The effects of smoking cessation on the progression of depressive disorders: A systematic review and meta-analysis

Ahmed Ouaamr[1,2], Boujdid Mohamed[3], Aziz Mengad[4], Chikhaoui Mourad[5], Katim Alaoui[1]

AFFILIATION
1 Pharmacodynamics Research Team ERP, Laboratory of Pharmacology and Toxicology, Faculty of Medicine and Pharmacy, University Mohammed V in Rabat, Rabat, Morocco
2 High Institute of Nursing Professions and Health Techniques, Tiznit, Morocco
3 Laboratory for Research and Innovation in Health Science, Faculty of Medicine and Pharmacy of Agadir, Agadir, Morocco
4 Research Team Pharmacoeconomics and Pharmacoepidemiology, Laboratory of Pharmacology and Toxicology, Faculty of Medicine and Pharmacy of Rabat, Mohamed V University, Rabat, Morocco
5 Laboratory of Ecology and Environment, Faculty of Sciences Ben M'sik, Hassan II University, Casablanca, Morocco

CORRESPONDENCE TO
Ahmed Ouaamr. Pharmacodynamics Research Team ERP, Laboratory of Pharmacology and Toxicology, Faculty of Medicine and Pharmacy, University Mohammed V in Rabat, BP 6203, Rabat, Morocco
E-mail: ad.bani82@gmail.com
ORCID iD: https://orcid.org/0000-0001-8694-8887

KEYWORDS
smoking cessation, depressive disorders, mental health, quality of life, public health

Received: 2 August 2025, **Revised:** 4 October 2025,
Accepted: 17 October 2025

Popul. Med. 2025;7(October):24

https://doi.org/10.18332/popmed/215739

ABSTRACT

INTRODUCTION Smoking and depression frequently co-occur, posing a major public health challenge. While the physical benefits of smoking cessation are well established, its impact on depressive disorders remains debated. Clarifying this relationship is essential for optimizing mental health interventions.

METHODS We conducted a systematic review and meta-analysis of randomized controlled trials and longitudinal cohort studies assessing changes in depressive symptoms following smoking cessation among adults (≥18 years) diagnosed with depressive disorders. In addition, the reference lists of three relevant meta-analyses were screened to identify additional eligible primary studies, but these meta-analyses were not counted as included studies. Searches were performed in PubMed, Scopus, Web of Science, and PsycINFO up to 30 April 2025. Risk of bias was assessed using the Cochrane RoB 2.0 tool for RCTs and the Newcastle–Ottawa Scale for cohort studies. Effect sizes were pooled using a random-effects (DerSimonian–Laird) model, and heterogeneity (I^2) was evaluated.

RESULTS A total of 22 primary studies (10 randomized controlled trials and 12 cohort studies; >30000 participants) met the inclusion criteria, and 18 contributed to the quantitative synthesis. The primary outcome – change in depressive symptom severity measured using validated scales (PHQ-9, BDI, CES-D, HAM-D) – showed a pooled standardized mean difference of -0.25 (95% CI: -0.37 – -0.12; p<0.001), indicating a modest but significant reduction in depressive symptoms among abstainers. Findings were consistent across study designs and populations, with moderate heterogeneity (I^2 about 60%).

CONCLUSIONS This review provides consistent evidence that smoking cessation is safe and beneficial for individuals with depressive disorders, improving depressive symptoms and psychological well-being. Although some individuals experience transient increases in symptoms post-cessation, structured support effectively mitigates these effects. Integrating cessation treatment within mental healthcare and developing scalable, tailored interventions should be prioritized in future research.

INTRODUCTION

Tobacco smoking continues to be disproportionately prevalent among individuals suffering from depressive disorders[1-3]. This co-occurrence is not coincidental: depressive symptoms and nicotine dependence often reinforce one another, creating a bidirectional relationship that complicates cessation efforts and worsens mental health outcomes[4-6]. Epidemiological studies consistently show that individuals with depressive disorders are less likely to quit successfully than the general population[7]. For instance, long-term twin cohort data reveal that baseline moderate-to-severe depressive symptoms significantly reduce the likelihood of successful cessation[7].

Historically, clinicians and patients have believed that

smoking alleviates depressive symptoms. This assumption has contributed to hesitancy in promoting cessation among depressed individuals, based on the fear that abstinence might exacerbate emotional distress[5]. However, emerging evidence has challenged this paradigm. Recent systematic reviews and meta-analyses demonstrate that smoking cessation is associated with significant improvements in mental health and reductions in depressive symptoms[5-8]. The pooled standardized mean differences observed across multiple analyses (approximately -0.25; 95% CI: -0.37 – -0.12) suggest clinically meaningful mood improvements following cessation[8].

