*
[7]*Department of Internal Medicine, King Edward Medical University, Nila Gumbad Chowk, Neela Gumbad, Lahore, Punjab, Pakistan*
[8]*Department of Psychiatry, University of Toronto, Toronto, Canada*
[9]*Department of Psychiatry, University of Texas Health Sciences Center, Houston, TX, USA*
[10]*Department of Psychiatry, Wake Forest University School of Medicine Program, Winston-Salem, NC, USA*
[11]*Department of Psychiatry, Oklahoma State University, Tulsa, OK, USA*
[12]*Department of Psychiatry, Griffin Memorial Hospital, Norman, OK, USA*
[13]*Department of Psychiatry, Psychosis Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran*
[14]*Department of Psychiatry, ASL 4 Teramo, Teramo, Italy*
[15]*Department of Psychiatry, DH Pulwama, Kashmir, India*
[16]*Department of Psychiatry, Sharda University, Greater Noida, Uttar Pradesh, India*
[17]*Department of Psychiatry, Mind wellness Center, Nawab Bazar Srinagar, India*

## Introduction

Non-suicidal self-injury (NSSI) in adolescents is a growing public health concern.[1] It represents one of the strongest predictors of future suicidal behavior in both inpatient and general populations.[2] Non-suicidal self-injury is defined as an intentional injury to one's own body without suicidal intent. Common forms of self-injury include but are not limited to cutting, hitting, burning, scratching, and banging.[3] According to the research, men are more likely to use hitting or burning as a form of NSSI, whereas women are more likely to use cutting. Non-suicidal self-injury typically manifests between the ages of 13 or 14 and is most prevalent among adolescents and young adults with lifetime rates of 15%-20%.[3] As per the national survey data from 2015, 18% of US high school students had engaged in NSSI at least once in the previous year, and 6% had engaged 6 or more times.[4] An estimated 10% of the worldwide population engages in NSSI behavioral patterns.[5]

According to the US data from 2001 to 2015, self-injury-related hospitalization rates changed drastically, with an increase of more than 130% for ages 10-14 and 47% for ages 15-19.[6] As per the 2018 data released by the Center for Disease Control and Prevention, there were approximately 312,000 hospitalizations due to self-injurious behaviors (i.e., attempted suicide and NSSI). Despite such roaring numbers of self-injury-related hospitalizations, it only accounts for an estimated 50% of individuals who inflict self-harm.[7]

Non-suicidal self-injury was added to the Diagnostic and Statistical Manual of Mental Disorders, (DSM-5), after years of research that distinguished it from other types of suicidal behaviors.[8]

Copyright@Author(s) - Available online at alpha-psychiatry.com.
Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Early adolescent NSSI may foster the development of psychiatric conditions such as anxiety disorders, depression, and eating disorders.[9,10] Non-suicidal self-injury may also lead to strained relationships between children and their parents, compromising healthy communication and, as a result, encouraging more severe mental health consequences.[11,12] Individuals engaging in NSSI may fall victim to a negative spiral of thoughts, including suicidal ideation, which may drive them to take their own lives.[13] Non-suicidal self-injury is thought to increase suicide attempts by 30 fold.[14] The occurrence of high NSSI rates among young adults emphasizes the importance of discerning the risk factors for this behavior.[8]

Amongst various reasons why people engage in self-injury, the most common is the transient elevation of overwhelmingly negative emotions right before performing NSSI, which culminates in a sense of calm and relief with a decrease in negative emotions after performing the act.[3] Moreover, research by Klonsky et al[3] also suggests that there is a causal relationship between self-criticism and NSSI since people have also reported self-harm as a form of self-punishment or self-directed anger, and in a minority of cases, self-harm is used as a tool to influence others or create a sign of physical distress. It was discovered that shame could also be a variable in predicting NSSI-related behaviors through association with NSSI predictors like body esteem and loneliness, and adverse caregiving experiences.[15] Mahtani et al[15] further uncovered that these children and adolescents form a shame-based schema where they experience increased proneness to shame when exposed to constant abuse, neglect, and/or invalidated relational experiences. Moreover, these children develop maladaptive shame coping responses when faced with decreased opportunities to openly recognize and regulate shame in the setting of adverse caregiving environments. The internalizing maladaptive shame-coping directly leads to NSSI or through developing psychological stress indirectly.

Adverse childhood experiences (ACEs) are potentially traumatic events that occur in childhood (between the ages of 0-17 years). These include but are not limited to experiencing violence, abuse, or neglect, witnessing violence in the home or community, or having a family member attempt or die by suicide.[16] Also included are aspects of the child's environment that can undermine their sense of safety, stability, and bonding, such as growing up in a household with substance use problems, mental health problems, instability due to parental separation or household, and members being in jail or prison.[16] As per the National Survey of Children's Health 2016 data, in the US, 46.3% of all children and 55.7% of adolescents aged 12-17 years have had at least 1 abuse or neglect-related ACE.[17] Early childhood experiences lay the foundation for a child's learning, forming interpersonal relationships, social growth, problem-solving skills, etc., and hence encountering childhood adversities can leave a long-lasting impact on their current and future lives, giving rise to health issues such as chronic diseases, mental illnesses, and functional limitations.[18]

NSSI is a neglected and less talked about public health problem associated with a substantial population-level burden on youth that poses a great public health challenge for youth-serving clinicians and health systems. NSSI and ACEs have both been strongly associated with suicidality. ACEs are an established risk factor for other psychiatric disorders, and this systematic review will explore the relationship between different types of ACEs and their impact on NSSI in depth.

## Methods

### Search Strategy

This systematic review aimed to assess the relationship between NSSI and ACEs. A comprehensive literature search was conducted to include original research studies examining the described relationship in children or young adolescents less than or equal to 21 years of age. Systematic or other types of review articles and letters to editors were not included in the results. Studies published in languages other than English were excluded as well. The review was conducted using databases

### MAIN POINTS

- *This study tried to review the impact of adverse childhood experiences (ACE) on non-suicidal self-injury (NSSI).*
- *Increasing ACE score, physical, sexual, or emotional abuse, parental neglect and substance use, parental separation or dysfunctional family, and death of a close family member had a statistically significant correlation with NSSI.*
- *This study suggested controlling ACE may prevent NSSI in adulthood.*

*Dr. Sadia Usmani and Dr. Meghana Mehendale have contributed equally to the manuscript as first authors.

**Corresponding author**:
Fahimeh Saeed
✉ Fa.saeed@uswr.ac.ir

**Received:** January 27, 2023
**Revision Requested:** May 9, 2023
**Last Revision Received:** January 9, 2024
**Accepted:** January 24, 2024
**Publication Date:** April 24, 2024

**Cite this article as**: Suhail Usmani S, Mehendale M, Yousif Shaikh M, et al. Understanding the impact of adverse childhood experiences on non-suicidal self-injury in youth: A systematic review. *Alpha Psychiatry.* 2024;25(2):150-164.

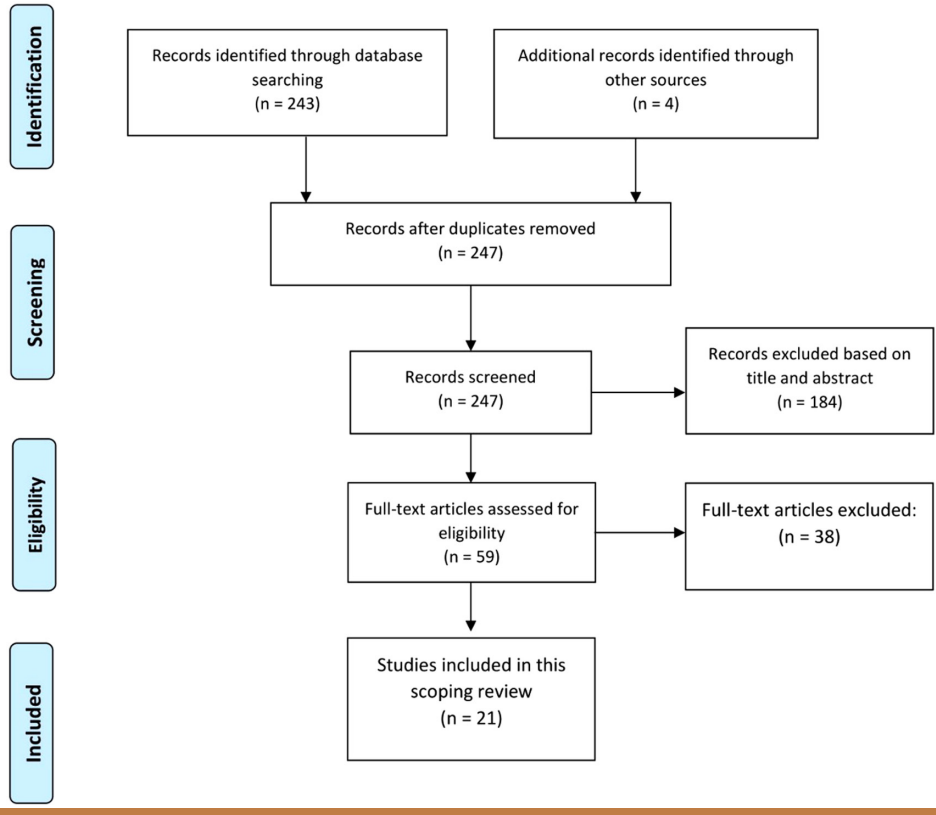



**Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.**

including Medline Ovid, Embase, PubMed, Scopus, and PsycINFO. The search methodology included keywords such as adolescent*, children*, Deliberate Self-Harm, Non-suicidal Self Injury, adverse experience*, childhood experiences, and trauma*. A manual search was also conducted to include additional articles if any. There were no articles found in the gray literature.

