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Systematic Review

Risk factors of suicidal thoughts and attempts among individuals with primary depression: a systematic review of 47 cohort studies

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Abstract

Introduction: Suicidal thoughts (ST) and attempts (SA) are significant concerns among individuals with primary depression. This systematic review aims to explore risk factors associated with these phenomena to inform better prevention strategies.

Methods: A systematic review was conducted. We searched 4 databases (PubMed, Embase, Scopus, Web of Science) from 2000 to the 7 February 2026, using "suicide," "self-killing," "suicidal," and "suicidium," while "depression" and "depressive" were used for depression, and "risk factor," "risk factors," "risk scores," and "relative risk" as keywords, and assessed for quality using the Newcastle-Ottawa Quality Assessment Form checklist. Relevant data were extracted and recorded from the eligible articles.

Results: In 47 cohort studies (687,156 participants), key risk factors for ST and SA in primary depression across MDD, BD, and dysthymia included depressive severity, hopelessness, childhood trauma, and prior attempts. ST were linked to cognitive-emotional factors (rumination, perceived burdensomeness, anxiety). In contrast, SA were predicted by behavioral/clinical indicators (psychiatric hospitalization, substance use, unemployment, personality pathology, especially Cluster B in BD). Age patterns emerged: younger age/early onset increased SA risk in BD, while older age/social isolation were prominent in MDD. Biological (lipid abnormalities) and medication factors showed diagnosis-specific associations.

Conclusion: Suicide risk in primary depression follows a progressive cascade from early trauma and personality vulnerabilities to clinical deterioration and behavioral manifestation. Prevention requires diagnosis-specific, age-sensitive strategies incorporating routine trauma screening, severity monitoring, and comorbidity management.

Keywords: Risk, Thoughts, Attempts, Suicidal, Depression

Introduction

Depression is the second most common psychological disorder, affecting approximately 280 million people globally[1]. However, this condition is not uniform; it is often categorized into primary and secondary

depression to understand its etiology better. Primary depression arises independently, without being a direct consequence of another medical condition or substance use. In contrast, secondary depression emerges because of an underlying medical illness (e.g., thyroid disorders, chronic pain) or substance use[2].

The clinical significance of primary depression is magnified by its strong association with suicidal behaviors. It is estimated that two-thirds of depressed patients experience ST, and the lifetime prevalence of SA in this population is 10-15%[3]. While a meta-analysis reported a global prevalence of 37.7% for ST among individuals with major depressive disorder (MDD)[4], the wide variation in these estimates underscores the need to understand the underlying risk factors that drive the transition from thoughts to actions.

Although numerous risk factors have been proposed, including demographic, clinical, psychosocial, and biological determinants[5], a unifying framework that distinguishes risk factors for ST versus SA across the full spectrum of primary depressive disorders (MDD, BD, and dysthymia) remains lacking. Previous research has identified factors such as depressive severity, childhood trauma, and hopelessness as common correlates[5-7]. However, many studies have been limited by small sample sizes, cross-sectional designs, or a focus on a single diagnostic category. More importantly, the evidence regarding whether risk factors are diagnosis-specific or universally shared, and whether they differ between ST and SA, is fragmented and requires systematic synthesis.

Despite growing awareness of the importance of trauma-related factors, such as childhood maltreatment and post-traumatic stress disorder, there has been no comprehensive review that simultaneously evaluates all hypothesized risk factors while interpreting trauma within the broader clinical context of depressive psychopathology. Moreover, the progressive cascade from early vulnerability to suicidal behavior, whereby childhood adversity contributes to maladaptive personality traits, which in turn exacerbate clinical severity and lead to eventual suicidal actions, has not been systematically examined across cohort studies[6,7]. Therefore, the objective of this systematic review was to synthesize evidence from published cohort studies to: (1) identify and categorize all risk factors for ST and SA that have been reported among individuals with MDD, BD, and dysthymia; (2) compare the pattern of risk factors between ST and SA, and across these three diagnostic groups; and (3) integrate the findings into a conceptual framework that highlights common versus diagnosis-specific pathways, thereby providing practical guidance for clinical risk assessment and future research.

Methods

Search strategy

The research question for the study was developed following the PICO (Population, Intervention, Comparator, and Outcome) framework to create an effective search strategy. The systematic review followed the PRISMA Statement guidelines [8]. A comprehensive computerized search was conducted on Scopus (n=45), Web of Science (n=6), PubMed (n=1776), and Embase (n=3214) for articles published until 7 February 2026. The search terms used for suicide included "suicide," "self-killing," "suicidal," and "suicidium." In contrast "depression" and "depressive" were used for depression, and "risk factors," "risk factors," "risk scores," and "relative risk" were used for the risk factor. Every suicide term was combined using "OR" and "AND" operators with every depression and risk factor term. The search strategy used in PubMed and Embase, which was adapted to the other two electronic sources, is presented in **Table 1.**

Inclusion and exclusion criteria

The purpose of this study was to examine the risk factors associated with ST and SA. The studies were screened for eligibility based on four inclusion criteria: a) full-text accessibility, b) English language, c) Cohort articles only, and d) articles that addressed depressive disorders and suicidal behaviors (including ST and SA) in individuals with primary depression. Out of the full-text articles assessed for eligibility, 28 articles were excluded for the following reasons: a) no access to the full-text document (n=8), b) non-English articles (n=3), c) letters to the editor (n=2), and d) conference papers (n=0), e) book (n=0) and review/meta-analysis (n=15).

Study selection

In accordance with PRISMA guidelines, the eligibility of studies was evaluated through three stages: title, abstract, and full text. Initially, duplicate articles (n=650) were removed, and the remaining records were screened for eligibility (n=4391). The screening process involved excluding certain articles based on their titles (n=1266) and abstracts (n=3050), which resulted in 75 studies that underwent full-text screening. The final sample of 47 studies was identified as relevant to this

study and was reviewed and included in the systematic review (see Figure 1).

Table 1. PubMed, Embase, Scopus and Web of Science search strategy utilized for literature review: A focus on selected descriptors

Strategy	Descriptors used
#1	PubMed "suicide"[mesh] OR suicide[ti] OR self killing[ti] OR suicide*[ti]; Embase 'suicide'/exp OR 'suicide':ti OR 'self killing':ti OR 'suicide*':ti; Scopus TITLE(suicide* OR "self killing"; Web of science TI= ("suicide*" OR "self killing")
#2	PubMed "depression"[mesh] OR depression[ti] OR depressive[ti]; Embase 'depression'/exp OR 'depression': ti OR 'depressive': ti; Scopus depression OR depressive; Web of science "depression" OR "Depressive"
#3	PubMed "risk factors"[mesh] OR risk factor[ti] OR risk score[ti] OR relative risk[ti]; Embase 'risk factor'/exp OR 'risk factor':ti OR 'risk score':ti OR 'relative risk':ti; Scopus "risk factor" OR "relative risk" OR "risk score"; Web of science "risk factor" OR "risk score" OR "relative risk"
#4	#1 AND #2 AND #3

