A preliminary investigation of Cyberchondria and its correlates in a clinical sample of patients with obsessive–compulsive disorder, anxiety and depressive disorders attending a tertiary psychiatric clinic

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ABSTRACT

Objectives. This cross-sectional study aimed to investigate the frequency and presentation of cyberchondria (CYB) in patients with obsessive–compulsive disorder (OCD), anxiety disorders (ADs), and major depression disorder (MDD).

Methods. Seventy-seven patients (OCD:25, ADs:26, MDD:26) referred to a tertiary psychiatry outpatient clinic and 27 healthy controls (HCs) were included. A 'working' definition of CYB was used to measure CYB frequency. CYB severity was measured with the Cyberchondria Severity Scale (CSS).

Results. CYB as currently defined was present in just 1.3% of the combined patients' sample. Using a broader definition (omitting the disability criterion), we found a higher distribution (OCD:12%, ADs:19.2%, MDD:15.4%, HCs:3.7%) and greater CYB symptom severity. Patients with OCD (63.3 ± 18.9) and ADs (63.3 ± 25.9) showed a higher CYB severity, compared with HCs (48.4 ± 9.9, $p < .05$). In the combined patients' sample, a positive correlation was found between the CSS scores and measures of health anxiety or hypochondriasis. Higher CYB symptom severity emerged in patients with a positive family history of psychiatric disorders and in those prescribed benzodiazepines or mood-stabilisers.

Conclusion. CYB represents a common transdiagnostic syndrome in patients with OCD, ADs, and MDD with a spectrum of severity and indicates a variable burden of illness, supporting the need for specific clinical considerations and interventions.

KEYWORDS
Cyberchondria; online health information searches; obsessive–compulsive disorder; problematic usage of the Internet

KEY POINTS

- Cyberchondria (CYB) represents a common transdiagnostic syndrome in patients with obsessive–compulsive disorder, anxiety, and depressive disorders.
- CYB's frequency as a syndrome of compulsive online health searches associated with an increased anxiety and distress was reported in 10–20% patients.
- Health anxiety/hypochondriasis showed a strong correlation with CYB.
- Patients with a positive family history of psychiatric disorders and those prescribed benzodiazepines or mood-stabilisers showed higher CYB symptom severity.
- Considering the spread of Internet use for health-related information, additional studies investigating CYB in clinical samples are encouraged.

Introduction

Nowadays, the Internet has become one of the main sources to answer questions about health or illness. This tool can provide a quick and easy access to health-related information, and most individuals report a relief and empowerment after online health searches. However, some individuals might experience a higher level of anxiety or distress that, when associated with a pattern of excessive or repetitive searching, characterise a behaviour named Cyberchondria (CYB) (Starcevic and Berle 2013; Starcevic et al. 2020; Vismara et al. 2020).

CYB has been only recently described, and investigations in research and clinical contexts are an early stage, with comprehensible controversies about its conceptualisation and definition. Indeed, on the one hand, some authors consider CYB as the modern version of health anxiety or hypochondriasis, wherein the Internet is simply a modern conduit for medical checking (White and Horvitz 2009; Bodoh-Creed 2014; Starcevic 2017). In this regard, the association between CYB and health anxiety or hypochondriasis has been investigated and substantiated in previous investigations (McMullan et al. 2019). On the other hand, CYB is also conceptualised as a syndrome-like and multidimensional

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construct that primarily reflects anxiety about health but includes several additional components: the repetitive and time-consuming nature of the searches (resembling obsessive–compulsive behaviour) frequently motivated by a reassurance seeking urge; the negative emotional state (e.g., anxiety or distress) occurring as a result of these searches; and the consequential interruption of other daily activities conducted online or offline (McElroy et al. 2019; Vismara et al. 2020). In this regard, CYB has been listed in the group of problematic usage of the Internet (PUI) subtypes, alongside Internet-related gaming disorder, Internet-related gambling disorder, and other forms of addictive behaviour conducted online (Fineberg et al. 2020).

To date, the investigation of CYB in clinical samples remains extremely limited. To the best of our knowledge, only three studies have recruited a clinical sample, two of which collected non-psychiatric outpatients from general hospitals (Wijesinghe et al. 2019) or orthopaedic clinics (Blackburn et al. 2019), while the last included patients with hypochondriasis (i.e., illness anxiety disorder and/or somatic symptom disorder, according to DSM-5 criteria (Diagnostic and Statistical Manual of Mental Disorders, 5th edition; American Psychiatric Association 2013)) (Newby and McElroy, 2020). This latter study validated for the first time an effective treatment approach for CYB (i.e., Interned-based cognitive behavioural therapy), but a description of CYB related variables was missing.

Considering the importance of a consensus-based definition to investigate CYB in research and clinical settings, in a previous review published by our group (Vismara et al. 2020), we tentatively proposed the following CYB 'working' definition:

Working definition of cyberchondria

A pattern of excessive searching on the Internet for medical or health-related information with the following features:

- Searching is compulsive, hard to resist and serves the purpose of seeking reassurance;
- Initial relief, if obtained, through online searching is short-lived and anxiety or distress usually worsens during these searches and persists afterwards;
- Online searching takes precedence over other interests or daily activities and continues or escalates despite the occurrence of negative consequences associated with the searching.

Figure 1. 'Working' definition of Cyberchondria proposed in Vismara et al. (2020).

During the formulation of this 'working' definition, we considered the relationship between CYB and PUI as supported by previous investigations (Fergus and Dolan 2014; Singh and Brown 2016; Fergus and Spada 2017; Durak Batigun et al. 2018; Selvi et al. 2018; Starcevic et al. 2019). Therefore, we conceptualised CYB as a form of behavioural addiction. Thus, the 'time-consuming' nature (criterion 3) was considered essential to CYB characterisation, reflecting the negative impact on functioning and daily life and the disability associated with this behaviour. The other two criteria proposed were derived following the characteristics mostly reported in previous CYB descriptions, but the extent to which each of them reflects a clinically meaningful level of symptoms has not been yet verified in a research setting.

Objectives

This study primarily aimed to characterise CYB in a clinical population, in terms of symptom severity and related variables. Additionally, we wanted to test the CYB 'working' definition in a clinical setting.

Considering the compulsive nature of CYB (Norr et al. 2015; Fergus and Russell 2016; Vismara et al. 2020), we decided to include patients with OCD. Our *a priori* hypothesis was that this population would exhibit higher CYB symptom severity, compared to other psychiatric conditions. Indeed, we wanted to understand CYB broader expression outside purely health anxiety or hypochondriasis, whose robust association has been already extensively supported (Fergus and Russell 2016; McMullan et al. 2019; Newby and McElroy 2020). As comparator disorders, we included patients with anxiety disorders (ADs) and major depressive disorder (MDD). These disorders share overlapping features with health anxiety or hypochondriasis (van den Heuvel et al. 2014; Tyrer and Tyrer 2018) and, therefore, potentially with CYB, but lack the characteristic compulsive determinants of OCD. Moreover, considering the high prevalence of these conditions in the general population (American Psychiatric Association 2013), an investigation of CYB in these patients groups seemed reasonable.

Material and methods

Participants

The present observational and naturalistic study was conducted at the outpatient tertiary psychiatric service of 'Luigi Sacco' Hospital, in Milan. The study was conducted in accordance with the declaration of Helsinki (World Medical Association 2001). The patients provided their written informed consent to participate in this study and for the use of their anonymised data for research purposes.

