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**Mapping the landscape and structure of global research on binge eating disorder:
Visualization and bibliometric analysis**

Zyoud SH *et al* Global research in binge eating disorder

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Abstract

BACKGROUND

Binge-eating disorder (BED) is a clinical syndrome and is considered the most common type of eating disorder. However, our understanding of the global performance and progress of BED research is limited.

AIM

The main objective of this study was to describe and perform a bibliometric analysis of the state of BED research.

METHODS

The term 'Binge eating' was searched in the title throughout the previous year's up to 31 December 2020. We searched the Scopus and *Reference Citation Analysis (RCA)* for publications on Binge eating. The VOSviewer software version 1.6.17 was used to produce the network visualization map of the most frequent author, collaborative relationships between countries/regions, and to determine the hotspots related to binge eating research. In addition, conventional bibliometric indicators were generated.

RESULTS

The search strategy found 2,713 total articles and an average of 62 articles per year. Among them, 'Article' represented 82.49% of the publications ($n = 2238$ articles) and was the most frequent type, followed by reviews ($n = 243$; 8.96%). The number of publications increased steadily during the last decade of the study period. One hundred and thirty-two countries contributed to binge eating research, with 1495 (55.11%) articles published in the USA, followed by Italy with 256 (9.44%), the UK with 183 (6.75%), and Germany with 182 (6.71%). Currently, the main hot topics related to BED are 'type of treatment and management and treatment provided to BED'; "processes and pathways to binge eating"; and 'diagnosis, signs and symptoms, comorbidities and prevalence and associated factors with BED'.

CONCLUSION

The number of publications has increased noticeably during the previous decade. There are indeed relatively few publications on BED from low-and middle-income nations, so that that there is much to be learned from the experience of all countries. Studies on this topic are critical in all countries to discover risk factors and effective intervention measures. Although our findings are preliminary, they imply that the future prospects for interventions aimed at BED management are bright, focusing on complex models of care and long-term maintenance of therapeutic gains.

Key Words: Binge-eating disorder; Scopus; Bibliometric; VOSviewer; Eating disorders.

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Core Tip: Over the last decade, research on binge eating disorder (BED) has focused on various issues. A review of the published literature would aid in determining the density and gaps of research. We found a few bibliometric publications on specific nutritional topics, but none on BED; therefore, this article is unique in this field. This study examines the global performance and progress of BED research and uses a visualization tool to chart research patterns and trends. A bibliometric analysis of prior publications could lay the groundwork for a comprehensive understanding of the state-of-the-art in BED research and identify some future research directions. The number of publications has significantly increased over the last decade. The notion that data are scarce from many low- and middle-income countries may be misunderstood. Research on this topic is critical for identifying risk factors and developing effective intervention strategies in all countries. Although our findings are preliminary, they suggest that the

future of BED management interventions is bright, with an emphasis on complex models of care and long-term maintenance of therapeutic gains.

INTRODUCTION

Disordered eating is a common condition that is often comorbid, especially when associated with obesity. Patients may suffer from ¹⁰ various forms of eating disorders, including anorexia nervosa, bulimia nervosa, and binge eating disorder (BED). In the general population, almost 1–3% of individuals will develop BED during their lifetime, making this form the most common eating disorder [1–3]. Psychiatrist Albert Stunkard first identified BED in 1959 [4]. Stunkard outlines an eating habit characterized by eating large amounts of food at irregular intervals in his study "*Eating Patterns and Obesity*" [4]. Binge eating disorder is characterized by recurrent episodes in which people eat larger amounts of food than most people could eat simultaneously and under similar circumstances while experiencing feelings of loss of control and the absence of compensatory behaviors such as vomiting. Individuals suffering from BED can experience rapid eating in the absence of hunger, uncomfortable fullness, and afterward feelings of disgust, guilt, or sadness [5–9].

Several studies reported that many factors could facilitate binge eating, including impulsivity, inability to control emotions, and negative mood conditions [10–13]. In 2015, a meta-analysis of 33 studies found that negative mood conditions increase food intake in patients with BED compared to those who do not suffer from BED, suggesting a strong relationship between negative mood conditions and binge eating behaviors [14].

However, despite the significant physical and psychological impairment, the higher percentage of binge-eaters did not seek treatment or receive any treatment [15, 16]. Therefore, current treatments for BED primarily focus on behavioral, psychological, and physical outcomes that include cognitive behavioral therapy (CBT) and behavioral weight loss therapy (BWLT) [15, 17]. CBT is considered the most effective approach for BED episodes, while BWLT is more effective in weight loss [18].

