Obsessive-compulsive symptoms among the general population during the first COVID-19 epidemic wave in Italy

Francesca Pacitti [a], Valentina Socci [a], Giulia D'Aurizio [a], Tommaso Benedetto Jannini [b],
Alessandro Rossi [a], Alberto Siracusano [b], Rodolfo Rossi [b,*], Giorgio Di Lorenzo [b]

[a] *Department of Biotechnological and Applied Clinical Sciences, University of L'Aquila, Italy*
[b] *Department of Systems Medicine, University of Rome Tor Vergata, Italy*

ABSTRACT

This study investigated obsessive-compulsive symptoms (OCS) in the Italian general population during the initial stage of the pandemic and the impact of COVID-19 related potential risk factors. A web-based survey was spread throughout the internet between March 27th and April 9th, 2020. Twenty thousand two hundred forty-one individuals completed the questionnaire, 80.6% women. The Dimensional Obsessive-Compulsive Scale (DOCS) was included to assess the severity of the obsessive-compulsive symptom domains. Further, selected outcomes were depression, anxiety, insomnia, perceived stress, and COVID-19 related stressful life events. A panel of logistic or linear regression analyses was conducted to explore the impact of COVID-19 related risk factors, socio-demographic variables, and mental health outcomes on OCS. A total of 7879 subjects (38,9%) reported clinically relevant OCS. Specifically, more than half of the sample (52%) reported clinically relevant symptoms in the Contamination domain, 32.5% in the Responsibility domain, 29.9% in the Unacceptable thoughts domain, and 28.6 in the Symmetry/Ordering domain. Being a woman was associated with OCS, except for Symmetry/Ordering symptoms. A lower education level and younger age were associated with OCS. Moreover, depression, anxiety, perceived stress symptoms, insomnia, and different COVID-19 related stressful events were associated with OCS. We found high rates of OCS, particularly in the contamination domain, in the Italian general population exposed to the first COVID-19 epidemic wave and COVID-19 related risk factors. These findings suggest the need to investigate further the trajectories of OCS in the general population along with the long-term socio-economic impact of the pandemic.

1. Introduction

Since late December 2019, the rapid spread of a novel coronavirus disease (COVID-19) worldwide has demonstrated a considerable potential to impact mental health negatively. Italy was the first western country to experience a large COVID-19 health emergence, with the first outbreaks located in the northern regions by the end of February 2020. Due to the rapid spread of contagion, on March 9th, 2020, lockdown measures initially imposed on the hardest-hit northern areas were enforced on the entire national territory, including travel restrictions and the mandatory closure of schools and nonessential commercial activities. These unprecedented measures have been accompanied by considerable public education on disease prevention, with strong recommendations on social distance, regular hand hygiene, and personal protective equipment.

It is well established that health emergencies such as epidemics can have dramatic psychosocial implications for the population (Talevi et al., 2020; Tucci et al., 2017). Coherently with preliminary reports from China (Qiu et al., 2020; Wang et al., 2020), high rates of depressive, anxiety, stress-related symptoms, and insomnia among the Italian general population were found three weeks into the first COVID-19 related lockdown measures (Rossi et al., 2020b). Moreover, these adverse mental health outcomes were associated with several pandemic-related risk factors such as working, financial, relationship, or housing problems, suggesting a significant psychosocial impact of the pandemic and the related restrictive measures on the general population. Since the COVID-19 outbreak, an increasing number of investigations accumulated so far confirmed a substantial proportion of mental health issues on both the general population and specific at-risk populations worldwide (de Sousa Júnior et al., 2021; Rajkumar, 2020).

However, less attention has been dedicated to the potential consequences of the COVID-19 pandemic on specific symptom dimensions such as those related to obsessive-compulsive disorder (OCD) in the general population, a psychopathological domain that could be exacerbated in the context of pandemic emergences.