Eligible patients were adults (over age 18 years) with a diagnosis of OCD, MDD, or ADs (panic disorder, general anxiety disorder, social anxiety disorder), according to DSM-5 criteria (American Psychiatric Association 2013). Exclusion criteria included brain diseases, intellectual disability, psychiatric disorders secondary to a medical condition. Patients above 70 years were not included, considering the limited use of the Internet in this population. The recruitment of study samples took place between March 2020 and September 2020.

A convenience sample of healthy controls (HCs) (recruited from study investigators, their relatives, and acquaintances) was included as a control condition (see section Limitations). Inclusion in the HCs group required the participants to be free of any history of mental disorder.

Clinical assessment

Subjects' diagnostic assessment was conducted by trained psychiatrists through the administration of the Structured Clinical Interviews for DSM-5 (SCID) clinical version (First et al. 2015) and the Structured Clinical Interview for DSM-5, Personality Disorder (First et al. 2015).

To measure disease severity at the study entry, expert clinicians administered the Yale-Brown Obsessive-Compulsive Rating Scale (Y-BOCS, Goodman et al. 1989) to OCD patients and the Hamilton Depression Rating Scale, 21 items (HAM-D, Hamilton, 1960) and the Hamilton Anxiety Rating Scale (HAM-A, Hamilton, 1959) to patients with MDD and ADs. A predefined level of disease severity was not an inclusion criterion. The following sociodemographic and clinical variables were investigated: age, gender, highest level of education achieved, relationship status, family history of psychiatric disorders, age at onset, psychiatric and medical comorbidities, and current medications. Additionally, specific variables investigating habits related to Internet use were collected

Table 1. Socio-demographic variables in patients' subgroups and healthy controls.

Variables	All patients	OCD	ADs	MDD	HCs	*p* Value
Number	77	25	26	26	27	
Age	46.4 ± 12.8	**44.9 ± 15.2**	**41.8 ± 11**	**52.5 ± 9.8**	**35.2 ± 12**	**MDD versus ADs: 0.012 MDD versus HCs: <0.001 OCD versus HCs: 0.027**
Female gender	62.3	56	61.5	69.2	66.7	>0.05
Education						
Secondary school	15.6	24	7.7	15.4	3.7	>0.05
High school	51.9	**48 a,b**	**50 a**	**57.7 a**	**14.8 b**	**0.004**
University	29.9	**28 a**	**38.5 a,b**	**23.1 a**	**74.1 b**	**0.004**
Post-university degree	2.6	0	3.8	3.8	7.4	>0.05
Employment						
Employed	71.4	64	80	69.2	88.9	>0.05
Unemployed	14.3	12	15.4	15.4	0	>0.05
Retired	13	20	3.8	15.4	7.4	>0.05
Student	1.3	4.0	0	0	3.7	>0.05
Co-habitation						
Family/partner	54.5	**36 b**	**53.8 a,b**	**73.1 a**	**74.1 a**	**0.017**
Parents	20.8	20	30.8	11.5	7.4	>0.05
Alone	24.7	44	15.4	15.4	18.5	>0.05
Marital status						
Single	33.8	**44 b**	**30.8 a,b**	**26.9 a,b**	**11.1 a**	**0.002**
Partner	24.7	**28 a**	**30.8 a,b**	**15.4 a**	**66.7 b**	**0.002**
Married	41.6	**28 a,b**	**38.5 a,b**	**57.7 a**	**22.2 b**	**0.002**

ADs: anxiety disorders; HCs: healthy controls; MDD: major depressive disorder; OCD: obsessive compulsive disorder. *Statistics:* Each subscript letter (a,b) denotes a subset of diagnosis (OCD, ADs, MDD, HCs) categories whose column proportions differ significantly from each other at the .05 level. Values for categorical and continuous variables are expressed in percentages and mean ± standard deviation (SD), respectively. The significance of bold values is indicated in the "p value" columns in each Tables.

through a survey redacted for the purpose of the study (see the Appendix section for the detailed list of questions).

To test the CYB 'working' definition (Vismara et al. 2020), all subjects were assessed as to whether their online health searches were characterised or not by the following features, which reflect the three components of CYB definition: criterion (1) 'Difficulty resisting Internet-searching for health related information motivated by the need to be reassured', reflecting the compulsive nature of CYB; criterion (2) 'Any relief obtained from searching is short-lived and anxiety or worry increase during the research and persist afterwards'; and criterion (3) 'Online research takes precedence over other interests or daily activities and continues or worsens despite the negative consequences of researching' that reflects the time-consuming and disabling nature of CYB. The presence of 'full' CYB was established when all the three components were present at the same time.

To measure CYB symptom severity, the Italian version of the Cyberchondria Severity Scale (CSS) (Fergus 2014; Marino et al. 2020) was administered. This self-reported questionnaire consists of 33 items rated on a 5-point scale from 1 (never) to 5 (always) comprising the five CYB subscales: compulsion, distress, excessiveness, reassurance, and mistrust of medical professionals. Previous investigations and a recent systematic review on the CSS showed very good to excellent psychometric properties for the CSS (Starcevic et al. 2020).

The Italian versions of the following self-reported validated questionnaires were administered to measure symptom severity of different CYB related constructs that showed, in previous investigations, an association with CYB: the Health Anxiety Questionnaire (HAQ) (Melli et al. 2007); the Internet Addiction Test (IAT) (Young 1998; Ferraro et al. 2007); the Obsessive-Compulsive Inventory-Revised (OCI-R) (Foa et al. 2002; Marchetti et al. 2010); the General Anxiety Disorders-7 (GAD-7) (Spitzer et al. 2006); and the Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al. 2001).

Statistical analyses

First, descriptive analyses of socio-demographic and clinical variables and of survey's responses were performed in the whole sample. The three diagnostic subgroups and HCs were compared using analysis of variance (ANOVA) for continuous variables, whereas Chi-squared tests with post-hoc tests (Bonferroni) were used for categorical ones.

To test the CYB 'working' definition, the presence of each criterion and their combination (criteria 1 + 2 or criteria 1 + 2 + 3) was measured and compared (with Chi-squared test) among the three diagnostic subgroups and HCs. Additionally, to compare CSS scores with respect to CYB criteria, ANOVA (in the combined patient sample) and Kruskal–Wallis non-parametric test (in each patients' subgroup and HCs) were performed.

In the combined patients' group and separately in each of the three patients' samples, linear regression analyses were used to assess the correlation between the CSS and the other psychometric scales (the OCI-R, the HAQ, the IAT, the GAD-7, the PHQ, the HAM-D, the HAM-A, and the Y-BOCS).

Lastly, to determine the impact on CYB (measured with the CSS), different explanatory variables were considered as independent variables running Chi-squared tests for categorical predictors. Linear regression analyses were used to measure correlation between the CSS and continuous variables.

For all the analyses, the level of statistical significance was set at 0.05. Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 26 software (IBM Corp., Armonk, NY).

Results

Sample description

Seventy-seven patients (females: 62.3%; mean age: 46.4 ± 12.8; 25 with OCD, 26 with MDD, 26 with ADs) and 27 HCs (females: 66.7%, mean age: 35.2 ± 12.0) were enrolled. Among patients with ADs, 14 (54%) had panic disorder, 10 (38%) general anxiety disorder, and 2 (8%) social anxiety disorder. Some baseline characteristics variably differed between the three diagnostic subgroups and HCs: age, age at illness onset, highest level of education achieved, living and relationship status, duration of illness, comorbidities,

Table 2. Clinical variable in patient's subgroups.