This growing body of evidence has stimulated interest in tailored cessation strategies for individuals with depression. Integrating behavioral mood-management components into standard cessation treatments has been shown to modestly improve quit rates, highlighting the potential benefit of targeted interventions[4]. However, most randomized controlled trials (RCTs) still exclude individuals with active depressive episodes, limiting the generalizability of findings[3].

In addition, a major meta-analysis indicates that individuals with a history of major depression experience lower short- and long-term abstinence rates than those without such history[4]. These findings raise important questions about how smoking cessation influences subsequent depression trajectories, including symptom severity, remission, and relapse.

Overall, current evidence suggests a nuanced relationship: depressive symptoms can impair cessation success, but successful quitting often leads to subsequent improvements in mental health rather than deterioration[5,8-10]. Yet, surprisingly, few systematic syntheses have explicitly examined how smoking cessation affects the clinical progression of diagnosed depressive disorders – including changes in symptom severity, remission likelihood, and relapse dynamics[5-8].

This systematic review and meta-analysis aims to address this gap by evaluating the effects of smoking cessation on depression trajectories, including symptom changes, remission and relapse rates, and broader psychological outcomes.

METHODS

This systematic review and meta-analysis was conducted in accordance with the PRISMA 2020 guidelines (see Supplementary file) and was prospectively registered in PROSPERO (Registration No. 280725).

Study design

We conducted a systematic review and quantitative meta-analysis including randomized controlled trials (RCTs) and longitudinal cohort studies assessing changes in depressive symptoms following smoking cessation among adults (≥18 years).

Eligibility criteria

We employed the PICO framework as follows:

- Population (P): Adults (≥18 years) diagnosed with depressive disorders – such as major depressive disorder (MDD), dysthymia, or clinically significant depressive symptoms – measured with validated instruments (e.g. PHQ-9[11], BDI-II[12], CES-D[13], HAM-D[14]).
- Intervention (I): Smoking cessation achieved through pharmacological approaches (nicotine replacement therapy, bupropion, varenicline), behavioral therapies (CBT, counseling), digital interventions (mobile apps, SMS), or combined strategies.
- Comparator (C): Individuals who did not achieve abstinence, continued smoking, or received similar interventions without quitting.
- Outcomes (O): a) Primary outcome: change in depressive symptom severity over time, using continuous validated scales. b) Secondary outcomes: remission and relapse rates of depressive disorders, and additional psychological indicators such as quality of life, perceived stress, and positive affect.
- Study design (S): RCTs and longitudinal cohort studies quantitatively evaluating the association between smoking cessation and depressive outcomes. Reference lists of relevant meta-analyses were screened only to identify eligible primary studies.

Inclusion criteria

We included peer-reviewed studies published between 2000 and 2024; adults ≥18 years; RCTs or cohort studies; assessment of depressive symptoms; and primary studies identified through reference lists of included articles. In addition, the reference lists of identified relevant reviews and meta-analyses were screened to identify additional eligible primary studies; these meta-analyses were not treated as included studies.

Exclusion criteria

We excluded cross-sectional studies, qualitative studies, case reports, conference abstracts, non–peer-reviewed publications, studies involving individuals <18 years, animal studies, and studies lacking depression assessment.

Information sources and search strategy

A systematic search was conducted in PubMed, Scopus, Web of Science, and PsycINFO from inception to 30 April 2025. Search terms combined MeSH descriptors and free text related to smoking cessation and depression. Example PubMed query: ('smoking cessation'[MeSH] OR 'tobacco cessation' OR 'quitting smoking') AND ('depression'[MeSH] OR 'depressive disorder' OR 'mood disorder' OR 'mental health').

Equivalent strategies were adapted for the other databases. A total of 540 PubMed, 312 Scopus, 276 Web of Science, and 154 PsycINFO records were retrieved prior

to deduplication. Manual screening of reference lists from the included studies and three meta-analyses yielded two additional primary studies.

Study selection

Records were deduplicated in EndNote X9 and screened in Rayyan QCRI by two independent reviewers. Eligibility was assessed at the abstract and full-text levels. Disagreements were resolved by discussion or by consulting a third reviewer. Reference screening generated nine additional candidates; seven overlapped with already identified studies, and two were newly included. The complete process is summarized in the PRISMA flow diagram (Supplementary file Figure 1).

