Trends in Mental Health: A Review of the Most Influential Research on Depression in Children and Adolescents

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Abstract

Background Depression is a common mental disorder in children and adolescents, with a global prevalence of approximately 33%, severely affecting their physical, mental health, and academic performance. This study aims to identify and assess the 100 most-cited articles (T100 articles) on depression in children and adolescents.

Methods The T100 articles in the field of depression were retrieved from the SCI-E and SSCI databases. A comprehensive analysis of the T100 articles was conducted, including the number of citations, countries, journals, keywords, authors, and topics.

Results Between 1981 and 2021, T100 articles in child and adolescent depression received 423 to 3949 citations. Most articles originated from the USA, with Kovacs M as the top-ranked author. The University of Pittsburgh and Columbia University published the top two T100 articles. The T100 articles were published in 36 journals, led by AMA Psychiatry. Co-occurrence keywords analyses reveal six key foci: Pathogenesis of Depression, Treatment of MDD in Children, Early Childhood Treatment, Adolescent Depression Manifestations, Gender and Depression, and Primary Care Considerations, with pathogenesis as a future trend.

Conclusions Our research presents an exhaustive list of the most highly cited articles on depression in children and adolescents. Our findings not only underscore the significance of international cooperation but also reveal a pressing need to prioritize and bolster preventive research, particularly the development and refinement of early screening and intervention programs.

Keywords Adolescents, Bibliometric analysis, Children, Depression

Introduction

Depression, once primarily perceived as a challenge faced by adults, has now emerged as a critical concern spanning all age groups, including children and adolescents [1]. Depression persists for prolonged durations, adversely affecting the patient's daily life, social functionality, and comprehension of self and the surrounding world [2]. The evolving understanding of depression's demographic distribution calls for a reassessment of its societal implications [3, 4]. The COVID-19 pandemic, in particular, has been linked to a significant increase in depression diagnosis rates, highlighting the need for a comprehensive approach to mental health support [5]. In a word, depression is no longer a niche issue; rather, it has become a global public health concern that necessitates urgent attention and action.

The impacts of depression on children and adolescents are multifaceted and profoundly concerning. The prevalence and severity of depressive disorders in this age group are particularly high, demanding urgent attention

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[6]. Depressed children and adolescents often struggle with educational achievements, experiencing difficulties in concentration, motivation, and academic performance [7]. This can significantly hinder their chances of success in school and future careers. Socially, depression can have a detrimental impact on children and adolescents' ability to engage in meaningful interactions with peers and family members [8]. The withdrawal, isolation, and difficulty in expressing emotions can lead to a breakdown in relationships and a sense of loneliness. Moreover, depression can have a profound impact on children and adolescents' overall well-being [9]. It can cause a loss of interest in activities that were once enjoyable, lead to feelings of hopelessness and worthlessness, and diminish one's sense of purpose and meaning. Comparative analyses reveal that adolescents suffering from depression and anxiety engage in risky behaviors, such as binge eating and smoking, at significantly higher rates than their healthy peers [10]. These behaviors can further exacerbate the depressive symptoms and lead to a cycle of unhealthy coping mechanisms. Furthermore, the suicide rate among depressed adolescents is alarmingly high, reaching 1.81 times the average among the general adolescent population [11]. This statistic underscores the urgency of addressing depression in children and adolescents and the need for comprehensive and strategic approaches to prevention and intervention.

Existing literature reviews give significant insights into the present status of research on depression in children and adolescents. However, these reviews have limitations in terms of scope and depth. For example, a study using the method of science mapping scrutinized the research trajectory of child and adolescent depression from 1970 to 2019, yet it omitted an evaluation of the quality of the papers included [12]. Another systematic review limited its scope to subthreshold depression, a state that doesn't meet the diagnostic criteria for major depression [13]. Furthermore, the limitations of traditional literature analysis methods struggle to effectively identify and track key studies and research trends, which is crucial for grasping the direction of development in this field.

To solve these limitations and gain a deeper understanding of the research landscape, this study employs bibliometric analysis, a valuable tool for evaluating the impact of research articles [14]. Citation counts serve as a valuable indicator of an article's contribution to the field and its overall significance [15]. By leveraging this approach, we will conduct a rigorous analysis of the top 100 most-cited articles in the field of childhood and adolescent depression. The objective is to identify the key research questions and future research directions in this field and to provide valuable references for researchers, clinicians, and policymakers.

Methods

Search strategy

A literature search was conducted on November 25, 2023, using the Web of Science Core Collection (WoS-CC), specifically the Science Citation Index Expanded (SCI-E) and Social Science Citation Index (SSCI) databases. The WoS covers a wide range of publications from different fields, has become the preferred choice among numerous scholars as a digital repository for academic literature, particularly for conducting bibliometric studies [16, 17]. This extensive coverage guarantees that the retrieved data is both broad and indicative of the entire field. An advanced search strategy was employed utilizing the following search string: TS = (children OR child* OR teen* OR youth* OR adolescent OR adolescen* OR teenager OR youngster) AND TS = (depress* OR depressive disorder* OR depressive symptom* OR depression).

Eligibility criteria

We excluded studies unrelated to depressive symptoms, literature reviews, editorials, and consensus statements. Our analysis included studies on children and adolescents (< 18 years old) that explored depressive symptoms.

Bibliometric analysis

Visualization was constructed using the free software VOSviewer and CiteSpace with some elements to get a visual form of the bibliometric analysis. VOSviewer and CiteSpace present the overall external characteristics of a subject area and offer unique advantages in cluster analysis. Pajek is a data visualization and analysis tool that optimizes the layout of the visualizations drawn by VOSviewer. Most of the graphs covered in the article are based on the combined application of these three software, while other graphs are realized with the help of Excel software.

Data extraction and conversion

We downloaded and processed all relevant data from the WoS core database. To eliminate time bias, we used the Average Citations per Year (ACY) to measure the impact of each publication. ACY is calculated as the total number of citations for a publication divided by the number of years since its publication [18]. ACY = citation times/ (2023-publication year + 1).