This study was guided by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement.

### Study Selection

The screening of the articles by title and abstract was independently conducted by 2 reviewers and verified by the lead authors. In the next step, articles were selected by full text and according to inclusion and exclusion criteria. In case of any disagreement, it was resolved by the reviewer or via a consensus-based discussion. The data extraction from the final subset of articles was conducted by using a data extraction template.

The comprehensive search across the various databases yielded a total of 247 manuscripts. After eliminating the duplicates and screening the abstracts, 59 articles were reviewed. A total of 21 studies met our eligibility criteria and were included in this review. Figure 1 describes the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of the multiple steps involved in the selection process.

### Data Extraction

The data extraction from the final subset of articles was conducted by (S.U., M.M., S.S.) reviewers using a data extraction template. The data being extracted included the name of authors, year of publication, sample size and demographic characteristics of the study participants, validated surveys used to collect data, and results of the reported association between adverse experiences and the outcomes.

## Results

In this systematic review, after a thorough literature search, we studied the relationship between different types of ACEs and NSSI in depth. We found 21 original observational studies. The characteristics of included studies are listed in Table 1. The qualitative synthesis of key findings is presented below.

### Gender and Sex Differences

The likelihood of females engaging in NSSI was 2.43 times greater than that of males [adjusted odds ratio (AOR) = 2.43, 95% confidence interval (CI) = 1.92-3.06] in a study by Baiden et al,[19] of 2038 participants. Similarly, in the study by Li et al,[20] which included 1810 participants, more females were found to have engaged in NSSI than males (AOR = 1.592, 95% CI = 1.021-2.482). However, a study by Carbone et al,[21] concluded that exposure to more than 3 ACEs showed a significantly increased probability of NSSI in males (AOR = 13.72) compared to females (AOR = 3.84). The difference in the odds of engaging in NSSI on exposure to an increasing number of ACEs was significantly higher in males, $P < .05$. On the contrary, Meeker et al,[22] concluded that females with ACEs were almost 3 times more likely to report NSSI than male participants (odds Ratio [OR] = 2.98, $P < .05$) in a community sample of 1528 adolescents.