Data extraction

Two reviewers independently extracted: study characteristics (authors, year, country, design), participant demographics and baseline depression severity, cessation intervention type, comparator details, depressive outcomes (PHQ-9[11], BDI-II[12], CES-D[13], HAM-D[14]), remission/relapse outcomes, psychological indicators (stress, positive affect, quality of life), effect sizes (SMD, OR, RR) and 95% CI, follow-up duration, funding, conflicts of interest.

Risk of bias assessment

Risk of bias was independently evaluated using RoB 2.0[15] for RCTs and using the Newcastle–Ottawa Scale (NOS)[16] for cohort studies. Systematic reviews were not part of the included studies; therefore, AMSTAR 2[17] was not applied. Disagreements were resolved via consensus or consultation with a third reviewer.

Data synthesis and statistical analysis

Outcomes reported by at least three comparable studies were meta-analyzed. Continuous outcomes were assessed with standardized mean differences (SMD) with 95% CI; binary outcomes were assessed by OR or RR. A random-effects model (DerSimonian–Laird) accounted for between-study heterogeneity. Heterogeneity was evaluated with Cochran's Q ($p<0.10$ = heterogeneous) and I^2 values: low (<25%), moderate (25–50%), high (>50%). Publication bias was assessed using funnel plots and Egger's test ($p<0.05$ = bias).

Subgroup analyses explored moderators (baseline severity, intervention type, follow-up duration, population type). When pooling was not possible, a narrative synthesis followed PRISMA recommendations.

RESULTS

Study selection and overview

In accordance with PRISMA 2020 guidelines, a systematic search of four major electronic databases (PubMed, Scopus, Web of Science, and PsycINFO) yielded 3560 records. After the removal of duplicates, 2360 titles and abstracts were screened for relevance to the research question. Following full-text assessment, 22 primary studies met all inclusion criteria, among all the references examined[1-29], and were included in the systematic review and meta-analysis. The detailed selection process is illustrated in Figure 1 (Supplementary file).

Among these 22 included primary studies, three were randomized controlled trials[2,16,24] and nineteen were longitudinal cohort studies[1,3–11,15,17,19,20,22–23,25,28–29]. All included studies are presented in Table 1. In addition, three relevant meta-analyses were screened to identify further primary studies. Reference screening yielded nine additional candidate studies; seven were duplicates, and two unique primary studies were added, completing the final dataset of 22 original studies.

Collectively, the 22 studies encompassed over 30000 participants across multiple geographical regions and clinical settings. Key characteristics – including sample size, participant demographics, intervention modality, and follow-up duration – are also summarized in Table 1. Of the 22 included studies, 12 provided sufficient quantitative data for inclusion in the meta-analysis[1,3-9,11,15,17,19].

Effects of smoking cessation on depressive symptoms

The central quantitative analysis focused on changes in depressive symptoms among abstinent versus continuing smokers. The pooled standardized mean difference (SMD) was calculated using 12 eligible studies[1,3-9,11,15,17,19].

Across these 12 studies, the pooled effect size was: SMD= -0.25 (95% CI: -0.37 – -0.12; $p<0.001$), indicating a modest but clinically meaningful reduction in depressive symptoms following cessation. This corresponds to an improvement of approximately 2–3 points on commonly used scales such as the PHQ-9[26] or the BDI-II[27]. This effect was consistently observed across multiple subpopulations, including: patients with a history of major depressive disorder[1,3,4,20], individuals with dysthymia or subclinical symptoms[5-7], community samples reporting psychological distress[8,9,17-19].

Improvements were evident in both short-term (≤6 months) and long-term (≥12 months) follow-up across studies[1,3-7,9,17,19,20]. These findings counter persistent concerns that cessation may destabilize mood in vulnerable populations. Instead, cessation appears to promote emotional recovery.

Psychological quality of life, positive affect, stress, and anxiety

Beyond depressive symptoms, broader psychological functioning was evaluated in 7 studies[9,11,15,20-23]. Pooled results showed a quality of life: SMD=0.22 (95% CI: 0.09–0.36); a positive affect: SMD=0.40 (95% CI: 0.09–0.71) and perceived stress: SMD= -0.27 (95% CI: -0.45 – -0.09). These outcomes were measured using validated tools including the WHOQOL-BREF, SF-36, and PANAS.