Results

An initial exploration of the Web of Science Core Collection identified over 110,000 documents on the topic of depression in children and adolescents. Table 1 presents the 100 most cited articles on this topic, including

Table 1 The top 100 cited articles in depression among children and adolescents

Rank	Article	Journal	Years	Citations	ACY	Topic
1	The Children's Depression, Inventory (CDI)	Psychological Bulletin	1985	3949	101.26	Scales/measurement
2	Rating-scales to assess depression in school-aged children	Acta Paedopsychiatr	1981	1701	39.56	Scales/measurement
3	Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study	Journal of Abnormal Psychology	1998	1582	60.85	Epidemiology
4	Development of a short questionnaire for use in epidemiological studies of depression in children and adolescents	International Journal of Methods In Psychiatric Research	1995	1458	50.28	Scales/measurement
5	The use of the center for epidemiologic studies depression scale in adolescents and young-adults	Journal of Youth and Adolescence	1991	1436	43.52	Scales/measurement
6	The emergence of gender differences in depression during adolescence	Psychological Bulletin	1994	1347	44.90	Epidemiology
7	Depression in adolescence	Lancet	2012	1302	108.50	review
8	Adolescent psychopathology:l. Prevalence and incidence of depression and other DSM-III-R disorders in high school students	Journal of Abnormal Psychology	1993	1274	41.10	Epidemiology
9	The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders	JAMA Psychiatry	1998	1249	48.04	Medical psychiatry
10	Fluoxetine, cognitive-behavioral therapy, and their combination for adolescents with depression: Treatment for Adolescents With Depression Study (TADS) randomized controlled trial	Journal of the American Medical Association	2004	1234	61.70	Clinical/management
11	Childhood and adolescent depression: A review of the past 10 years	Journal of the American Academy of Child & Adolescent Psychiatry	1996	1217	43.46	review
12	Comorbidity of attention-deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders	American Journal of Psychiatry	1991	1194	36.18	Medical psychiatry
13	Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale	Behaviour Research and Therapy	2000	1172	48.83	Scales/measurement
14	Violence and risk of PTSD, major depression, substance abuse/dependence, and comorbidity: Results from the national survey of adolescents	Journal of Consulting and Clinical Psychology	2003	1033	49.19	Medical psychiatry
15	Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory	Psychological Bulletin	2001	932	40.52	Pathogenesis
16	The children's depression inventory—a systematic evaluation of psychometric properties	Journal of Consulting and Clinical Psychology	1984	853	21.33	Scales/measurement
17	Adolescent onset of the gender difference in lifetime rates of major depression: A theoretical model	JAMA Psychiatry	2000	840	35.00	Epidemiology
18	Mood disorders in children and adolescents: An epidemiologic perspective	Biological Psychiatry	2001	802	34.87	Epidemiology
19	National trends in the prevalence and treatment of depression in adolescents and young adults	Pediatrics	2016	797	99.63	Epidemiology
20	Global prevalence of depressive and anxiety symptoms in children and adolescents during covid-19 a meta-analysis	JAMA Pediatrics	2021	760	253.33	Epidemiology

Table 1 (continued)

Rank	Article	Journal	Years	Citations	ACY	Topic
21	Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior	Child Development	2003	751	35.76	Psychosocial characteristics
22	Major depressive disorder in older adolescents: Prevalence, risk factors, and clinical implications	Clinical Psychology Review	1998	734	28.23	review
23	A double-blind, randomized, placebo-controlled trial of fluoxetine in children and adolescents with depression	JAMA Psychiatry	1997	729	27.00	Clinical/management
24	Selective serotonin reuptake inhibitors in childhood depression: Systematic review of published versus unpublished data	Lancet	2004	716	35.80	Clinical/management
25	Suicidality in pediatric patients treated with antidepressant drugs	JAMA Psychiatry	2006	700	38.89	Clinical/management
26	Age, gender, race, socioeconomic status, and birth cohort differences on the children's depression inventory: A meta-analysis	Journal of Abnormal Psychology	2002	699	31.77	Scales/measurement
27	Suicidality and depression disparities between sexual minority and heterosexual youth: A meta-analytic review	Journal of Adolescent Health	2011	698	53.69	Medical psychiatry
28	Mental health, educational, and social role outcomes of adolescents with depression	JAMA Psychiatry	2002	690	31.36	Psychosocial characteristics
29	Puberty and depression: The roles of age, pubertal status and pubertal timing	Psychological Medicine	1998	682	26.23	Epidemiology
30	Major depression in the national comorbidity survey-adolescent supplement: Prevalence, correlates, and treatment	Journal of the American Academy of Child & Adolescent Psychiatry	2015	677	75.22	Review
31	Screening for adolescent depression: a comparison of depression scales	Journal of the American Academy of Child & Adolescent Psychiatry	1991	667	20.21	Scales/measurement
32	Is there an epidemic of child or adolescent depression?	Journal of Child Psychology and Psychiatry	2006	663	36.83	Epidemiology
33	Normative and reliability data for the children's depression inventory	Journal of Abnormal Child Psychology	1986	655	17.24	Scales/measurement
34	Depressed adolescents grown up	Journal of the American Medical Association	1999	647	25.88	Medical psychiatry
35	Stress, sensitive periods and maturational events in adolescent depression	Trends in Neurosciences	2008	646	40.38	Pathogenesis
36	Adolescent peer relations, friendships, and romantic relationships: Do they predict social anxiety and depression?	Journal of Clinical Child and Adolescent Psychology	2005	638	33.58	Pathogenesis
37	Cortical abnormalities in adults and adolescents with major depression based on brain scans from 20 cohorts worldwide in the enigma major depressive disorder working group	Molecular Psychiatry	2017	636	90.86	Pathogenesis
38	Increases in depressive symptoms, suicide-related outcomes, and suicide rates among u.s. Adolescents after 2010 and links to increased new media screen time	Clinical Psychological Science	2018	621	103.50	Medical psychiatry
39	Practice parameter for the assessment and treatment of children and adolescents with depressive disorders	Journal of the American Academy of Child & Adolescent Psychiatry	2007	603	35.47	Scales/measurement
40	The validity of depressive disorder in childhood and the development of a self-rating scale: A research report	Journal of Child Psychology and Psychiatry	1981	600	13.95	Scales/measurement

Table 1 (continued)

Rank	Article	Journal	Years	Citations	ACY	Topic
41	Depressive-disorders in childhood. I. A longitudinal prospective-study of characteristics and recovery	JAMA Psychiatry	1984	594	14.85	Review
42	Bullying, depression, and suicidality in adolescents	Journal of the American Academy of Child & Adolescent Psychiatry	2007	592	34.82	Pathogenesis
43	The development of depression in children and adolescents	American Psychologist	1998	592	22.77	Pathogenesis
44	Trajectories of stressful life events and depressive symptoms during adolescence	Developmental Psychology	1994	590	19.67	Pathogenesis
45	Predictors and consequences of childhood depressive symptoms: A 5-year longitudinal-study	Journal of Abnormal Psychology	1992	585	18.28	Pathogenesis
46	Social supports and serotonin transporter gene moderate depression in maltreated children	Proceedings of the National Academy of Sciences of the United States of America	2004	583	29.15	Pathogenesis
47	Effects of psychotherapy for depression in children and adolescents: A meta-analysis	Psychological Bulletin	2006	582	32.33	Clinical/management
48	Testing standard and modular designs for psychotherapy treating depression, anxiety, and conduct problems in youth	JAMA Psychiatry	2012	573	47.75	Scales/measurement
49	A prospective study of the role of depression in the development and persistence of adolescent obesity	Pediatrics	2002	571	25.95	Medical psychiatry
50	Adult outcomes of childhood and adolescent depression. I. Psychiatric status	JAMA Psychiatry	1990	570	16.76	Psychosocial characteristics
51	Major depression in community adolescents—age at onset, episode duration, and time to recurrence	Journal of the American Academy of Child & Adolescent Psychiatry	1994	569	18.97	Epidemiology
52	Subthreshold depression in adolescence and mental health outcomes in adulthood	JAMA Psychiatry	2005	549	28.89	Epidemiology
53	Psychometric properties of the revised child anxiety and depression scale in a clinical sample	Behaviour Research and Therapy	2005	541	28.47	Scales/measurement
54	Does bullying cause emotional problems? A prospective study of young teenagers	British Medical Journal	2001	536	23.30	Pathogenesis
55	Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem	Journal of Adolescence	2016	535	66.88	Pathogenesis
56	Prevalence and treatment of depression, anxiety, and conduct problems in us children	Journal of Pediatrics	2019	534	106.80	Review
57	Childhood abuse and neglect: Specificity of effects on adolescent and young adult depression and suicidality	Journal of the American Academy of Child & Adolescent Psychiatry	1999	530	21.20	Pathogenesis
58	The prevention of depressive symptoms in children and adolescents: A meta-analytic review	Journal of Consulting and Clinical Psychology	2006	522	29.00	Prevention
59	Gene-environment interaction analysis of serotonin system markers with adolescent depression	Molecular Psychiatry	2004	520	26.00	Pathogenesis
60	Sex differences in adolescent depression: Stress exposure and reactivity models	Child Development	2007	516	30.35	Pathogenesis
61	Comorbidity of anxiety and depression in children and adolescents: 20 years after	Psychological Bulletin	2014	515	51.50	Medical psychiatry

