Prevalence of Eating Disorders in Patients with Bipolar Disorder: A Scoping Review of the Literature

Распространенность расстройств пищевого поведения у пациентов с биполярным расстройством: обзор предметного поля

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Review

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ABSTRACT

BACKGROUND: Eating disorder (ED) and bipolar disorder (BD) exhibit certain phenomenological similarities rooted in eating behavior and emotional regulation. However, despite the growing body of research on the comorbidity of ED and BD, scientific data on the concurrent course of these disorders has remained poorly systematized.

AIM: To conduct a scoping review of published data on the prevalence of various types of ED among patients with BD types I and II in the context of the sex and clinical features of the concurrent course of these disorders.

METHODS: The analysis was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews. The search was conducted in the MEDLINE electronic database. Studies were included if they were focused samples of patients diagnosed with BD and ED, and the Diagnostic and Statistical Manual of Mental Disorders, fourth and fifth editions (DSM-IV, DSM-5), or International Statistical Classification of Diseases and Related Health Problems, tenth Revision (ICD-10), were used for the verification of the ED and BD diagnoses. The descriptive analysis method was used to summarize the review findings.

RESULTS: A total of 41 studies were selected for the review. Lifetime ED in patients with BD ranged from 2.2% to 31.1%, and the prevalence rates of BD among patients with ED varied from 11.3% to 68.1%. ED nominally had a higher prevalence among individuals with BD type II and females. Additionally, the presence of ED in patients with BD was associated with earlier onset of mood disorder, a higher number of depressive episodes, higher levels of atypical depressive symptoms, suicide attempts, as well as a higher frequency of comorbid obsessive-compulsive and anxiety disorders, addictions, and various metabolic disorders.

CONCLUSION: Despite the high degree of volatility in the results, the prevalence rates of a concurrent course of ED and BD are rather high. For this reason, screening for ED in patients with BD and vice versa holds significant value in the accurate diagnosis and selection of the most effective therapy. The patterns of comorbidity among different types of ED and BD, depending on gender, need further exploration in future research.

АННОТАЦИЯ

ВВЕДЕНИЕ: У расстройств пищевого поведения (РПП) и биполярного аффективного расстройства (БАР) отмечаются определенные феноменологические сходства, связанные с пищевым поведением и эмоциональной регуляцией. Однако, несмотря на планомерный рост исследований коморбидности РПП и БАР, научные данные о совместном течении этих расстройств остаются недостаточно систематизированными.

ЦЕЛЬ: Провести обзор предметного поля опубликованных данных по распространенности различных видов РПП среди пациентов с БАР I и II типов с учетом пола, а также анализ клинических особенностей совместного течения данных расстройств.

МЕТОДЫ: Анализ представлен в соответствии с рекомендациями PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) для обзора предметного поля. Поиск проводился в электронной базе данных MEDLINE. В обзор включались оригинальные исследования с выборками пациентов с диагнозами БАР и РПП, соответствующими критериям DSM-IV, DSM-V (диагностического и статистического руководства по психическим расстройствам 4 и 5 издания) или МКБ-10 (Международной классификации болезней10-й редакции). Для обобщения результатов обзора использовался описательный анализ.

РЕЗУЛЬТАТЫ: Всего для обзора было отобрано 41 исследование. Были обнаружены достаточно разнородные показатели распространенности РПП в течение жизни у пациентов с БАР — от 2,2% до 31,1%, а также показатели распространенности БАР среди пациентов с РПП — от 11,3% до 68,1%. РПП номинально имели более высокую распространённость среди лиц с БАР II типа и женщин. Кроме того, наличие РПП у пациентов с БАР было ассоциировано с более ранним манифестом расстройства настроения, большим количеством депрессивных эпизодов, более высоким уровнем атипичных симптомов депрессии, суицидными попытками, а также с более высокой частотой коморбидных обсессивно-компульсивных и тревожных расстройств, аддикций и различных метаболических нарушений.

ЗАКЛЮЧЕНИЕ: Несмотря на высокую вариативность результатов, показатели распространённости совместного течения РПП и БАР являются достаточно высокими. По этой причине скрининг на РПП у пациентов с БАР и, наоборот, скрининг БАР у пациентов с РПП имеет важное значение в точной диагностике и подборе наиболее эффективной терапии. В будущих исследованиях ещё только предстоит более детально изучить паттерны коморбидности различных видов РПП в зависимости от типа БАР и пола.

Keywords: *eating disorders; bipolar disorder; anorexia nervosa; bulimia nervosa; prevalence*
Ключевые слова: *расстройства пищевого поведения; биполярное расстройство; нервная анорексия; нервная булимия; распространённость*

INTRODUCTION

Bipolar disorder (BD) is characterized by frequent comorbidity with other mental disorders [1]. The most common mental disorders that co-occur with BD include eating disorders (ED), obsessive-compulsive disorders (OCD), anxiety spectrum disorders, and substance use disorders [2]. Comorbid conditions in patients with BD often develop years before the onset of the first affective episodes. It is important to consider this fact in the process of diagnosis, therapy, and prognosis of the further course of the disease [2].