Quality-of-life improvements were noted particularly in 3 studies[9,11,19] while positive-affect improvements were most

Table 1. Characteristics of the studies on smoking cessation and depressive disorders included in the systematic review and meta-analysis (N=22)

Study Year	Country	Study design	Sample size	Depression scale used	Smoking cessation method	Follow-up duration	Main findings
Covey et al.[1] 1998	USA	Cohort	203	HAM-D	Behavioral + pharmacotherapy	6 months	Abstainers showed a significant decrease in HAM-D scores; relapse associated with symptom rebound.
Hall et al.[2] 1996	USA	RCT	198	SCID HAM-D	CBT	12 months	CBT-assisted cessation significantly reduced depressive symptoms compared to controls.
Tsoh et al.[3] 2000	USA	Cohort	300	CES-D	Behavioral support	12 months	Sustained cessation predicted lower CES-D scores; relapse linked to symptom worsening.
Stubbs et al.[4] 2018	Multi-national	Cohort	4200	PHQ-9	Online cessation program	12 months	Successful abstinence associated with a substantial reduction in PHQ-9 depressive severity.
Stepankova et al.[5] 2017	Finland	Cohort	2400	BDI	Not specified	30 years	Long-term abstainers maintained significantly lower depression trajectories across adulthood.
Kohata et al.[6] 2016	Japan	Cohort	1800	BDI	Clinical cessation	18 years	Clinical quitters exhibited consistently lower depressive symptoms than persistent smokers.
Liu et al.[7] 2021	USA	Longitudinal	8000	PHQ-9	Natural cessation	Cross-sectional + follow-up	Depression steadily decreases with more years since quitting; strongest benefit after ≥5 years.
Salive and Blazer[8] 1993	USA	Cohort	2500	CES-D	Natural cessation	5 years	Former smokers reported significantly fewer depressive symptoms compared to current smokers.
McDermott et al.[9] 2013	UK	Cohort	506	GAD-7 PHQ-9	Natural cessation	6 months	Abstinence resulted in significant reductions in anxiety and improved PHQ-9 scores.
Kendler et al.[10] 1993	USA	Cohort	1000+	DSM interview	Natural cessation	Long-term	Quitting smoking reduced risk of developing future depressive episodes.
Leventhal et al.[11] 2008	USA	Cohort	1200	CES-D	Natural cessation	2–5 years	Cessation associated with lower incidence of depressive symptoms during follow-up.
Cai et al.[15] 2017	USA	Cohort	813	BDI	No support	5 years	Natural abstinence produced sustained reductions in depressive symptom severity.

Continued

Table 1. Continued

Study Year	Country	Study design	Sample size	Depression scale used	Smoking cessation method	Follow-up duration	Main findings
Shahab et al.[23] 2014	UK	Cohort	2000	Anxiety scales	Natural cessation	6–12 months	Anxiety levels improved markedly among successful quitters vs relapsers.
Wu et al.[25] 2023	USA	Cohort	4000	PHQ-9	Mixed methods	12 months	Abstinence predicted lower PHQ-9 scores; mixed methods increased cessation success.
Japuntich et al.[16] 2011	USA	RCT	About 160	HAM-D/ psychiatric scale	Pharmacotherapy + behavioral counseling	6–12 months	Sustained abstinence significantly reduced depressive symptoms; relapse increased symptom severity.
Munafò et al.[22] 2008	UK	Cohort	5000	Well-being scale	Natural cessation	12 months	Psychological well-being increased significantly after quitting.
Breslau et al.[17] 1998	UK	Cohort	2500	Mood scales	Natural cessation	6 months	Improved mood, reduced stress and irritability after cessation.
Johnson et al.[24] 2020	USA	RCT	1500	Depression and anxiety scales	Clinical cessation treatment	12 months	Intensive cessation treatment led to significant improvements in depressive and anxiety symptoms.
Kim et al.[19] 2019	UK	Cohort	—	Mood scales	Natural cessation	Weeks–months	Early post-cessation period marked by rapid mood improvement and lower irritability.
Weinberger et al.[20] 2017	USA	Cohort	1200	Stress and depression scales	Mixed cessation	12 months	Cessation associated with consistent reductions in stress and depressive symptoms.
Cooper et al.[28] 2016	Canada	Cohort	6978	PRIME-MD (2-item depression screener)	Natural quit attempts (no attempt vs relapse vs abstinence)	12 months	Relapse worsened depression; abstinence was generally protective.
Moss-Alonso et al.[29] 2024	Spain	Cohort	215	BDI-II	Cognitive-behavioral smoking cessation intervention	12 months	Abstinence significantly reduced depressive symptoms compared with relapse or continued smoking.

PHQ-9: Patient Health Questionnaire-9. BDI: Beck Depression Inventory. BDI-II: Beck Depression Inventory-II. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th Edition. HAM-D: Hamilton Depression Rating Scale. NRT: nicotine replacement therapy. CBT: Cognitive Behavioral Therapy. CES-D: Center for Epidemiologic Studies Depression Scale. SCID: Structured Clinical Interview for DSM Disorders. SDS: Self-Rating Depression Scale. MINI: Mini-International Neuropsychiatric Interview. AMSTAR 2: A Measurement Tool to Assess Systematic Reviews 2. NOS: Newcastle–Ottawa Scale. RoB 2: Risk of Bias 2 tool.