Table 1 (continued)

Rank	Article	Journal	Years	Citations	ACY	Topic
62	Association of serum interleukin 6 and c-reactive protein in childhood with depression and psychosis in young adult life a population-based longitudinal study	JAMA psychiatry	2014	514	51.40	Pathogenesis
63	Depression in adolescence	American Psychologist	1993	510	16.45	Review
64	The association of insomnia with anxiety disorders and depression: Exploration of the direction of risk	Journal of Psychiatric Research	2006	502	27.89	Medical psychiatry
65	An investigation of mental health status of children and adolescents in china during the outbreak of Covid-19	Journal of Affective Disorders	2020	499	124.75	Epidemiology
66	Internalizing problems of childhood and adolescence: Prospects, pitfalls, and progress in understanding the development of anxiety and depression	Development and Psychopathology	2000	498	20.75	review
67	Scales to assess child and adolescent depression—checklists, screens, and nets	Journal of the American Academy of Child & Adolescent Psychiatry	1988	494	13.72	Scales/measurement
68	The comorbid psychiatric symptoms of internet addiction: Attention deficit and hyperactivity disorder (ADHD), depression, social phobia, and hostility	Journal of Adolescent Health	2007	491	28.88	Medical psychiatry
69	Pubertal transition, stressful life events, and the emergence of gender differences in adolescent depressive symptoms	Developmental Psychology	2001	489	21.26	Pathogenesis
70	Adult sequelae of adolescent depressive symptoms	JAMA Psychiatry	1986	487	12.82	Psychosocial characteristics
71	Comorbidity of anxiety and depression in children and adolescents	Psychological Bulletin	1992	486	15.19	Medical psychiatry
72	Developmental changes in hypothalamus–pituitary–adrenal activity over the transition to adolescence: Normative changes and associations with puberty	Development And Psychopathology	2009	483	32.20	Pathogenesis
73	A clinical psychotherapy trial for adolescent depression comparing cognitive, family, and supportive therapy	JAMA Psychiatry	1997	482	17.85	Clinical/management
74	Offspring of depressed parents—10 years later	JAMA Psychiatry	1997	468	17.33	Epidemiology
75	Internet addiction in korean adolescents and its relation to depression and suicidal ideation: A questionnaire survey	International Journal of Nursing Studies	2006	464	25.78	Pathogenesis
76	Bullying, depression, and suicidal ideation in finnish adolescents: School survey	British Medical Journal	1999	461	18.44	Pathogenesis
77	Rumination as a transdiagnostic factor in depression and anxiety	Behaviour Research And Therapy	2011	458	35.23	Pathogenesis
78	Reciprocal relations between rumination and bulimic, substance abuse, and depressive symptoms in female adolescents	Journal of Abnormal Psychology	2007	453	26.65	Pathogenesis
79	Epidemiology of childhood depressive-disorders: a critical-review	Journal of the American Academy of Child & Adolescent Psychiatry	1990	452	13.29	Epidemiology
80	Adolescents' electronic media use at night, sleep disturbance, and depressive symptoms in the smartphone age	Journal of Youth and Adolescence	2015	449	49.89	Pathogenesis
81	Low self-esteem prospectively predicts depression in adolescence and young adulthood	Journal of PersonalityaAnd Social Psychology	2008	448	28.00	Pathogenesis

Table 1 (continued)

Rank	Article	Journal	Years	Citations	ACY	Topic
82	Targeted prevention of unipolar depressive disorder in an at-risk sample of high-school adolescents—a randomized trial of group cognitive intervention	Journal of the American Academy of Child & Adolescent Psychiatry	1995	447	15.41	Prevention
83	Preliminary studies of the reliability and validity of the children's depression rating-scale	Journal of the American Academy of Child & Adolescent Psychiatry	1984	447	11.18	Scales/measurement
84	The clinical picture of major depression in children and adolescents	JAMA Psychiatry	1987	445	12.03	Psychosocial characteristics
85	Prospective relations between social support and depression: Differential direction of effects for parent and peer support?	Journal of Abnormal Psychology	2004	442	22.10	Pathogenesis
86	Efficacy of paroxetine in the treatment of adolescent major depression: A randomized, controlled trial	Journal of the American Academy of Child & Adolescent Psychiatry	2001	440	19.13	Clinical/management
87	Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys	Journal of Clinical Child and Adolescent Psychology	2006	439	24.39	Psychosocial characteristics
88	Poly-victimization and risk of posttraumatic, depressive, and substance use disorders and involvement in delinquency in a national sample of adolescents	Journal of Adolescent Health	2010	438	31.29	Pathogenesis
89	Evaluation of the patient health questionnaire-9 item for detecting major depression among adolescents	Pediatrics	2010	436	31.14	Scales/measurement
90	Switching to another SSRI or to venlafaxine with or without cognitive behavioral therapy for adolescents with SSRI-resistant depression: the TORDIA randomized controlled trial	Journal of the American Medical Association	2008	435	27.19	Clinical/management
91	Prevalence of and risk factors for depressive symptoms among young adolescents	Archives of Pediatrics & Adolescent Medicine	2004	435	21.75	Review
92	Adolescent depression: why more girls	Journal of Youth and Adolescence	1991	435	13.18	Pathogenesis
93	Depressive comorbidity in children and adolescents: empirical, theoretical, and methodological issues	American Journal of Psychiatry	1993	434	14.00	Medical psychiatry
94	Adolescent psychopathology: II. Psychosocial risk-factors for depression	Journal of Abnormal Psychology	1994	433	14.43	Pathogenesis
95	Altered striatal activation predicting real-world positive affect in adolescent major depressive disorder	American Journal of Psychiatry	2009	431	28.73	Pathogenesis
96	Self-efficacy pathways to childhood depression	Journal of Personality And Social Psychology	1999	431	17.24	Pathogenesis
97	Amygdala response to fearful faces in anxious and depressed children	JAMA Psychiatry	2001	429	18.65	Pathogenesis
98	Adolescent depressive symptoms as predictors of adult depression: Moodiness or mood disorder?	American Journal of Psychiatry	1999	429	17.16	Pathogenesis
99	Depressive-disorders in childhood .2. A longitudinal-study of the risk for a subsequent major depression	JAMA Psychiatry	1984	425	10.63	Pathogenesis
100	A randomized trial of a group cognitive intervention for preventing depression in adolescent offspring of depressed parents	JAMA Psychiatry	2001	423	18.39	Clinical/management

their journals, citation counts, and average citations per year (ACY). Reviews comprised 12% of the article types within this top 100 list.