Quality assessment

The quality of the included studies was assessed using the Newcastle-Ottawa Scale (NOS), a validated and easy-to-use scale consisting of eight items across three domains: selection, comparability, and outcome. The NOS assigns a maximum of nine points (stars), with one point allocated to each item except for comparability, which can receive up to two points [9]. Based on the NOS scoring system, studies scoring between 0 and 2 were considered of poor quality (high risk of bias), those scoring between 3 and 5 were considered of fair quality (moderate risk of bias), and those scoring between 6 and 9 were considered of good or high quality (low risk of bias). Two independent reviewers assessed each study, and any disagreements were resolved through discussion and consensus. The relevant data were then extracted and documented from the articles that met the eligibility criteria (Table 2**).**

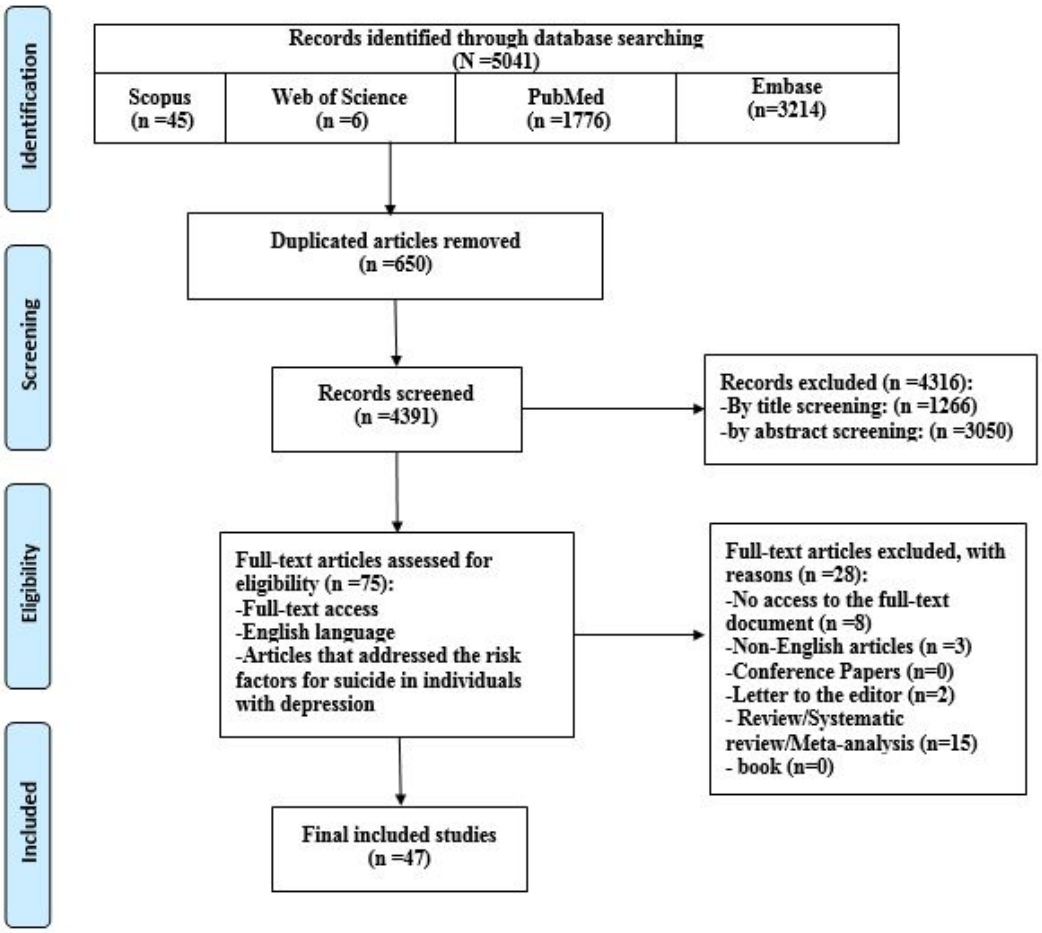

Fig.1 PRISMA 2020 flow diagram of study retrieval process

Data extraction

During the original search, the two independent reviewers screened full-text articles and extracted data. A standardized form was used to ensure consistency, and the extracted data was checked for accuracy. Reviewers worked independently to screen records and reports, ensuring unbiased and consistent selection of studies. Any discrepancies or disagreements between reviewers were resolved through discussion and consensus to reach a final decision on study inclusion. The information extracted included details about the study population and various risk factors reported to be related to suicide in depressed individuals (see Table 1S).

Table 2. Newcastle-Ottawa Scale (NOS) bias risk assessment for the included studies

NO	First author (reference)	Selection	Comparability	Exposure/Outcome	Total
1	Stringer, Barbara [10]	***	**	***	8
2	Maruani, Julia [11]	****	**	***	9
3	Chiu, Chih-Chiang [12]	****	*	**	7
4	Østergaard, Marie LD [13]	****	*	**	7
5	Bobo, William V [14]	****	**	***	9
6	Webb, Roger T [15]	****	**	***	9
7	Chan, Lai Fong [16]	****	*	***	8
8	Holma, K Mikael [17]	****	*	***	8
9	Pallaskorpi, Sanna [18]	****	**	***	9
10	Bogers, Ista CHM [19]	****	**	***	9
11	Hallensleben, N [20]	****	*	***	8
12	Tidemalm, Dag [21]	***	**	***	8
13	Eikelenboom, Merijn [22]	****	**	***	9
14	Ernst, Mareike [23]	****	**	***	9
15	Popiolek, Katarzyna [24]	****	**	**	8
16	Hansson, C [25]	***	**	***	8
17	Coryell, William [26]	****	*	***	8
18	Shinozaki, Gen [27]	**	*	**	5
19	Wiebenga, Jasper XM [28]	****	**	***	9
20	Leadholm, Anne Katrine K [29]	**	*	**	5
21	Xu, Pengfei [30]	****	**	***	9
22	Gonçalves Peter, Angélica [31]	****	**	**	8
23	Tang, Hao [32]	***	**	**	7
24	Kamali, Masoud [33]	***	**	**	7
25	Pawlak, Joanna [34]	***	**	***	8
26	Wang, Yan-yu [35]	***	**	***	8
27	Olgiati, Paolo [36]	****	**	***	9
28	Huber, Rebekah S [37]	****	**	**	8
29	Lieberman, Amy[38]	***	**	**	7
30	Guo, Zixuan[39]	***	**	**	7
31	Huang, Xinyu[40]	**	**	**	6
32	Edwards, Alexis[41]	****	**	**	8
33	Nobile, Bénédicte[42]	***	**	**	7
34	Kim, Sojeong[43]	****	**	**	8
35	Nobile, B[44]	****	**	**	8
36	Chen, Ya[45]	***	**	**	7
37	Sun, Nana[46]	***	**	***	8
38	Yiming, Subinuer[47]	***	**	**	7
39	Yang, Jeong Hun[48]	***	*	**	6
40	Jiang, Tammy[49]	****	**	***	9
41	Liu, Zhiwei[50]	***	*	*	5
42	Mao, Ruizhi[51]	***	**	**	7
43	Lai, Wenjian[52]	***	*	**	6
44	Lin, Kunrong[53]	****	**	***	9
45	Ding, Ruoxi[54]	***	*	**	6
46	Denee, Tom[55]	***	**	*	6
47	Ielmini, Marta[56]	***	*	**	6

Note: 7 to 9 stars: High quality/low risk of bias, 4 to 6 stars: Moderate quality, 0 to 3 stars: Low quality/ High risk of bias

Results

Study selection and quality assessment

The quality of the 47 included cohort studies was assessed using the Newcastle-Ottawa Scale (NOS), with a maximum score of 9 points. Many of the studies demonstrated high methodological quality. Specifically,

38 studies received scores between 6 and 9, indicating a low risk of bias. Among these, twelve studies achieved a full score of 9. A total of 3 studies scored between 3 and 5, reflecting fair quality with a moderate risk of bias. No study received a score below 3 (poor quality). Common strengths across the studies included adequate definition of exposed cohorts, representative participant selection, and sufficient follow-up duration. The primary limitations observed in some studies were a lack of comparability between groups and inadequate description of outcome assessment. Overall, the included studies were predominantly of high quality, with a low risk of bias, supporting the validity of the synthesized findings.