**Table 1.** Literature Reviewed

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Baiden, 2017, England/ Canada[19] | Secondary data analysis | 2038 | 12.49 (SD = 2.88), 61.1% M | interRAI CYmHA | 1. Older children were more likely to engage in NSSI (MA = 13.66 years) as compared to children with no history of NSSI (MA = 12.01 years) [$P < .001$].<br>2. According to the multivariate analysis, physical abuse [AOR = 1.49, 95% CI: 1.06-2.09], and sexual assault [AOR = 1.60, 95% CI: 1.09-2.34] increased the incidence of NSSI. However, Foster care facility, legal custody, emotional abuse, neglect, exposure to domestic violence, and addiction amongst the parents had negligible influence on NSSI tendency [$P > .05$].<br>3. Females more likely to engage in NSSI as compared to males [(AOR = 2.43, 95% CI: 1.92-3.06)].<br>4. Subsequent years of age increased the probability of involvement in NSSI by 21% (AOR = 1.21, 95% CI: 1.16-1.27). |
| Carbone, 2021/ United States[21] | Cross-sectional study | 143 113 677 | 5-17, both | Analysis used the Healthcare Cost and Utilization Projects Nationwide Emergency Department Sample | 1. Maximum number of NSSI occurred between 15 and 17 years of age (86.04%) [68.04% weighted frequency (67.60-68.48)]. Of the participants, 69.39% of them with a history of NSSI were females [69.39% weighted frequency (68.95-69.83)].<br>2.Death of a family member increased the risk of NSSI [AOR = 5.86, 95% CI: 3.69-9.29; $P < .05$].<br>3. Parenteral separation elevated the risk of developing tendency for NSSI [AOR = 4.94, 95% CI: 3.23-56); $P < .05$], as well as other household health issues [AOR = 4.90, 95% CI: 2.51-9.56); $P < .05$].<br>4. History of physical abuse led to higher chances of NSSI [4.64 4.16-5.18]; $P < .05$ as compared to emotional trauma [1.34 1.08-1.68]; $P < .05$, and psychological abuse [2.71 1.20-6.14]; $P < .05$.<br>5. There was a positive correlation between one and more ACEs and involvement in NSSI [(AOR: 4.90, 95% CI: 4.39-10.57); $P < .05$]. 10.9% of individuals were prone to self-harm in case of exposure to 5 or more ACEs. >3 ACEs showed a significantly increased probability of NSSI more prominently in males [AOR = 13.72] as compared to their female counterparts [AOR = 3.84]. The difference in the odds of engaging in NSSI on an exposure to an increasing number of ACEs was found to be significantly higher in males [$P < .05$]. |
| Carr, 2020[28] | Retrospective observational cohort study | 58 409 | 15-35, both | National Birth Cohort (3 case–control datasets) | IRR-95% CI of self-harm was 4.04 [3.29, 4.97] in association with childhood assault, 1.39 [1.30, 1.50] in conjunction with sibling death, 1.80 in association with parental death, and child–parent separation 2.57 [2.50, 2.65] |
| Duke, 2010/ United States[29] | Self-reported student survey | 136 549 | 14.4, both | • The evidence comes from the 2007 MSS, a 3-year anonymous community survey administered to pupils in schools.<br>• ACEs were identified based on the Centers for Disease Control and Prevention concept of toxic stress by asking 6 questions to identify household abuse and dysfunction. | 1. Females were more likely to engage in NSSI than males.<br>2. The OR was 4.34 [4.12-5.28, 95% CI], 3.31 (3.03-3.61), 4.16 (3.91-4.43), 2.64 (2.52-2.76), 2.71 (2.57-2.86), and 3.14 (2.99-3.30) in association with physical abuse, sexual abuse by a family member, sexual abuse outside of family, alcohol abuse by a family member, drug abuse by a family member, and witnessing physical abuse, respectively, for females engaging in NSSI.<br>3. The OR was 4.07 (3.82–4.33), 6.14 (5.34-7.06), 5.56 (5.00-6.17), 2.49 (2.34-2.64), 2.74 (2.56-2.93), 3.14 (2.95-3.41), in association with physical abuse, sexual abuse by a family member, sexual abuse outside of family, alcohol abuse by a family member, drug abuse by a family member, and witnessing physical abuse, respectively, males engaging in NSSI. |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Forster, 2020[34] | - Observational study conducted across the schools in the state of Minnesota<br>- Only ninth graders and eleventh graders were included<br>- Goal was to find a correlation between family adversity and NSSI | 73 648<br>Ninth graders n = 39 682<br>Eleventh graders n = 33 966 | MA for ninth graders = 14 (SD = 0.52)<br>MA for eleventh graders = 17 (SD = 1.02) | • NSSI was measured via a questionnaire<br>• Family-based adversity was measured with 6 items based on study done by Felliti et al | Based on the pattern of family adversities, the whole group was divided into 3 classes<br>C1: no/low family adversity<br>C2: parental dysfunction but low maltreatment<br>C3: parental dysfunction and maltreatment<br>*Results: Among ninth graders<br>6349 (16%) had experienced NSSI.<br>The incidence of NSSI among the group C2 was twice compared to the C1 (AOR = 2.49, 95% CI: 2.26-2.74)<br>While incidence of NSSI in group C3 was thrice compared to the C1 (AOR = 3.42, 95% CI, 3.13-3.73).<br>Eleventh graders<br>5095 (15%) had experienced NSSI<br>The results were almost similar with<br>almost twice risk in C2 and thrice risk in C3 (AOR = 3.10, 95% CI: 2.81-3.44) compared to the C1 respectively. |
| Isohookana, 2012/ Finland[23] | Cohort study | 508 | 15.4; F = 300, M = 208 | . | 1. Female victims of sexual abuse were 1.79 times more prone to NSSI [OR = 1.79 (1.00-3.20) and *P* = .049].<br>2. In boys, physical abuse by parents increased the odds of engaging in NSSI by 2.43 times [OR = 2.43 (0.92-6.41) and *P* = .073].<br>3. Also, in females, the influence of parental divorce on NSSI behavior was significant (OR 2.55, 95% CI: 1.03-6.32, *P* = .043).<br>4. Increase in the number of ACEs increased the chances of NSSI in females [OR = 1.2 and *P* = .016]. |
| Kaess, 2013[33] | Observational study done in psychiatric inpatient in the University Hospital of Heidelberg, Germany | 125 | 17.1 (SD = 3.1)<br>63 F<br>62 M | • Self-reported NSSI assessed by FASM<br>• ACEs were assessed by CECA.Q | Total 75 patients reported engaging in NSSI, 64% of those i.e., 48 patients engaging in NSSI reported at least 1 kind of ACE.<br>• Using univariate regression, a significant association was found between having experienced an ACE and engaging in NSSI<br>• The ACEs having the highest odds of engaging in NSSI were1. Maternal antipathy and NSSI<br>OR = 7.83 (2.22-27.67), 95% CI: (2.22-27.67)<br>*P* = .001<br>2. Paternal antipathy<br>AOR: 2.87 95% CI (1.22-6.77) *P* = .016<br>3. Maternal neglect<br>OR = 7.58, 95% CI: (1.67-34.32) *P* = .009<br>5. Sexual abuse<br>OR = 3.90, 95% CI: (1.24-12.28), *P* = .020<br>• In the stepwise logistic regression model (*P* < .001), maternal antipathy (OR 7.30, 95% CI: 2.04-26.13) and experiences of sexual abuse (OR 3.47, 95% CI: 1.06-11.39) had a best predictive model of NSSI |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Kappel, 2021/ United States[24] | Cross-sectional household survey | 2659 | 20.7 | • Demographic data of the subjects were collected using the VACS questionnaire.<br>• Negative Childhood Experiences the ACEs in VACS were measured using items from the ISPCAN Child Abuse Screening Tool-Retrospective, the Juvenile Victimization Questionnaire.<br>• Kessler Psychological Distress Screening Scale (K6) | The AOR for NSSI in case of sexual violence was found to be 4.9 (3.6, 6.5; $P < .0001$].<br>AOR for emotional abuse was noted to be 4.9 [3.7,6.6]; $P < .0001$.<br>AOR for physical violence was noted to be 3.2 (2.5, 4.3); $P < .0001$<br>AOR for witnessing violence at home 2.5 (2.0, 3.3); $P < .0001$<br>AOR for witnessing violence in the community was 2.3 (1.8, 2.9); $P < .0001$<br>Orphanage was 1.4 (1.0, 2.0), $P = .0661$<br>Parenteral migration was 1.6 (1.2, 2.1); $P = .0005$.<br>1-2 ACEs showed an OR of 2.2 (95% CI,1.3, 3.5) $P = .0021$ whereas more than 3 ACEs showed an OR of 6.3 (95% CI, 3.9, 10.0) $P < .0001$. |
| Li, 2019/ China[20] | Survey based / China | 1810 | 805 (44.48%) F students.<br>1005 (55.52%) M students.<br>96 (5.30%) ≤15 years old<br>553 (30.55%) 16 years old.<br>867(47.90%) 17 years old. 294 (16.25%) students ≥18 years old. | • YRBSS<br>• BRFSS<br>• ACE module and Kristen Clements-Nolle's investigation on the ACE model of American high school students. | 1. Females had a higher tendency for NSSI than males [AOR = 1.592; 95% CI: 1.021-2.482]; $P < .05$.<br>2. In the binary logistic regression model, after controlling for covariables, the results showed that compared with heterosexual/0-ACE students, LGB students (AOR = 1.455, 95% CI: 1.01-2.26), ACE (AOR = 1.894, 95% CI: 1.20-3.00), and LGB students with ACE (AOR = 2.821, 95% CI: 1.51-5.29) were more likely to engage in NSSI ($P < .05$).<br>2. Bullying at school and participation in school fights had a positive correlation with NSSI AOR = 2.286; 95% CI: 1.352-3.866 and AOR = 1.817; 95% CI: 1.039-3.177, respectively. Alcohol abuse was found to have an association with NSSI [(AOR = 2.431; 95% CI: 1.372-4.305].<br>3. Increase in the number of ACEs experienced was associated with higher tendency of ACES. (AOR = 2.431; 95% CI: 1.372-4.305). |
| Loxton, 2021[25] | Cross-sectional/ Australia | 8609 | 20-25,<br>F | • ACEs-questionnaires to identify childhood physical abuse, sexual abuse, emotional abuse, substance abuse, psychiatric illness in immediate family members, witnessing domestic violence at home, and criminal behavior.<br>• Self-reporting on health-related questions on current health and pre-existing medical conditions, baseline anthropological, and substance use history.<br>• The Kessler Psychological Distress Scale (K10) for assessment of psychological distress. | Adjusted prevalence ratio [APR] of self-harm amongst the participants in association with:<br>1 ACE: 1.54 (1.41, 1.69)<br>2 ACEs: 1.73 (1.57, 1.90)<br>3 ACEs: 1.88 (1.70, 2.08)<br>4 or more ACEs: 2.03 (1.84, 2.23) |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Luby, 2019[53] | Observational study done in USA to find out psychosocial characteristics in children with NSSI, suicidal behaviors (SB) and suicidal ideation | • Total children were 314,<br>• Of these 229 were randomized into the study after meeting all the inclusion/ exclusion criteria.<br>• Fifty-nine were initially selected but were not randomized later on.<br>• Twenty-six children were recruited in addition to serve as controls | 3-6.11 | • Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS-EC) was used to assess NSSI, suicidal ideation (SI) and suicidal behaviors (SB).<br>• Life events checklist was used to assess for traumatic events and other stressful events in the lifetime of child. | The whole sample was divided into 3 groups:<br>• Children with sSI/SB<br>• Children with NSSI<br>• Children with no such behaviors (NO) Children with NSSI had a greater number of different violent life events than children with NO SI/SB/NSSI.<br>NSSI (mean = 0.55) SD [0.73] vs. NO SI/SB/NSSI (mean = 0.25) [SD = 0.55], OR [95% CI] = 2.15 [1.29, 3.56], $P = .004$, FDR $P = .0155$] as calculated using the multinomial logistic regression analysis. |
| Ludtke, 2016[30] | Cross-sectional study/Switzerland and Germany | 72 | 16.08 (SD = 1.29) F | • DSM-5 for NSSI *CECA.Q | • None of the childhood maltreatment variables, such as maternal and paternal neglect and physical abuse were significant predictors for NSSI.<br>• Sexual abuse was the only predictor for NSSI, $P = .05$ |
| Mahtani, 2019[15] | Cross-Sectional Study/ Australia | 573 | 20.72, (SD = 2.20) F = 69.1% | • The Inventory of Statements about Self-Injury (ISAS; Klonsky and Glenn 2009) for NSSI.<br>• CTQ<br>• Invalidating Childhood Experiences Scale—Parental<br>• Invalidation subscale (ICES; Mountford et al 2007) | Participants who reported recent NSSI compared to those without a history of NSSI were more likely to have experienced neglect (OR = 4.40; $P \leq .05$), emotional abuse (OR = 3.33; $P \leq .001$), physical abuse (OR = 2.06; $P \leq .05$), maltreatment during childhood (OR = 2.84; $P \leq .05$), increased levels of perceived maternal and paternal invalidation (OR = 2.20, 2.05; $P \leq .05$), sexual abuse (OR = 3.82; $P \leq .05$)<br>• Females were 3 times more likely to engage in NSSI (OR = 3.09; $P = .001$) |
| Martin, 2016[26] | Cross-sectional/ Canada (part of a bigger study) | 957 | 20.14 (SD = 3.38) F = 747 Self-injury subsample = 86; F = 74 | • NSSI was accessed via the Ottawa Self- Injury Inventory<br>• Comprehensive Childhood. Maltreatment Scale (CCMS) and other scales for parental maltreatment and adverse family events. | • Group differences between self-injurers and non-self-injurers showed more maternal maltreatment, paternal maltreatment, adverse family life events, and relational trauma than self-injurers: (between subjects effects (F) = 28.59, 27.69, 31.95, 61.32, respectively, $P < .001$)<br>• Experiencing more adverse family-life events (OR = 1.34 95% CI: 1.09-1.66; $P < .01$) and higher perceived relational trauma (OR = 1.05 95% CI: 1.03-1.06; $P < .001$) were linked with increases in the odds of NSSI behavior.<br>• Differences between subjects effects analysis showed participants who endorsed 3 or more addictive features reported more perceived paternal maltreatment and relational trauma (F = 3.94 and 6.02, $P < .05$) |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Meeker, 2021[22] | Cross-sectional/ USA | 1528 | 14+<br>F = 52% | • Youth Risk Behavior Survey (YRBS)<br>• 11-item ACE questionnaire<br>• 3 questions asked for self-injury | • Youth with 1 ACE were significantly more likely than youth without ACEs to report NSSI (OR = 1.88, $P < .01$)<br>• Youth with 2 or more ACEs were significantly more likely than youth without ACEs to report NSSI (OR = 6.12, $P < .001$)<br>• Females with ACEs were significantly more likely to report NSSI than males. (OR = 2.98, $P < .05$) |
| Pitkanen, 2019[35] | Longitudinal study/Finland | 155855 | 0-14 | Administrative register data: Data obtained from National Institute for Health and Welfare (hospital discharge records), Social Insurance Institution of Finland (information on purchases of prescription medication), and Statistics Finland (all suspected criminal offenses known to the police)<br>ACE: Parental substance abuse, psychiatric disorders, criminality, and hospitalizations due to interpersonal violence or self-harm | • There is an increase in risk of self-harm among those exposed to maternal or paternal adversities with HRs between 1.5 (95% CI: 1.1- 2.0, $P < .05$) and 5.4 (95% CI: 2.9-10.1, $P < .05$) among boys and 1.7 (95% CI: 1.4- 2.2, $P < .05$) and 3.9 (95% CI: 2.2-6.7, $P < .05$) among girls.<br>• Paternal and maternal purchases of psychotropic medications had the lowest HRs.<br>• HR is highest for hospitalization of the mother due to domestic violence. HR = 3.11 (95% CI: 1.79-5.39) in girls and HR = 4.06 (95% CI: 2.36-6.97)<br>• Experiencing paternal adversity increased the rate of self-harm by 58% and maternal by 57% among girls, whereas for boys, maternal adversity increased the rate of self-harm by 44% and paternal by 35% |
| Wan, 2019[28] | Student survey across 20 schools/ China | 14820 | 15.4<br>(SD = 1.8)<br>F = 50.2% | • ACE - the Child Trauma Questionnaire (CTQ), Household dysfunction questions -Centers for Disease Control and Kaiser Permanente Adverse Childhood Experiences Study in the USA.<br>• NSSI -screening questionnaire. | Increased number of ACEs is directly associated with a higher prevalence of NSSI when adjusted for social support level:<br>• 1-2 ACEs; OR = 1.86 (95 CI: 1.56-2.23, $P < .001$).<br>• 3-4 ACEs; OR = 2.80 (95% CI: 2.34-3.35, $P < .001$)<br>• 5-6 ACEs; OR = 4.65 (95% CI: 3.79-5.70, $P < .001$)<br>• Emotional abuse and neglect, physical abuse, sexual abuse, and household dysfunction were all associated with NSSI in both genders, $P < .001$ |
| Wan, 2020[27] | Observational study was conducted across 15 schools in China | 9704 | 15.59<br>(SD = 1.80)<br>F = 52.60% | • ACEs- CTQ<br>• NSSI- screening questionnaire.<br>• The trait coping style questionnaire | • Among the participants, 3740 (38.54%) reported at least 1 NSSI in the past 12 months ($P = .002$).<br>• 1965 (48.21%) experienced more than 3 ACEs<br>• 1500 (34.21%) experienced 1-2 ACEs<br>• 275 (22.12) experienced 0 ACE ($P < .001$)<br>• In adolescents with ≥3 ACEs, a significant association of NSSI with low positive component (PC) of coping style score was seen (AOR 1.33, 95 % CI: 1.13-1.58, $P < .001$), whereas the risk of NSSI increased with moderate and high negative component score across the ACEs groups in both genders (all $P < .001$). Girls with ≥ 3 ACEs with low PC tertile scores were at higher risk of NSSI (AOR 1.45, 95 % CI, 1.14-1.84, $P = .003$) |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Thomassin, 2016[31] | Cross-sectional study involving youth and children recruited from psychiatry units in the southeastern United States<br>The aim of the study was to find 1) A correlation between childhood abuse and NSSI 2)Weather emotional expressivity and emotional coping play a role in linking abuse to NSSI | 95 | 14.22 (SD = 1.67)<br>F = 58% | • NSSI was assessed via Deliberate self-harm inventory<br>• ACE was assessed via the CTQ<br>• Emotional expressivity was measured via the EESC scale.<br>• Emotional coping was Children Emotion Management Scale | • Overall, 72.6% of the sample reported NSSI.<br>• Sexual abuse was not found to have a direct or indirect correlation with the NSSI ($P = .129$)<br>• Physical abuse was not related to NSSI ($P = .091$)<br>• It was found that only emotional expressivity played a linking role between abuse and NSSI and that too only in the case of Emotional abuse ($P = .027$ 95% CI: 0.013-0.214)<br>• There was no significant correlation.<br>• Between physical abuse ($P = .4$, 95% CI: [−0.108-0.043]) or sexual abuse ($P = .538$, 95% CI: [−0.045-0.086]) leading to emotional expressivity and NSSI |
| Tschan, 2015[12] | Cross-sectional study conducted across Switzerland and Germany<br>The aim of the study was to find out how parenting behaviors differ in adolescents with NSSI compared to the ones with other mental conditions (clinical controls) or normal ones (normal controls) | The total number of participants was 116.<br>• Among these, 45 had experienced NSSI<br>• Twenty-seven were those who were diagnosed with other mental disorders. They were kept as the clinical controls.<br>• Fort-four were those who had no current or past mental condition.These were kept as non-clinical controls.Apart from this, 116 parents, including 92 mothers and 24 fathers, were also recruited | 16.01 (SD = 1.64) | • Kinder DIPS for assessing mental disorders<br>• Adult DIPS<br>• SKID<br>• Depression anxiety stress scale (DASS-21)<br>• Parental stress scale<br>• Zurich Short Questionnaire | Differences in parenting behavior.<br>It was observed that the adolescents with NSSI had reported significantly less maternal warmth as compared to the normal controls ($P < .01$, $d < 0.64$).<br>However, there was no significant difference in maternal warmth between the NSSI and clinical control group as well. Clinical controls and normal controls ($P > .5$).<br>Differences in parent–adolescent agreement.<br>It was observed that in the NSSI and CC group, the maternal warmth and support perceived by the adolescents was significantly lower than what was reported by the mothers (Cohen's $d = 0.64$ for NSSI group; $d = 0.26$ for clinical control)<br>• Difference in maternal psychopathologyIt was observed that the mothers in NSSI had more depressive symptoms ($P < .05$, $d = 0.7$), anxiety symptoms ($P < .05$, $d = 0.7$) and stress symptoms ($P < .01$, $d = 0.86$)<br>• Differences in Paternal PsychopathologyPost hoc analysis indicated that parents in NSSI group reported more stress that the parents in normal control groups ($P < .05$, $d = 0.9$) |