Year of publication

The 100 most cited articles were published between 1981 and 2021 (Fig. 1). Two publication peaks emerged: 1998–2001 and 2004–2007. Both 2001 and 2006 saw the highest number of publications (7 each). The list includes the oldest articles on childhood depression: "Rating Scales to Assess Depression in School-Aged Children [19]" (1701 citations) by M. Kovacs (1981) and "The Validity of Depressive Disorder in Childhood and the Development of a Self-Rating Scale: A Research Report [20]" (600 citations) by P. Birleson (1981). The most recent article, "Global Prevalence of Depressive and Anxiety Symptoms in Children and Adolescents During COVID-19: A Meta-analysis" by N. Racine et al. (2021), boasts 760 citations [21]. However, no articles published in 2022 or 2023 are included in this top 100 list.

Citations

A citation analysis was conducted on the 100 selected articles using the Web of Science Core Collection (WoS-CC). The total citation count for the articles was 69,145. The number of citations per article ranged from 423 to 3,949, with an average of 691.45 citations per article. Furthermore, 64% of the articles received at least 500 citations, and 14% received more than 1,000 citations. The most cited article was "The Children's Depression

Inventory (CDI)" by M. Kovacs (1985), published in Psychological Bulletin [22]. This article also had the sixth-highest average citations per year (ACY) score. The least cited article was "A randomized trial of a group cognitive intervention for preventing depression in adolescent offspring of depressed parents", by Clarke et al. (2001), published in Archives of General Psychiatry [23]. Figure 2 displays the annual total citations and average article citations per year. The year 1998 saw the highest total number of citations, reaching 4,839.

Contributing journals

The 100 articles were published in 36 journals (Fig. 3). JAMA Psychiatry led publication counts (n=17) and total citations (10,167), followed by the Journal of the American Academy of Child & Adolescent Psychiatry (n=12, 7,135 citations) and the Journal of Abnormal Psychology (n=7, 5,468 citations).

Contributing countries, authors, and organizations

The United States led publication output (79 articles, 80% citations) in WoS-CC, followed by the United Kingdom (n=6175 citations; 9%), Canada (n=2288 citations; 3%), and Australia (n=1611 citations; 4%). Figure 4 illustrates the collaboration network between countries for these articles. The United States exhibits a strong emphasis on international collaboration, maintaining partnerships with 14 countries and regions. Notably, collaboration with the United Kingdom is particularly intensive, as indicated by the stronger color of the connecting line in
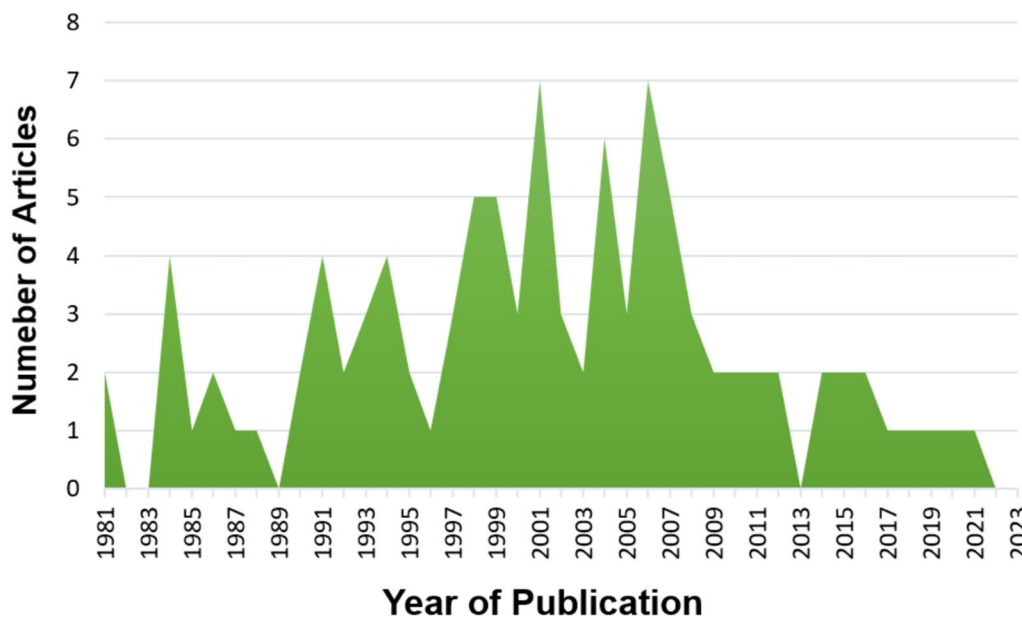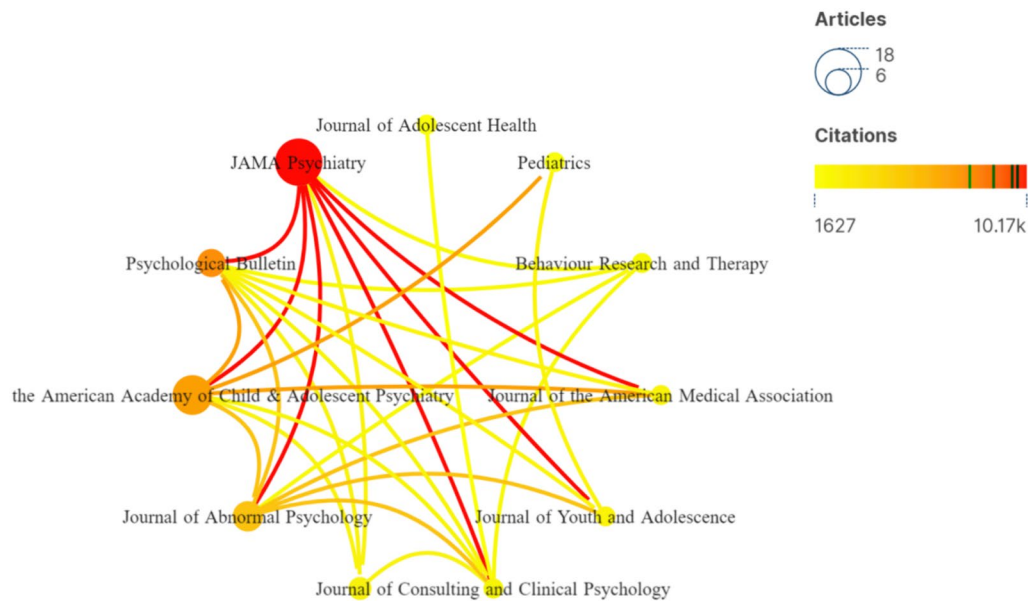