Variables	All patients	OCD	ADs	MDD	*p* Value
Age at onset	29.7 ± 14	**20.9 ± 10.1**	**28.5 ± 12.4**	**38.8 ± 13.1**	**MDD versus ADs: 0.008** **MDD versus OCD: <0.001**
Duration of illness (years)	17.2 ± 13.6	**24.9 ± 15.7**	**13.3 ± 11.3**	**13.6 ± 11.6**	**OCD versus MDD: 0.007** **OCD versus ADs :0.005**
Family history of psychiatric disorder	55.8	56	50	61.5	>0.05
Psychiatric comorbidities	40.3	**68 b**	**30.8 a**	**23.1 a**	**0.002**
Medical comorbidities	60.8	63.6	46	73.1	>0.05
Current medication					
Antidepressant	97.4	100	96.2	96.2	>0.05
Antipsychotic	20.8	**40 a**	**3.8 b**	**19.2 a,b**	**0.006**
Mood stabiliser	15.6	16	7.7	23.1	>0.05
Benzodiazepine	35.1	48	26.9	30.8	>0.05
HAM-D (total score)	–	–	5.1 ± 5.1	7.15 ± 6.9	–
HAM-A (total score)	–	–	6.5 ± 7.6	6.0 ± 6.8	–
Y-BOCS (total score)	–	16.6 ± 10	–	–	–
Y-BOCS (obsession score)	–	8.7 ± 5.3	–	–	–
Y-BOCS (compulsion score)	–	7.6 ± 6.1	–	–	–

ADs: anxiety disorders; HAM-A: Hamilton anxiety rating scale; HAM-D: Hamilton depression rating scale; HCs: healthy controls; MDD: major depressive disorder; OCD: obsessive compulsive disorder; YBOCS: Yale-Brown Obsessive-Compulsive Scale. *Statistics*: Each subscript letter (a,b) denotes a subset of diagnosis (OCD, ADs, MDD) categories whose column proportions differ significantly from each other at the .05 level. Values for categorical and continuous variables are expressed in percentages and mean ± standard deviation (SD), respectively.

Table 3. Variables related to Internet use and to online health searches in patients' subgroups and healthy controls.

Variables	All patients	OCD	ADs	MDD	HCs	*p* Value
Time spent on the Internet on average for any reasons						0.35
<1 h/day	29.9	36	19.2	34.6	18.5	
1–3 h/day	36.4	20	42.3	46.2	40.7	
3–5 h/day	16.9	24	19.2	7.7	29.6	
>5 h/day	16.9	20	19.2	11.5	11.1	
Most used tool to access the Internet						0.52
Smartphone	64.9	64	76.9	53.8	74.1	
Computer	24.7	24	19.2	30.8	22.2	
Tablet	10.4	12	3.8	15.4	3.7	
Most used source for HRI						0.6
Internet	48.1	44	38.5	61.5	48.1	
Health professional	42.9	44	50	36.4	40.7	
Others	9	12	11.5	2.1	11.2	
Frequency of Internet use for HRI						0.51
Never	13	16	19.2	3.8	7.4	
Monthly	63.6	60	61.5	69.2	81.5	
Weekly	20.8	24	15.4	23.1	7.4	
Daily	2.6	0	3.8	3.8	3.7	
Number of pages visited for HRI	3.2 ± 2.6	2.8 ± 2.7	3.0 ± 2.6	3.7 ± 2.6	2.9 ± 1.9	0.6
Positive emotional state after OHS	50.6	44	38.5	69.2	74.1	
Negative emotional state after OHS	33.8	**48 b**	**38.5 a,b**	**15.4 a,b**	**11 a**	**0.019**
Pos + Neg emotional states after OHS	15.6	8	23	15.4	14.9	
Use of verified Internet sources						0.4
Never	36.4	28	38.5	42.3	59.3	
Sometimes	50.6	56	46.2	50	33.3	
Never considered this before	13	16.6	15.4	7.7	33.3	
To be influenced on medical decision because of OHS	51.9	48	42.3	65.4	63	0.26
To talk with professional about HRI	59.7	60	53.8	65.4	37	0.18
To independently assume a new treatment after OHS	15.6	16	19.2	11.5	7.4	0.61
To do "self-diagnosis" after OHS	13	16	3.8	19.2	22.2	0.27
Use of digital health applications	33.8	20	50	30.8	51.9	0.05
Changes of OHS after COVID-19 pandemic						0.29
No change	84.4	88	88.5	76.9	92.6	
Increased	11.7	12	3.8	19.2	7.4	
Decreased	3.9	0	7.7	3.8	0	

ADs: anxiety disorders; HCs: healthy controls; HRI: health-related information; OHS: online health searches; MDD: major depressive disorder; OCD: obsessive compulsive disorder. *Statistics*: Each subscript letter (a,b) denotes a subset of diagnosis (MDD, ADs, OCD) categories whose column proportions differ significantly from each other at the .05 level. Values for categorical and continuous variables are expressed in percentages and mean ± standard deviation (SD), respectively.

and current psychotropic medications. With respect to the latter, although a substantial proportion of patients with OCD (40%) and MDD (19.2%) were receiving dopamine-antagonists, a post-hoc clinical review of the medical notes showed none were psychotic at baseline and the drugs were being used to treat OCD or depression. Moreover, at statistical analyses, all these variables did not influence CYB-related measures.

Table 1 outlines socio-demographic and clinical variables of patients and HCs; Table 2 shows clinical variables in the three diagnostic subgroups.

Table 4. Mean scores on the Cyberchondria Severity Scale and on the other psychometric questionnaires in patients' subgroups and healthy controls.

Variables	All patients	OCD	ADs	MDD	HCs	*p* value
CSS total score	62.8 ± 20.1	**63.3 ± 18.9**	**63.3 ± 25.9**	**61.6 ± 14.1**	**48.4 ± 9.9**	**MDD versus HCs: 0.054** **ADs versus HCs: 0.021** **OCD versus HCs: 0.022**
CSS-Compulsion	11.9 ± 5.7	11.8 ± 5.8	**13.3 ± 7.5**	10.5 ± 2.6	**9.3 ± 1.9**	**ADs versus HCs: 0.03**
CSS-Distress	15.2 ± 7	**16.0 ± 7.3**	**15.6 ± 8**	14.5 ± 5.5	**10 ± 3.2**	**ADs versus HCs: 0.01** **OCD versus HCs: 0.005**
CSS-Excessiveness	17.8 ± 6.6	17.5 ± 5.8	17.7 ± 8.4	18.3 ± 5.5	13.9 ± 3.9	>0.05
CSS-Reassurance	12.3 ± 5	12.0 ± 4.8	11.7 ± 5.6	13.2 ± 4.7	10.2 ± 4	>0.05
CSS-Mistrust of medical professionals	5.6 ± 3	6 ± 3.3	5.0 ± 2.8	5.7 ± 3.1	4.9 ± 2.4	>0.05
OCI-R total score	17.5 ± 12.5	**25.4 ± 16.6**	**13.0 ± 8.3**	**14.4 ± 7**	**7.7 ± 6.3**	**OCD versus MDD: 0.001** **OCD versus ADs: <0.001** **OCD versus HCs:<0.001**
HAQ total score	40.8 ± 14.2	**43.7 ± 16.6**	**41.5 ± 16.0**	37.3 ± 10	**28.4 ± 7.3**	**ADs versus HCs: 0.002** **OCD versus HCs:<0.001**
IAT total score	30.8 ± 11.1	31.8 ± 12.2	31.4 ± 10.3	29.1 ± 11	28.4 ± 8.0	>0.05
GAD-7 total score	8.5 ± 6.1	**10.4 ± 6.8**	7.4 ± 5.9	7.7 ± 5.4	**4.4 ± 3.4**	**OCD versus HCs: 0.001**
PHQ-9 total score	8.7 ± 6.3	**10.2 ± 6.9**	6.5 ± 4.5	**9.6 ± 7**	**3.7 ± 2.9**	**MDD versus HCs: 0.001** **OCD versus HCs: < 0.001**

Values for continuous variables are expressed in mean ± SD. ADs: anxiety disorders; CSS: Cyberchondria Severity Scale; GAD-7: General Anxiety Disorders Scale; HAQ: Health Anxiety Questionnaire; HCs: healthy controls; IAT: Internet Addiction Test; MDD: major depressive disorder; OCD: obsessive compulsive disorder; OCI-R: Obsessive Compulsive Inventory-Revised; PHQ-9: Patient Health Questionnaire. *Statistics*: Values are expressed in mean ± standard deviation.