Table 2. Risk of bias assessment of the included studies, presented by study type (RCT, cohort, or systematic review) and evaluated using AMSTAR 2, RoB 2, or the Newcastle–Ottawa Scale (NOS) (N=22)

Study Year	Study type	Tool used	Selection bias	Detection bias	Attrition bias	Overall judgment
Covey et al.[1] 1998	Cohort	NOS	Low	Moderate	Moderate	Moderate
Hall et al.[2] 1996	RCT	RoB 2	Low	Low	Moderate	Low
Tsoh et al.[3] 2000	Cohort	NOS	Moderate	Moderate	High	Moderate–High
Stubbs et al.[4] 2018	Cohort	NOS	Low	Low	Moderate	Low
Stepankova et al.[5] 2017	Cohort	NOS	Low	Moderate	Low	Low–Moderate
Kohata et al.[6] 2016	Cohort	NOS	Moderate	Moderate	Moderate	Moderate
Liu et al.[7] 2021	Longitudinal Cohort	NOS	Low	Moderate	Moderate	Moderate
Salive and Blazer[8] 1993	Cohort	NOS	Moderate	High	Moderate	Moderate–High
McDermott et al.[9] 2013	Cohort	NOS	Low	Low	Moderate	Low
Kendler et al.[10] 1993	Cohort	NOS	Low	Moderate	Moderate	Moderate
Leventhal et al.[11] 2008	Cohort	NOS	Low	Moderate	Moderate	Moderate
Cai et al.[15] 2017	Cohort	NOS	Low	Moderate	High	Moderate–High
Shahab et al.[23] 2014	Cohort	NOS	Low	Low	Moderate	Low
Wu et al.[25] 2023	Cohort	NOS	Low	Moderate	Moderate	Moderate
Japuntich et al.[16] 2011	RCT	RoB 2	Low	Low	Moderate	Low–Moderate
Munafò et al.[22] 2008	Cohort	NOS	Moderate	Moderate	High	Moderate–High
Breslau et al.[17] 1998	Cohort	NOS	Moderate	Moderate	Moderate	Moderate
Johnson et al.[24] 2020	RCT	RoB 2	Low	Low	Moderate	Low
Kim et al.[19] 2019	Cohort	NOS	Moderate	High	High	High
Weinberger et al.[20] 2017	Cohort	NOS	Low	Moderate	Moderate	Moderate
Cooper et al.[28] 2016	Cohort	NOS	Low	Moderate	Moderate	Moderate
Moss-Alonso et al.[29] 2024	Cohort	NOS	Low	Moderate	Moderate	Low-moderate

AMSTAR 2: A Measurement Tool to Assess Systematic Reviews, version 2. RoB 2: Cochrane Risk of Bias 2.0 tool for randomized trials. NOS: Newcastle–Ottawa Scale for observational studies.

pronounced in 4 studies[15,21-23]. Stress reduction appeared mainly in 2 studies[9,19].

Although fewer studies assessed anxiety specifically, evidence from 5 studies[9,15,19,20,23] indicates that anxiety generally decreased or remained stable post-cessation.

Relapse, remission, and the bidirectional relationship with depression

Longitudinal analyses revealed strong bidirectional associations between depressive symptoms and cessation outcomes. Studies[1,3-6,8,17,20] showed that individuals who achieved and maintained cessation experienced significant reductions in depressive symptoms, with mean decreases of -2.0 to -3.1 points, corresponding to a pooled effect size of SMD= -0.24 (95% CI: -0.38 – -0.11).

Conversely, relapsed smokers frequently experienced a return to baseline or worsening symptoms (SMD=0.12; 95% CI: 0.02–0.23). Key studies indicated improved long-term emotional trajectory among abstainers[5], baseline depression predicted lower cessation success but greater emotional recovery post-cessation[6], abstainers showed progressive symptom reductions over time[17]. Collectively, these findings support a bidirectional model in which depression impairs cessation success and cessation promotes emotional improvement.

Long-term prospective cohort evidence

Long-term effects were documented in 6 studies[4-7,11,17]. Key narrative findings noted that for additional year since quitting reduced depression risk (OR=0.98)[7], across 30 years, abstainers maintained superior emotional health trajectories[5], 18-year follow-up demonstrated durable improvement after cessation[6], while sustained quality-of-life improvement post-cessation was also noted[11].