Fig. 1 The number of publications on depression in children and adolescents per year
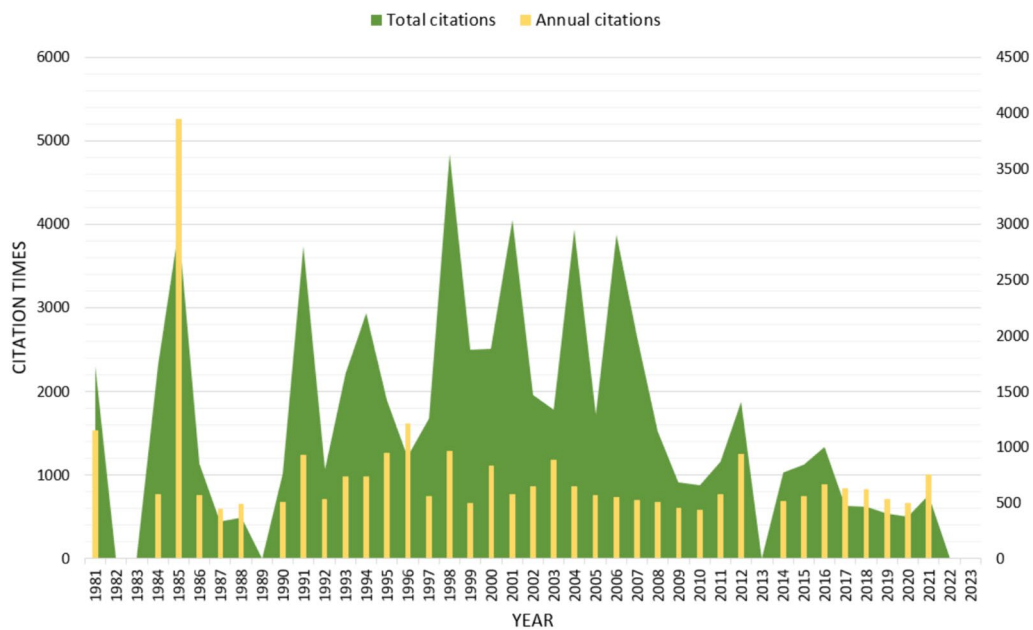
Fig. 2 Annual Citation Trends: This figure shows both the average number of citations received per year (yellow bars) and the average total number of citations accumulated (green shaded area) by published articles across different years


Fig. 3 Journal Co-Citation Network: This figure shows the relationships between journals based on citations. Circles represent journals that published at least four articles (indicated by circle size) within the 100 most cited list. The color intensity of each circle represents the total citations for all the journal articles on the list (darker = more citations)

the figure. The co-authoring countries are predominantly concentrated in North America and Europe, with European nations constituting the largest proportion.

Our analysis of 419 author publication records highlighted a collaborative network of 17 authors (Fig. 5), with Lewinsohn PM, Seeley JR, and Ryan ND showing the highest linkage intensity (total link strength = 16 times). M. Kovacs emerged as the most-cited author with 6,669 citations. The top 10 institutions with the highest number of published articles are presented in Table 2.
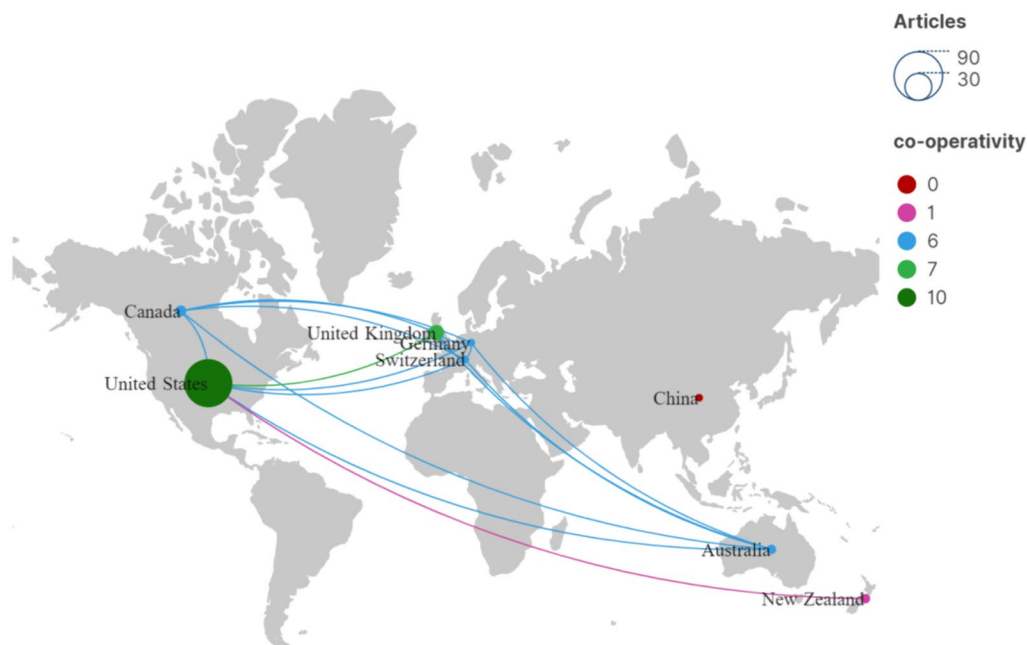
Fig. 4 International Collaboration in Depression Research: This world map illustrates countries contributing research on childhood and adolescent depression within the top 100 cited articles. The green circle highlights the United States as the nation with the most extensive collaboration network. The curved line color intensity indicates the strength of international co-authorship

The University of Pittsburgh led publication contributions with 12 articles, followed by Columbia University and the National Institute of Mental Health with 8 and 7 publications, respectively. All top 10 institutions are in the United States. As shown in Fig. 6, despite this concentration, there is extensive global collaboration among institutions and authors.

Keyword analysis

The sample data literature contains a total of 193 keywords, with 37 high-frequency keywords occurring more than 4 times (see Table 3). The keywords in the table are ranked in descending order of frequency, reflecting their occurrence in the research literature. "PSYCHIATRY" tops the list with a high frequency of 52 times and first appeared in 1981, demonstrating its long-term importance in the research of depression in children and adolescents. Keywords such as "sex differences" and "unipolar depression", although appearing less frequently, their first appearance years also reveal the rise of specific research topics. These keywords reflect the research hotspots of the past forty years, and their corresponding nodes can be seen in the visualization map in Fig. 7.