(*Continued*)

**Table 1.** Literature Reviewed (*Continued*)

| Author/ Year/ Country | Study Design | Sample Size | Mean Age/ Gender | Data Collection | Study Results |
|---|---|---|---|---|---|
| Armiento, 2016[32] | Canadian cross-sectional study | 747 | 12.02 (SD = 2.73) M = 68% | interRAI ChYMH | 23.70% had previously engaged in NSSI. Bivariate chi-square analyses indicated positive associations with NSSI and both direct: sexual maltreatment and NSSI ($P < .001$) and physical maltreatment and NSSI ($P < .001$) and indirect child maltreatment: witnessing domestic violence and NSSI ($P < .001$). In a binary multivariate logistic regression analysis controlling for participant age and sex, only witnessing domestic violence significantly predicted NSSI ($P = .03$). Children were 1.6 times more likely to engage in NSSI if they witnessed e domestic violence. (AOR = 1.596, 95% CI: 1.046-2.435) |

ACEs, adverse childhood experiences; AOR, adjusted odds ratio; BRFSS, Behavioral Risk Factor Surveillance System; CECA.Q, Childhood Experiences of Care and Abuse Questionnaire; CI, confidence interval; CTQ, Child Trauma Questionnaire; EESC, Emotion Expressivity Scale for Children; F, female; FASM, Functional Assessment of Self-Mutilation; interRAI CYmHA, child and youth mental health assessment; IRR, incidence rate ratio; M, male; MA, mean age; NSSI, non-suicidal self-injury; OR, odds ratio; YRBSS, Youth Risk Behavior Surveillance System; SD, Standard deviation; MSS, Minnesota Student Survey; LGB, lesbian, gay, or bisexual; FDR, false discovery rate; DSM-5, the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders; HRs, Hazard ratio; DIPS, Diagnostic Interview for Mental Disorders in Children and Adolescents (Kinder-DIPS); SKID, Structured Clinical Interview for DSM-IV.