Over the last decades, research on BED has focused on a variety of topics. An examination of the published literature would aid in determining the density of research and the gaps. We found some bibliometric publications related to certain nutritional subjects [19-22], but none related to BED; therefore, this article is a novelty in this field. ² This study investigates the global performance and progress of BED research and maps the research patterns and trends using a visualization tool to address this gap. A bibliometric study of previous publications could serve as a foundation for a comprehensive understanding of existing research on BED and highlight some future research topics.

MATERIALS AND METHODS

Data Source

The Scopus database was used to perform a descriptive bibliometric evaluation of BED publications. The Scopus database has a wider coverage of health and biomedical disciplines than the Web of Science and PubMed and has a higher coverage of citation reports [23, 24]. It is also simple to access various legitimate analytical tools, making it an ideal choice for our research [23, 24]. Scopus has also been used and validated in bibliometric analyses published in the previous two years [25-29].

Search Strategies

On October 1, 2021, the search and download procedure was completed in order to avoid significant mistakes caused by daily database changes. The data was immediately retrieved from the database to an excel spreadsheet. "Binge eating" was used as a search term in the Scopus database for the whole preceding year, up to December 31, 2020. This search term included 'Binge eating', 'Binge-eating', 'Binge eating disorder', and 'Binge-eating disorder'. We used the keyword 'binge-eating' because we are concerned with binge-eating per se rather than related terminology. The search method for phrases relevant to binge-eating was confined to title alone to gain higher accuracy in the findings since when other search fields such as Abstract and Keywords were widened; numerous publications were found that were not connected to binge-eating

(i.e., false-positive data). According to the researchers' experience ^[30-32], including search elements in the title rather than a topic search (title, abstract, and keywords) substantially improves specificity with minimal loss of sensitivity.

Bibliometric Indicators

Document types, yearly number of publications, author names, journal names, country names, institution names, funding agency names, and number of citations were included in the data exported from the Scopus. The *Impact Index per article* for the top ten most-cited publications based on *Reference Citation Analysis* (RCA) is shown in Table 5. RCA is an open, multidisciplinary citation analysis database owned by Baishideng Publishing Group Inc. (Pleasanton, CA 94566, USA)^[33].

Network Visualization Maps

The VOSviewer 1.6.17 software produced the network visualization map of the most frequent author, collaborative relationships between countries/regions, and the hotspots related to binge-eating research. The size of the nodes on the network visualization map is proportional to the number of occurrences, while the distance between words reflects the strength of the relationship between countries, authors, and terms, with a closer distance suggesting a stronger relationship ^[34].

Ethical Approval

Because all data were collected from previously published articles, there was no ethical approval requirement for this bibliometric study.

RESULTS

General Description of the Retrieved Publications

The search strategy found 2,713 total documents and an average of 62 documents per year. Among them, 'Article' represented 82.49% of the publications ($n = 2,238$ articles) and was the most frequent type, followed by reviews ($n = 243$; 8.96%). The remaining publication types were 232 documents (8.54%).

Annual Growth of Publications

The oldest paper was written by Wilson, G.T. in 1976 entitled 'Obesity, binge eating, and behavior therapy: some clinical observations' in *Behavior Therapy*. After this, the number of publications grew slowly from 1976 to 1990, with little fluctuation. Figure 1 shows the publication trend related to BED from 1976 to 2020. Clearly, the number of relevant publications has increased sharply since 2011, while 2020 netted the largest amount of binge eating research (195 published documents).

Active Countries

One hundred and thirty-two countries contributed to binge eating research, with 1,495 (55.11%) articles published in the United States, followed by Italy with 256 (9.44%), the UK with 183 (6.75%), and Germany with 182 (6.71%) (Table 1). Figure 2 shows the collaboration of the international network. Countries with a minimum contribution of ten articles ($n = 26$) were included in the network. The map is divided into eight clusters of varying colors, each representing one of eight different cross-country network collaborations. The United States and Canada had the strongest cross-country collaboration, as indicated by the thickness of the connecting line.

Active Institutions

Table 2 Lists the top ten core institutions publishing the most documents on the BED. The most active institutions in this field were those associated with American colleges. The top 10 active institutions contributed 835 articles (30.77%). Ten of the top active institutions were located in North America. *The Yale School of Medicine* came in first with 172 articles, followed by *Yale University* with 116, the *University of Minnesota Twin Cities* with 91, and the *Neuropsychiatric Research Institute, Fargo* with 85.