The network map of keywords analysis can reflect the focus and interdisciplinary situation of depression in children and adolescents research to a certain extent. We analyzed a total of 104 keywords that were identified as appearing more than five times utilizing

VOSviewer, which were subsequently categorized into six clusters (Fig. 7). The map is annotated with key terms, where the larger the label, the higher the frequency of the keyword's occurrence; the closer the distance between the labels, the closer their relationship. To understand the correlation between keywords, our study sorted the vocabulary of the six clusters, as shown in Table 4. The red cluster (Pathogenesis of Depression), encompassing 21 keywords, delves into the pathogenesis of depressive disorders in children and adolescents. It focuses on environmental determinants, temperamental and personality attributes, and relevant screening scales. The green cluster (Treatment of MDD in Children), comprising 19 keywords, prioritizes the evaluation and pharmacotherapeutic interventions for major depressive disorder (MDD) in children, particularly the application of escitalopram. The dark blue cluster (Early Childhood Treatment), consisting of 18 keywords, examines the efficacy of treatments for depressive disorders during early childhood. The yellow cluster (Adolescent Depression Manifestations), featuring 18 keywords, addresses the spectrum of affective and behavioral manifestations associated with adolescent depression. The purple cluster (Gender and Depression), containing 16 keywords, explores the gender-specific manifestations of depression in children and adolescents. The sky blue cluster (Primary Care Considerations), with 12 keywords, pertains to primary
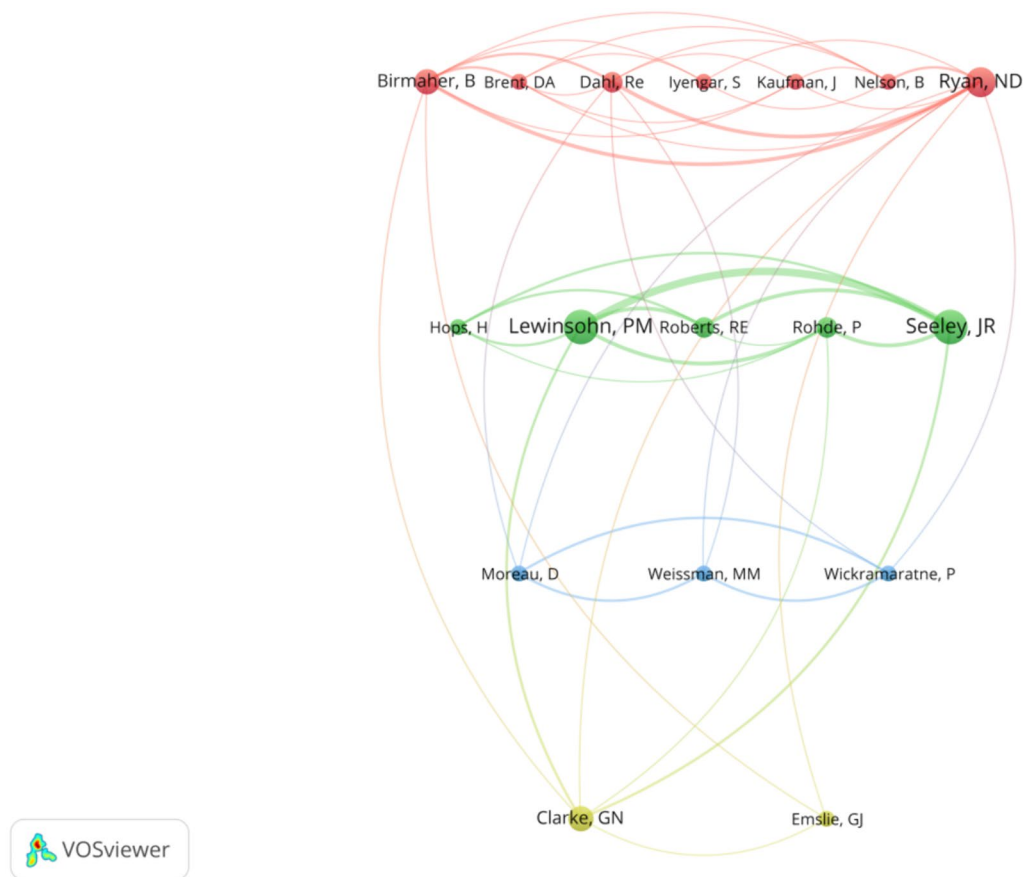
Fig. 5 Author Collaboration Network: This network map visualizes connections between authors who have published more than twice. Circle size reflects the number of top 100 cited articles, and line thickness indicates the strength of collaboration
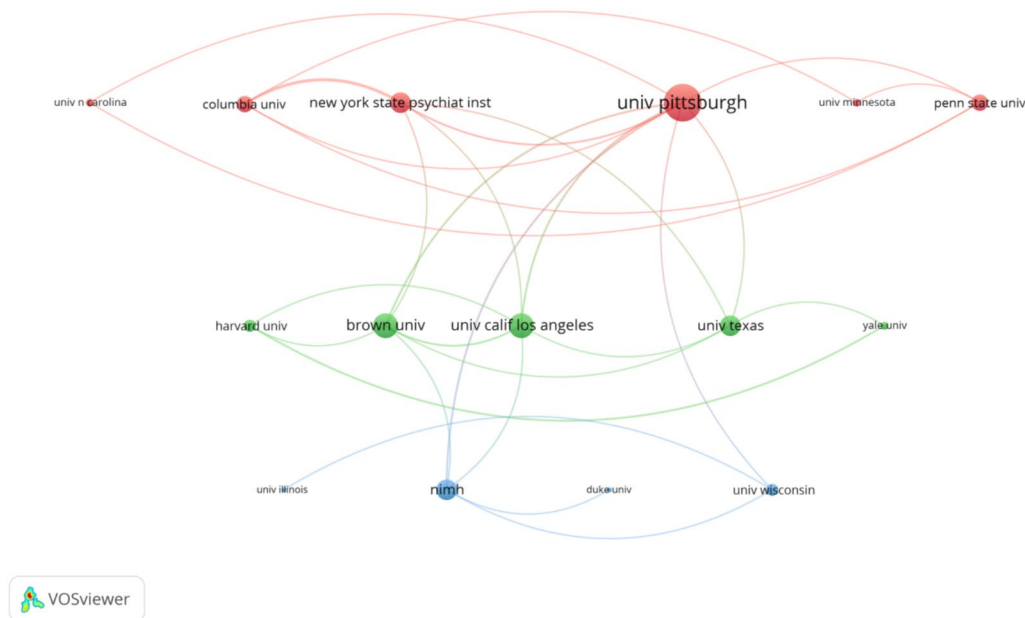
Table 2 Top 10 most published institutions

Institutions	Publication	Citations	Country
University of Pittsburgh	12	7616	USA
Columbia University	8	5241	USA
National Institute of Mental Health	7	5010	USA
New York State Psychiatric Institute	7	4494	USA
Harvard University	6	4255	USA
University of Texas System	5	3338	USA
University of Illinois	4	2343	USA
Brown University	4	2310	USA
The Pennsylvania State University	4	2298	USA
Yale University	4	2296	USA

care considerations for depressive disorders in the same age groups.