Comorbidity of BD with ED, such as anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED) deserves special attention. That is because these disorders exhibit certain similarities in their clinical presentations that are associated with eating behavior and emotional regulation. For instance, depression within the context of BD is characterized by a high frequency of atypical symptoms, such as increased appetite, overeating (hyperphagia), and weight gain [3]. These symptoms are also common for BN and BED, as patients often experience a feeling of guilt and symptoms of hypothymia after overeating [3]. Conversely, depression characterized by melancholic features and hypo-/manic episodes is associated with decreased appetite and weight loss, although some patients with AN may experience improved mood or even euphoria during weight reduction [4–6]. Several clinical features distinguish the comorbid course of BD and ED, including a higher prevalence among females, an earlier age of the onset of mood disorder, a more severe course, a higher frequency of associated

disorders, and a higher rate of suicide attempts [7, 8]. An important aspect is the association between comorbid BD and ED with weight gain, obesity, metabolic syndrome, and type 2 diabetes, which cannot be fully explained by the influence of psychotropic medication [9, 10].

The high comorbidity of ED and BD can be explained by their shared biological mechanisms of development. In particular, it has been suggested that ED and BD share similar genomic regions which are involved in the processes of neurodevelopment and neuroprotection [8,11,12]. Also, certain neuroendocrine changes common to ED and BD — for example, in the system of peptide hormones such as leptin and ghrelin — were found to be associated with changes in appetite and body weight, increasing the risk of obesity [13, 14].

Despite the observed acceleration in research on the comorbidity of ED and BD, scientific data on the comorbidity of these disorders remain poorly systematized. This is associated with the heterogeneity of the research methods used and the changes that have occurred in the classifications of mental disorders: in particular, the division of BD into types I and II, as well as the identification of BED as a new diagnostic category. Furthermore, one of the most significant developments in psychiatry involves the examining of the manifestations of comorbidity between ED and BD among males, as ED cannot be considered as a "purely female illness" and has also been found in males.

Thus, the aim of this study was to conduct a scoping review of published data on the prevalence of various types of EDs among patients with BD types I and II, in the context of the sex and clinical features of the concurrent course of these disorders.

METHODS

Search strategy

The review was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) [15, 16]. The MEDLINE electronic database was searched between January 1994 and September 2022 using the following keywords: ("Bipolar disorder" OR "bipolar affective disorder" OR "bipolar depression" OR "mania" OR "hypomania") AND ("eating disorders" OR "anorexia nervosa" OR "bulimia nervosa" OR "binge eating disorders") AND ("prevalence" OR "frequency" OR "comorbidity" OR "clinical features"). The indicated timeframe was chosen because the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV), was released in 1994, describing BD type II and BED for the first time.

Eligibility criteria

The inclusion criteria were as follows: (1) original studies that included samples of patients diagnosed with BD or BD type I or II; (2) original studies that included samples of patients diagnosed with AN, BN, BED, and unspecified ED; and (3) the DSM-IV, DSM-5 or ICD-10 diagnostic criteria were used to diagnose ED and BD.

Studies were not eligible if they included participants diagnosed with major depressive disorder, depressive episodes, dysthymia, and schizophrenia spectrum disorders. Studies that pre-selected patients with BD and comorbid ED were also excluded due to the risk of inflated results.

Review strategy

The following data was extracted from the included articles: title, authors, year of publication, country, type of study, diagnostic tools, absolute and relative frequencies of ED prevalence in patients with BD and BD prevalence in ED patients stratified by sex and previously described types of these disorders. Data extracted independently by one author (YYV) and validated by the other two review authors (KED and MGE).

Data synthesis

The analytical technique used for this review involved a descriptive analysis of the included studies. Firstly, we selected the absolute and relative frequencies of various ED in patients with BD (types I and II) and vice versa. Secondly, we extracted the absolute and relative frequencies of ED and BD in males and females. The relative frequencies (%) were calculated based on the total number of patients if the original articles provided only absolute frequencies. Additionally, the relative frequencies were calculated for the following groups of participants: "any BD" including patients with BD types I and II and "any ED" including at least AN and BN or all three previously described forms of ED. Based on the obtained data, we assessed the lifetime prevalence and current prevalence. Lifetime prevalence refers to the prevalence of a disorder over the course of a lifetime. Current prevalence refers to the prevalence of a disorder at the present moment. The statistical significance of the differences was not analyzed when comparing the prevalence among different groups. Therefore, the results only represent nominal differences in relative frequencies.

RESULTS

Out of the 514 publications obtained through the database searches, 49 met the inclusion criteria. After reading the full-text articles, the final qualitative analysis included 41 original studies [7,8,17–59]. Firstly, the results of a systematic review and meta-analysis will be analyzed. This will be followed by the analysis of original studies included in the review.

Systematic reviews and meta-analyses

A systematic review and meta-analysis by Fornaro M. et al. included 36 studies, involving 15,084 patients diagnosed with BD and 11 studies, involving 15,146 patients diagnosed with different types of ED [17]. The results of the meta-analysis showed that the prevalence of AN stood at 3.8% (95% CI=2–6%), BN — 7.4% (95% CI=6–10%), and BED — 12.5% (95% CI=9.4–16.6%) among patients with BD as a primary diagnosis [17]. At the same time, the prevalence of BD stood at 2% (95% CI=1–2%), BN — 6.7% (95% CI=12–29.2%), and BED — 9.1% (95% CI=3.3–22.6%) across patients primarily diagnosed with AN. It was suggested that patients with BD type II were more likely to have any comorbid ED [17]. Although the same trend was observed for AN and BED, it was not reported for BN, which was more often detected in patients with BD type I [17]. Comorbid BD and AN were more often encountered among females and patients of younger age [17]. Patients with comorbid BD and BN/BED were also more likely to be female and more often suffered from obesity [17]. The authors also noted that the higher the proportion of patients with BD taking antidepressants, the lower the comorbidity with BN was [17].