Study and patient characteristics

A total of 47 cohort studies with nearly 687,156 participants (ranging from 66 to 307,476 individuals per study) were included in this systematic review. The mean age of participants across studies ranged from 13 to 69 years, with the majority of studies reporting a mean age between 35 and 50 years. Specifically, studies involving adolescent and young adult populations (aged 13–25 years) were conducted by Huber et al. [37], Sun et al. [46], Guo et al. [39], and Lin et al.[53]. In contrast, studies focusing on older adults (mean age >60 years) included Bogers et al. [19], which reported a mean age of 69.1±6.7 years.

An analysis of the 47 cohort studies demonstrated that the existing evidence has primarily focused on patients with MDD, whereas BD represented the second most frequently investigated diagnostic group. Regarding study outcomes, SA were examined considerably more often than ST, suggesting that cohort studies have predominantly emphasized predicting actual SA rather than ST. Geographically, the largest body of evidence originated from China, the United States, and Northern European countries, particularly the Netherlands, Sweden, and Denmark. Interestingly, studies conducted in Asian countries, especially China, primarily focused on MDD and ST. In contrast, studies from the United States, Sweden, and Denmark mainly investigated SA among patients with bipolar disorder.

In this study, it is suggested that suicide risk in individuals with depressive disorders can be conceptualized as a sequential cascade of interconnected vulnerabilities. Across the included studies, childhood adversity, including physical, emotional, and sexual abuse, neglect, and other adverse childhood experiences, was repeatedly associated with the subsequent development of maladaptive personality traits and psychological characteristics, particularly neuroticism, impulsivity, aggression, anger, and psychological pain. These psychological vulnerabilities frequently coexisted with psychiatric comorbidities, most notably anxiety disorders and substance use disorders, which in turn were linked to greater depressive symptom severity, recurrent illness, and poorer clinical outcomes. As depressive illness became more severe and clinically complex, the prevalence of suicidal ideation increased substantially, and longitudinal studies consistently identified both baseline ST and previous SA as the strongest predictors of subsequent SA. Collectively, these findings indicate that the reported risk factors should not be interpreted as independent determinants; rather, they appear to form a progressive pathway extending from early-life vulnerability through psychological and clinical deterioration to ST and, ultimately, SA.

Table 3. Description of demographic characteristics and risk factors of suicidal thoughts and attempts among individuals with primary depression

ID	Author (reference)	Country	Population Total/ Age (Mean ±SD)	Type of depression	ST Or SA	Risk Factors
1	Stringer, Barbara [10]	Netherland	1838 588 (32%) 1250 (68%) / (46.1 ±12.7)	MDD, Dysthymia	SA	anger (independently increase the risk of recurrent SA), fights (independently decreased the risk of recurrent SA). the number of depressive disorders. Number of months with both depression and anxiety symptoms (increase the risk of recurrent SA). borderline personality traits (increase the risk of recurrent SA), having social phobia, A lifetime diagnosis of dysthymia, mean Inventory of Depressive Symptomatology (IDS) score.
2	Maruani, Julia [11]	France	261 102 (39.1%) 159 (60.9%) / (53±13.3)	MDD	ST	mean age of 53 years Having more severe depressive symptoms, Having more lifetime depressive episodes Hypnotics intake (reduced risk of SI at one-year follow-up) Having higher anxiety levels on the STAI-A daytime dysfunction (increased the risk of SI over the one-year follow-up), more marked impulsivity on the impulsiveness with the Baratt impulsiveness Scale (BIS), more childhood trauma on the Childhood trauma Questionnaire (CTQ)
3	Chiu, Chih-Chiang [12]	Taiwan	1978 680 (34.2 %), 1298(65.8%) / (SA) group (42.56±14.8)	MDD	SA	employment= had lower risk Depression symptom (disinterest (higher Agitation restlessness previous suicide attempts (higher suicide risk)
4	Østergaard, Marie LD [13]	Denmark	181392 77813 / Total (27-33) bipolar disorder (33.65 ±10.01) unipolar depression (31.27±10.23)	BD and unipolar	SA (completed suicide or SA)	Other illicit substances use (sedatives, stimulants, hallucinogens, and other) (except bipolar disorder) Current alcohol use disorder, Current cannabis use (in bipolar disorder), Having any Current substance use disorders (SUDs), Other illicit substances use (the subcategories opioids, sedatives, cocaine, stimulants, hallucinogens, and other) (except bipolar disorder).
5	Bobo, William V [14]	USA	1465 575 (39.2%) 890 (60.8 %) / Total: 42 SA BD I: (40.6 ±12.9) None SA (BD- I) (44.3 ±16.0) SA (BD-I I) (41.0± 12.6) None SA (BD- II) (42.3 ±15.4)	BD-I, BD- II	SA	Sex (women), early age of bipolar illness onset, Rapid cycling was a strong risk factor for attempted suicide, particularly in men with BD-I psychiatric comorbidities (anxiety disorders), comorbid binge eating disorder (Having binge eating behavior only in the subset of persons with BD-II) (Comorbid bulimia nervosa was a significant predictor of SA in persons with BD-I and BD-II). alcohol abuse/dependence, nicotine dependence, substance use /dependence
6	Webb, Roger T [15]	Sweden	15337 / N/A	BD	SA	Sex (being male predicted lower SA) Having the first 2 episodes of bipolar disorder as an inpatient. History of violent crime, history of nonviolent crime, Being from a low-income family Parental factors (suicide, alcohol/drug disorder, psychiatric disorder, violent and nonviolent crime).
7	Chan, Lai Fong [16]	Malaysia	66 / (43.8 ±12.1)	MDD	SA	severity of subjective ratings of depression at baseline (higher baseline BDI total score), previous psychiatric hospitalization (the most effective predictor of a future SA and the transition from SI to future SA) Low social class major personal injury or illness from baseline SRRS (Social Readjustment Rating Scale) past SA prior to baseline assessment, severity of SI at baseline (higher baseline total score of Scale for Suicidal ideation (SSI)), Previous alcohol use disorder, any type of substance use disorder i.e. alcohol, nicotine, amphetamine, opioid or benzodiazepine
8	Holma, K Mikael [17]	Finland	MDD; 249 64 (25.7%), 185 (74.3%) MDE:106 50 (47.2%), 56 (52.8%) Bipolar mixed episode:41 15 (36.6%) 26(63.4%) / MDD (40.1±11.0) Bipolar MDE (38.3±12.2) Bipolar mixed episode (33.6±11.7)	MDD, BD-I, BD-II	ST	Hopelessness, Neuroticism HAM-D score (higher level of depression (Hamilton Rating Scale for Depression) Alcohol use disorder
					SA	Sex (being female in MDD), Age (younger) (in Bipolar mixed episode)