Contributions of Funding Agencies

Table 3 includes the top ten core funding agencies with the most documents in the BED. Among them, nine agencies were from the USA, and one agency was from the UK. The *National Institutes of Health* came first, with 562 studies that the *Department of Health* supported. The *US Department of Health and Human Services* came second ($n = 537$). In contrast, the *National Institute of Diabetes and Digestive and Kidney Diseases* came third ($n = 319$), and the *National Institute of Mental Health* came fourth ($n = 289$).

Active Authors

The total number of authors who published on BED was 6,223, of whom 40 (0.64%) published more than 20 documents for each author. Figure 3 shows the map of the co-authorship network of authors with at least ten publications. The authors with the largest node size contributed the most and included Grilo, C.M.; Masheb, R.M.; Mitchell, J.E.; Crosby, R.D.; White, M.A.; McElroy, S.L.; Crow, S.J.; Peterson, C.B.; Wilfley, D.E.; and Bulik, C.M..

Active Journals

Table 4 shows the top ten active journals for the literature related to BED. The *International Journal of Eating Disorders* ($n = 398$, 14.57%) was first ranked, followed by *Eating Behaviors* ($n = 139$, 5.12%), *Appetite* ($n = 94$, 3.46%), and the *European Eating Disorders Review* ($n=85$; 3.13%).

Citation Analysis

According to citation analysis, the retrieved articles got 99,491 citations, with an average of 36.7 per article and an h-index of 137. The number of citations ranged from 0 to 1454. Two hundred and fifty of the articles retrieved had zero citations, while 248 received 100 or more citations. The top 10 most-cited papers received 7,126 citations in all. The total citations of these articles that quoted the research on BED research ranged from 458 to 1454 (Table 5). Furthermore, the ten most cited articles have an impact index per article of 0.7 to 64.4 (Table 5).

Research Themes

Three clusters emerged from the mapping of terms in the titles and abstracts of the retrieved literature, reflecting three major research themes in this field; (Figure 4). The first group (blue) signifies a research theme on the management and treatment provided for BED (psychotherapy, cognitive behavioral therapy, interpersonal psychotherapy, and pharmacotherapy). The second cluster (green) is a research theme that focuses on processes and pathways to binge eating (dietary restriction theory, cognitive models of binge eating, cognitive behavior model of BED, and emotional regulation theory). Finally, the third theme (red) is the largest topic and discusses

diagnosis, signs and symptoms, comorbidities, and prevalence and associated factors with BED.

DISCUSSION

The present study used a bibliometric methodology to analyze global research publications on BED. In addition to reviewing current research on BED, this study identifies hot topics in this field and suggests future study options. The interest in global research in BED has increased significantly in recent years. Furthermore, it is clear that the output in this field has risen steadily as the risk of BED has been better understood. Due to a greater knowledge of persons seeking bariatric surgery for weight reduction, bariatric surgeons have advised a shift from surgical to preventative and minimum intervention techniques for BED management, including lifestyle interventions such as weight training, peer support groups, or medication therapy [35-39]. The United States, Italy, the United Kingdom, Germany, and Canada had the most binge eating research published in the literature, accounting for 83.8% of all publications in the study. Although no bibliometric study on BED has been published on BED, some studies have been conducted on nutrition research productivity in various fields [40, 41], as measured by publications, and found that the United States, the United Kingdom, and Europe countries were the top producers of binge eating publications during this time. Eating disorders are more common in western societies than in non-western societies, although the incidence appears to be increasing [42, 43]. Furthermore, the burden of eating disorders is likely to increase in low- and middle-income countries as they grow and experience cultural change [43]. As a result, the rising prevalence of eating disorders among Western cultures or in low- and middle-income countries and the scarcity of research documents published in these areas point to an urgent need for more research on this subject.

Based on the analysis of terms and specific domains of research interest, three significant research themes were identified in binge-eating research. This study identified the terms most often used terms in the scientific literature and showed how

they appeared in various publications. One of the main hot topics in the current study was the 'type of treatment and management provided for BED'. The most well-known psychotherapy treatment for BED is cognitive-behavioral therapy. In addition, interpersonal psychotherapy has been investigated as an alternative treatment for BED by targeting these individuals' social and interpersonal impairments [44]. BED's remission rates for the cognitive behavioral therapy and interpersonal psychotherapy have been higher than remission rates for anorexia nervosa and bulimia nervosa [45].