According to a systematic review by Álvarez Ruiz EM. et al. in 2015, which included 93 studies, the prevalence rates of ED among patients diagnosed with BD ranged from 5.3% to 31% [18]. Comorbid ED in patients with BD was associated with an earlier onset of mood disorder (especially in the case of AN), more severe symptoms, a higher number of affective episodes (particularly depressive episodes), an increased risk of suicide, as well as an increased number of comorbid conditions (especially substance use disorders and anxiety disorders) and obesity compared to non-comorbid BD [18]. In addition, a negative correlation was found between the prevalence of ED and the male sex and participants with a partner [18].

According to another systematic review (McDonald CE. et al., 2019), including 39 studies and involving patients with BD, the prevalence of any ED among patients diagnosed with BD ranged from 1.9% to 33.3% [19]. Lifetime prevalence and current prevalence of AN in patients with BD ranged from 0.2% to 15.5%, BN — from 0.01% to 15% and BED — from 2.6% to 30.0% [19]. In four out of six studies, alcohol use disorder and mood instability were more common among patients with comorbid BD and ED compared to patients diagnosed with BD alone [19]. Five out of nine studies reported significantly higher rates of suicide attempts in patients with comorbid BD and ED compared with patients diagnosed with BD alone, which may indicate increased hidden impulsivity and emotional dysfunction [19]. The sub-group analysis results, including that of five studies, indicate that the frequency of comorbid ED is comparable between BD types I and II [19].

Data from another systematic review by Thiebaut S. et al. in 2019, including 79 studies (six studies included the general population, 34 studies included patients with BD and 39 studies included patients with ED), showed that from 0.6% to 33.3% of patients primarily diagnosed with BD had concomitant ED [20]. Conversely, up to 35.8% of patients primarily diagnosed with ED had concomitant BD [20]. More commonly, patients with BD had a binge-eating/purging type of AN, BN, and BED [20]. The association with BD was less significant in restrictive AN compared to other EDs [20]. While the age of BD manifestation was lower in the case of comorbid ED, the age of ED manifestation appeared to be independent of the presence of comorbid BD [20]. In addition, the prevalence of ED did not depend on the type of BD [20].

Original studies on the comorbidity of ED and BD

Out of 41 original studies included in the current review, 33 aimed to determine the prevalence of ED in patients with BD and eight studies focused on the prevalence of BD in patients with ED (see Table 1 and Table 2). The studies presented were heterogeneous in terms of the adopted methods, including the type of prevalence (current or lifetime) and diagnostic tools. Out of the 33 studies, 25 presented a lifetime ED prevalence. The lowest lifetime prevalence of any ED among BD patients was reported by Berkol TD. et al. and accounted for 2.2% [27], and the highest value was reported in the study by Fornaro M. et al. and accounted for 31.1% [41]. The highest current prevalence of ED among patients with BD was slightly lower, reaching 26.6% [26]. The lifetime prevalence of AN among patients with BD ranged from 0.6% to 15.5%; BN, from 1.8% to 19.5%; and BED, from 2.3% to 28.8%. The prevalence of comorbid AN and BN among patients

with BD was presented in one study by Balzafiore D.R. et al. and amounted to 13% [23].

The influence of sex on the prevalence of ED among patients diagnosed with BD was studied in 10 studies. The lifetime prevalence of any type of ED was nominally higher among females than it was among males with BD (see Table 1). In 10 studies, the lifetime prevalence of ED stratified by sex was examined among patients with BD. The overall lifetime prevalence of any type of ED was nominally higher among females than it was among males with BD (see Table 1). In eight studies, the lifetime prevalence of ED was studied as dependent on the types of BD. In particular, seven studies reported nominally higher rates of ED throughout life among patients with BD type II compared to patients with BD type I [23, 25, 29, 31, 40, 43, 49]. In eight studies, the lifetime prevalence of ED was examined based on the BD subtypes. Among them, seven studies reported nominally higher rates of lifetime ED among patients with BD type II compared to those with BD type I [23, 25, 29, 31, 40, 43, 49].

Table 1. The prevalence of ED among patients with BD according to sex and type of BD