ID	Author (reference)	Country	Population Total/ Age (Mean ±SD)	Type of depression	ST Or SA	Risk Factors
						Subthreshold depression (spent more time in subthreshold depression (in MDD)), spent more time in MDEs (in BD major depressive episode), having a longer duration of illness (in BD major depressive episode) anxiety disorder (less likely to have anxiety disorders and panic disorders (in MDD)), having agoraphobia (in MDD), having simple phobia (in BD major depressive episode), having cluster B personality disorders (in BD), BAI score (having more anxiety symptoms (in Beck Anxiety Inventory (BAI)) (in Bipolar mixed episode)), Psychotic symptoms (baseline) (having more frequent psychotic symptoms, (in Bipolar mixed episode) having more SAs prior to baseline, (in BD major depressive episode), having a higher level of suicidal ideation (in Bipolar mixed episode).
9	Pallaskorpi, Sanna [18]	Finland	Total; 177 86 (48.6%) 91(51.4%) / (37.9 ±12.1)	BD-I, BD- II	SA	Age (younger age), rapid cycling form of the illness at baseline Psychosocial and personality factor (Neuroticism at baseline) the duration of major depressive episode (only during major depressive episodes), severity of depression (BDI score (higher scores)) comorbid anxiety disorder, comorbid cluster A personality disorder, comorbid cluster C personality disorders, higher scores in Beck Anxiety Inventory, The Beck Hopelessness Scale, Suicidal Ideation, HAM-D, lower score DSM-IV Social and Occupational Functional Assessment Scale
10	Bogers, Ista CHM [19]	Netherlands	378 / ST group (69.1±6.7)	MDD	ST	education status (higher education level) severity of depression symptoms (higher) Loneliness, recent life events panic disorder, Comorbid dysthymia (past year) previous SA, at-risk alcohol use
11	Hallensleben, N [20]	Germany	79 24 (N/A %) 53 (71.6%)/ (37.6±14.3)	MDD, dysthymia	ST	interpersonal variables (Thwarted belongingness, Perceived burdensomeness) (positive associations with passive and active ST) Hopelessness
12	Tidemalm, Dag [21]	Sweden	6086 2408 (39.56%) 3678 (60.43%) / Men (49.3 ±12.8) Women (48.3± 13.0)	BD-I, II Schizophrenia	SA	Sex (women) many lifetime depressive episodes (≥4) (in both genders), many lifetimes mixed (manic and depressive) episode (In women), Recent affective episodes (in both genders), recent psychiatric inpatient care (in both genders), early onset of mental disorder (In women) economy-related social problems (in both genders) Personality disorder (in women), eating disorder (in men) Previous SAs (in both genders), substance use disorder (in men).
13	Eikelenboom, Merijn [22]	Netherlands	1713 N/A (31.1%) N/A (68.9%) / (42.1± 12.3)	MDD	SA	Age (Younger), Education status (lower educated), Employment status (Unemployment) personality factors (higher neuroticism, lower extraversion, lower agreeableness, lower control of events and higher aggression) higher severity of depression, longer duration of the depressive disorder, Insomnia childhood life events, loneliness Antidepressant use: tricyclic antidepressants, selective serotonin re-uptake inhibitors, other antidepressants current suicidal thoughts, lifetime history of SA, Current cigarette smoking, receiving psychotherapy, drugs use.
14	Ernst, Mareike [23]	Germany	368 116 (31.5%) 252 (68.7%) / Total (40.95 ± 10.35) SA group (41.84± 9.92)	MDE , dysthymia	SA	Education (less likely to report advanced Educated) interpersonal problem (dominant/hostile) having suffered sexual abuse as a child Severity of depressive Symptoms personality disorders, QIDS-C sum score (more depressed by diagnosticians), Non-suicidal self-injury
15	Popiolek, Katarzyna [24]	Sweden	1255 430 (34.3%) 825 (65.7) / (52.2 ±17.0)	BD depression	SA	lower age (significant association with higher risk of (RoS) Rehospitalization post-discharge treatment with antipsychotics or benzodiazepines (increased risk of ROS) A small (1−5) and a large (13 or above) number of ECT sessions in the index series (associated with a higher risk of RoS).
16	Hansson, C [25]	Sweden	12850 4844 8006 / Suicide group (47.4 ±14.8)	BD-II	SA	Gender (male) recent affective episodes, recent depressive episodes, psychiatric inpatient care, involuntary commitment criminal conviction, Living alone comorbid psychiatric disorder (in particular substance use disorder, anxiety disorder, and personality disorder) previous attempted suicide
17	Coryell, William [26]	USA	Cohort (CDS) 288; 154 (53.5%) Cohort Consortium 1748	BD-I	SA	Gender(male) (In the CDS), Divorced or separated (in the Genomic cohort) to have expressed prominent feelings of hopelessness (In the CDS) previous attempted suicide (In the CDS).