Li et al[20] was the only study that explored the relationship between ACEs and NSSI in adolescents with different sexual orientations who identified as lesbian, gay, or bisexual (LGB). They concluded that high school students identified as LGB had a higher tendency of NSSI when compared to heterosexual students (AOR = 3.250, 95% CI = 1.69-6.28, $P < .01$).

## Number of Adverse Childhood Experiences

Nine out of 21 studies showed that there was a strong correlation between NSSI and higher ACE scores. A study by Carbone et al,[21] demonstrated a positive correlation between 1 and more ACEs and involvement in NSSI (AORs = 4.90, 95% CI = 4.39-10.57, $P < .05$). Overall, in both genders, the odds of engaging in NSSI increased by 5.87 times [AOR=5.87, 95% CI = 3.25-10.57] on exposure to more than 3 ACEs. Isohookana et al,[23] found that an increase in the number of ACEs increased the chances of NSSI in females by 1.2 times (OR = 1.2, $P = .016$). The research population consisted of inpatient psychiatric patients treated for acute mental illnesses. As a result, generalizing the study's findings seems far-fetched. Similarly, Kappel et al,[24] discovered that exposure to more ACEs was directly proportional to engagement in NSSI. Exposure to 1-2 ACEs increased the likelihood of engaging in NSSI by 2.2 times. Likewise, there was a 6-fold increase in the risk of engaging in NSSI on exposure to >3 ACEs. Also, in the study by Li et al,[20] the tendency for NSSI increased by 2.4 (AOR = 2.431, 95% CI = 1.372-4.305) times associated with exposure to more ACEs. Loxton et al,[25] included 8961 female participants aged 20-25 in their research. The risk of self-harming behavior was directly related to the number of ACEs encountered by an individual throughout childhood. Individuals with 1 ACE had a risk of self-harm of 1.54. For 2, 3, and 4 more ACEs, the risk was 1.73, 1.88, and 2.03, respectively. Moreover, in a study by[26] Martin and colleagues, experiencing more adverse family-life events (OR = 1.34, $P < .01$) and higher perceived relational trauma (OR = 1.05, $P < .001$) were associated with increased NSSI behavior. Furthermore, Meeker et al,[22] concluded that as the number of ACEs increased, youth were more likely to report NSSI. Participants who had 2 or more ACEs were 6 times more likely to report NSSI compared to someone without ACEs (OR = 6.12, $P < .001$).[27] Yuhai wan et al,[2] in 2020, examined a large-scale health survey dataset to identify the individual roles of positive components (PC) and negative components (NC) of coping styles in increasing NSSI in both genders and investigate the effects of ACEs on these relationships. In participants with ≥ 3 ACEs, a significant association of NSSI with low PC score was seen (AOR = 1.33, 95% CI = 1.13-1.58, $P < .001$), whereas the risk of NSSI increased with moderate and high NC scores across the ACEs groups in both genders (all $P < .001$). Girls with ≥3 ACEs with low PC tertile scores were at higher risk of NSSI (AOR 1.45, 95% CI = 1.14-1.84, $P = .003$). Another study by Yuhai wan et al,[2] in 2019, with a community sample of 14,820 students, found that higher ACEs and low social support are associated with an increased risk of NSSI in Chinese adolescents. Participants that had ACEs score of 3-4, when adjusted for social support, were almost 3 times more likely to self-harm (OR = 2.80, 95% CI = 2.34-3.35, $P < .001$). An ACEs score of 5-6 increased the adjusted OR to 4.65, 95% CI 3.79-5.70, $P < .001$.

## Physical Abuse

In their study, Baiden et al,[19] reported that physically abused children were 1.49 times more likely to engage in NSSI (AOR = 1.49, 95% CI = 1.06-2.09). Carr et al[28] concluded that the risk of NSSI rose by 4.4

times in children exposed to assault, and the incidence rate ratio was 4.04 [3.29, 4.97]. According to Duke et al,[29] females who had experienced physical abuse were 4.34 times more likely to practice NSSI (OR = 4.34, 95% CI = 4.12-5.28).[24] Kappel et al[24] observed that children who had experienced physical abuse were 3.2 times more likely to have NSSI (AOR = 3.2, 95% CI = 2.5-4.3, $P < .0001$). Physical abuse raised the likelihood by 2.06 times in adolescents with a history of physical abuse, according to Mahtani et al,[15] (OR = 2.06; $P = .001$). Similarly,[2] Yuhai wan et al,[2] found in their 2019 study that physical abuse is a substantial risk factor for NSSI throughout adolescence, in both boys and girls ($P < .001$). A few studies, however, showed no link between childhood physical abuse and NSSI. According to Ludtke et al,[30] physical abuse throughout childhood did not significantly influence the prevalence of NSSI during adolescence. Thomassin et al,[31] found the same ($P = .4$).

### Sexual Abuse

In their study, Baiden et al,[19] found that victims of sexual abuse are 1.6 times more likely to engage in NSSI (AOR = 1.60, 95% CI = 1.09-2.34). According to the study by Duke et al,[29] females with a history of sexual abuse outside of the family are more vulnerable to NSSI than those whom a family member has sexually abused. Being sexually assaulted by a family member raised the likelihood of NSSI in females by 3.31 times (OR = 3.31, 95% CI = 3.03-3.61), whereas sexual assault outside the family increased the likelihood of NSSI by 4.16 (OR = 4.16, 95% CI = 3.91-4.43). Similarly, they found that males with a household history of sexual abuse were 5.56 (OR = 5.56, 95% CI = 5.00-6.17) times more likely to indulge in NSSI while being subjected to sexual assault outside of the family was 6.14 (OR = 6.14, 95% CI = 5.34-7.06) times more likely to try NSSI. They discovered that females with past experiences of childhood sexual abuse were more likely to be involved in NSSI (OR = 1.8, $P < .0001$). Kappel et al,[24] discovered that female and male victims of sexual assault as children increased their chances of actively engaging in NSSI-like behavior by 4.9 times (AOR = 4.9, 95% CI = 3.6, 6.5, $P < .0001$). In their respective studies, Mahtani et al and Ludtke et al,[15,30] found comparable findings (OR = 3.82, $P = .001$) and ($P = .05$). Armiento et al,[32] observed comparable findings with a $P$-value less than .0001 in their research. Yuhai Wan et al,[28] in 2019 discovered that among the cohort they investigated, more males reported lesser social support but sexual abuse was significantly associated with NSSI in both genders ($P < .001$). However, a study conducted by Thomassin et al,[31] found no link between childhood sexual abuse and NSSI.

### Emotional Abuse

In a study by Kappel et al,[24] they discovered that emotional abuse increased the odds of NSSI by 4.9 times (AOR = 4.9, 95% CI = 3.7-6.6, $P < .0001$). According to Mahtani et al,[15] the probability of NSSI increases by 3.3 times in adolescents who experienced emotional abuse (OR = 3.33, $P = .001$). Similar results were reported in research conducted by Yuhai Wan et al, 2019[2] ($P < .001$). Thomassin and his colleagues[31] found that emotional expressivity resulted in the NSSI in instances of emotional abuse (95% CI = 0.013-0.214, $P = .027$). However, a study by Baiden et al,[19] found no link between emotional abuse and NSSI.

### Maternal Abuse and Paternal Abuse and Neglect

Martin et al[26] found a positive correlation between NSSI and mother and paternal abuse ($P < .001$). Furthermore, in a study by Kaess et al,[33] maternal hostility was a risk factor for NSSI (OR = 7.58, 95% CI = 1.67-34.32, $P = .009$). Tschan et al[12] observed comparable results ($P < .01$, $d < 0.64$).