With respect to the survey on Internet use habits, Table 3 shows the detailed results comparing the three diagnostic subgroups and HCs.

In this survey, positive (i.e., being reassured, relieved, comforted, or eager to pass information) and negative (i.e., being frustrated, confused, overwhelmed, or scared) emotional states occurring after online health searches were registered. The only statistically significant difference emerged with respect to negative emotional states that were lower in HCs (11.0%) compared with patients' subgroups (MDD: 15.4%; ADs: 38.5%; OCD: 48.0%, $p = 0.019$) and higher in patients with OCD compared with subjects with MDD or ADs.

The CYB severity scale and other questionnaires

Table 4 compares mean scores on the CSS and on the other psychometric questionnaires (OCI-R, HAQ, IAT, GAD-7, PHQ) among the three diagnostic subgroups and HCs (Figure 1).

Focussing on the CSS (Figure 2), all subgroups of patients showed a higher total CSS score compared with HCs (48.4 ± 9.9), and this difference was statistically significant in subjects with OCD or ADs (MDD: 61.6 ± 14.1, $p = 0.054$; OCD: 63.3 ± 18.9, $p = 0.022$; ADs: 63.3 ± 25.9, $p = 0.021$). With respect to CSS subscales, patients with ADs showed a higher mean score on the CSS-compulsion subscale (11.8 ± 5.8 versus 9.3 ± 1.9, $p = 0.03$) and on the distress subscale, compared with HCs (15.6 ± 8.0 versus 10.0 ± 3.2, $p = 0.01$). Patients with OCD showed a higher mean score on the distress subscale, compared with HCs (16.0 ± 7.3 versus 10.0 ± 3.2, $p = 0.005$).

CYB correlation with other constructs

In the combined patients' sample, CSS showed a positive correlation with the HAQ (r^2=0.39, $p < 0.001$) and, to a lower extent, with the OCI-R (r^2=0.10, $p = 0.005$) and the GAD-7 (r^2=0.10, $p = 0.005$). Linear regression analysis was conducted also in the three separate disorders. Indeed, ADs showed the strongest correlation between the CSS and the HAQ (r^2=0.60, $p < 0.001$), and was confirmed and nearly similar in patients with OCD (r^2=0.23, $p = 0.01$) or MDD (r^2=0.24, $p < 0.01$). The CSS and the OCI-R positively correlated in patients with OCD (r^2=0.15, $p = 0.048$), but not with MDD ($p = 0.11$) or ADs ($p = 0.05$). With respect the GAD-7, a positive correlation was not statistically significant if the three disorders were considered separate (OCD: $p = 0.07$, GAD: $p = 0.07$, MDD: $p = 0.28$).

The CYB severity scale scores in relation to sociodemographic and clinical variables and to variables linked to online health searches

The following results refer to the combined patients' sample, considering the limited sample size of each subgroups. Table 5 outlines the results for categorical variables.

A significant difference in CYB symptom severity (as measured with the CSS total mean scores) emerged in patients with a positive family history of psychiatric disorders that showed a higher CSS total score (68.5 ± 21.4 versus 55.5 ± 15.6, $p = 0.004$) compared with patients with a negative family history for psychiatric disorders.

With respect to patients stratified according to medication prescribed at the assessment, subjects taking mood stabilisers showed higher CYB symptoms severity compared with patients who did not (CSS total mean scores: 73.5 ± 16.8 versus 60.8 ± 20.1, $p = 0.04$). Moreover, compared with patients not prescribed benzodiazepines, a higher CSS total score emerged in patients taking these medications (70.3 ± 22.4 versus 50.7 ± 17.4, $p = 0.013$).

Considering the association between CYB and online health search habits, patients who habitually use the Internet as the main source of health-related information showed a higher mean CSS total score (68.4 ± 19.2 versus 57.5 ± 19.4, $p = 0.016$), compared with subjects who used a different source. Additionally, patients who reported experiencing both positive and negative emotional states (as consequences to online health searches) showed a higher CYB symptom severity compared with patients with negative emotional states only (CSS mean total scores 76.4 ± 21.1 versus 65.1 ± 21.1) and, at a statistically significant level, higher than patients who experienced only positive ones (57 ± 16.8, $p = 0.008$).

Lastly, higher CYB symptoms severity (as measured with the CSS total mean scores) emerged in patients who reported to be influenced on their health decision by the information found online (69.2 ± 18.9 versus 55.8 ± 18.9, $p = 0.003$), in subjects who affirmed to talk with a general practitioner/health professional about online health searches (67.9 ± 19 versus 55.2 ± 19.3,