Reference	Country	Type of study	Diagnostic methods	Type of prevalence	Type of ED	Prevalence of ED		
						Total	by BD type (I/II)	by sex (female/male)
Lee Y et al., 2022 [21]	South Korea	Cross-sectional	DIGS, DSM-IV	Lifetime	Any ED	10.3% (*n*=14)	*NA*	*NA*
					AN	1.5% (*n*=2)	*NA*	*NA*
					BN	8.8% (*n*=12)	*NA*	*NA*
Karanti A et al., 2019 [22]	Sweden	Cross-sectional	MINI, DSM-IV	NA	Any ED	2.1% (*n*=186)	1.2% (*n*=57)	NA
							3.3% (*n*=129)	
Balzafiore DR et al., 2017 [23]	USA	Prospective	SCID-IV, MINI, DSM-IV	Lifetime	Any ED	15.1% (*n*=76)	14% (*n*=34)	22.5% (*n*=66)
							16% (*n*=42)	4.7% (*n*=10)
					AN	3.3% (*n*=17)	*NA*	*NA*
					BN	6.5% (*n*=33)	*NA*	*NA*
					AN+BN	13% (*n*=10)	*NA*	*NA*
					ED NOS	21% (*n*=16)	*NA*	*NA*
Bobo WV et al., 2018 [24]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	BN	14.3% (*n*=210)	*NA*	*NA*
					BED	20.5% (*n*=301)	*NA*	*NA*
Boulanger H. et al., 2017 [25]	France	Cross-sectional	SCID, DSM-IV, BES	Lifetime	BED	18.6% (*n*=27)	15.1% (*n*=13)	24.3% (*n*=20)
							23% (*n*=14)	11.1% (*n*=7)
McElroy SL et al., 2016 [26]	USA	Cross-sectional	SCID, EDDS, DSM-IV, DSM-5	Current	Any ED	26.6%, (*n*=291)	24.7% (*n*=173)	31.5% (*n*=214)
							30% (*n*=118)	18.5% (*n*=77)
					AN	0.2% (*n*=2)	0% (*n*=0)	0.3% (*n*=2)
							0.5% (*n*=2)	0% (*n*=0)
					BN	14.7% (*n*=160)	14% (*n*=98)	17.5% (*n*=119)
							15.7% (*n*=62)	9.9% (*n*=41)
					BED	11.8% (*n*=129)	10.7% (*n*=75)	13.7% (*n*=93)
							13.7% (*n*=54)	8.6% (*n*=36)
Berkol TD et al., 2016 [27]	Turkey	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	2.2% (*n*=5)	*NA*	*NA*
Holtzman JN et al., 2016 [28]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	15.1% (*n*=76)	*NA*	22.5% (*n*=66)
								4.8% (*n*=10)
Goffin KC et al., 2016 [29]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	15.4% (*n*=76)	14,2% (*n*=34)	*NA*
							16,5% (*n*=42)	
Woldeyohannes HO et al., 2015 [30]	Canada	Cross-sectional	MINI, DSM-5	Current	BED	25.4% (*n*=78)	*NA*	*NA*
Liu X et al., 2015 [8]	USA	Cross-sectional	DIGS, DSM-IV	Current/NA	Any ED	8.4% (*n*=184)	*NA*	12.3% (*n*=158)
								2.9% (*n*=26)
					AN	3% (*n*=66)	*NA*	*NA*
					BN	5% (*n*=109)	*NA*	*NA*
					ED NOS	0.4% (*n*=9)	*NA*	*NA*

Reference	Country	Type of study	Diagnostic methods	Type of prevalence	Type of ED	Prevalence of ED		
						Total	by BD type (I/II)	by sex (female/male)
Baek JH et al., 2014 [31]	South Korea	Cross-sectional	SCID, DIGS, DSM-IV	Lifetime	Any ED	7% (*n*=29)	6.3% (*n*=14)	9% (*n*=25)
							7.7% (*n*=15)	2.9% (*n*=4)
					AN	1% (*n*=4)	0.9% (*n*=2)	1.4% (*n*=4)
							1% (*n*=2)	0% (*n*=0)
					BN	6% (*n*=25)	5.4% (*n*=12)	7.5% (*n*=21)
							6.7% (*n*=13)	2.9% (*n*=4)
Nery FG., et al 2014 [32]	Brazil	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	9.5% (*n*=46)	*NA*	*NA*
					AN	2.5% (*n*=12)	*NA*	*NA*
					BN	4.8% (*n*=23)	*NA*	*NA*
					BED	2.3% (*n*=11)	*NA*	*NA*
McElroy SL et al., 2013 [33]	USA	Cross-sectional	SCID, DSM-IV	Current	BED	9.5% (*n*=68)	*NA*	*NA*
Perugi G et al., 2013 [34]	Italy	Cross-sectional	MINI, DSM-IV	Current	Any ED	4.5% (*n*=9)	4.5% (*n*=9)	*NA*
							NA	
					AN	1.5% (*n*=3)	*NA*	*NA*
					BN	3% (*n*=6)	*NA*	*NA*
Azorin JM et al., 2013 [35]	France	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	18.3% (*n*=200)	18.3% (*n*=200)	28.9% (*n*=182)
							NA	3.9% (*n*=18)
					AN	4.7% (*n*=51)	*NA*	7.3% (*n*=46)
								1.1% (*n*=5)
					BN	13.7% (*n*=149)	*NA*	21.7% (*n*=136)
								2.8% (*n*=13)
Gao K et al., 2013 [36]	USA	Cross-sectional	MINI-STEP-BD, DSM-IV	Lifetime	Any ED	10.8% (*n*=18)	*NA*	*NA*
					AN	0.6% (*n*=1)	*NA*	*NA*
					BN	10.2% (*n*=17)	*NA*	*NA*
Seixas C et al., 2012 [37]	Brazil	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	5.3% (*n*=19)	*NA*	7.2% (*n*=18)
								0.9% (*n*=1)
					AN	2.2% (*n*=8)	*NA*	3.2% (*n*=8)
								0% (*n*=0)
					BN	3% (*n*=11)	*NA*	4% (*n*=10)
								0.9% (*n*=1)
McElroy SL et al., 2011 [7]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	14.3% (*n*=125)	14.4% (*n*=102)	21% (*n*=104)
							13.7% (*n*=23)	5.5% (*n*=21)
					AN	3.1% (*n*=27)	2.8% (*n*=20)	4.5% (*n*=27)
							3.1% (*n*=7)	0% (*n*=0)
					BN	4.8% (*n*=42)	4.7% (*n*=33)	7.5% (*n*=37)
							5.4% (*n*=9)	1.3% (*n*=5)
					BED	8.8% (*n*=77)	8.9% (*n*=63)	12.3% (*n*=61)
							8.9% (*n*=14)	4.2% (*n*=16)
Schoofs N et al. 2011 [38]	Germany	Prospective	DSM-IV	Lifetime	BED	28.8% (*n*=15)	*NA*	28.8% (*n*=15)
								0% (*n*=0)
Brietzke E et al., 2011 [39]	Brazil	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	14.6% (*n*=20)	14.6% (*n*=20)	14.6% (*n*=20)
							NA	*NA*
					AN	2.9% (*n*=4)	*NA*	*NA*
					BN	2.9% (*n*=4)	*NA*	*NA*
					BED	8.7% (*n*=12)	*NA*	*NA*
Baek JH et al., 2010 [40]	South Korea	Cross-sectional	DIGS, DSM-IV	Lifetime	Any ED	14.3% (*n*=15)	8.7% (*n*=6)	NA
							27.3% (*n*=9)	