Other pharmacological treatment methods that are effective for BED include antidepressants, antiepileptic drugs, anti-obesity medications, and central nervous system stimulants. These treatments show modest short-term efficacy in reducing binge eating, and fewer eating compulsions without losing weight that patients experienced when using antidepressants, while topiramate showed a greater weight reduction [46]. However, the use of pharmacological treatment is limited due to the presence of potential adverse effects and harms, which are reported in 80% of studies and lead to higher rates of discontinuation [47].

⁴ In 2015, the United States Food and Drug Administration (FDA) approved lisdexamfetamine dimesylate (LDX) as the first and only drug for BED. LDX was previously approved as ⁷ a central nervous system stimulant for the treatment of Attention Deficit Hyperactivity Disorder (ADHD) and is now considered the only currently approved drug for BED [48].

Another subject that has received much attention has focused on processes and pathways to binge eating, including concepts related to dietary restriction theory, cognitive models of binge eating, the cognitive-behavioral model of BED, and emotional regulation theory. Most of the research on cognitive models of binge eating has concentrated on limiting or dieting behavior, negative affect, emotional control and behavioral dysregulation, preoccupations with body, shape, and weight, and low self-esteem [49, 50]. Dietary restriction and body image or weight worries may cause the development and/or maintenance of binge eating behavior in certain people. However, for others, highly processed meals may induce neuroplastic changes in the brain,

resulting in an addictive process [51]. Some theoretical advances have focused on investigating the persistence of beliefs or schemas that can contribute to the high rate of post-treatment relapse found in the binge eating group [52, 53].

Another hot topic is the diagnosis, signs and symptoms, comorbidities, prevalence, and associated factors with BED. Furthermore, BED has a major burden on psychiatric and physical health [54]. Almost 80% of individuals with BED have suffered from mood disorders, such as major depressive disorder, anxiety, suicidal tendency, and bipolar disorder, as well as physical comorbidities, such as hypertension, obesity, chronic types of pain, and chronic diabetes [1, 54, 55].

Several studies estimate the prevalence, incidence, and sex differences in BED in adolescents and children and found that the prevalence rates are the same as those of adults and count between 1 and 3%, with almost double the number of girls compared to boys, which are similar to the results in adults [56]. Late adolescence to early adulthood was the age of onset of BED and is also associated with physical and psychological impairments [57]. BED was found to be strongly associated with diabetes and metabolic syndrome. Furthermore, those with obesity and BED have a higher risk of respiratory and gastrointestinal diseases than those without obesity and BED [58]. This makes people with BED suffer from a lower quality of life-related to health [59, 60].

Citation analysis is one of the most important ways to evaluate the influence or importance of a specific publication for some time or determine its level of recognition. The most cited articles can determine which study topic has received the most attention from the scientific community [61, 62]. The most cited article was by Heatherton and Baumeister [63] and published in the *Psychological Bulletin*. This study put a hypothesis for BED to break away from self-awareness. Specifically, binge eaters tend to avoid the surrounding stimuli and significant ideas that will result in disinhibition of eating. The second most cited article was by Gormally *et al* [64] and published in *Addictive Behaviors*. Using two tools to assess binge eating among obese individuals, the study found a varied degrees of binge disorder. It should be noted that those who had severe binge eating were more likely to plan rigorous eating habits that are difficult to follow and

maintain. The third most cited article was Spitzer *et al* [65], published in the *International Journal of Eating Disorders*. This study discussed the deep associations of certain characteristics with binge eating problems, including, but not limited to, the frailty of social and working life, inappropriate feelings toward body weight, and having psychological problems or substance abuse. The fourth most cited article was by Spitzer *et al* [66] and was published in *International Journal of Eating Disorders*. The researchers in this article have tested the criteria for the diagnosis of binge disorder. They found that this problem is prevalent in women and people who follow hospital weight control programs and it was correlated with the degree of obesity of individuals. The fourth most cited article was by Kessler *et al* [1] and published in *Biological Psychiatry*. A public survey reported a prevalence of binge eating problems, which is a little closer to the prevalence of bulimia nervosa. The binger begins in late adolescence, and its risk increases in females. However, the study identified the clinical value of asking patients about eating abnormalities.

The sixth most cited article was undertaken in 2002 by Stice *et al* [67]. This publication concluded a list of biological and psychological variables that predict BED. The need to be thin, modeling of eating disorder, exaggerated appearance, body shape umbrage, depression, body weight, and low self-confidence were potential risk factors for binge eating. The seventh most cited article was published in 2000 by Stice *et al* [68]. This study established a self-diagnostic tool for binge eating problems, tested for reliability and validity, and showed acceptable levels for both tests. Consequently, the researchers recommend that this instrument be used clinically and for research purposes.