Discussion

Adolescent depression is a prevalent mental health with diverse clinical manifestations across developmental stages [24]. Accurate diagnosis can be challenging due to factors such as misattribution of emotional fluctuations and behavioral changes to normal teenage development [25], and communication barriers that hinder adolescents from expressing their emotional distress [26, 27]. In addition to genetic factors [28], family environment [29], adverse childhood experiences [30], sleep disorders [31], and gut bacteria [32] have been proven to significantly influence the onset of depression in youth. The complexity of children and adolescent depression necessitates an interdisciplinary approach to fully understand this condition. To gain a comprehensive perspective on current research trends, we employed a bibliometric analysis of highly cited literature with significant academic impact.

Fig. 6 The co-authorship network between institutions with more than 3 articles: Circle size corresponds to the count of articles among the 100 most cited, while line thickness reflects the collaboration strength

Table 3 High-Frequency Keywords in Child and Adolescent Depression Literature (Threshold ≥ 4)

Number	Keywords	Frequency	First appeared year	Number	Keywords	Frequency	First appeared year
1	Psychiatry	52	1981	19	Sex differences	7	1993
2	Community sample	30	1993	20	Unipolar depression	7	1993
3	Major depression	27	1991	21	Young adolescents	7	1994
4	Children	23	1991	22	Life events	6	1991
5	Pediatrics	21	1984	23	National comorbidity survey	6	1996
6	Childhood	17	1994	24	Risk	6	1999
7	Symptoms	16	1991	25	Psychology	5	1981
8	Disorders	16	1992	26	Adolescent depression	5	1991
9	Amitriptyline	16	2001	27	Anxiety	5	1999
10	Psychiatric disorders	14	1993	28	Adolescents	5	2000
11	Efficacy	13	2001	29	Eficacy	5	2001
12	Risk factors	10	1993	30	Adulthood	5	2002
13	Gender differences	10	1994	31	Association	5	2004
14	Affective disorders	9	1991	32	Co morbidity	4	1991
15	Inventory	8	1991	33	Community sample	4	1993
16	Prevalence	8	1991	34	Dsm ili disorders	4	1993
17	Psychopathology	8	1992	35	Age	4	1997
18	Mental disorders	7	1993				

Analysis of the top 100 cited articles on children and adolescent depression reveals a strong presence of research from the United States, with 79 publications (55,326 total citations), and all 11 institutions publishing four or more articles are based in the United States The most impactful original article was Kovacs' (1985) study establishing the reliable and valid Children's Depression Inventory (CDI-R) [22]. The
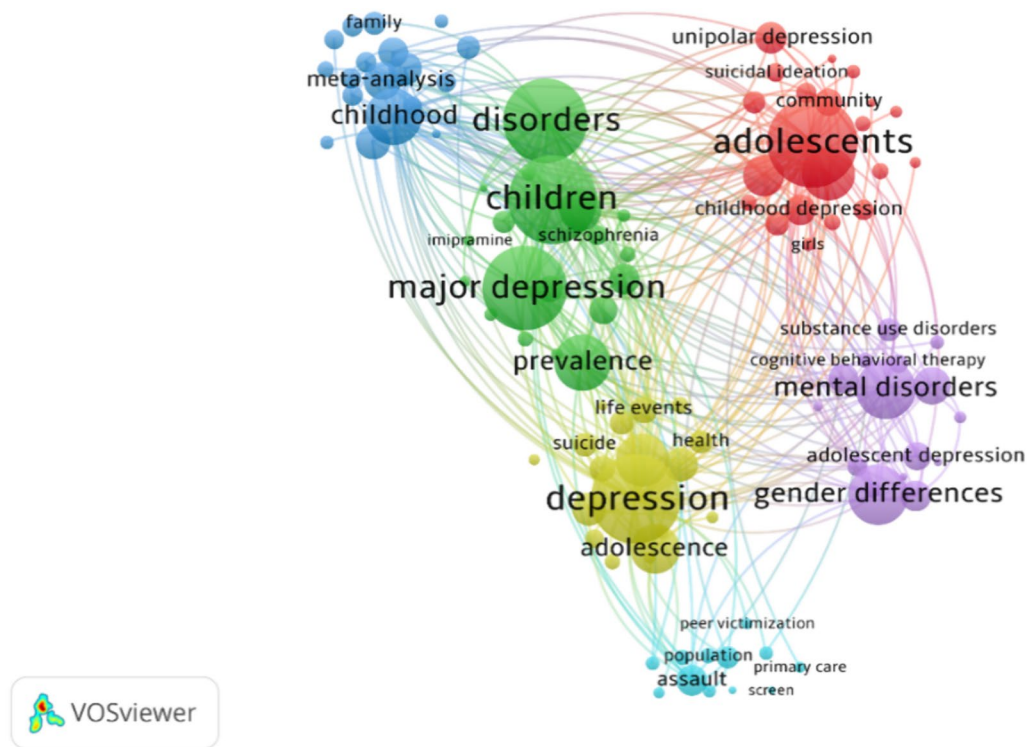
Fig. 7 Network map of keywords analysis with more than 5 articles: Different colors represent different clusters of keywords. The size of the circles indicates the frequency of the terms, and the curves represent the relatedness of the keywords

Table 4 Cluster of keywords on depression in children and adolescents research field

Cluster	Color	Keywords
1	(red)	Adolescents, risk factors, psychopathology, unipolar depression, childhood depression, community, negative affect, scale, personality, psychiatric disorder, psychometric propert, social support, suicidal ideation, trajectories, behavior, girls, internet addiction learned helplessness, self, substance use, suicidality
2	(green)	Disorders, children, major depression, prevalence, inventory, affective disorders, reliability, epidemiology, age, schizophrenia, fluoxetine, agreement, validity, sertraline, interview, imipramine, diagnostic, criteria, classification, assessment
3	(blue)	Childhood, risk, meta-analysis, psychotherapy, efficacy, double-blind, major depressive, services, cognitive behavioral treatment, family, interpersonal psychotherapy, intervention, placebo, prevention, randomized-trial, school-children, serotonin reuptake inhibitors, therapy
4	(yellow)	Depression, adolescence, anxiety, self-esteem, life events, young adulthood, adulthood, association, health, stress, suicide, communication, duration, insomnia, polymorphism, psychological adjustment, sleep, sleep duration
5	(purple)	Gender differences, mental disorders, comorbidity, national, comorbidity survey, mental health, adolescent depression, dsm-ili disorders, attributional style, pubertal status, substance use disorders, behavioral inhibition, cognitive behavioral therapy, conduct disorder, maternal depression, pediatric primary care, stressful life events
6	(cyan)	Assault, victimization, diagnostic interview schedule, responses, abuse, alcohol, peer victimization, population, post-traumatic-stress-disorder, primary care, rumination, screen

most-cited review [33], by Nolen-Hoeksema and Girgus (1994), delved into gender differences in adolescent depression, highlighting the interplay of biological, psychological, and sociocultural factors, with girls exhibiting a higher susceptibility during adolescence.