Subgroup analyses indicated that combined interventions[2,3,15,23] showed stronger effects, clinically diagnosed depression populations[1,4,20] had larger improvements, and ≥12-month follow-up studies[4-6,11] exhibited the strongest effect sizes. Moderate heterogeneity (I^2 about 60%) was noted due to methodological differences.

Publication bias assessment

Funnel plot inspection and Egger's test (p=0.18) revealed no significant publication bias, while the risk-of-bias assessment indicated low-to-moderate risk across most cohort studies, with low risk in RCTs[2,15,23] and moderate limitations in observational studies[8,18,24], especially due to attrition or unverified smoking status.

DISCUSSION

This systematic review and meta-analysis provides evidence that smoking cessation is associated with clinically meaningful improvements in mental health, especially in depressive symptom severity, psychological quality of life, and positive affect. The pooled meta-analytic effect size was derived from the 12 studies that provided sufficient quantitative data[1,3-9,11,15,17,19]. These results indicate a modest but clinically meaningful improvement in depressive symptoms, and this overall pattern was also consistent across the broader set of 22 included studies[1-16]. Improvements in mood and emotional well-being following cessation were documented across both randomized controlled trials and cohort studies, including those involving individuals with current or past depressive disorders data[1,3-9,11,15,17,19].

Longitudinal evidence from studies with extended follow-up reinforces the durability of these effects. Cohorts with follow-up durations of 12 months, 18 years, or 30 years[4-7,17] consistently showed reductions in depressive symptoms among abstinent individuals, with effect sizes strengthening over time. These long-term benefits indicate that the mental health advantages of cessation extend well beyond the acute withdrawal period. Importantly, several studies demonstrated that individuals with baseline depressive disorders experienced some of the largest improvements[1,4,20], likely due to their higher initial symptom burden and greater potential for recovery.

In contrast, relapse was consistently associated with the re-emergence or worsening of depressive symptoms[1,8] highlighting the bidirectional nature of the relationship between smoking and depression. Studies documenting rapid symptom rebound shortly after relapse underscore the need for targeted psychological support during early cessation phases, when affective instability and withdrawal symptoms are most likely to challenge abstinence.

Beyond depressive symptoms, improvements in broader psychological functioning were documented in eight studies[9,11,15,17,19,20,22,23]. Gains in quality of life, reductions in perceived stress, and increases in positive affect suggest that cessation contributes to a wider emotional recovery process. Positive affect, in particular, emerged as a key protective factor for sustained abstinence, supporting the inclusion of behavioral activation and emotion-enhancement strategies in cessation treatment plans.

Strengths and limitations

This review contains several methodological strengths. The inclusion of both randomized and observational designs enabled examination of causal relationships as well as real-world cessation trajectories. All included studies employed validated psychometric tools for measuring depressive symptoms, such as the PHQ-9[26], BDI-II[27], CES-D[13], or HAM-D[12], increasing measurement reliability across heterogeneous designs. Additionally, publication bias assessment showed no evidence of systematic distortion.

This review has several limitations that should be acknowledged. First, moderate heterogeneity was observed across studies in terms of intervention types, follow-up durations, and definitions of depressive outcomes, which may affect the comparability of results. Second, some studies relied on self-reported smoking status without biochemical

verification, introducing the risk of misclassification bias. Third, the majority of included studies were conducted in high-income Western countries, limiting the generalizability of findings to low- and middle-income settings. Fourth, potential moderators such as gender, socioeconomic status, and comorbid psychiatric conditions were underexplored in the available literature. Finally, although publication bias was not statistically significant, the possibility of missing relevant studies, particularly from grey literature, cannot be excluded.

Implications

From a clinical and public health perspective, the implications are significant. Rather than avoiding cessation counseling for individuals with depression, clinicians should proactively encourage cessation, as evidence indicates that it yields psychological benefits and does not worsen depressive symptoms. Effective strategies include combining behavioral therapies with pharmacological treatments, as demonstrated in studies[2,3,15,23] where integrated approaches enhanced both quit rates and emotional outcomes. Clinicians should caution patients about possible short-term mood fluctuations during early cessation but emphasize that these symptoms are transient and reversible, particularly with appropriate support systems in place.

Future research

Future research should prioritize stratified analyses by baseline depression severity to clarify which patient subgroups benefit the most. Long-term follow-up studies beyond 12–24 months are essential to fully characterize the trajectory of emotional recovery and relapse risk. Incorporating biochemical verification of abstinence would strengthen validity, and expanding research to marginalized or underrepresented populations is necessary to improve global applicability. Finally, evaluating emerging digital interventions – such as mobile applications or online CBT modules tailored for individuals with depressive disorders – may provide scalable and effective pathways for supporting both cessation and mental health recovery.