### Maternal and Paternal Adversities (Substance Abuse, Psychiatric Illness, Witnessing Interpersonal/Domestic Violence, Criminality) and Familial Dysfunction

Duke et al,[29] in their study, demonstrated the association of NSSI with familial dysfunction. They found a strong correlation between household dysfunction and NSSI, including alcohol abuse by a family member (OR = 2.64, 95% CI = 2.52-2.76) in females and males (OR = 2.49, 95% CI = 2.34-2.64), drug abuse by a family member in females (OR = 2.71, 95% CI = 2.57-2.86) and males (OR = 2.74, 95% CI = 2.56-2.93), and witnessing physical abuse (OR = 3.14, 95% CI = 2.99-3.30) for females and males (OR = 3.14, 95% CI = 2.95-3.41), engaging in NSSI. Similarly, Forster et al[34] validated the association relationship between the 2 in their study. They found that the odds of NSSI were twice as high in students who had experienced parental dysfunction alone as in those who had not (AOR = 2.49, 95 % CI = 2.26-2.74) and nearly 3 times higher in students who had experienced both parental dysfunction and maltreatment as in those who had not (AOR = 3.42, 95% CI = 3.13-3.73).

Furthermore, Pitkanen et al[35] found a link between NSSI and maternal and paternal adversity. NSSI rates increased by 58% in girls who experienced parental adversity and 57% in girls who experienced maternal adversity. In males, maternal hardship raised the risk of NSSI by 44%, whereas paternal adversity increased the rate by 35%. Both parental adversities increased the likelihood of NSSI by 2.5 times in males and 3 times in girls. In a study by Isohookana[23], they demonstrated that the odds of NSSI increase by 2.55 times in females with a history of parental separation (OR = 2.55, 95% CI = 1.03-6.32, $P = .043$) than in those without similar circumstances. Similar findings were reported by Kappel et al and colleagues[24] (OR = 1.6, 95% CI = 1.2-2.1, $P < .0005$).

Kappel et al,[24] in their study, demonstrated that witnessing domestic violence increased the odds of NSSI by 3.2 times (OR = 3.2, 95% CI = 2.5-4.3, $P < .0001$) more than those without any exposure to the same, while community violence increased the odds of NSSI by 2.5 times (OR = 2.5, 95% CI = 2.0-3.3, $P < .0001$) than those without any exposure to the same. Similar findings were noted by Armiento and his colleagues[32] in their study. They demonstrated that witnessing domestic violence was significantly associated with NSSI ($P < .001$). Children were 1.6 times more likely to engage in NSSI if they witnessed domestic violence (AOR = 1.596, 95% CI = 1.046-2.435).

### Death of a Family Member

Carr et al[28] found that experiencing the death of a sibling or parent before the age of 15 raised the likelihood of NSSI, (Internal rate of return (IRR) = .39, 95% CI = 1.30-1.50) and (IRR = 1.80, 95% CI = 1.70-1.91), respectively.

## Discussion

### Suicidal Self-Injury Increasing with the Number of Adverse Childhood Experiences

Collectively, the results of the studies show a direct correlation between most ACEs and NSSI, with the incidence of NSSI rising with the number of adverse events in childhood. This is in accordance with several other studies[26,33] This correlation can be explained by

the fact that ACEs may expose the individual to a greater degree of stress throughout their lifespan, thereby serving as triggers for NSSI behavior. Furthermore, it should be noted that engaging in NSSI behaviors is often due to a lack of emotional regulation, and efforts should be made to educate children and families about this aspect of mental health.

### Gender Differences and Lesbian, Gay, Bisexual, and Transgender

Our study had dichotomous results in that some studies Isohookana et al,[23] showed that women were more likely to engage in NSSI while others, such as the one conducted by Yuhai Wan et al,[2] showed that men were more likely to do so. This could be explained by the fact that men have less social support and therefore are less likely to speak up and seek help. Interestingly, the literature on gender differences on this topic is scarce, and existing literature is also conflicting.[36] Garcia et al[37] showed a positive association between childhood trauma history and risk of positive, negative, and depressive symptoms in women as they tend to internalize their emotional pain. Whereas the same study also showed that childhood trauma was associated with poorer social cognition in both men and women. On the other hand, Peters et al[39] reported almost equal rates of self-harm among men and women. A study by Sarah et al[38] showed that men began NSSI later in life and presented with lower self-reported levels of psychopathology, thereby highlighting the lack of thorough assessment of NSSI in men. In addition, men are more likely to be diagnosed with substance use disorders, thereby supporting the theory that men use other strategies to cope with stress and therefore have lower reported rates of NSSI. Moreover, people who identified as lesbian, gay, bisexual, and transgender (LGBT) also reported increased rates of NSSI, which was expected as this is a marginalized group and therefore less likely to have acceptance, thus making them more prone to NSSI as evidenced by many other studies.[38,39]

### Maternal vs. Paternal Abuse and Neglect

Several studies from our sample demonstrated a strong association between child maltreatment in the form of maternal and paternal abuse and the risk of NSSI. A study by Pitkanen et al,[35] showed a significant association between maternal abuse and NSSI than paternal abuse. It could be due to the fact that the daughter is playing the role of a caregiver for her mother and taking on additional responsibilities at home that are not meant for her, thus adding to her overall stress. A retrospective study conducted by Brown et al[40] in 2007 further corroborates these findings as those women who experienced maternal abuse and carried out additional responsibilities, including household chores and acting as emotional support, were at the highest risk of developing chronic depression.[41] This is in contrast with the study conducted by Johnstone et al,[42] which showed that low paternal care was associated with non -suicidal self-injury.[40] Low maternal care is associated with poorer health outcomes due to a lack of attachment to caregivers and, therefore, a lack of self-esteem, a fact that is further reinforced by a study by Kaess et al,[33] which attributed maternal antipathy as one of the strongest predictors for NSSI. In addition, there is also poor emotional regulation which leads to increased incidences of NSSI as several studies have shown that NSSI is mainly committed to dealing with distress.

### Sexual, Physical, and Emotional Abuse

In line with previous studies, our results also reveal a rise in NSSI with past experiences of sexual, physical, and emotional abuse.[42,43] Children are vulnerable, and incidences of any kind of abuse make them even more vulnerable, and this feeling of vulnerability persists even after the child is placed in a beneficial environment.[44] Children who experience abuse of any kind tend to become more needy and insecure and therefore resort to NSSI as a way to relieve emotional distress. In addition, children suffering from sexual abuse tend to internalize shame and often blame themselves for the incident, thereby causing further distress and increasing the likelihood of NSSI. A study by Liu et al[45] demonstrated that emotional abuse had the strongest predilection for NSSI, a relatively newer finding as emotional abuse was previously not considered as important. However, Liu et al claimed that this is the most prevalent form of abuse. Hence it is most damaging as it continuously invalidates the child's emotions and does not provide them with the opportunity to develop effective emotional regulation skills. However, the literature exploring the associations between different forms of abuse is quite confusing as the study by Thomassin et al,[32] claimed that physical abuse is not as important a risk factor for NSSI as sexual and emotional abuse, whereas multiple studies have proven otherwise.[46,47]

### Other Adverse Childhood Experiences (Parental Separation, Incarceration, and Household Mental Illness)

It is worth noting that domestic violence was also one of the most powerful driving forces behind NSSI. It is plausible that these children view the world as a threatening and unsafe place because of the violence they view at home, thus hindering their ability to form friendships and bonds that can act as a source of support in such trying circumstances. This breeds a cycle of isolation as the child doesn't feel safe at home either, hence making them more prone towards NSSI.[48]

Another interesting finding by Pitkanen and colleagues[35] was that purchasing psychotropic medications by either or both parents had the lowest risk associated with NSSI. This may be the result of the awareness regarding mental health illnesses which made the youth feel like they will be heard and taken seriously in case of their own mental illness as well. Numerous studies have shown that children of parents who are understanding of NSSI are more likely to seek help if need be.[49,50] Our results also indicate that parental separation and/or divorce has a strong link with NSSI, particularly in girls. Parental separation wreaks havoc on children's minds as they are pretty sensitive and dependent on their parents for emotional support. Multiple studies further illustrate the relationship between parental divorce and NSSI.[51,52] However, further research identifying the relation between parental conflict and divorce needs to be undertaken for better understanding.

Our study concludes that NSSI is strongly associated with ACEs. We would like to reiterate that NSSI strongly predicts future suicide. There is an unmet need for identifying and remedying the ACEs to prevent and help NSSI behavior and other mental health challenges that could arise due to ACEs. Early intervention and prevention are critical for positive mental health outcomes. Family practitioners and pediatric providers, who are the first point of healthcare contact with adolescents, have a unique opportunity to screen and assess the ACE score by giving their patients the ACE questionnaire. Adverse childhood experience screening for children at their regular health checks holds high validity for maintaining the overall health of the patient. Health care providers also have the means to get families in touch with assistance and outreach programs to help intervene earlier on.