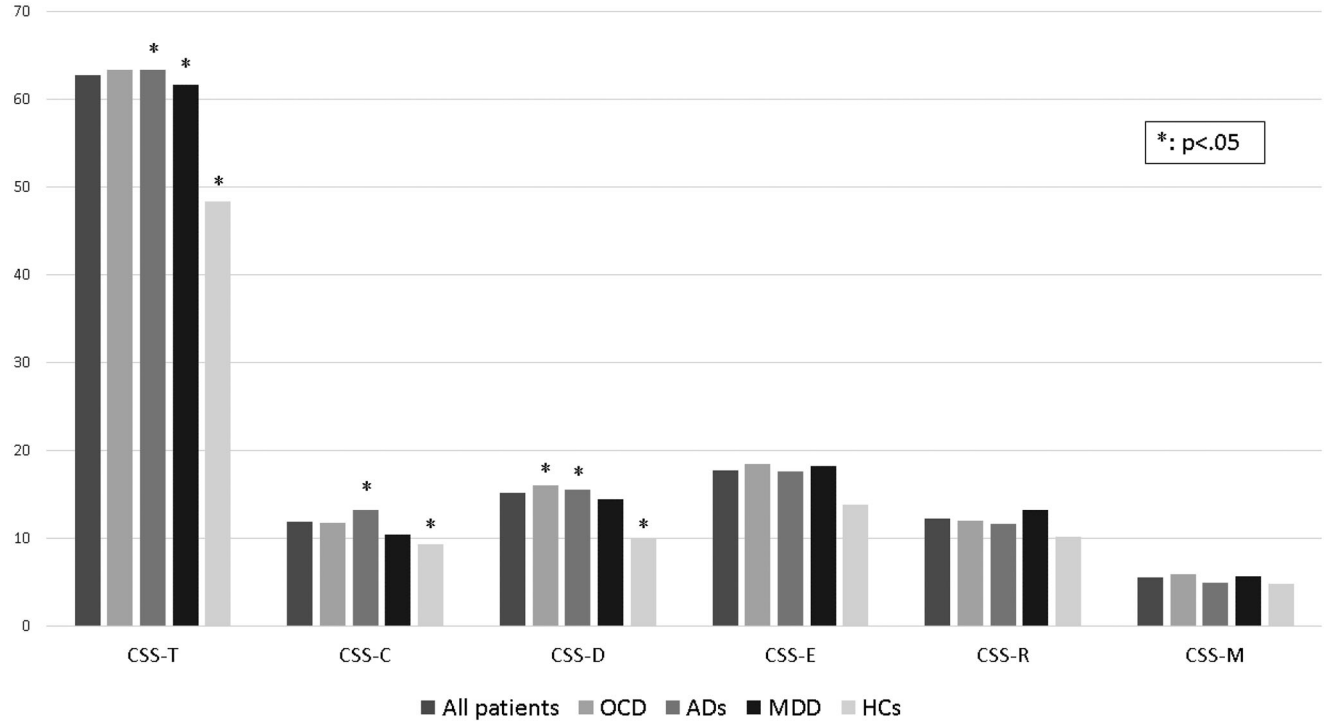

Figure 2. Differences in the Cyberchondria Severity Scale mean scores between patients and healthy controls. ADs: anxiety disorders; CSS: Cyberchondria Severity Scale, T: total score, C: compulsion subscale, D: distress subscale, E: excessiveness subscale, R: reassurance subscale, M: mistrust of medical professionals subscale; HCs: healthy controls; OCD: obsessive compulsive disorder; MDD: major depressive disorder.

$p = 0.006$), and in those who have assumed new treatment because of the information found online (74.4 ± 20.2 versus 60.6 ± 19.3, $p = 0.027$).

CYB definition and frequency

Table 6 outlines the distribution of the three CYB criteria and relative scores on the CSS. Considered the 'working' definition of CYB (as indicated by the presence of all three criteria), the frequency of 'full' CYB was set at 3.8% in the ADs subgroup and, overall, at 1.3% of the combined patients' sample. Indeed, only one patient with ADs reported simultaneously all the three criteria. The other criteria were variably present, with criterion three (time-consuming and disability nature of CYB) being the one less frequently reported (in only two patients with ADs, one of which simultaneously reported criteria 1 and 3 (1.3%), but omitted the increased anxiety/distress associated with online health searches). No statistically significant differences emerged with respect to the frequency of each criterion or their combination between the three diagnostic subgroups or HCs.

In the combined patients' sample (after excluding, because of the limited sample size of these subgroups, the two patients who reported criterion 3), ANOVA analyses showed a statistically significant higher CSS total mean score in subjects with criteria 1 and 2 simultaneously (84.4 ± 20.9), compared with patients with only criterion 1 (64.8 ± 19.5) or 2 (66.3 ± 17.5), and, lastly, compared with patients without any criterion (53 ± 14.2, $p < 0.001$). Non-parametric analyses showed a similar trend for patients with OCD, MDD, ADs, and HCs, that were significantly different for the two latter groups.

Discussion

The present investigation was a first attempt to describe CYB in a clinical sample of subjects with psychiatric disorders, aimed to improve the definition, conceptualisation, and characterisation of this newly described behaviour.

First, a higher CYB symptom severity emerged in the patients' samples. Indeed, the CSS total score was higher in patients with MDD and, at a statistically significant level, in patients with OCD or ADs, compared with HCs. Additionally, patients with ADs showed a higher mean score on the CSS-compulsion and distress subscales, compared with HCs. Moreover, on the distress subscale, patients with OCD showed a higher mean score, compared with HCs. No other statistically significant differences emerged on the excessiveness, reassurance, and mistrust of medical professional CSS subscales, even if patients showed, in general, higher mean scores also on these subscales. To the best of our knowledge, this is the first investigation that compared psychiatric patients with HCs. Therefore, the reasons behind a higher CYB symptom severity in these groups and CYB independence from existing psychopathological manifestations (associated with OCD, ADs, or MDD) can only be speculated and need to be confirmed by further investigations in clinical settings. In the context of OCD, higher CSS scores might be a consequence of somatic obsessions and checking compulsion, even if this cannot be the only determinant, seeing the CSS-excessiveness and compulsion subscales' scores were not statistically higher in patients with OCD compared with HCs. Considering patients with MDD or ADs, higher CSS scores might reflect a combination of mood states and general or health-related anxiety that are associated with these disorders (Joiner et al. 1999; van den Heuvel et al. 2014; Scarella et al. 2016; Tyrer and Tyrer 2018), and, in patients with ADs, might

Table 5. Scores on the Cyberchondria Severity Scale in relation to the most relevant sociodemographic and clinical variables and to variables related to Internet use habits in the combined patients' sample.