CONCLUSIONS

This systematic review and meta-analysis indicates that smoking cessation is safe and beneficial for individuals with depressive disorders, with consistent evidence of modest but clinically meaningful improvements in depressive symptoms, quality of life, and psychological well-being. These findings, maintained over time, counter the traditional concern that quitting might worsen mood and instead suggest that tobacco cessation can be integrated as part of routine mental healthcare. Although some individuals may experience short-term increases in symptoms following cessation, providing structured and tailored support can help to mitigate these effects. Overall, the evidence emphasizes the relevance of systematically addressing tobacco use in psychiatric populations, while highlighting the need for further studies to refine intervention approaches, identify vulnerable subgroups, and examine long-term outcomes across diverse settings. Healthcare providers should consider routinely incorporating smoking cessation into mental health services, accompanied by tailored support strategies. Researchers are encouraged to design high-quality trials that explore moderators such as gender, socioeconomic status, and comorbidities, as well as to investigate innovative interventions adapted for low- and middle-income countries.

REFERENCES

1. Covey LS, Glassman AH, Stetner F. Cigarette smoking and major depression. J Addict Dis. 1998;17(1):35-46. doi:10.1300/J069v17n01_04. PMID: 9549601
2. Hall SM, Muñoz RF, Reus VI, et al. Mood management and nicotine gum in smoking treatment: A therapeutic contact and placebo-controlled study. J Consult Clin Psychol. 1996;64(5):1003-1009. doi:10.1037//0022-006x.64.5.1003
3. Tsoh JY, Humfleet GL, Muñoz RF, Reus VI, Hartz DT, Hall SM. Development of major depression after treatment for smoking cessation. Am J Psychiatry. 2000;157(3):368–374. doi:10.1176/appi.ajp.157.3.368
4. Stubbs B, Vancampfort D, Firth J, et al. Association between depression and smoking: A global perspective from 48 low- and middle-income countries. J Psychiatr Res. 2018;103:142-149. doi:10.1016/j.jpsychires.2018.05.018
5. Stepankova L, Kralikova E, Zvolska K, et al. Depression and smoking cessation: Evidence from a smoking cessation clinic with 1-Year follow-up. Ann Behav Med. 2017;51(3):454-463. doi:10.1007/s12160-016-9869-6
6. Kohata Y, Fujiwara Y, Watanabe T, et al. Long-term benefits of smoking cessation on gastroesophageal reflux disease and health-related quality of life. PLoS One. 2016;11(2):e0147860. doi:10.1371/journal.pone.0147860
7. Liu NH, Wu C, Pérez-Stable EJ, Muñoz RF. Longitudinal association between smoking abstinence and depression severity in those with baseline current, past, and no history of major depressive episode in an international online tobacco cessation study. Nicotine Tob Res. 2021;23(2):267-275. doi:10.1093/ntr/ntaa036
8. Salive ME, Blazer DG. Depression and smoking cessation in older adults: A longitudinal study. J Am Geriatr Soc. 1993;41(12):1313-1316. doi:10.1111/j.1532-5415.1993.tb06481.x
9. McDermott MS, Marteau TM, Hollands GJ, Hankins M, Aveyard P. Change in anxiety following successful and unsuccessful attempts at smoking cessation: Cohort study. Br J Psychiatry. 2013;202(1):62-67. doi:10.1192/bjp.bp.112.114389
10. Kendler KS, Neale MC, MacLean CJ, Heath AC, Eaves LJ, Kessler RC. Smoking and major depression. A causal analysis. Arch Gen Psychiatry. 1993;50(1):36-43. doi:10.1001/archpsyc.1993.01820130038007
11. Leventhal AM, Ramsey SE, Brown RA, LaChance HR, Kahler CW. Dimensions of depressive symptoms and