ID	Author (reference)	Country	Population Total/ Age (Mean ±SD)	Type of depression	ST Or SA	Risk Factors
			1154 (66%) / Cohort (CDS) (36.7±13.1) Cohort Genomic (42.2±13.0)			
18	Shinozaki, Gen [27]	USA	422 294(N/A %) / (44.2±12.9)	Mood disorders	SA	child abuse history increased rates of SA 5HTTLPR genotype (with the long/ long (l/l) genotype) (statistically significant with prevalence of SA).
19	Wiebenga, Jasper XM [28]	Netherlands	1576 1060(32.8%) 516(67.2%) / (41.1 ±12.4)	MDD, dysthymia	ST	More years of education increased rates of ST elevated disruptive aggression increased rates of suicide ideation, higher introversion is associated with higher suicide ideation higher severity of depression increased rates of suicide ideation Presence of comorbid depressive and anxiety disorder vs pure anxiety disorder increased rates of suicide ideation. Presence of childhood trauma increased rates of suicide ideation
					SA	non-Western descent increased SA, lower education level increased SA, lower age of onset of a depressive or anxiety disorder increased SA higher levels of aggression increased SA, higher external locus of control increased SA higher severity of depression increased SA lower social support increased SA. more childhood trauma increased SA presence of comorbid depressive and anxiety disorder vs pure anxiety disorder increased SA. comorbid lifetime alcohol use disorder increased SA
20	Leadholm, Anne Katrine K [29]	Denmark	34671 / N/A	BD psychotic (PD)	SA	age (Older age increased SA), gender (being male increased SA), living in an institution (decreased risk of suicide), Receiving disability pension (decreased risk of SA) a previous incident of self-harm (non-fatal intentional self-harm significant risk factors for SA) previous analgesia poisoning (significant risk factors for SA only in non-PD patients).
21	Xu, Pengfei [30]	China	446 137 (30.72%) 309 (69.28%) / SA group; (41.06±7.33) No-SA group (40.69±8.17)	melancholic of depressive	SA	Gender (female) SA was higher in women. Frequent depressive episodes frequent (≥ 4 times per year) was associated with higher rate of SA. Sleep disorder increased SA rate. Living alone increased SA rate. Alcohol drinking was associated with higher SA rate. number of previous admissions to hospital (≥ 3) increased SA rate.
22	Gonçalves Peter, Angélica [31]	Brazil	377 63 (16.7%) 314 (83.3%) / (18-60)	MDD	SA	low schooling Experiencing intense physical abuse during childhood increased SA rate Being at prior suicide risk (plans and ideation) increased SA rate.
23	Tang, Hao [32]	China	309 / SA group (23±16) None SA group (32 ±23)	MDD, BD	SA	Very high scores of the Nurse's Global Assessment of Suicide Risk (NGASR), especially the patients who were in the reflection sub-group, were more likely to commit suicide.
24	Kamali, Masoud [33]	USA	151 with BP and 119 healthy controls / adult populations (ages 21 and above) and college age populations (ages 17–20)	BD-I	ST	personality factors (Only Self-Consciousness and Vulnerability have statistically significant higher odds ratios for ST) having an episode of depression (elevated odds ratios for ST) (The strongest predictor of reporting SI during follow-up), Having a manic episode during follow-up (elevated odds ratios for ST)
25	Pawlak, Joanna [34]	Poland	Total:1160 460 700 Patients group:597 230 (38.6%) 367(61.4%) control group 563 230 333 / Patient group (47±14) control group (42 SD±13)	Uni- (UP) and bipolar (BP) affective disorders	SA	Age (SA greater in patients under 45 years old) Early onset of unipolar disorder was associated with higher SA. Inappropriate guilt in depression was associated with higher SA. Chronic insomnia was associated with higher SA. psychoactive substance abuse Family history of psychiatric disorders, affective disorders /dependence was associated with higher SA.
26	Wang, Yan-yu [35]	China	159 71 (44.7%) 88 (55.4%) / (36.33 ±13.08)	MDD	ST	depression severity (significantly and positively correlated with SI both in current and at worst point), higher levels of hopelessness (significantly and positively correlated with SI both in current and at worst point)
27	Olgiati, Paolo [36]	Netherlands	249 / 43.04 ± 12.51	MDD	ST	age of onset (elderly is protective against ST) childhood sexual abuse

ID	Author (reference)	Country	Population Total/ Age (Mean ±SD)	Type of depression	ST Or SA	Risk Factors
						childhood physical abuse, childhood emotional abuse, childhood neglect, childhood maltreatment Panic disorder, PTSD, sleep-onset insomnia (sleep-onset insomnia was protective against severe ST)
28	Huber, Rebekah S[37]	USA	151 Female: (83.4%) Male: (16.6%) / Total (13–21) MDD group: 17.41±2.11 BD group: 16.85±2.31	BD I, II. MDD	ST	younger age of illness onset Compared to MDD youth, BD youth were more likely to report experiencing more severe ST.
					SA	older age, younger age of illness onset (Significantly predicted history of SA)
29	Lieberman, Amy[38]	USA	119 / 43.61 ±11.57	MDD, Bipolar	ST	Age (higher), Gender (female) Change in cognitive and functioning.
30	Guo, Zixuan[39]	USA	546 / 19.61±1.31	MDD, Bipolar	ST	Age, Gender, Level of Education, Income Schizophrenia, Post-traumatic stress disorder, Insomnia Nightmares, Alcohol, Coffee
31	Huang, Xinyu[40]	China	532 / 26.91± 6.94	MDD	ST	Higher levels of reflection
					SA	Higher levels of brooding
32	Edwards, Alexis C[41]	China	4380 / 44.63±8.82	MDD	ST	Divorce/separation
					SA	Divorce/separation Polygenic scores for suicidal behavior were associated with ideation and plans.
33	Nobile, Bénédicte [42]	France	379 / 44.7 (rang18.1±72/6)	Mood disorders	SA	Trait anxiety, Anger, Anxious lability No history of violent SA
34	Kim, Sojeong[43]	South Korea	480 / 23.06±3.37	MDD, BD- I, II	SA	Childhood maltreatment (emotional abuse, emotional neglect, physical abuse)
35	Nobile, B[44]	France	679 / 41±14	Mood disorders	SA	younger age psychological pain, suicidal ideation, History of SA anxiety disorders
36	Chen, Ya[45]	China	511 / 28.7±6.7	MDD	ST	Stressful life events, Events and insomnia symptoms, Childhood physical abuse
37	Sun, Nana[46]	China	515 / Rang 13-17 years	depressive disorders	ST	Increase in the number of hospitalizations, Elevated Hamilton Depression Rating Scale scores Escalated antidepressant dosage. Heightened TC/HDL-C ratio
					SA	Escalated antidepressant dosage Heightened TC/HDL-C ratio
38	Yiming, Subinuer[47]	China	1274 / 27.7±6.8	MDD	ST	High intensity of somatic symptoms (pain-related, autonomic, energy-related, and neurological)
39	Yang, Jeong Hun[48]	Korea	312 / 48.88 ± 16.90 Age < 25 y 20.20 ± 2.25	MDD BPD	ST	ST and SI were more common in patients with BD across all ages. Younger Age (<25 years) Unemployment in older MDD Low use or inadequate prescription of mood stabilizers was associated with increased ST in patients with BD. More comorbid physical illness in older MDD.
					SA	ST and SI were more common in patients with BD across all ages. History of SA, especially for BD patients
40	Jiang, Tammy[49]	Denmark	17995 / Men: 32 (17) Women: 29 (19)	Persons with depression	SA	Being single / remaining single History of poisoning (possibly as a previous course of action), Alcohol-related disorders, Reaction to severe stress and adjustment disorders, Specific personality disorders especially in women, schizoaffective disorders - in women. Toxic effects of substances chiefly nonmedicinal as to source Receipt of state pension Drugs used to treat addictive disorders. Anxiolytics or antianxiety drugs. Hypnotics and sedatives. Antipsychotics - specially in women. Antithrombotic agents - in men. Other analgesics and antipyretics - in women in the previous 48 months.
41	Liu, Zhiwei [50]	China	756 / Hypercholesterolemia group: 14.49 ± 1.68 Hypertriglyceridemia group. 15.0 (14.0, 16.0)	MDD	ST, SA	, hypertriglyceridemia, low HDL-C risk marker for increased likelihood.
42	Mao, Ruizhi[51]	China	1745 / 40.18 ± 13.23	MDD	ST	Most female patients: increased appetite, respiratory symptoms, circulatory system symptoms, limb pain

ID	Author (reference)	Country	Population Total/ Age (Mean ±SD)	Type of depression	ST Or SA	Risk Factors
43	Lai, Wenjian [52]	China	556 / Age (years), median (IQR) :26.0 (22.0, 30.0)	MDD	ST	Persistent high levels of depressive symptoms are directly associated with an increased risk of suicidal ideation
44	Lin, Kunrong [53]	China	951 / 13-25 years	MDE	SA	Mixed features (co-occurring manic symptoms during depression) lead to increased SA Previous history of SA, HAMD-17 total score (excluding suicide item 3)
45	Ding, Ruoxi [54]	China	1461 / 32.4±11.3	MDD	ST	protective factors against ST: Older age, Higher education, Higher income Increased risk of persistent or slowly improving ST: Depression severity, Anhedonia, protective factor, associated with a decreased risk (or a more favorable trajectory: Atypical depressive symptoms SSRI use and antidepressant-antipsychotic/mood stabilizer combination therapy were linked to a slower decline in ST
46	Denee, Tom[55]	England	307476 / 44.5 ±17.0	MDD	SA	Patients with moderate-to-high-suicide-intent were younger on average (39.0 vs. 44.8 years). Being male is considered a risk factor
47	Ielmini, Marta[56]	Italy	105 / 50-59 years	MDD	SA	High scores on the Beck Depression Inventory, Mental Pain Questionnaire, and Hamilton Rating Scale for Depression were significantly associated with an increased risk of SA

Note: Suicidal thoughts; ST, Suicide attempts; SA, Not reported; N/A, Major Depressive Disorder; MDD, MDE; Major depressive episodes.