The providers should be trained to foster and advocate safe, stable, nurturing relationships and environments for all children and families to prevent ACEs and help all children reach their full potential. Possible interventions to offset the ACEs, for those who are identified with NSSI, need to be managed proactively based on their experiential circumstances.

### Strengths and Limitations

To the best of our knowledge, our study is the first to evaluate the relationship between a multitude of adverse clinical experiences and NSSI. Our findings prove a direct link between ACEs and NSSI. They also show an additive effect of adverse clinical experiences, thereby emphasizing the need for educating healthcare workers, family, friends, and social workers to identify signs of emotional distress for early intervention. Secondly, our results also consider multiple factors that may count as adverse clinical experiences, such as maternal and paternal abuse and sexual, emotional, and physical abuse. However, there is a lack of data suggesting the link between all 3 forms of abuse, and therefore more research should be conducted with emphasis on each form of abuse and its relation to NSSI. Our findings also consider gender differences, thereby making it easier to tailor recommendations accordingly. One characteristic finding by Yuhai Wan et al in 2020[27] was that females are more likely to suffer from emotional abuse, further highlighting the need for research in this area.[1]

Furthermore, the role of social support in engaging in NSSI was underscored in our findings. More research regarding the protective and harmful factors for NSSI should be carried out. Furthermore, adolescents who present with NSSI to the hospital should have their psychosocial and family environment considered as part of a thorough assessment for NSSI.[1]

Our study is not without its limitations. First, the age of participants in most studies was not clearly defined. Second, our relatively small study size prevented us from generalizability of results. Third, most studies had different traits and less uniformity, thereby increasing the risk of confounding. Fourth, our study did not consider pre-existing mental illness and sexual orientation in participants, which can further skew results. Last, most studies did not clearly define NSSI behaviors, thereby increasing the probability of eliminating a vast majority of cases that may account for NSSI. Therefore, to overcome those limitations, future prospective studies should cover well-defined populations with an appropriate sample size.

Adverse childhood experiences are a predictor of NSSI, which makes its prompt diagnosis a call for immediate action to prevent NSSI. The timely identification of ACEs in NSSI dictates not just the response to treatment but also guides the further plan and management of the patient to circumvent a myriad of devastating psychosocial manifestations. Further, there is a dearth of research on the subject, making it a compelling moot for a deep dive not just for practitioners, parents, and social workers but also for policymakers to gather relevant data and address the need head-on. Gender-specific reported disparity in NSSI also needs to be studied further to strengthen the linkages and support systems across the community and healthcare providers. Early identification of ACEs and prompt intervention engaging all relevant stakeholders could timely prevent NSSI and reduce long-term complications and suicides.

*Availability of Data and Materials:* *The data that support the findings of this study available from the corresponding author, upon reasonable request.*

*Peer-review:* *Externally peer-reviewed.*

*Author Contributions:* *Conception - S.S.U., M.M., M.Y.S., S.S., P.G., A.S.M., N.S., L.O., N.W., K.S., F.S., D.D.B., Sh.Sh.; Design - S.S.U., M.M., M.Y.S., S.S., P.G., L.O., A.S.M., N.S., N.W., K.S., F.S., D.D.B., Sh.Sh.; Supervision - S.S.U., Sh.Sh.; Fundings - M.M., M.U.S., L.O.; Data Collection - M.Y.S., S.S., P.G., L.O., N.W.; Analysis/Interpretation - A.S.M., N.S., K.S. Literature Review - A.S.M., N.S., N.W., K.S.; Writing - M.M., M.Y.S., P.G., L.O., A.S.M., N.S., N.W., K.S.; Critical Review - S.S.U., S.S., F.S., D.D.B., Sh.Sh.*

*Declaration of Interests:* *Domenico De Berardis is serving as one of the Editorial Board members of this journal. We declare that Domenico De Berardis had no involvement in the peer review of this article and has no access to information regarding its peer review. Other authors have no conflicts of interest to declare.*

*Funding:* *The authors declare that this study received no financial support.*

## References

1. Hawton K, Saunders KE, O'Connor RC. Self-harm and suicide in adolescents. *Lancet*. 2012;379(9834):2373-2382. [CrossRef]
2. Wan Y, Chen R, Ma S, et al. Associations of adverse childhood experiences and social support with self-injurious behaviour and suicidality in adolescents. *Br J Psychiatry*. 2019;214(3):146-152. [CrossRef]
3. Klonsky ED, Victor SE, Saffer BY. Nonsuicidal self-injury: what we know, and what we need to know. *Can J Psychiatry*. 2014;59(11):565-568. [CrossRef]
4. Westers NJ, Culyba AJ. Nonsuicidal self-injury: A neglected public health problem among adolescents. *Am J Public Health*. 2018;108(8):981-983. [CrossRef]
5. Halicka J, Kiejna A. Non-suicidal self-injury (NSSI) and suicidal: criteria differentiation. *Adv Clin Exp Med*. 2018;27(2):257-261. [CrossRef]
6. Ballesteros MF, Williams DD, Mack KA, Simon TR, Sleet DA. The epidemiology of unintentional and violence-related injury morbidity and mortality among children and adolescents in the United States. *Int J Environ Res Public Health*. 2018;15(4):616. [CrossRef]
7. Crosby A, Ortega L, Melanson C. Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements. National Center for Injury Prevention and Control (U.S.). Division of Violence Prevention; February, 2011. https://stacks.cdc.gov/view/cdc/11997.
8. Singhal N, Bhola P, Reddi VSK, Bhaskarapillai B, Joseph S. Non-suicidal self-injury (NSSI) among emerging adults: sub-group profiles and their clinical relevance. *Psychiatry Res*. 2021;300:113877. [CrossRef]
9. Cassels M, van Harmelen AL, Neufeld S, Goodyer I, Jones PB, Wilkinson P. Poor family functioning mediates the link between childhood adversity and adolescent nonsuicidal self-injury. *J Child Psychol Psychiatry*. 2018;59(8):881-887. [CrossRef]
10. Mars B, Heron J, Crane C, et al. Clinical and social outcomes of adolescent self harm: population based birth cohort study. *BMJ*. 2014;349:g5954. [CrossRef]
11. Byrne S, Morgan S, Fitzpatrick C, et al. Deliberate self-harm in children and adolescents: a qualitative study exploring the needs of parents and carers. *Clin Child Psychol Psychiatry*. 2008;13(4):493-504. [CrossRef]
12. Tschan T, Schmid M, In-Albon T. Parenting behavior in families of female adolescents with nonsuicidal self-injury in comparison to a clinical and a nonclinical control group. *Child Adolesc Psychiatry Ment Health*. 2015;9:17. [CrossRef]
13. Guan K, Fox KR, Prinstein MJ. Nonsuicidal self-injury as a time-invariant predictor of adolescent suicide ideation and attempts in a diverse community sample. *J Consult Clin Psychol*. 2012;80(5):842-849. [CrossRef]