OCD is characterized by the presence of recurrent and persistent thoughts, urges, or images that are experienced as intrusive and highly distressing, typically associated with thoughts or actions aimed to ignore or neutralize them (American Psychiatric Association, 2013). OCD is highly comorbid with anxiety disorders and depression (Fontenelle et al., 2006), including social anxiety disorder, generalized anxiety disorder (GAD), and major depressive disorder (Lochner et al., 2014). While the full disorder's lifetime prevalence is estimated at 2–3% for the general population (Ruscio et al., 2010; Subramaniam et al., 2019), the lifetime prevalence of Obsessive-Compulsive symptoms (OCS) ranges from 21 to 25% in the community (Fullana et al., 2009). Such symptom domains typically include contamination obsession and washing/cleaning compulsion, obsession concerning responsibility for harm, injury, or bad luck and checking compulsion, unacceptable obsessional thoughts concerning sex, violence or religion associated with mental neutralizing strategies, and obsession about symmetry, completeness, and exactness and ordering compulsion (Abramowitz et al., 2010).

During a pandemic, people are required to focus on preventing the threat of the contagion of self and others. Therefore, the intense fear related to the unexpected and rapid spread of contagion and the normalization of hygiene practices may become reinforcements for obsessive thinking and compulsive behaviors in the population, particularly in the domain of contamination. Further, stressful life events may become predisposing or precipitating factors for the development of OCS. The significant threat or disruption of personal health, social routines, health- and economic systems, may increase the risks associated with the genesis of OCS in the population.

In the context of the COVID-19 health emergency, while a substantial proportion of individuals with OCD reported symptom worsening, particularly in the contamination domain (Guzick et al., 2021), the role of the pandemic in promoting new-onset OCS as well as OCS symptoms trajectories in the general population is less clear. In the early stage of the pandemic in China, a web-based study in a sample of 1060 respondents showed that more than 70% of the sample had moderate to high levels of psychological symptoms, including OCS, such as worrying about the neatness of clothes and manners and having to wash hands repeatedly (Tian et al., 2020). The degree of compliance with COVID-19 related contamination-prevention behaviors was significantly associated with contamination obsessions and pre-pandemic to current change in OCS symptom severity in a population-based survey of U.S. adult residents (Samuels et al., 2021). A web-based survey on a Canadian sample of 6041 respondents (Abba-Aji et al., 2020) showed onset of OCS in 60.3% of the sample, and 53.8% had compulsions to wash hands during the COVID-19 pandemic. Further, OCS were associated with elevated stress, anxiety, and depressive symptoms (Abba-Aji et al., 2020). Moreover, an online prospective cohort study in a sample of Chinese medical students showed a higher prevalence of possible OCD (11.3%) at the early stage of the COVID-19 pandemic compared to the rates observed in subsequent follow-up measurements corresponding to a progressive reduction in quarantine levels and new infections. Moreover, COVID-related fear and anxiety were positively correlated to the rate of possible OCD, suggesting that pandemic-related fear could be implicated in the disorder's etiology (Ji et al., 2020).

Collectively, these findings suggest the need to accurately assess the impact of the pandemic on OCS in the general population. The present study aimed to evaluate the magnitude of OCS in the general population during the first COVID-19 epidemic wave in Italy and to explore the impact of COVID-19 related risk factors. We expected a general increase in OCS three to four weeks into the first lockdown measures in Italy corresponding to the contagion peak. Moreover, we assumed that specific COVID-19 related risk factors could show a relevant association with OCS in the general population.

2. Materials and methods

2.1. Study design

This study is a part of the long-term monitoring of mental health outcomes in the Italian population (Rossi et al., 2020a, 2020b) A cross-sectional web-based survey design was adopted. Approval for this study was obtained from the local Internal Review Board at the University of L'Aquila. Data on mental health were collected between March 27th and April 9th, 2020, among a self-selected Italian sample using an anonymous online questionnaire spread throughout the internet. Participants were invited using sponsored social network advertisements together with a snowball recruiting technique. Online consent was obtained from the participants; they were allowed to terminate the survey at any time they desired. Questionnaires were evenly distributed across the national territory during a timeframe corresponding to the contagion peak of the first COVID-19 epidemic wave in Italy (World Health Organization, 2020). The survey was developed using the free software Google Forms®.