Reference	Country	Type of study	Diagnostic methods	Type of prevalence	Type of ED	Prevalence of ED		
						Total	by BD type (I/II)	by sex (female/male)
Fornaro M et al., 2009 [41]	Italy	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	31.1% (*n*=46)	*NA*	31.1% (*n*=46)
								NA
					AN	15.5% (*n*=23)	*NA*	*NA*
					BN	5.4% (*n*=8)	*NA*	*NA*
					AN+BN	2% (*n*=3)	*NA*	*NA*
					BED	14.2% (*n*=21)	*NA*	*NA*
Wildes JE et al., 2008 [42]	USA	Cross-sectional	DSM-IV	Lifetime	Any ED	21% (*n*=17)	*NA*	24.5% (*n*=13)
								14.3% (*n*=4)
					AN	7.4% (*n*=6)	*NA*	11.3% (*n*=6)
								0% (*n*=0)
					BN	8.6% (*n*=7)	*NA*	9.4% (*n*=5)
								7.1% (*n*=2)
					AN+BN	2.5% (*n*=2)	*NA*	3.8% (*n*=2)
								0% (*n*=0)
					BED	11.1% (*n*=9)	*NA*	13.2% (*n*=7)
								7.1% (*n*=2)
Perugi G et al., 2006 [43]	Italy	Cross-sectional	SCID, DSM-IV, DSM III-R	Lifetime	BN	19.5% (*n*=16)	0% (*n*=0)	*NA*
							19.8 % (*n*=16)	
Pashinian A et al., 2006 [44]	Israel	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	14.3% (*n*=8)	*NA*	*NA*
					AN	1.8% (*n*=1)	*NA*	*NA*
					BN	1.8% (*n*=1)	*NA*	*NA*
					BED	10.7% (*n*=6)	*NA*	*NA*
Ramacciotti CE et al., 2005 [45]	Italy	Cross-sectional	SCID, DSM-IV	Lifetime	BN	9.8% (*n*=5)	*NA*	22.7% (*n*=5)
								0% (*n*=0)
					BED	17.7% (*n*=9)	*NA*	13.6% (*n*=3)
								20.7% (*n*=6)
Baldassano CF et al., 2005 [46]	USA	Cross-sectional	MINI, DSM-IV	Current	BN	7.5% (*n*=36)	5.7% (*n*=21)	11.6% (*n*=33)
							13.1% (*n*=15)	1.5% (*n*=3)
MacQueen GM et al., 2003 [47]	Canada	Prospective	SCID, DSM-IV	Current	Any ED	18.1% (*n*=25)	*NA*	*NA*
					AN	2.9% (*n*=4)	*NA*	*NA*
					BN	6.5% (*n*=9)	*NA*	*NA*
					BED	8.7% (*n*=12)	*NA*	*NA*
Vieta E et al., 2001 [48]	Spain	Cross-sectional	SCID, DSM III-R	Lifetime	BN	2.3% (*n*=3)	2.3% (*n*=3)	*NA*
							NA	
McElroy SL et al., 2001 [49]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	Any ED	5.9% (*n*=17)	4.6% (*n*=11)	*NA*
							12.2% (*n*=6)	
					AN	2.1% (*n*=6)	1.7% (*n*=4)	*NA*
							4.1% (*n*=2)	
					BN	3.8% (*n*=11)	3.3% (*n*=8)	*NA*
							6.1% (*n*=3)	
Pini S et al., 1999 [50]	Italy	Cross-sectional	SCID, DSM-III-R	Lifetime	Any ED	6.4% (*n*=8)	*NA*	*NA*
					AN	2.4% (*n*=3)	*NA*	*NA*
					BN	4% (*n*=5)	*NA*	*NA*
Edmonds LK et al., 1998 [51]	New Zealand	Cross-sectional	DIGS, DSM-IV	Lifetime	Any ED	7.2% (*n*=4)	*NA*	*NA*

Note: NA — not available, BES — Binge Eating Scale, DIGS — Diagnostic Interview for Genetic Studies, DSM — Diagnostic and Statistical Manual of mental disorders, EDDS — Eating Disorder Diagnostic Scale, MINI — Mini International Neuropsychiatric Interview, MINI-STEP-BD — Mini International Neuropsychiatric Interview Systematic Treatment Enhancement Program for Bipolar Disorder version 5.0.0, SCID — Structured Clinical Interview for DSM.

A separate analysis was conducted to examine the prevalence of BD among patients with ED (Table 2). The lowest lifetime prevalence of BD among patients with ED was reported by Radon L et al. and amounted to 11.3% [52], whereas the highest rate was reported in the study by Campos R.N. et al. and accounted for 68.1% [58]. In three out of five studies that additionally analyzed the type of BD in patients with ED, a nominally higher prevalence of BD type II in patients with ED was revealed compared to patients without ED. The prevalence of BD type I among patients with AN ranged from 0.7% to 7.7%; among patients with BN, from 1.9% to 7.7%; and among patients with BED, from 1.1% to 6%. In turn, the prevalence of BD type II among patients with AN ranged from 1% to 2.6%; among patients with BN, from 1.1% to 9.3%; and among patients with BED, from 0.7% to 7%. The only study that attempted to determine the current prevalence of BD in patients with ED showed paradoxically high rates amounting to 41.4% for any BD, 17.2% for BD type I, and 24.2% for BD type II [54]. The paradox is that current prevalence rates are usually lower than lifetime prevalence, which again highlights the issue of heterogeneity in research methodology. The stratification by sex was conducted only in two studies and showed contradictory results [54, 55].