The United States dominates depression research, evident in its extensive coverage of topics like childhood and adolescent depression, MDD [34], heart failure comorbid with depression [35], and electroconvulsive therapy [36]. With the development of early depression scales like the Self-Rating Depression Scale (SDS) by William W.K. Zung, and the presence of top institutions like the University of Pittsburgh and the University of California, the U.S. has a strong foundation for depression research. Substantial government investment further drives its depth and development. While the U.S. significantly influences global diagnostic and treatment standards, its dominance may lead to culturally incongruent standards and widen the gap in childhood depression care worldwide.

We have also found a growing trend in research from countries other than the United States in this field [37]. This suggests an increasing globalization of research efforts, with contributions from diverse nations. For example, some studies have explored the incidence of depression against the backdrop of China [38], providing valuable insights into the localized understanding of this important public health issue. At the same time, there are studies focusing on the adolescent population in Finland [39], which provide profound insights into the psychological health issues of adolescents in different cultural environments. In addition, research on the relationship between internet addiction and depression and suicidal ideation among South Korean adolescents reveals the complex interplay between technological advancement and psychological health [40], a phenomenon particularly prominent in the context of globalization.

The analyzed papers displayed a relatively even distribution across three main topics: Pathogenesis, Scales/ Measurement, and Epidemiology. Notably, research on depression scales for children and adolescents, like Kovacs' (1985, 1981) studies [19, 22], exhibited higher average rankings and citation frequencies. These findings suggest that the field prioritizes mapping the global prevalence and causes of adolescent depression, followed by methods for screening and diagnosing patients and evaluating symptom severity. Interestingly, only two of the top 100 articles specifically focused on prevention in children and adolescents [41, 42]. While early diagnosis and treatment are crucial for improving long-term outcomes [43], preventive interventions hold immense potential for population-level benefits [44]. This highlights the need for a stronger research focus on preventative strategies.

According to our co-occurrence keywords network, current research hotspots focus on understanding the pathogenesis of depression in children and adolescents (Pathogenesis of Depression cluster) and developing effective treatment methods (Treatment of MDD in Children cluster). In particular, environmental factors, temperament, and personality traits as key directions in etiological research highlight the need for early identification of risk factors [45]. Moreover, pharmacological treatment for major depressive disorder (MDD) in children, especially the application of escitalopram [46], demonstrates research interest in establishing evidence-based treatment practices. At the same time, research on early treatment (Early Childhood Treatment cluster) emphasizes the importance of intervention measures in early childhood, which may help to improve long-term prognosis [47, 48].

In addition to etiology and treatment, research on depression in children and adolescents also highlights gender-specific manifestations (Gender and Depression cluster) and adolescent-specific depressive symptoms (Adolescent Depression Manifestations cluster). These studies reveal the impact of gender and age on the expression of depressive symptoms, emphasizing the need for gender-sensitive therapeutic approaches in clinical practice [49]. Meanwhile, primary care (Primary Care Considerations cluster) plays a pivotal role in the diagnosis and management of depression in children and adolescents. Studies indicate the necessity to enhance training and resources for primary care providers to improve early recognition and intervention capabilities for depression [50].

Implications

To effectively address depression among children and adolescents, we should prioritize several key areas in clinical and practical settings. Firstly, enhancing the effectiveness of primary care is paramount. This requires investing in regular training workshops and educational materials for primary care providers, such as family doctors and pediatricians [51, 52]. For instance, a continuing education program could focus on recognizing the warning signs of depression in young patients, such as changes in mood, sleep patterns, and school performance. This enables them to recognize depressive symptoms better and offer timely interventions. Secondly, establishing robust early screening and intervention programs is crucial [53–56]. Schools can play a pivotal role in this, by implementing regular mental health screenings for students. These screenings could include self-report questionnaires and assessments by trained professionals [57, 58]. By identifying risk factors early and providing targeted support, such as counseling or referral to mental

health services, we can mitigate the negative impact of depression on children and adolescents' long-term development.

Additionally, we must consider gender and age differences at a micro-level. This means tailoring therapeutic approaches to the unique needs of boys, girls, and adolescents [59, 60]. For example, girls may be more likely to express depressive symptoms through anxiety or eating disorders, while boys may manifest them through anger or aggression. Age also plays a role, as younger children may not have the vocabulary to articulate their feelings, while adolescents may be more likely to engage in risk-taking behaviors [61]. Recognizing that depressive symptoms may manifest differently across genders and age groups allows us to provide more tailored support. By incorporating these considerations into our clinical and practical work, we can create a more holistic and effective system for supporting the mental health of children.

Limitations and future directions

This study presents a bibliometric analysis of the 100 most frequently cited articles in the field of child and adolescent depression, with certain limitations acknowledged. Firstly, despite our efforts to ensure the accuracy of the research, it must be recognized that the inherent characteristics of the software algorithm have had a certain impact on the research results. Secondly, the influence of publication age on citation counts was addressed using the Average Citations per Year (ACY) score, yet this approach may have overlooked significant recent contributions. Therefore, future research should consider analyzing literature from the past five years to capture these potentially influential contributions. Finally, while we have analyzed the 100 most frequently cited articles based on citation counts, it is important to acknowledge that citation metrics are not the absolute determinant of an article's quality. Some excellent articles from other languages and cultures may not have been included due to limited citations, primarily because their publication language restricts access to a broader research community. Future reviews should necessarily extend to high-impact articles from diverse languages and cultures.

Despite these limitations, the present study presented here reveals the trends in depression research among children and adolescents to guide other researchers in the field of depression. Moreover, the data offers valuable insights into the field and suggests that future efforts should concentrate on international collaboration, promoting early identification and intervention, and enhancing public awareness to develop and implement effective prevention strategies and interventions. Furthermore, based on the analysis of research hotspots, it is recommended that future studies focus on refining and enhancing early identification mechanisms, developing more sensitive screening tools, devising early intervention plans, and evaluating the efficacy of various intervention methods across diverse patient populations to achieve superior therapeutic outcomes.

Conclusions

In conclusion, this is the first bibliometric study to identify the 100 most cited papers on depression in children and adolescents. Our results reveal research hotspots, key research directions, the evolutionary process, productive authors, productive countries, and institutions focusing on depression in the past 40 years. Keyword network analysis points to 'major depression,' 'childhood,' 'symptoms,' and 'psychiatric disorders' as key areas of current discussion and future research, suggesting an evolving research focus from epidemiology and scale validation to deeper explorations of pathogenesis.

Overall, the United States dominates in terms of publications, researchers, and institutions. JAMA Psychiatry is the most frequent publication of these highly significant papers between 1981 and 2021. While studies related to Pathogenesis, Scales/Measurement, and Epidemiology have garnered considerable academic attention, especially in the area of Scales/Measurement, there is a noted gap in focus on prevention. Given the increasing prevalence of depression among young populations, this highlights the urgent need to develop and refine early screening and intervention programs that are sensitive to gender and age differences, which have been less emphasized in the research field.

Declarations

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