Variables	CSS-T	CSS-C	CSS-D	CSS-E	CSS-R	CSS-M
Sex						
Male	61.6 ± 21	11.6 ± 7	14 ± 5.9	17.8 ± 6.4	12.3 ± 5.2	5.8 ± 3.2
Female	63.5 ± 19.6	12 ± 4.8	15.9 ± 7.5	17.8 ± 6.4	12.3 ± 5	5.4 ± 3
Education						
Secondary school	70.3 ± 24.4	13.3 ± 6.4	18.5 ± 1.	19.4 ± 7.6	11.6 ± 5.7	7.5 ± 3.3
High school	62 ± 19	11.7 ± 5.8	14.9 ± 5.9	17.1 ± 6.4	12.7 ± 5.4	5.6 ± 2.9
University	58.9 ± 19.5	11.1 ± 5.6	13.5 ± 6.4	17.7 ± 6.4	12.1 ± 4.2	4.5 ± 3
Post-university degree	77 ± 7.1	15 ± 2.8	20.5 ± 6.4	25 ± 2.8	11 ± 1.4	5.5 ± 0.7
Employment						
Employed	56.5 ± 16.8	10.7 ± 4.4	13.3 ± 6.2	15.9 ± 5.5	11.4 ± 4.3	5.2 ± 2.9
Unemployed	73.1 ± 25.6	14.6 ± 8.6	17.4 ± 8.6	22.8 ± 7.6	13.4 ± 5.4	4.9 ± 2.5
Retired	62.8 ± 22.4	11.4 ± 5.2	14.2 ± 6.8	17 ± 7.4	13.7 ± 7	6.5 ± 3.5
Student	57 ± 7.1	10.5±.5	13.5 ± 7.8	19 ± 2.8	7.5 ± 2.1	6.5 ± 5
Co-habitation						
Family/partner	62.2 ± 21.1	12.5 ± 7.7	14.1 ± 6.1	18 ± 7	12.7 ± 5.3	4.8 ± 2.8
Parents	66.3 ± 17.7	11.7 ± 5.0	16.5 ± 6.9	19.4 ± 6	13 ± 5.3	5.7 ± 2.9
Alone	60.2 ± 21.2	11.6 ± 5	14.8 ± 7.5	16.5 ± 6.8	11.5 ± 4.6	5.8 ± 3.4
Marital status						
Single	66.3 ± 17.7	11.7 ± 5	16.5 ± 6.9	19.4 ± 6	13 ± 5.3	5.7 ± 2.9
Partner	62.2 ± 21.1	12.5 ± 7.7	14.1 ± 6.1	18 ± 7	12.7 ± 5.3	4.8 ± 2.8
Married	60.2 ± 21.2	11.6 ± 5	14.8 ± 7.5	16.5 ± 6.8	11.5 ± 4.6	5.8 ± 3.4
Family history						
Negative	**55.5 ± 15.6**	**10 ± 3.3**	**13.2 ± 5.3**	**15.4 ± 5.7**	11.6 ± 5.4	5.4 ± 3.2
Positive	**68.5 ± 21.4**	**13.4 ± 6.7**	**16.8 ± 7.7**	**19.8 ± 6.7**	12.9 ± 4.7	5.7 ± 3
Medical comorbidity						
No	63.1 ± 21.8	12.8 ± 6.5	16 ± 7.3	17.5 ± 7.1	11.7 ± 5.1	5.1 ± 2.5
Yes	62.9 ± 19.6	11.4 ± 5.1	14.9 ± 6.8	17.9 ± 6.6	12.7 ± 5.1	6 ± 3.4
Psychiatric comorbidity						
No	60.5 ± 16.6	11.3 ± 4	17.8 ± 6.5	17.2 ± 5.4	12 ± 5.1	5.2 ± 3
Yes	66.2 ± 24	12.7 ± 7.6	15.8 ± 7.6	18.8 ± 8.1	12.8 ± 4.8	6 ± 3.2
Antidepressants						
No	60.5 ± 23.3	9.5 ± 2.1	18.5 ± 14.9	16.5 ± 5	11.5±.07	4.5 ± 2.1
Yes	62.8 ± 20	11.9 ± 5.8	15.1 ± 6.8	17.9 ± 6.7	12.4 ± 5.1	5.6 ± 3.1
Antipsychotic						
No	63.5 ± 20	12.1 ± 5.9	15.5 ± 7.1	18.4 ± 6.6	12.2 ± 4.7	5.3 ± 2.8
Yes	60 ± 20.3	11.1 ± 5.2	13.9 ± 6.5	16.6 ± 6.6	12.9 ± 6.2	6.5 ± 3.8
Mood-stabilisers						
No	**60.8 ± 20**	11.6 ± 5.8	**14.5 ± 6.7**	**17.1 ± 6.6**	12.1 ± 5.1	5.4 ± 3.3
Yes	**73.5 ± 16.8**	513.1 ± 5.5	**19 ± 7.3**	**21.6 ± 5.6**	13.4 ± 4.2	6.4 ± 1.5
Benzodiazepines						
No	**50.7 ± 17.4**	**10.5 ± 5.2**	13.5 ± 5.7	17.8 ± 5.1	11.4 ± 4.6	4.9 ± 2.3
Yes	**70.3 ± 22.4**	**14.3 ± 6.7**	18.3 ± 8.0	16.8 ± 3.9	12.1 ± 5.3	5.7 ± 3
Main source for HRI						
Internet	68.4 ± 19.2	12.6 ± 6.3	16.5 ± 6.3	20.3 ± 6.6	13.2 ± 4.6	5.8 ± 3.0
Others	57.5 ± 19.4	11.2 ± 5.1	14 ± 7.4	15.6 ± 5.9	11.5 ± 5.3	5.3 ± 3.1
Consequences of OHS						
Not to be influenced on medical decision	55.8 ± 18.9	10.8 ± 5.4	13.3 ± 6	15.7 ± 6.5	11 ± 5.5	5.1 ± 3.3
To be influenced on medical decision	69.2 ± 18.9	12.8 ± 5.9	17 ± 7.3	19.8 ± 6.2	13.5 ± 4.2	6 ± 2.8
Not to assume a new treatment	**60.6 ± 19.3**	**11.3 ± 4.8**	15 ± 7.2	**16.9 ± 6.3**	**11.8 ± 5.2**	5.6 ± 3.2
To assume a new treatment	**74.4 ± 20.2**	**414.8 ± 9.1**	16.4 ± 5.5	**22.7 ± 6.4**	**15 ± 2.9**	5.5 ± 2.6
Not to talk with medical professionals	**55.2 ± 19.3**	10.6 ± 4.1	13.6 ± 7.5	**15.7 ± 7**	**9.3 ± 4.5**	6.2 ± 3.6
To talk with medical professionals	**67.9 ± 19**	12.7 ± 6.5	16.3 ± 6.4	**19.3 ± 6**	**14.4 ± 4.2**	5.1 ± 2.6
Not to make a "self-diagnosis"	61.3 ± 20.7	11.9 ± 5.9	14.9 ± 7.1	17.4 ± 6.7	11.9 ± 5.1	5.3 ± 3.2
To make a "self-diagnosis"	72.6 ± 10.5	11.9 ± 4.5	17.5 ± 5.5	21.1 ± 5.2	15.1 ± 3.3	7 ± 2.1
Emotional status after OHS						
Negative	65 ± 21.1	**12.7 ± 6**	17.7 ± 7.3	17.1 ± 7	**10.9 ± 5**	6.7 ± 3.7
Positive	**57 ± 16.8**	**10.5 ± 4.8**	12.4 ± 4.7	17.3 ± 6.3	12.3 ± 4.9	4.5 ± 2
Neg + Pos	**76.4 ± 21.1**	**14.4 ± 6.8**	19 ± 8.8	21.2 ± 6.3	**15.6 ± 4.2**	6.3 ± 3.5
Changes in OHS frequency after COVID-19 pandemic						
No change	62 ± 20.7	11.6 ± 5.8	14.9 ± 7	17.7 ± 7	12 ± 5.1	5.8 ± 3.2
Increased	69.3 ± 17.7	13.4 ± 5.8	18 ± 7.2	19.8 ± 4	13.6 ± 4.5	4.6 ± 1.4
Decreased	60 ± 6.6	13 ± 4.4	13 ± 3.6	16.7 ± 2.1	15 ± 2.6	3.3 ± 0.6

CSS: Cyberchondria Severity Scale, T: total score, C: compulsion subscale, D: distress subscale, E: excessiveness subscale, R: reassurance subscale, M: mistrust of medical professionals subscale. HRI: health related information; OHS: online health searches. *Statistics*: values are expressed in mean ± standard deviation. Bold indicates a statistically significant differences with $p < 0.05$.

indicate a degree of compulsivity given the higher CSS-compulsion score.

Contrary to our a priori hypothesis, patients with OCD showed a similar CYB symptom severity compared with the other disorders. This might be explained by considering that excessiveness and compulsion are important features and predisposing factors of CYB, but not the only ones. Among these, CYB has been associated with health anxiety or hypochondriasis (McMullan et al. 2019) that are constructs that have been related with MDD and ADs in previous investigations (Joiner et al. 1999; Noyes, 2004;

Table 6. Distribution of Cyberchondria criteria and relative scores on the Cyberchondria Severity Scale in patients' subgroups and healthy controls.

	All patients	OCD	ADs	MDD	HCs	*p*
No criteria						
Frequency	46.8	52	50	38.5	63	0.3
CSS-total mean score	**53 ± 14.2**	56.8 ± 13.6	**46.8 ± 14.8**	56.1 ± 12.6	**43.9 ± 7.4**	–
Criterion 1 - compulsive search						
Frequency	42.9	20	19.2	34.6	29.6	0.45
CSS-total mean score	**64.8 ± 19.5**	59.8 ± 13.3	**77.4 ± 30**	60.7 ± 13.4	**56.9 ± 7.4**	–
Criterion 2 – anxiety/distress increase						
Frequency	27.3	16	3.8	11.5	3.7	0.2
CSS-total mean score	**66.3 ± 17.5**	72 ± 21.3	**57**	61.7 ± 15.9	**39**	–
Criterion 3 – time consuming/disability nature						
Frequency	2.6	0	7.7	0	0	0.1
CSS-total mean score	62.3 ± 21.2	–	62.3 ± 21.2	–	–	–
Criteria 1 + 2 = CYB syndrome						
Frequency	16.9	12	19.2	15.4	3.7	0.22
CSS-total mean score	**84.4 ± 20.9**	86 ± 30	**88.8 ± 24.9**	77.8 ± 9.2	**66**	–
Criteria 1 + 2+3 = 'full' CYB						
Frequency	1.3	0	3.8	0	0	>1
CSS-total mean score	77	–	77	–	–	–
p value						
–	**<0.001**	0.3	**0.008**	0.1	**0.007**	-

ADs: anxiety disorders; CYB: Cyberchondria; CSS: Cyberchondria Severity Scale; HCs: healthy controls; OCD: obsessive compulsive disorder; MDD: major depressive disorder. *Statistics*: statistical differences in frequencies of each criterion were analysed between the samples (columns), while differences in the mean CSS-total scores were compared within the samples (rows). Values for categorical and continuous variables are expressed in percentages and mean ± standard deviation (SD), respectively. Bold indicates a statistically significant differences with $p<.05$.