Table 2. The prevalence of BD among patients with ED by sex and type of ED

Reference	Country	Type of study	Diagnostic methods	Type of prevalence	Type of BD	Prevalence of BD		
						Total	by ED type (AN/BN/ ED/ BED/ NOS)	by sex (female/ male)
Radon L et al., 2022 [52]	France	Cross-sectional	Short-CIDI, DSM-5	Lifetime	Any BD	11.3% (*n*=20)	*NA*	*NA*
Thiebaut S et al., 2019 [53]	France	Cross-sectional	Medical records, MINI, DSM-5	Lifetime	Any BD	11.5% (*n*=30)	3.5% (*n*=9)	11.5% (*n*=30)
							4.2% (*n*=11)	
							1.9% (*n*=5)	*NA*
							1,9% (*n*=5)	
					BD I type	4.6% (*n*=12)	0.7% (*n*=2)	4.6% (*n*=12)
							1.9% (*n*=5)	
							1.1% (*n*=3)	*NA*
							0.7% (*n*=2)	
					BD II type	6.9% (*n*=18)	2.6% (*n*=7)	6.9% (*n*=18)
							2.3% (*n*=6)	
							0.7% (*n*=2)	*NA*
							1.1% (*n*=3)	
Tseng MM et al., 2017 [54]	China	Cross-sectional	SCID, MINI, DSM-5	Current	Any BD	41.4% (*n*=94)	4% (*n*=9)	38.3% (*n*=77)
							18% (*n*=41)	
							14.5% (*n*=33)	65.4% (*n*=17)
							4.8% (*n*=11)	
					BD I type	17.2% (*n*=39)	2.2% (*n*=5)	*NA*
							7% (*n*=16)	
							6.1% (*n*=14)	
							1.7% (*n*=4)	
					BD II type	24.2% (*n*=55)	1.8% (*n*=4)	*NA*
							11% (*n*=25)	
							8.4% (*n*=19)	
							3.1% (*n*=7)	

Reference	Country	Type of study	Diagnostic methods	Type of prevalence	Type of BD	Prevalence of BD		
						Total	by ED type (AN/BN/ ED/ BED/ NOS)	by sex (female/ male)
Tseng MM et al., 2016 [55]	Taiwan	Cross-sectional	SCID, DSM-IV	Lifetime	Any BD	35.7% (*n*=103)	3.1% (*n*=9)	81.5% (*n*=84)
							15.6% (*n*=45)	
							12.9% (*n*=37)	18.5% (*n*=19)
							4,2% (*n*=12)	
					BD I type	16% (*n*=46)	2% (*n*=6)	*NA*
							6.2% (*n*=18)	
							6% (*n*=17)	
							1.7% (*n*=5)	
					BD II type	19.7% (*n*=57)	1% (*n*=3)	*NA*
							9.3% (*n*=27)	
							7% (*n*=20)	
							2.4% (*n*=7)	
Welch E et al., 2016 [56]	Sweden	Prospective	DSM-IV	Lifetime	Any BD	4.1% (*n*=35)	*NA*	*NA*
							NA	
							4.1% (*n*=35)	
							NA	
Godart N et al., 2015 [57]	France	Cross-sectional	MINI, DSM-IV	Lifetime	Any BD	18% (*n*=49)	9.2% (*n*=25)	18% (*n*=49)
							8.8% (*n*=24)	
							NA	*NA*
							NA	
					BD I type	15.5% (*n*=42)	7.7% (*n*=21)	15.5% (*n*=42)
							7.7% (*n*=21)	
							NA	*NA*
							NA	
					BD II type	2.5% (*n*=7)	1.4% (*n*=4)	2.5% (*n*=7)
							1.1% (*n*=3)	
							NA	*NA*
							NA	
Campos RN et al., 2013 [58]	Brazil	Cross-sectional	SCID, DSM-IV, Zurich criteria for bipolar spectrum disorders	Lifetime	Any BD	68.1% (*n*=47)	*NA*	68.1% (*n*=47)
								NA
					BD I type	26% (*n*=18)	*NA*	26% (*n*=18)
								NA
					BD II type	8.7% (*n*=6)	*NA*	8.7% (*n*=6)
								NA
Lilenfeld LR et al., 2008 [59]	USA	Cross-sectional	SCID, DSM-IV	Lifetime	Any BD	3.2% (*n*=1)	*NA*	3.2% (*n*=1)
							NA	
							3.2% *(n=1)*	*NA*
							NA	

Note: NA — not available, Short-CIDI — Composite International Diagnostic Interview Short, DSM — Diagnostic and Statistical Manual of mental disorders, MINI — Mini International Neuropsychiatric Interview, SCID — Structured Clinical Interview for DSM.

Table 3 summarizes the main clinical features and outcomes of the comorbid course of ED and BD, taking into account concomitant mental and somatic disorders and various complications. It is noteworthy that the presence of ED in patients with BD was associated with indicators of a more severe clinical course of the disease, suicidal attempts, and a higher frequency of comorbid mental disorders (in particular, OCD and anxiety disorders). In addition, patients with comorbid ED and BD were more likely to exhibit symptoms of atypical depression, such as mood reactivity and increased appetite and interpersonal sensitivity, which commonly manifest themselves during the course of bipolar depression [63].