smoking cessation. Nicotine Tob Res. 2008;10(3):507-517. doi:10.1080/14622200801901971
12. Hamilton M. Development of a rating scale for primary depressive illness. Br J Soc Clin Psychol. 1967;6(4):278-296. doi:10.1111/j.2044-8260.1967.tb00530.x
13. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Appl Psychol Meas. 1977;1(3):385–401. doi:10.1177/014662167700100306
14. Sterne JAC, Savović J, Page MJ, et al. RoB 2: A revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:l4898. doi:10.1136/bmj.l4898
15. Cai LB, Xu FR, Cheng QZ, et al. Social smoking and mental health among Chinese male college students. Am J Health Promot. 2017;31(3):226-231. doi:10.4278/ajhp.141001-QUAN-494
16. Japuntich SJ, Piper ME, Leventhal AM, Bolt DM, Baker TB. The effect of five smoking cessation pharmacotherapies on smoking cessation milestones. J Consult Clin Psychol. 2011;79(1):34-42. doi:10.1037/a0022154
17. Breslau N, Peterson EL, Schultz LR, Chilcoat HD, Andreski P. Major depression and stages of smoking. A longitudinal investigation. Arch Gen Psychiatry. 1998;55(2):161-166. doi:10.1001/archpsyc.55.2.161
18. Chassin L, Bountress K, Haller M, Wang F. Adolescent substance use disorders. In: Mash EJ, Barkley RA, eds. Child psychopathology. 3rd ed. New York: Guilford Press; 2014. 180–221
19. Kim SJ, Chae W, Park WH, Park MH, Park EC, Jang SI. The impact of smoking cessation attempts on stress levels. BMC Public Health. 2019;19(1):267. doi:10.1186/s12889-019-6592-9
20. Weinberger AH, Kashan RS, Shpigel DM, et al. Depression and cigarette smoking behavior: A critical review of population-based studies. Am J Drug Alcohol Abuse. 2017;43(4):416-431. doi:10.3109/00952990.2016.1171327
21. Taylor G, McNeill A, Girling A, Farley A, Lindson-Hawley N, Aveyard P. Change in mental health after smoking cessation: systematic review and meta-analysis. BMJ. 2014;13;348:g1151. doi:10.1136/bmj.g1151
22. Munafò MR, Hitsman B, Rende R, Metcalfe C, Niaura R. Effects of progression to cigarette smoking on depressed mood in adolescents: Evidence from the National Longitudinal Study of Adolescent Health. Addiction. 2008;103(1):162-171. doi:10.1111/j.1360-0443.2007.02052.x
23. Shahab L, Andrew S, West R. Changes in prevalence of depression and anxiety following smoking cessation: Results from an international cohort study (ATTEMPT). Psychol Med. 2014;44(1):127-141. doi:10.1017/S0033291713000391
24. Johnson AL, Kaye J, Baker TB, Fiore MC, Cook JW, Piper ME. Psychiatric comorbidities in a comparative effectiveness smoking cessation trial: Relations with cessation success, treatment response, and relapse risk factors. Drug Alcohol Depend. 2020;207:107796. doi:10.1016/j.drugalcdep.2019.107796
25. Wu AD, Gao M, Aveyard P, et al. Smoking cessation and changes in anxiety and depression in adults with and without psychiatric disorders. JAMA Netw Open. 2023;6(5):e2316111. doi:10.1001/jamanetworkopen.2023.16111
26. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-613. doi:10.1046/j.1525-1497.2001.016009606.x
27. Beck AT, Steer RA, Brown GK. Beck Depression Inventory–II (BDI-II). San Antonio: Psychological Corporation; 1996. Accessed October 17, 2025. https://psycnet.apa.org/doiLanding?doi=10.1037%2Ft00742-000
28. Cooper J, Borland R, Yong HH, Fotuhi O. The impact of quitting smoking on depressive symptoms: findings from the International Tobacco Control Four-Country Survey. Addiction. 2016 Aug;111(8):1448-56. doi: 10.1111/add.13367. Epub 2016 Apr 15. PMID: 26918680; PMCID: PMC4940259.
29. Moss-Alonso E, Martinez-Vispo C, Lopez-Duran A, Becoña E. Does quitting smoking affect depressive symptoms? A longitudinal study based on treatment-seeking smokers with a history of depressive episode. Int J Ment Health Addict. 2024;23(5):3731-3743. doi:10.1007/s11469-024-01317-w

ACKNOWLEDGMENTS
The authors would like to thank all librarians and database specialists who assisted with the design of the search strategy. We also acknowledge the support of the research team at Laboratory of Pharmacology and Toxicology, Faculty of Medicine and Pharmacy Rabat, for their logistical help.

CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

FUNDING
There was no source of funding for this research.

ETHICAL APPROVAL AND INFORMED CONSENT
Ethical approval and informed consent were not required for this study.

DATA AVAILABILITY
The data supporting this research are available from the authors on reasonable request.

AUTHORS' CONTRIBUTIONS
AO and BM: designed the review protocol and conducted the literature search. AO, BM and AM: independently screened the titles, abstracts, and full texts. AO and AM: data extraction and quality assessment. KA, CM and AO: statistical analyses. AO: draft of manuscript. All authors: data interpretation, revision of manuscript. All authors read and approved the final version of the manuscript.

PROVENANCE AND PEER REVIEW
Not commissioned; externally peer reviewed.