Discussion

Trends in Risk Factors for ST and SA in MDD

The synthesis of studies conducted across Europe, Asia, North America, and South America demonstrates that although the prevalence of ST and SA among patients with MDD has been investigated in diverse cultural settings, the overall pattern of risk factors is remarkably consistent. Rather than exhibiting substantial geographical variation, the findings suggest that a relatively stable core of clinical and psychological risk factors underlies suicidality in MDD across different populations.

Among all identified variables, depression severity emerged as the most reproducible factor of suicidality. Regardless of whether studies were conducted in France [11], Finland [17], the Netherlands [19,22,28,36], China [35,52,54], Germany [23], Malaysia [16], or Italy [56], increasing depressive symptom severity consistently predicted either ST, SA, or both. This remarkable consistency across countries suggests that depressive symptom burden represents the central clinical substrate of suicidality in MDD, largely independent of sociocultural context. Likewise, hopelessness was repeatedly identified in studies from Finland[17], Germany[20], and China[35], indicating that cognitive distortions accompanying depression are shared factors across geographically distinct populations rather than culture-specific phenomena.

A second important observation emerging from the reviewed studies is that risk factors evolve as patient's progress from ST to SA. Across studies evaluating ST, cognitive-emotional variables predominated. Hopelessness, loneliness, anxiety symptoms, neuroticism, rumination, interpersonal vulnerability (perceived burdensomeness and thwarted belongingness), depressive severity, and childhood trauma were repeatedly associated with ST[11,17,19,20,28,35,36,40,45,47,52,54]. In contrast, studies examining SA consistently identified a broader multidimensional profile in which behavioral history, psychiatric complexity, and social adversity became increasingly important. Previous suicide attempts, previous psychiatric hospitalization, substance use disorders, alcohol misuse, unemployment, low educational attainment, aggression, personality disorders, and current suicidal ideation repeatedly predicted suicide attempts across Malaysia[16], Taiwan[12], Germany [23], the Netherlands[22,28], Brazil [31], England[55], Korea [43,48], and China[32,40,41]. These findings suggest that while ST is largely influenced by internal psychological distress, progression toward suicidal behavior requires the accumulation of behavioral vulnerability, psychiatric chronicity, and adverse social circumstances. Rather than representing different phenomena, ST and SA appear to reflect sequential stages within the same clinical continuum, characterized by progressively increasing clinical complexity.

Another noteworthy pattern concerns the influence of age on suicide risk profiles. The reviewed studies indicate that risk factors are not static throughout life but gradually shift across developmental stages. In

adolescent cohorts from the United States[37], earlier onset of mood disorders markedly increased both ST and SA, emphasizing the importance of developmental vulnerability during adolescence. In younger adult populations from Finland, China, the Netherlands, and Korea, psychological characteristics including hopelessness, impulsivity, anxiety, rumination, insomnia, and childhood trauma were consistently associated with suicidality[17,28,40,43,45]. However, studies including middle-aged and older adults demonstrated a gradual transition toward greater importance of social isolation, unemployment, physical illness, and medical comorbidity [19,41,48,54]. Moreover, several investigations identified older age as a protective factor against persistent ST[36,54], whereas younger individuals generally exhibited greater vulnerability to SA[16,22,37,55]. These observations suggest that although depression remains the principal clinical determinant throughout adulthood, the mechanisms facilitating suicidality evolve considerably with aging.

Cross-cultural comparison also revealed an interesting pattern. However, the principal psychological determinants were largely universal; studies from East Asian countries, including China and Korea, more frequently identified biological and somatic correlates of suicidality, including insomnia, severe somatic symptoms, hypercholesterolemia, hypertriglyceridemia, polygenic susceptibility, and rumination[40,45,47,50,51,54]. Conversely, European studies more consistently emphasized interpersonal dysfunction, loneliness, educational attainment, employment status, and childhood adversity[11,19,20,22,23,28,36]. Rather than indicating fundamentally different mechanisms of suicidality, these regional differences likely reflect variation in environmental exposures, healthcare systems, socioeconomic conditions, and cultural expression of depressive symptoms. Importantly, the shared presence of depression severity, hopelessness, previous suicidal behavior, and childhood trauma across nearly all countries indicates that these variables constitute the universal core of suicide risk in patients with MDD.

Trends in Risk Factors for ST and SA Across BD and other Depressive Disorders

The studies included in this review demonstrated that ST and SA were consistently associated with indicators reflecting progressive illness burden rather than isolated demographic or psychosocial characteristics. Across cohort studies from Europe, North America, and Asia involving individuals with BD, primary depression, unipolar depression, melancholic depression, MDE, depressive disorders, and other mood disorders, the reported risk factors followed a similar temporal pattern, with predictors evolving from early clinical characteristics toward markers of illness chronicity and increasing clinical complexity.

During the early stages of BD, melancholic, MDE, and studies involving adolescents and young adults consistently identified early age at onset, mixed affective presentations, rapid cycling, and predominantly depressive polarity as the principal characteristics associated with SA. These findings were reported across cohorts from the United States, China, and several European countries, indicating that illness instability represents one of the earliest identifiable clinical patterns linked to suicidal behavior[14,30,33,46,53].

As the disorder progressed, the risk factors changed. Studies conducted in Denmark, Sweden, Finland, France, Poland, and China increasingly reported recurrent depressive episodes, multiple psychiatric hospitalizations, history of previous SA, psychiatric comorbidity, and substance use disorders as the predominant correlates of suicide attempts. Across these studies, suicide risk was more frequently observed among patients with repeated episodes and accumulated clinical burden than among those experiencing isolated affective episodes[15,18,21,24-30,34,44,49,53].

Age-related trends also showed a gradual shift in the distribution of risk factors. In younger populations, SA were predominantly associated with illness-related variables, including rapid cycling, mixed episodes, impulsive clinical features, and early disease onset. In contrast, studies involving middle-aged and older adults more frequently report factors reflecting cumulative disease burden, including repeated hospitalization, long illness duration, previous suicidal behavior, psychiatric comorbidity, living alone, and social disadvantage. Despite these differences, previous SA remained one of the few predictors consistently identified across all adult age groups[18,21,24,29,34,44,53].