Newby et al. 2017; Tyrer and Tyrer 2018; Scarella 2016). This is potentially the case in our sample, where linear regression analyses showed a positive correlation with measure of health anxiety, even stronger in patients with ADs and positive also in patients with MDD. Moreover, CYB has been previously linked to PUI (although this association was not confirmed in the present study) (Fergus and Dolan 2014; Fergus and Spada 2017), that has been, in turn, associated also with MDD and ADs (Shapira et al. 2000; Spada 2014). Even if not investigated in the present research, intolerance of uncertainty, low self-esteem, anxiety sensitivity, and pain catastrophizing are additional features associated with CYB (Vismara et al. 2020) that potentially explain the burden of CYB in patients with MDD or ADs (Quartana et al. 2009; Manna et al. 2016; Saulnier et al. 2019).

Only one previous investigation assessed CYB in a clinical sample of subjects with hypochondriasis (i.e., illness anxiety disorder and/or somatic symptom disorder) (Newby and McElroy 2020). In this study, the CSS total score was higher than in our sample (CSS total mean score 102.2 ± 21.4). A previous investigation conducted on orthopaedic patients reported a CSS total mean score of 60 ± 16, which is similar to the score emerged in our patients' group (Blackburn et al. 2019). However, in this latter study, only subjects who searched on the Internet for health-related information were included, while this criterion was not followed in our study. In our sample, if only patients who used the Internet as the main source to search for health-related information are selected, the CSS total score was numerically higher (68.4 ± 19.2). Comparing our results with previous investigations, we could affirm that patients with ADs, MDD, or OCD suffer a level of CYB that is lower than patients with health anxiety or hypochondriasis, but is higher than patients with a medical concern (e.g., orthopaedic problems).

Among the constructs and predictors underpinning CYB, health anxiety and hypochondriasis showed the highest role in all the three diagnostic subgroups. CYB has been terminologically and conceptually linked with health anxiety or hypochondriasis. Moreover, health anxiety or hypochondriasis and CYB are mutually influenced. People who are more anxious about their health appear to search the Internet for health information more frequently (Baumgartner and Hartmann 2011; Eastin and Guinsler 2006; Muse et al. 2012) and for greater amounts of time (Singh and Brown 2016). On the other hand, health anxiety resulting from online health searches may in turn precipitate further or more detailed searches (White and Horvitz 2009) resulting in CYB, in a vicious circle. If this is true for patients with health anxiety or hypochondriasis, our results have broadened this construct to include other psychiatric patients and underlined its determinant effect on CYB for patients with OCD, MDD, and ADs as well.

A positive but weak correlation emerged between CYB and obsessive-compulsive symptoms in the combined patients' sample, confirmed only in subjects with OCD. However, no correlation emerged if obsessive–compulsive symptoms were assessed by a clinician (through the Y-BOCS).

This result is in contrast with our *a priori* hypothesis that emphasised the compulsive nature of CYB and the role of obsessive–compulsive symptoms as predictor of CYB. CYB is linked to health anxiety or hypochondriasis (McMullan et al. 2019) and the compulsive nature of hypochondriasis has been highlighted in the forthcoming ICD-11 classification (International classification of diseases for mortality and morbidity statistics, ICD-11th Revision (World Health Organization International classification of diseases 2019)), where hypochondriasis is included in the obsessive–compulsive or related disorders (OCRDs) grouping (van den Heuvel et al. 2014). Indeed, OCD and hypochondriasis share several overlapping diagnostic criteria of relevance to CYB, including obsessive thoughts about illness and compulsive behaviours such as checking and reassurance seeking, which are conducted online. Previous literature investigations shed the light on the association between CYB and OCD, with heterogeneous results (Starcevic et al. 2019; Fergus and Russell 2016; Vismara et al. 2020). Overall, further studies in clinical sample are needed to clarify the association between CYB and OCD symptoms.

A positive, even if very low, correlation between the CSS and the GAD-7 emerged in the combined patients' group, but was not confirmed when the three disorders were considered as separate. Potentially, also general anxiety, and not only health anxiety, might be a trigger of online health searches and some items included in the GAD-7 (i.e., 'feeling afraid as if something awful

might happen' or 'not being able to stop or control worrying') might relate to health worries. With respect to general anxiety symptoms measured with the HAM-A rating scale, no correlation emerged with the CSS total score. Overall, considering together the weak correlation with the GAD-7 and the absent correlation with the HAM-A rating scale, we could conclude that CYB, in the present sample, did not correlate with measures of general anxiety. Similarly, in a recent network analysis, CYB and general anxiety were minimally correlated (Starcevic et al. 2019).

In the combined patients' sample, some clinical variables were associated with higher CYB symptoms severity. Indeed, patients with a positive family history of psychiatric disorders showed higher CSS total, compulsion and distress subscales scores compared with patients with a negative family history of psychiatric disorders. A family history of psychiatric disorders has been previously associated with negative disease outcomes in different psychiatric conditions, including OCD, MDD, and ADs (Milne et al. 2009; American Psychiatric Association 2013; Benatti et al. 2020; Benatti et al., 2016). These patients might manifest a more severe form of the disease that potentially reflect a higher degree of compulsivity and anxiety symptoms eventually predisposing CYB.

Another interesting result is the higher CYB symptoms severity emerged in patients taking benzodiazepines or mood stabilisers, compared with patients not prescribed these compounds. These subjects might be associated with a higher severity of anxiety symptoms that in the clinical practice are treated with benzodiazepines or, in specific circumstances, with mood stabilisers (e.g., augmentation with GABAergic compounds as second-line therapy) (National Institute for Health and Care Excellence 2020). Additionally, these patients might be prescribed mood stabilisers to reduce symptoms related to poor impulse control, which could be the reason of excessive online health searches. No previous literature studies investigated the correlation between CYB and psychotropic compounds; therefore, the present results must be interpreted in light of additional data.

The impact online health searches have on patients' health choices has been extensively underlined in previous investigations (Fox 2006; McDaid and Park 2010). In our sample, one out two patients affirmed to have been influenced by the information found online at some degree. Indeed, 15% of patients referred to have assumed a new treatment after online health searches. Moreover, nearly 60% of patients reported to have talked with their general practitioner/health professionals about health-related information found online. In both cases, these subgroups of patients showed a higher CYB symptom severity. Similarly, patients who reported a combination of negative and positive emotional states (as potential indicator of the ambiguity underpinning online health searches) manifested higher level of CYB. The greater level of CYB symptom severity in these patients' subgroups has to be interpreted as a consequence of CYB itself, but the potential influence of other causal factors must be ruled out. Overall, these data underlined the negative impact CYB has on healthcare utilisation with consequent significant public health implications and costs, as confirmed in previous publications (Mathes et al. 2018).