2.2. Participants

All Italian citizens ≥18 years were eligible. A final sample of 20241 individuals (16309 women) completed the questionnaire. No response rate could be estimated due to the web-based design of the study.

2.3. Measures

2.3.1. Dimensional Obsessive-Compulsive Scale

The Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010) is a self-report 20-items questionnaire assessing the severity of four OCD symptom domains: (a) contamination, (b) responsibility for harm, injury, or bad luck, (c) unacceptable obsessional thoughts and (d) symmetry, completeness, and exactness. The questionnaire includes a description of the symptom dimension, with examples of common obsession and compulsions within that specific dimension. Following each description are five items (rated 0 to 4) that measure (a) time occupied by obsessions and rituals, (b) avoidance behavior, (c) distress, (d) functional interference, and (e) difficulty disregarding the obsessions and refraining from doing compulsions. The DOCS has a total score and a score for each of the four subscales, with a score ranging between 0 and 20 for each subscale and from 0 to 80 for the total scale. According to the Italian validation study (Melli et al., 2015), the following cut-off scores were considered as suggestive of clinically relevant symptoms: DOCS total score ≥30; Contamination subscale ≥9; Responsibility, Unacceptable Thoughts and Symmetry subscales ≥8. In our sample, internal consistency was α = 0.94.

2.3.2. Patient Health Questionnaire

Depressive symptoms were assessed using the 9-item Patient Health Questionnaire (PHQ-9). PHQ-9 comprises nine depressive symptoms, rated on a 4-point Likert scale, range 0–27 (Spitzer et al., 1999). The total score has been taken into consideration as a continuous variable or accounted for with a categorical variable defined according to a cut-off score of 15 or higher for severe depression symptoms. PHQ-9 is a widely used instrument in epidemiological research as a depression screener. In our sample, internal consistency was α = 0.87.

2.3.3. Generalized anxiety disorder questionnaire

Anxiety symptoms were assessed using the 7-item Generalized anxiety disorder questionnaire (GAD-7), rated on a 4-point Likert scale, range 0–21 (Spitzer et al., 2006), The total score has been taken into consideration as a continuous variable or accounted for with a categorical variable defined according to a cut-off score of 15 or higher for

severe anxiety symptoms. GAD-7 is a widely used instrument in epidemiological research as an anxiety screener. In our sample, internal consistency was α = 0.92.

2.3.4. Insomnia severity index

The Insomnia Severity Index (ISI) is a 7-item self-report questionnaire assessing the nature, severity and impact of insomnia, on a 5-point Likert scale, range 0–28, with higher scores indicating higher severity of insomnia symptoms (Bastien et al., 2001; Castronovo et al., 2016) The total score has been taken into consideration as a continuous variable or accounted for with a categorical variable according to a cut-off score of 22 or higher for severe insomnia. ISI is a widely used instrument to evaluate sleep disorders. In our sample, internal consistency was α = 0.91.

2.3.5. Perceived stress scale

The 10-item Perceived Stress Scale (PSS) was used to assess subjectively perceived stress on a 5-point Likert scale, range 0–50 (Cohen et al., 1983), using a quartile split to separate the higher quartile from the remaining participants. Internal consistency in our sample was α = 0.88.

2.3.6. COVID-19 related risk factors

In this study, the impact of the COVID-19 pandemic and related lockdown measures were addressed exploring 1) any change in working activity due to the COVID-19 pandemic, i.e. working as usual, working from home, working activity discontinued, working more than usual; 2) having a loved one infected, hospitalized or deceased due to COVID-19; 3) Stressful events due to pandemic or lockdown using the International Adjustment Disorder Questionnaire (IADQ) (Shevlin et al., 2020). IADQ comprises a brief checklist of eight questions about any potential stressful life event that occurred in the recent past (i.e., financial, working, educational, housing, relationship, own or loved one's health and caregiving problems) with a yes/no response. In this study, the IADQ checklist was purposely modified to evaluate the presence of stressful events specifically related to the COVID-19 pandemic or lockdown measures. Accordingly, responses to the checklist were modified as follows: "no"; "yes"; "yes, due to COVID-19". Responses were collapsed in a binary variable where 1 = "any stressful life event only if due to COVID-19" and 0 = "no stressful life events or presence of a stressful life event not due to COVID-19".