Comparison across geographical regions demonstrated relatively limited variation in the principal clinical predictors. Studies from Scandinavian countries predominantly identified registry-derived variables, including repeated psychiatric admissions, criminal history, parental psychiatric disorders, socioeconomic disadvantages, and living alone. North American studies

more frequently reported childhood trauma, eating disorders, anxiety disorders, and genetic susceptibility, whereas studies from East Asia more commonly identified mixed depressive features, sleep disturbances, lipid abnormalities, and treatment-related variables. Nevertheless, these regional differences were observed primarily in secondary risk factors. At the same time, the central clinical pattern characterized by recurrent depressive illness, illness instability, previous suicide attempts, and psychiatric comorbidity remained consistent across countries.

Overall, the findings indicate that the profile of suicide risk factors in BD changes and other disorders progressively over the course of the illness. Early stages are characterized predominantly by markers of affective instability, whereas later stages are increasingly associated with indicators of illness chronicity, accumulated psychiatric burden, and recurrent suicidal behavior. Across the included studies, this temporal pattern remained largely consistent despite differences in country, study design, and population characteristics.

A Four-Layer Conceptual Synthesis of Risk Factors in Depressive Disorders

A conceptual synthesis of the evidence suggests that the identified risk factors can be organized into four interrelated layers that collectively characterize the progression from vulnerability to suicidal behavior in individuals with depressive disorders. The first layer comprises background vulnerability factors, including younger age, female sex (although sex differences were inconsistent across studies), family history of psychiatric disorders or suicide, childhood adversity[11,14,15,17,18,21,22,28,31,34,36,37,43,44,46,48,53]. These relatively stable characteristics appear to increase an individual's predisposition to suicidal behavior before the onset of severe clinical symptoms. The second layer consists of psychological vulnerability factors, including hopelessness, neuroticism, aggression, anger, impulsivity, psychological pain, and other maladaptive cognitive-emotional characteristics[10,11,17,18,20,22,26,28,35,44,45]. These factors were frequently reported together and appear to represent intermediate mechanisms through which early vulnerability may influence suicidal risk. The third layer reflects clinical deterioration, characterized by increasing depression severity, anxiety disorders, psychotic symptoms, insomnia, recurrent depressive episodes, repeated psychiatric hospitalizations, mixed affective features, and substance use disorders[10,11,13,14,16-18,21,22,25,28,34-36,39,42,44-46,49,54]. Across both major depressive disorder and bipolar depression cohorts, these clinical characteristics consistently marked the transition from psychological vulnerability to clinically significant suicide risk. Finally, the fourth layer represents behavioral manifestation, in which suicidal thoughts constitute the initial observable expression of suicide risk and, in the presence of accumulating clinical and psychological vulnerabilities, may progress to SA. Although the individual cohort studies evaluated different predictors and outcomes, synthesizing their findings suggests that these variables are better understood as interconnected domains within a hierarchical framework rather than as independent risk factors.

Discussion

This systematic review synthesized evidence from 47 cohort studies to identify risk factors for ST and SA among individuals with primary depressive disorders, including MDD, BD, and dysthymia. Overall, our findings indicate that suicide risk in primary depression is multifactorial. The several causes, including depressive symptom severity, hopelessness, previous SA, and childhood trauma, were consistently associated with suicidal outcomes across depressive disorders, other risk factors appeared to be diagnosis-specific. These findings support the importance of individualized suicide risk assessment while also highlighting the cumulative contribution of traumatic experiences within the broader clinical context of depression.

Similarities Between MDD, BD, and Dysthymia

Despite diagnostic differences, we observed considerable overlap in risk factors. The severity of depressive symptoms was a consistent and strong factor for both ST and SA across MDD, BD, and dysthymia [11,17,19,28]. Feelings of hopelessness were similarly associated with increased suicidality in all three conditions [17,35]. A history of childhood trauma (including abuse and neglect) was another common factor, increasing the risk of both ST and SA in MDD, BD, and dysthymia [23,28,36,43]. The association between childhood trauma observed in the present review is consistent with findings from several systematic reviews and meta-analyses. Angelakis et al. demonstrated that childhood maltreatment, including

physical, emotional, and sexual abuse as well as neglect, is associated with a two- to three-fold increase in suicidal ideation and suicide attempts in adulthood, irrespective of psychiatric diagnosis[57]. More recently, evidence has also shown that childhood maltreatment is associated with greater depressive symptom severity and poorer clinical outcomes in major depressive disorder, further supporting the interaction between traumatic experiences and suicidality in depressive disorders[58]. Also, a prior history of suicide attempts emerged as the single strongest factor of future SA regardless of the specific depressive disorder [12,16,21,25].

Differences Between MDD, BD, and Dysthymia

While similarities exist, important differences were noted, particularly in age, gender, personality, and medication-related factors.

In MDD, older age (over 50 years) was more strongly associated with ST[36,54]. Conversely, in BD, younger age at disease onset was a specific risk factor for SA[18,21]. Additionally, female sex was a notable risk factor for SA in BD type I and MDD, while male sex was a risk factor in BD type II and unipolar severe depression[14,17,26,29].

Our review found disorder-specific personality traits. In dysthymia and MDD, interpersonal and cognitive factors such as "thwarted belongingness" and "perceived burdensomeness" were uniquely associated with ST [20,40]. In contrast, in BD, the presence of a diagnosed personality disorder, particularly Cluster B (borderline), was a strong factor of SA [10,18].

The role of pharmacological agents also differed. In MDD, the use of antidepressants (SSRIs and TCAs) and specific combinations (e.g., SSRI with antipsychotics/mood stabilizers) showed complex associations with SA and ST[49,54]. However, in BD, the use of benzodiazepines, antipsychotics post-discharge, and illicit substances (other than cannabis) was more strongly associated with repeated suicidal behavior [13,24].

Trauma-related perspective

An important finding of the present review is that trauma-related factors were consistently identified across the included studies as contributors to ST and SA in individuals with primary depressive disorders[23,28,29,32,36]. Childhood physical, emotional, and sexual abuse, childhood neglect, PTSD, and severe stressful life events were identified as trauma-related risk factors across several of the included cohort studies involving patients with primary depressive disorders [39,43-45,49]. These findings suggest that trauma represents a transdiagnostic dimension of suicide risk rather than a risk factor confined to a specific depressive disorder.

Similar observations have been reported in previous systematic reviews, which consistently demonstrated that childhood maltreatment is associated with an increased risk of ST and SA across different psychiatric populations[57]. Another important observation is that trauma rarely appeared as an isolated factor of suicidal behavior. In most of the included studies, trauma-related exposures coexisted with other well-established risk factors, including greater depression severity, hopelessness, personality pathology, and previous SA[10-12,16-19,21,25,28,35]. This pattern suggests that traumatic experiences may increase vulnerability to suicidal behavior by interacting with multiple clinical and psychological factors rather than acting independently. Therefore, suicide risk assessment in patients with primary depression should incorporate a trauma-informed approach, including routine evaluation of lifetime traumatic experiences and trauma-related psychopathology, to improve identification and management of individuals at high risk.

Clinical and Research Implications

These findings underscore the need for diagnostic-specific risk assessment. For all depressed patients, clinicians should routinely screen for depression, severity, hopelessness, childhood trauma, and any history of prior attempts. However, for patients with MDD, closer monitoring of older adults and careful management of antidepressant prescriptions are warranted. For BD patients, clinicians should prioritize early intervention in younger patients and screen for comorbid personality disorders and substance use. For dysthymic patients, therapeutic interventions should focus on improving social belongingness and addressing interpersonal problems[22,23].