The eighth article most cited was the study by Telch *et al*'s [69] study using dialectical behavioral treatment in women with BED. It found a great improvement in binge eating measures, and most of them curbing this diet problem compared to the control group. However, factors related to changes in mood and weight were not found to be significant. The ninth most cited article was carried out in 1981 by Halmi and Schwartz [70]. This research was conducted to characterize BED among college students. It was found that 13% of students had main symptoms of eating disorder, with the main

skewed toward the female gender. Additionally, people with a history of increased weight were associated with symptoms of eating disorders. Lastly, the tenth most cited article was published in 2000 by Fairburn *et al* [71]. This article explained the natural sequence of BED in young women (aged 16 to 35 years) for a period of five years. In general, a great improvement was initially observed, and then the improvement gradually became gradual. The percentage with any form of clinical eating problem was decreased to 18% at the end of the study. However, the weight increased in thirty-nine percent of this population.

Strengths and Limitations

This is the first study to use bibliometrics to report and evaluate global trends in binge eating research. In addition, this study will assist researchers seeking to find hotspots and issues in need of investigation in this subject and those seeking to identify influential articles and the most prolific authors in this research niche. The present study has some limitations. Only one database (Scopus) was used to obtain bibliometric data; some binge-eating-related publications might have been missed. On the other hand, Scopus continues to be the finest accessible database for analyzing research activity and locating research hotspots on a certain topic. Another limitation is the possibility of errors in ranking institutions or authors due to differing spelling in various publications. Furthermore, publications that do not include the binge-eating term in the title might not be considered for our analysis. Despite these limitations, the findings of this investigation were sufficient to provide an accurate picture of the situation in binge-eating-related publications.

It's interesting and perhaps worthy of comment that there are few articles on the neurobiology or cognitive neuroscience of BED. This is truly a 'hot topic' in the field of eating disorders in general, and it is possible that less has been published on BED than on other eating disorders or that these types of articles are more often based on transdiagnostic dimensional features or underlying constructs (i.e., RDoC) that do not map neatly onto diagnoses such as BED and would be detected by a methodology as that employed herein.

CONCLUSION

This timely bibliometric review examines the findings of the BED, which could help to advance the discipline and establish the basis for future research. Over the last decade, the amount of global research output on BED has expanded substantially, accounting for the majority of publications in relevant journals. Both the USA and the UK have made significant contributions to the number of publications. Furthermore, research institutions from the United States have contributed to the centrality of publications. There are indeed relatively few publications on BED from low-and middle-income nations, so that that there is much to be learned from the experience of all countries. Studies on this topic are critical in all countries to discover risk factors and effective intervention measures. Currently, the main hot topics related to BED are 'type of treatment and management provided to BED'; "processes and pathways to binge eating"; and 'diagnosis, signs and symptoms, comorbidities and prevalence and associated factors with BED'. Although our findings are preliminary, they imply that the future prospects to identify some of the currently most important categories of studies, such as randomized clinical trials.

ARTICLE HIGHLIGHTS

Research background

BED is associated with a variety of psychological and non-psychological issues that impair daily life to varying degrees, with a few severe impairments. Diabetes, obesity, chronic pain, and hypertension are some of its comorbid conditions.

Research motivation

According to a growing body of evidence, the BED appears to have a significant impact on human health. We discovered some bibliometric publications on specific nutritional topics, but none on BED; thus, this article is novel in this field.

Research objectives

The purpose of this study is to analyze research publications on the BED, and identifies global hotspots on this topic.

Research methods

To meet the study's goal, a comprehensive research technique was undertaken using the SciVerse Scopus database.

Research results

This is the first bibliometric analysis of trends in BED publications. The interest in global research in BED has increased significantly in recent years. It is clear that the output in this field has risen steadily as the risk of BED has been better understood.

Research conclusions

In conclusion, based on our timely examination and analysis of hotspots and research trends, we found that the main hot topics related to BED are 'type of treatment and management provided to BED'; "processes and pathways to binge eating"; and 'diagnosis, signs and symptoms, comorbidities and prevalence and associated factors with BED'.

Research perspectives

² This study explores the global performance and advancement of BED research and maps the research patterns and trends using a visualization tool in order to fill this knowledge gap. A bibliometric analysis of prior articles could lay the groundwork for a full understanding of existing research on BED and indicate some potential future research subjects.

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SIMILARITY INDEX

PRIMARY SOURCES

- 1

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