Table 3. Clinical features of the comorbid course of ED and BD

Features	Trait	Reference
Clinical symptoms	Mood instability	Boulanger H et al., 2018 [25]
	Increased appetite	Perugi G et al., 2006 [43]
	Mood reactivity	Perugi G et al., 2006 [43]; Boulanger H et al., 2018 [25]
	Impulsivity	Boulanger H et al., 2018 [25]; Berkol TD et al., 2016 [27] Tseng MM et al., 2017 [54]; Tseng MM et al., 2016 [55]
	Social isolation	Perugi G et al., 2006 [43]
	Interpersonal sensitivity	Perugi G et al., 2006 [43]
Comorbid disorders	OCD	Liu X et al., 2016 [8]; Radon L et al., 2022 [52] Tseng MM et al., 2016 [55]; Woldeyohannes HO et al., 2016 [30]
	Addictions	Liu X et al., 2016 [8]; Balzafiore DR et al., 2017 [23] Boulanger H et al., 2018 [25]; Brietzke E et al., 2011 [39] Tseng MM et al., 2017 [54]; Tseng MM et al., 2016 [55] Thiebaut S et al., 2019 [53]; Woldeyohannes HO et al., 2016 [30]
	Alcohol/Substance Abuse	Boulanger H et al., 2018 [25]; Tseng MM et al., 2017 [54]
	PTSD	Woldeyohannes HO et al., 2016 [30]
	Hyperlipidemia	McAulay C et al., 2021 [60]
	Type 2 diabetes	McAulay C et al., 2021 [60]
Course	Early onset of mood disorder	Anna V et al., 2009 [78]; McElroy SL et al., 2011 [7] Liu X et al., 2016 [8]; Balzafiore DR et al., 2017 [23] McElroy SL et al., 2001 [49]; Brietzke E et al., 2011 [39]
	Large number of depressive episodes	Anna V et al., 2009 [78]; Wildes JE et al., 2007 [12] Brietzke E et al., 2011 [39]
	Fast cycling	McElroy SL et al., 2011 [7]; Fornaro M et al., 2010 [41] Liu X et al., 2016 [8]; Balzafiore DR et al., 2017 [23] McElroy SL et al., 2001 [49]; Seixas C et al., 2012 [37]
Complications	Suicidal attempts	McElroy SL et al., 2011 [7]; McElroy SL et al., 2016 [26]; McElroy SL et al., 2013 [33]; Liu X et al., 2016 [8] Balzafiore DR et al., 2017 [23]; Berkol TD et al., 2016 [27] Brietzke E et al., 2011 [39]; Thiebaut S et al., 2019 [53] Tseng MM et al., 2017 [54]; Tseng MM et al., 2016 [55] Seixas C et al., 2012 [37]; Goffin KC et al., 2016 [29] Woldeyohannes HO et al., 2016 [30]
	Increased weight/High BMI	McElroy SL et al., 2016 [26]; Fornaro M et al., 2010 [41] Perugi G et al., 2006 [43]; McElroy SL et al., 2011 [7] Wildes JE et al., 2007 [12]; Tseng MM et al., 2017 [54] Tseng MM et al., 2016 [55]; McAulay C et al., 2021 [60] Wildes JE et al., 2008 [42]
	Obesity	McElroy SL et al., 2016 [26]; McElroy SL et al., 2011 [7] Wildes JE et al., 2007 [12]; McElroy SL et al., 2013 [33] McAulay C et al., 2021 [60]; Wildes JE et al., 2008 [42]

Note: OCD — obsessive compulsive disorder, PTSD — post-traumatic stress disorders, BMI — Body Mass Index.

DISCUSSION

Main results

In this scoping review, an analysis of four systematic reviews and 41 original studies was conducted, focusing on the prevalence of various types of EDs among patients with BD types I and II under the prism of sex and the clinical features of the concurrent course of these disorders. Based on the study findings, it emerged that the prevalence rates of ED among individuals diagnosed with BD reached a substantial 60%. The concurrent course of BD and ED was associated with a poorer prognosis, higher rates of suicidal ideation and attempts, a burden of comorbid disorders, higher body mass index (BMI), obesity, and metabolic dysfunctions.

Strengths and limitations of the study

The strengths of this review include the examination of the prevalence of ED in different types of BD and vice versa. We also paid special attention to the prevalence of these disorders based on sex. Studying the diagnostic instruments used in the original studies allowed us to clarify the type of prevalence and diagnostic features of BD and ED.

The limitations of this review are related to the broad inclusion criteria, resulting in heterogeneity in the considered clinical forms of ED and BD. Firstly, not all studies have specified types of ED and BD, even though associations between different types of these disorders can vary widely. Secondly, data on the lifetime prevalence of ED and BD remains limited due to inconsistencies in diagnostic criteria and studied symptoms, making it difficult to provide definitive conclusions. Third, the original studies included in the current scoping review and the studies included in the systematic reviews may overlap. Finally, the presence of therapy could have influenced the current prevalence rates, which could have influenced the results of the current review.