Based on our findings, we propose the following evidence-based clinical recommendations:

1. Routine and Structured Risk Assessment:

Clinicians should systematically assess for the "core four" risk factors in every depressed patient: (a) severity of depressive symptoms (using validated tools like HAM-D or BDI), (b) hopelessness (Beck Hopelessness Scale), (c) history of childhood trauma (CTQ), and (d) prior SA [16,36]. This assessment should be repeated at each clinical encounter, particularly during transitions in care (e.g., hospital discharge).

2. Diagnosis-Specific Prevention Strategies:
For MDD patients: Older adults (≥50 years) require closer monitoring for ST[36,54]. Antidepressant prescription, particularly SSRIs and TCAs, should be accompanied by frequent follow-up in the first 4-6 weeks to monitor for emerging SA risk, especially in younger adults[54]. For BD patients: Clinicians should prioritize early intervention in patients with a younger age of onset [18,21]. Screening for comorbid personality disorders (especially Cluster B) and substance use disorders is essential, as these significantly elevate SA risk [10,14]. Mood stabilizers should be optimized, and benzodiazepines/antipsychotics prescribed cautiously post-discharge [24]. For patients with dysthymia: Therapeutic interventions should target interpersonal dysfunction and improve social belongingness. Cognitive-behavioral therapy focusing on perceived burdensomeness and thwarted belongingness may be particularly beneficial [20,40].

3. Pharmacovigilance and Medication Management:
Given the complex role of medications, clinicians should avoid unnecessary polypharmacy, particularly combinations of antidepressants with antipsychotics or benzodiazepines, unless clearly indicated [49]. Monitor lipid profiles in children and adolescents with depression, as elevated TC/HDL-C ratios were associated with increased suicidal behavior[46,50]. Exercise caution when prescribing hypnotics and anxiolytics, which showed protective effects for ST in some studies but were associated with SA in large population-based studies [11,49].

4. Trauma-Informed Care:
The consistent association between childhood trauma (sexual, physical, emotional abuse) and both ST and SA across all depressive disorders underscores the need for trauma-informed care. Screening for childhood adversity should be universal, not conditional, and referrals to trauma-focused therapies (e.g., EMDR, TF-CBT) should be integrated into depression treatment protocols [23,31,43]. In addition to conventional suicide risk assessment, our findings support incorporating trauma-informed approaches into routine psychiatric evaluation. Screening should not be limited to childhood abuse but should include lifetime traumatic experiences, interpersonal violence, traumatic loss, severe stressful life events, and PTSD symptoms. Integrating trauma-informed assessment may facilitate earlier identification of high-risk patients and guide appropriate referral to trauma-focused psychological interventions. Our findings also highlight that trauma-related factors should be considered alongside demographic, clinical, and psychological characteristics as an integral component of comprehensive suicide risk assessment in individuals with primary depressive disorders.

5. Suicide Prevention Programs:
Health systems should implement multi-level suicide prevention programs that include regular risk factor assessments at each visit, safety planning interventions for patients with active ST, means restriction counseling (reducing access to lethal means), and follow-up contacts (postcards or phone calls) after psychiatric hospitalization, which has been shown to reduce re-attempt rates [16].

Limitations and Strengths
This study has several limitations. First, the substantial clinical and methodological heterogeneity across the 47 included studies (e.g., varying definitions of ST/SA, different follow-up durations) precluded a meta-analysis. Second, some risk factors (e.g., specific biomarkers like lipid profiles) were reported in only a few studies[46,50], requiring cautious interpretation. Third, despite our comprehensive search strategy across four major databases, we cannot completely exclude the possibility of publication bias, as studies with statistically significant or positive findings are more likely to be published, which may have influenced the overall pattern of identified risk factors.

This systematic review also included a critical appraisal of the quality of the evidence. The evidence across risk factor domains was assessed qualitatively based on the number of studies reporting each factor, consistency of findings, and NOS quality scores. Risk factors such as depression severity demonstrated the most consistent evidence, being identified as a predictor of ST and/or SA in 10 studies across diverse populations[11,16,17,19,22,23,28,35,36,52,54,56]. Prior SA was consistently identified as the strongest predictor of future SA in multiple studies[12,16,21,25]. Risk factors such as hopelessness[17,20,35]and neuroticism[17,18] were reported in several high-quality studies, though collinearity with depression severity may limit independent effect estimation.

Trauma-related factors showed consistent associations across 9 studies [11,23,27,28,31,36,39,43,45], but recall bias remains a concern. Sociodemographic factors showed inconsistent results across studies, likely due to cultural heterogeneity and inadequate confounding control. For example, female sex was a risk factor in some studies[14,17] while male sex was identified in others[26,29]. Biological markers (lipid profiles) were reported in only 2 studies[46,50], and medication-related factors showed variable results with indication bias as a major limitation[11,24,49,54]. These factors require cautious interpretation.

Overall, differences in the strength of associations across risk factors appear to reflect methodological differences rather than true inconsistencies. Risk factors examined in multiple high-quality prospective cohort studies with adequate adjustment for confounding variables demonstrated more robust and reproducible associations. In contrast, factors evaluated in only a few studies or primarily through retrospective self-report were more susceptible to recall bias, residual confounding, and measurement heterogeneity, thereby reducing confidence in the observed associations.

Nevertheless, this review has notable strengths. It provides a comprehensive, up-to-date synthesis of risk factors across the full spectrum of primary depression, drawing from 47 cohort studies conducted across 15 countries, which enhances the generalizability of our findings. The clear separation of risk factors for ST versus SA, and for MDD versus BD versus dysthymia, offers a valuable evidence base for clinicians and researchers aiming to design targeted suicide prevention strategies.

Abbreviations

ST Suicidal thoughts
SA Suicide attempts
MDD Major Depressive Disorder
MD Mood Disorder
DD Dysthymic Disorder
BD Bipolar Disorder
WHO World Health Organization
PICO Population, Indicator, Comparator, and Outcome
NOS Newcastle-Ottawa Scale
SSRIs Selective Serotonin Reuptake Inhibitors
TCAs Tricyclic Antidepressants
IDS Inventory of Depressive Symptomatology
GAF Global assessment of functioning
HAM-D Hamilton Depression Rating Scale
ECT Electroconvulsive Therapy
PSS Perceived Stress Scale

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The authors declare that they have no competing interests

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Authors' Contributions

SA.SA, S.Y the conception and design of the study. E.M Acquisition of data. E. EB, H.MG, E.K, Pa.M, Pe.M, S.A, H.S and k.k analysis and interpretation of data. H.S, F.S, SH. J, SA.SA and S.Y drafting the article. SA.SA, E.M and S.Y revising it critically for important intellectual content. SA.SA, E.M.SH.J and S.Y final approval of the version to be submitted. All authors contributed to the article and approved the submitted version.

Ethical Statement

This study is a systematic review and does not deal with human Participants.

Declaration of Generative AI and AI-assisted technologies

The authors declare that the deep seek platform (English edition) was used for editing language and facilitating readability. However, all scientific content, data interpretation, and final conclusions were produced, reviewed, and verified directly by the authors.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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