2.4. Statistical analysis

Descriptive analyses were performed to assess the rates of OCS for each symptoms domains as well as the prevalence of the selected risk factors and rates of depressive, anxiety, stress-related, and insomnia symptoms in the sample. Pearson correlations between DOCS total score and COVID-19 related risk factors as well as all the included mental health measures (i.e., PHQ, GAD, PSS, and ISI total scores) were performed. Multivariable logistic or linear regression analyses was conducted – as appropriate depending on the dependent variable being continuous or binomial – in order to explore the impact of COVID-19 related risk factors in the IADQ checklist, sociodemographic variables, and mental health outcomes on OCS (i.e., DOCS total score and subscales total scores or categorical variables according to the cut-off scores). The following covariates were considered: age, gender, education, region, relational status, occupation. These covariates were selected due to their association with mental health outcomes during the COVID-19 pandemic (Wang et al., 2020); the region of residence was included to account for the large regional differences in COVID-19 pandemic impact in Italy. A history of childhood trauma and any previous mental illness were selected as potential confounders.

Data analysis was performed using Stata v. 16® (StataCorp).

3. Results

Socio-demographic characteristics of the sample are reported in Table 1. A total of 20241 individuals completed the questionnaire, of which 16309 (80.6%) were women and 3932 (19.4%) men; mean age was 39.0 (SD = 12.77); 12383 (61.1%) participants were employed, 9680 (47.8%) had a ≤undergraduate educational level, and 9680 (47.8%) lived in Northern Italy. Endorsement rates of the selected mental health outcomes as well as the prevalence of the COVID-19 related risk factors are reported in Table 2. Of the 20241 respondents, 7879 (38,9%) reported clinically relevant OCS according to the DOCS cut-off score, with a DOCS total median score of 25 (P_{25}–P_{75} = 15–38). Regarding each OC symptom domain, clinically relevant symptoms in the Contamination scale was reported by more than half of the sample (10557 subjects, 52.0%), with a median score of 9 (P_{25}–P_{75} = 5–12); 6587 (32.5%) respondents reported clinically relevant symptoms in the Responsibility scale, with a median score of 6 (P_{25}–P_{75} = 2–11); 6051 (29.9%) subjects reported clinically relevant symptoms in the Unacceptable thoughts scale with a median score of 4 (P_{25}–P_{75} = 1–10), and 5788 (28.6%) respondents in the Symmetry/Ordering scale, with a median score of 6 (P_{25}–P_{75} = 2–9). A total of 5697 (28.3%) respondents endorsed symptoms of depression (PHQ median score of 10, P_{25}–P_{75} = 6–15), 4273 (21.1%) anxiety (GAD median score of 9, P_{25}–P_{75} = 4–14), 1575 (7.8%) insomnia (ISI median score of 10, P_{25}–P_{75} = 4–16 and 4531 (22.3%) respondents scoring above the PSS 75th percentile, with high perceived stress symptoms (PTSS total score median of 21 (P_{25}–P_{75} = 14–27).

Correlational analysis showed significant correlations between DOCS total score and PSS (r = 0.44, p < .001), PHQ (r = 0.50; p < .001), GAD (r = 0.58; p < .001), ISI (r = 0.43; p < .001) total scores. Moreover, DOCS total score correlated with all the COVID-19 related risk factors in the IADQ checklist: financial (r = 0.09; p < .001), work (r = 0.06; p < .001), educational (r = 0.08; p < .001), housing (r = 0.05; p < .001) and relational problems (r = 0.10; p < .001), problems related to own's

Table 1
Sample characteristics.