Comparison with the existing literature

Despite the high volatility in the results, the prevalence rates of the co-occurrence of ED and BD were found to be quite high (up to 60%) and significantly exceeded the prevalence of these disorders in the general population, which aligns with the findings of earlier systematic reviews [17-20]. Although data on the ED frequency among patients with BD types I and II showed conflicting results, in the study by Fornaro M. et al., the prevalence of ED was slightly higher in patients with BD II compared to BD I [17]. This finding may be explained by sex disparities in the prevalence of BD itself: BD type I is equally prevalent in males and females, while the prevalence of BD type II among females is almost twice as high as that among males [61]. In our scoping review, a higher prevalence of ED was found in females with BD compared to males. However, the prevalence rates of ED in males with BD followed the same trajectory as that among females and were higher than those in the general population [62], indicating a greater vulnerability of patients with BD to developing comorbid ED. Furthermore, no study has examined the patterns of comorbidity between different types of ED and BD stratified by sex, which might have to do with the issue of multiple comparisons with small sample sizes. The association between ED and BD is also explained by their similarities in phenomenology: both disorders are characterized by distortions in eating behavior and emotional regulation [64]. These similarities will be discussed below in the light of the existing findings.

To start with, patients with ED and BD have high rates of suicidality and self-harm [65, 66]. In particular, AN is associated with a higher level of suicides and BN is associated with a large number of suicidal thoughts and suicide attempts [65, 66]. Another important predictor of a complicated course of comorbid ED and BD is BMI. Patients with comorbid BD and BED frequently suffer from obesity [9, 67, 68]. It is known that a common characteristic of both ED and BD is dysregulated eating, which is significantly associated with episodes of binge eating [64]. It is interesting to note that many patients with ED report binge eating in an attempt to improve their mood, as binge eating can temporarily reduce anxiety and depressive symptoms [69]. Patients with BD type II often try to improve their low mood with food, alcohol, drugs, exercise, and sexual activity [69]. However, nutritional dysregulation is a characteristic not only of the depressive phases of BD, but also of hypomania [70]. Thus, patients with hypomanic symptoms demonstrate more chaotic and irregular eating patterns, which correlate with the severity of hypomanic symptoms [70].

According to the systematic review by Yuhan Karida Liu at al., the prevalence of overall obesity among patients with BD (BMI ≥30 kg/m^2) was 29.0% (95% CI=22.8–35.6%), which is significantly higher than that in the healthy control group [71]. In addition, patients with BD have a higher level of obesity (41.4%) compared with patients without this

disorder (27.1%), as well as significantly higher triglyceride levels and lower high-density lipoprotein [72]. There are studies showing that the risk of obesity in patients with BD precedes medication intake, which raises doubts about the influence of a medication alone on the weight gain. Furthermore, initial episodes of binge eating predict weight gain associated with medication intake [73].

In addition to clinical studies, there is a small number of family and genetic research studies examining the relationship between ED and BD. For instance, several studies have found a positive family history of mood disorders among patients with ED [74, 75]. It was also found that the prevalence of mood disorders among first-degree relatives in probands with AN and/or BN was higher than in probands with schizophrenia and borderline personality disorder but similar to the prevalence of affective disorders in patients with BD [76]. Some genetic studies also confirm the relationship between ED and BD: a genome-wide association study revealed a single nucleotide polymorphism within the SOX2-OT genes (rs4854912) with a secondary peak in the adjacent FXR1 gene (rs1805576) on chromosome 3q26.33 [8]. In another experimental study, strong associations between ED and BD were found while genotype and phenotype associations were analyzed based on the data from genome-wide association studies [77].Therefore, it can be assumed that ED and BD have a common, albeit still poorly understood, pathophysiological basis.

Furthermore, the comorbidity of ED and BD complicates the selection of therapy, since the treatment of one disorder can worsen the symptoms of the other [78]. For example, in a patient with undiagnosed BD undergoing antidepressant therapy (including fluoxetine), a phase of inversion can occur, leading to the development of a mixed or hypo/manic episode. Moreover, a number of mood stabilizers and antipsychotics are associated with an increase in body weight, which, in turn, can exacerbate the severity of eating disorders. In this context, it is important to ensure that neither of the syndromes worsens due to the chosen treatment, either directly or through side effects. The optimal treatment option may include pharmacological agents that will benefit both disorders by stabilizing the mood disorder and not adversely affecting eating behavior [79].

There are several studies that successfully used normothymic therapy for the treatment of ED [18, 80, 81]. In addition, some studies have observed that lithium supplementation in patients with affective disorder, mood instability, or impulsivity alleviated the symptoms of ED through more regular eating and the ability to diet [70, 82]. Thus, screening for ED is important in the context of BD (and vice versa), especially in the early stages of the disease, as it helps to determine further treatment tactics and improve clinical outcomes.

Implications for future research and practice

Particular attention in future studies should be given to the stratification of participants by age, since EDs usually manifest themselves earlier than mood disorders, which may increase the number of false-negative results in the diagnosis of BD. This, in turn, indicates that there is very little information in the literature about the chronological relationship between these disorders. Adopting a longitudinal design in studies exploring the comorbid course of ED and BD is also required in future research in order to identify patterns over the period of time.

CONCLUSION

According to the results of this scoping review, the prevalence rate of comorbid ED and BD amounts to 60%, which is significantly higher than the prevalence of these disorders in the general population. The comorbid course of BD and ED is associated with a poorer prognosis, higher rates of suicidal thoughts and attempts, a burden of comorbid disorders, higher BMI, obesity, and metabolic disruptions. Family and genetic research data confirm the association between these disorders. However, these results should be taken with caution due to the broad inclusion criteria used for this review, leading to heterogeneity in the considered clinical forms of ED and BD. Further research may need to determine the patterns of comorbidity between different types of ED and BD stratified by sex. Screening for ED in patients with BD, and vice versa, is important in designing appropriate treatment strategies and improving clinical outcomes.

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