14. Graae F, Tenke C, Bruder G, et al. Abnormality of EEG alpha asymmetry in female adolescent suicide attempters. *Biol Psychiatry*. 1996;40(8):706-713. [CrossRef]
15. Mahtani S, Hasking P, Melvin GA. Shame and non-suicidal self-injury: conceptualization and preliminary test of a novel developmental model among emerging adults. *J Youth Adolesc*. 2019;48(4):753-770. [CrossRef]
16. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) study. *Am J Prev Med*. 1998;14(4):245-258. [CrossRef]
17. Bethell CD, Davis MB, Gombojav N, et al. Issue brief: Adverse childhood experiences among US children. Child and adolescent health measurement initiative.Johns Hopkins Bloomberg School of Public Health.; Accessed October, 2017. https://www.cahmi.org/docs/default-source/resources/issue-brief-adverse-childhood-experiences-among-us-children-(2017).pdf.
18. Jahn A, Rysgaard TK, Andersen JH, Winding TN. Adverse childhood experiences and future self-rated health: a prospective cohort study. *BMC Public Health*. 2021;21(1):895. [CrossRef]
19. Baiden P, Stewart SL, Fallon B. The role of adverse childhood experiences as determinants of non-suicidal self-injury among children and adolescents referred to community and inpatient mental health settings. *Child Abuse Negl*. 2017;69:163-176. [CrossRef]
20. Li X, Zheng H, Tucker W, et al. Research on relationships between sexual identity, adverse childhood experiences and non-suicidal self-injury among rural high school students in less developed areas of China. *Int J Environ Res Public Health*. 2019;16(17):3158. [CrossRef]
21. Carbone JT, Jackson DB, Holzer KJ, Vaughn MG. Childhood adversity, suicidality, and non-suicidal self-injury among children and adolescents admitted to emergency departments. *Ann Epidemiol*. 2021;60:21-27. [CrossRef]
22. Meeker EC, O'Connor BC, Kelly LM, Hodgeman DD, Scheel-Jones AH, Berbary C. The impact of adverse childhood experiences on adolescent health risk indicators in a community sample. *Psychol Trauma*. 2021;13(3):302-312. [CrossRef]
23. Isohookana R, Riala K, Hakko H, Räsänen P. Adverse childhood experiences and suicidal behavior of adolescent psychiatric inpatients. *Eur Child Adolesc Psychiatry*. 2013;22(1):13-22. [CrossRef]
24. Kappel RH, Livingston MD, Patel SN, Villaveces A, Massetti GM. Prevalence of Adverse Childhood Experiences (ACEs) and associated health risks and risk behaviors among young women and men in Honduras. *Child Abuse Negl*. 2021;115:104993. [CrossRef]
25. Loxton D, Forder PM, Cavenagh D, et al. The impact of adverse childhood experiences on the health and health behaviors of young Australian women. *Child Abuse Negl*. 2021;111:104771. [CrossRef]
26. Martin J, Bureau JF, Yurkowski K, Fournier TR, Lafontaine MF, Cloutier P. Family-based risk factors for non-suicidal self-injury: considering influences of maltreatment, adverse family-life experiences, and parent–child relational risk. *J Adolesc*. 2016;49:170-180. [CrossRef]
27. Wan Y, Chen R, Wang S, et al. Associations of coping styles with non-suicidal self-injury in adolescents: do they vary with gender and adverse childhood experiences? *Child Abuse Negl*. 2020;104:104470. [CrossRef]
28. Carr MJ, Steeg S, Mok PLH, et al. Adverse childhood experiences and risk of subsequently engaging in self-harm and violence towards other people-"dual harm". *Int J Environ Res Public Health*. 2020;17(24):9409. [CrossRef]
29. Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics*. 2010;125(4):e778-e786. [CrossRef]
30. Lüdtke J, In-Albon T, Michel C, Schmid M. Predictors for DSM-5 nonsuicidal self-injury in female adolescent inpatients: the role of childhood maltreatment, alexithymia, and dissociation. *Psychiatry Res*. 2016;239:346-352. [CrossRef]
31. Thomassin K, Shaffer A, Madden A, Londino DL. Specificity of childhood maltreatment and emotion deficit in nonsuicidal self-injury in an inpatient sample of youth. *Psychiatry Res*. 2016;244:103-108. [CrossRef]
32. Armiento J, Hamza CA, Stewart SL, Leschied A. Direct and indirect forms of childhood maltreatment and nonsuicidal self-injury among clinically-referred children and youth. *J Affect Disord*. 2016;200:212-217. [CrossRef]
33. Kaess M, Parzer P, Mattern M, et al. Adverse childhood experiences and their impact on frequency, severity, and the individual function of non-suicidal self-injury in youth. *Psychiatry Res*. 2013;206(2-3):265-272. [CrossRef]
34. Forster M, Grigsby TJ, Gower AL, Mehus CJ, McMorris BJ. The role of social support in the association between childhood adversity and adolescent self-injury and suicide: findings from a statewide sample of high school students. *J Youth Adolesc*. 2020;49(6):1195-1208. [CrossRef]
35. Pitkänen J, Remes H, Aaltonen M, Martikainen P. Experience of maternal and paternal adversities in childhood as determinants of self-harm in adolescence and young adulthood. *J Epidemiol Community Health*. 2019;73(11):1040-1046. [CrossRef]
36. Gratz KL, Conrad SD, Roemer L. Risk factors for deliberate self-harm among college students. *Am J Orthopsychiatry*. 2002;72(1):128-140. [CrossRef]
37. Garcia M, Montalvo I, Creus M, et al. Sex differences in the effect of childhood trauma on the clinical expression of early psychosis. *Compr Psychiatry*. 2016;68:86-96. [CrossRef]
38. Baams L, Grossman AH, Russell ST. Minority stress and mechanisms of risk for depression and suicidal ideation among lesbian, gay, and bisexual youth. *Dev Psychol*. 2015;51(5):688-696. [CrossRef]
39. Peters JR, Mereish EH, Krek MA, et al. Sexual orientation differences in non-suicidal self-injury, suicidality, and psychosocial factors among an inpatient psychiatric sample of adolescents. *Psychiatry Res*. 2020;284:112664. [CrossRef]
40. Brown GW, Craig TK, Harris TO, Handley RV, Harvey AL. Development of a retrospective interview measure of parental maltreatment using the Childhood Experience of Care and Abuse (CECA) instrument -- A life-course study of adult chronic depression - 1. *J Affect Disord*. 2007;103(1-3):205-215. [CrossRef]
41. Victor SE, Muehlenkamp JJ, Hayes NA, Lengel GJ, Styer DM, Washburn JJ. Characterizing gender differences in nonsuicidal self-injury: evidence from a large clinical sample of adolescents and adults. *Compr Psychiatry*. 2018;82:53-60. [CrossRef] [published correction appears in *Compr Psychiatry*. 2018;86:143. (https://doi.org/10.1016/j.comppsych.2018.07.011)]
42. Johnstone JM, Carter JD, Luty SE, Mulder RT, Frampton CM, Joyce PR. Childhood predictors of lifetime suicide attempts and non-suicidal self-injury in depressed adults. *Aust N Z J Psychiatry*. 2016;50(2):135-144. [CrossRef]
43. Serafini G, Canepa G, Adavastro G, et al. The relationship between childhood maltreatment and non-suicidal self-injury: A systematic review. *Front Psychiatry*. 2017;8:149. [CrossRef]
44. Maniglio R. The role of child sexual abuse in the etiology of suicide and non-suicidal self-injury. *Acta Psychiatr Scand*. 2011;124(1):30-41. [CrossRef]
45. Liu RT, Scopelliti KM, Pittman SK, Zamora AS. Childhood maltreatment and non-suicidal self-injury: a systematic review and meta-analysis. *The Lancet Psychiatry*. 2018;5(1):51-64. [CrossRef]
46. Di Pierro R, Sarno I, Perego S, Gallucci M, Madeddu F. Adolescent nonsuicidal self-injury: the effects of personality traits, family relationships and maltreatment on the presence and severity of behaviours. *Eur Child Adolesc Psychiatry*. 2012;21(9):511-520. [CrossRef]
47. Swannell S, Martin G, Page A, et al. Child maltreatment, subsequent non-suicidal self-injury and the mediating roles of dissociation, alexithymia and self-blame. *Child Abuse Negl*. 2012;36(7-8):572-584. [CrossRef]

48. Wolff J, Frazier EA, Esposito-Smythers C, Burke T, Sloan E, Spirito A. Cognitive and social factors associated with NSSI, and suicide attempts in psychiatrically hospitalized adolescents. *J Abnorm Child Psychol*. 2013;41(6):1005-1013. [CrossRef]
49. Rissanen ML, Kylmä J, Laukkanen E. Helping adolescents who self-mutilate: parental descriptions. *J Clin Nurs*. 2009;18(12):1711-1721. [CrossRef]
50. Arbuthnott AE, Lewis SP. Parents of youth who self-injure: a review of the literature and implications for mental health professionals. *Child Adolesc Psychiatry Ment Health*. 2015;9:35. [CrossRef]
51. Wang F, Lu J, Lin L, Cai J, Xu J, Zhou X. Impact of parental divorce versus separation due to migration on mental health and self-injury of Chinese children: a cross sectional survey. *Child Adolesc Psychiatry Ment Health*. 2021;15(1):71. [CrossRef]
52. Self-Harm NICE. Longer-term management; evidence Update 39. National Collaborating Centre for Mental Health: London, UK. Availabe at: https://www.nice.org.uk/guidance/CG133/documents/cg133-self-harm-longerterm-management-evidence-update2. Accessed 07.10.22; 2013.
53. Luby JL, Whalen D, Tillman R, Barch DM. Clinical and psychosocial characteristics of young children with suicidal ideation, behaviors, and non-suicidal self-injurious behaviors. *J Am Acad Child Adolesc Psychiatry*. 2019;58(1):117-127. [CrossRef]