Lastly, in the present article, we tested the clinical validity of the CYB 'working' definition (Vismara et al. 2020). Considering separately the different criteria, the compulsive nature of online health searches (criterion 1) was the one most frequently reported in the combined patients' sample (42.9%) and similarly in the three diagnostic subgroups (OCD:20%, ADs:19.2%, MDD:34.6%) and HCs (29.6%). Thus, contrary to our *a priori* hypothesis, the compulsive nature of online health searches was not more frequently represented in patients with OCD.

In the introduction section, the authors discussed the rationale of introducing the third criterion, underling the time-consuming nature of CYB and consequently its disability. Following this rationale, only one patient with ADs respected this condition, therefore the frequency of 'full' CYB could be stated at 3.8% in this subgroup and in the 1.3% of the combined patients' sample. This third criterion is clearly the most stringent. Indeed, if this is omitted, CYB frequency as a syndrome of compulsive online search *associated* with an increased anxiety and distress is present in a higher rate among the three diagnostic subgroups (ADs: 19.2%, OCD: 12%, MDD: 15.4%). Even if no statistically significant difference was reported, only one subject in the control group (3.7%) fulfilled this condition, underling a higher CYB expression in the clinical population investigated. In this second circumstance, CYB is conceptualised as a transdiagnostic form of disordered behaviour with a spectrum of severity and no requirement for associated functional disability (i.e., CYB syndrome). Considering CYB symptom severity (as measured by the CSS total score), the definition of CYB syndrome reflects a more severe form of the behaviour, compared with patients whose online health searches was only compulsive (only criterion 1) or exclusively associated with increasing anxiety/distress (only criterion 2) and, lastly, with subjects who did not report any of the CYB definition criteria. The patient with a diagnosis of 'full' CYB showed a lower CSS total score compared to the group of patients with CYB syndrome, but, seeing the different size of the samples, a direct comparison cannot be established.

CYB frequency has been differently reported in two previous investigations. A frequency of 16.3% was reported in one study recruiting outpatients from two general hospitals that considered the presence of *any* CSS factors as being indicative of CYB (Wijesinghe et al. 2019). Another report (conducted on employees working in the information technology sector recruited through an online survey) showed a frequency of 55.6%, considering 'Cyberchondria' when, in a cluster analysis, individuals with higher cluster scores centred on all the four CSS subscales (mistrust of medical professional excluded) (Makarla et al. 2019). In both cases, CYB frequency was arbitrarily formulated, with no referral to any clear definition and no CSS cut-off scores or set level of symptoms used to define clinically meaningful CYB. It is not surprising that in our sample CYB frequency was at a much lower level when we considered a disorder-like conceptualisation of CYB that can be formulated only when this behaviour is associated with negative impact on functioning and daily life. By the same token, it was clear in our analysis that around 10–20% patients reported 'subdiagnostic' CYB of varying levels of severity that correlated with measures of illness severity. These findings indicate that there is a severity 'spectrum' for CYB, that the syndrome is common and cuts across a range of mental disorders characterised by affective, anxiety and obsessive–compulsive psychopathology and that the 'working' definition of CYB as currently formulated (3 criteria) lacks adequate sensitivity to identify clinically relevant CYB symptoms in a non-hypochondriasis patient group.

Limitations

The first limitation is the cross-sectional nature of the study. Additionally, it must bear in mind the historical period where this research was conducted and the potential impact the COVID-19 might have had on online health-searches and consequently on CYB. Although the majority of subjects included affirmed the

COVID-19 did not change their online health searches habits, future comparative studies conducted after the COVID-19 pandemic are needed to confirm the present results. Moreover, HCs group represents a convenience sample that potentially have increased the differences observed between patients and HCs. Indeed, access to health care or reliable medical information may be more easily available to health professionals or individuals closely related to them. Additionally, some baseline differences (i.e., age, age at onset, highest level of education achieved, marital status, psychiatric comorbidities, and current medication) emerged within patients' groups and HCs; however, these variables did not show a statistic correlation with the CSS or its subscales, therefore, we could conclude that these variables did not influence the results. Lastly, mean total scores on the HAM-D and the HAM-A showed subsyndromal/mild symptoms which presumably reflects that individuals with a more stable and less clinically severe illness are the ones who voluntarily participate in clinical trials.

Conclusion

The present study described for the first time how patients with a range of psychiatric disorders (OCD, ADs, or MDD) manifest a variable degree of CYB symptomatology at a single time point. Considering the CYB 'working' definition we previously proposed, that emphasises a disorder-like conceptualisation, only 3.8% of the ADs subgroup and 1.3% of the group as a whole were affected. Refining the current 'working' definition to reflect the spectrum of symptom-severity is, therefore, likely to increase its sensitivity for capturing clinically meaningful CYB in patient groups. Indeed, between 10% and 20% patients reported distressing compulsive online searching for health-related information that correlated with symptoms severity. Among the predisposing factors, CYB symptom severity was associated with a positive family history of psychiatric disorders and with specific psychotropics' prescriptions.

Given the increasingly widespread use of the Internet and the potential negative effects of online health searches, CYB is likely to represent a growing health burden for the individual and for the society as a whole. Future directions will aim to develop a CSS that reflects a pathological level of CYB behaviour in the clinical groups affected and to investigate the longitudinal course of CYB, focussing in particular on treatment response to potential novel therapies for CYB.

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Data are available on request due to privacy/ethical restrictions.

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Appendix 1.

Survey on online health searches

Q: question; A: answers.

1. Q: How much time do you spend on the Internet on average each day (for work/study/leisure/other reasons)? **A:** $<$1 h; 1–3 h; 3–5 h; $>$ 5 h.

2. Q: Which is the tool you use most frequently to access the Internet? **A:** smartphone; computer; tablet.

3. Q: What is the source you use the most to research information about your health? **A:** Scientific journals/encyclopaedias/books; Internet; Television; Radio; Health professionals; Friends/acquaintances; Others.

4. Q: How often do you use the Internet on average to search for information about your health? **A:** I have never used the Internet to search for information about my health; monthly; weekly; daily.

5. Q: Which of the following sentences best describes how you feel after searching the Internet for information about your health? (more answers available) **A:** more confident to ask questions/discuss about health choices with the primary care physician/healthcare professional; reassured to make a more appropriate choice about their health; relieved or comforted by the information found on the Internet; eager to pass on information found on the Internet to others; confused by the information found on the Internet; scared of the gravity or the graphical representation; overwhelmed by the amount of information found online; frustrated by the lack of information or for not finding the information he/she was looking for online.

6. Q: How often do you check the reliability of the source of information concerning your health that you have found on the Internet? **A:** always; sometimes; I never thought about it/I do not notice.

7. Q: Do you use digital applications on your mobile/smartphone that provide/record information about your health (e.g., daily steps, heart rate, sleep, menstrual cycle? **A:** yes; no.

8. Q: What topics related to your health do you search most frequently on the Internet? (more answers available) **A:** specific disease or symptom; pharmaceutical compounds; healthy lifestyle habits (e.g., nutrition/sport); evaluations on healthcare professionals/structures; alternative medicines/treatments; specific intervention/procedure; patients' forum: others.

9. Q: Do you think the information you found on the internet influenced your health decisions? **A:** yes, definitely; yes, moderately; no.

10. Q: Do you happen to speak to your primary care physician/healthcare professional about your health information you found on the Internet? **A:** yes, always; yes, sometimes; no.

11. Q: Have you ever taken any treatment for your health (pharmacological/psychological or other) because of the information you found on the Internet? **A:** yes, no.

12. Q: Have you ever made a diagnosis for yourself or others, without consulting a healthcare professional, following information about your health that you found on the Internet? **A:** yes; no.

13. Q: Do you believe that the COVID-19 pandemic has changed your use of the Internet to search for information relating to your health? **A:** yes; no.