	N (%)
Gender	
Women	16309 (80.6)
Men	3932 (19.4)
Education	
≤Undergraduate	9680 (47.8)
≥Graduate	8639 (42.6)
Lower education	1922 (9.5)
In a relationship	14337 (71.0)
Have children	8667 (43.0)
Region	
North	8972 (44.3)
Centre	5070 (25.1)
South	5828 (28.8)
Missing	371 (1.8)
Occupation	
Housemaker	1392 (6.9)
Unemployed	2467 (12.2)
Employed	12383 (61.2)
Retired	353 (1.7)
Student	3646 (18.1)
Working activity change	
As usual	2738 (13.5)
Smart-working	7485 (36.9)
Discontinued	8491 (41.9)
More than usual	771 (3.8)
Missing	756 (3.7)
Loved one's status	
Not infected, deceased or Hospitalized	18428 (91.1)
Infected	935 (4.6)
Deceased	488 (2.4)
Hospitalized	309 (1.5)
Missing	81 (0.4)

Table 2
Rates of mental health outcomes and COVID-19 related stressful events in the sample.

	mean [SD]	median (P$_{25}$ – P$_{75}$)	N (%)**
PHQ	10.7 [6.4]	10 (6–15)	5697 (28.3)
GAD	9.0 [5.9]	9 (4–14)	4273 (21.1)
ISI	10.46 [7.2]	10 (4–16)	1575 (7.8)
PSS	20.6 [8.4]	21 (14–27)	4531 (22.4)[a]
DOCS			
Contamination	8.8 [4.6]	9 (5–12)	10557 (52.1)
Responsibility for harm	6.9 [5.2]	6 (2–11)	6587 (32.5)
Unacceptable thoughts	5.7 [5.3]	4 (1–10)	6051 (29.9)
Symmetry/ordering	5.9 [4.7]	6 (2–9)	5788 (28.6)
Total score	27.4 [15.0]	25 (15–38)	7879 (38.9)
COVID-19 stressful life event			
Economic problems			3062 (15.1)
Job problems			4566 (22.6)
Study difficulties			3101 (15.4)
Housing problems			768 (3.8)
Relational problems			1882 (9.3)
Health problems			800 (3.9)
Loved one's health problems			952 (4.7)
Caregivers problems			1388 (6.9)

PHQ, Patient Health Questionnaire; GAD, Generalized Anxiety Disorder scale; ISI, Insomnia severity Index; PSS, Perceived Stress Scale; DOCS, Dimensional Obsessive-Compulsive Scale.

[a] PSS 75th percentile; ** clinically significant scores.

health (r = 0.07; p < .001) or a loved one's health (r = 0.04; p < .001) and difficulties in caregiving (r = 0.08; p < .001).

Logistic and linear regression analyses are reported in Table 3 and Table 4. Younger age was associated with total OCS scores (b = −0.12; 95%CI = −0.14,-0.10) and symptoms in each symptom domain. Being a woman was associated with all the selected outcomes (Contamination, b = 0.27; 95%CI = 0.23,0.30; Responsibility, b = 0.18; 95%CI = 0.14,21; Unacceptable thoughts, b = 0.06; 95%CI = 0.02,0.09; Total OCS, b = 0.16; 95%CI = 0.13,0.20), except for Symmetry/Ordering symptoms. Having a lower education was associated with total OCS symptoms (b = 0.36; 95%CI = 0.31,0.41), compared to those who were ≥ graduate. Regarding the region of residence, participants from Southern Italy showed higher odds of OCS compared to Central and Northern Italy (b = 0.28; 95%CI = 0.25,0.32). Relative to participants who were employed, being unemployed (b = 0.12; 95%CI = 0.07,0.17), housemaker (b = 0.14; 95%CI = 0.08,0.20), and retired (b = 0.13; 95% CI = 0.01,0.26) was associated with total OCS. Working activity discontinued due to the pandemic (b = 0.13; 95%CI = 0.14,0.29) as well as working more than usual (b = 0.21; 95%CI = 0.14,0.29) were associated with total OCS. Having a loved one hospitalized due to Covid-19 was associated with total OCS (b = 0.15; 95%CI = 0.04,0.26). A history of childhood trauma (b = 0.15; 95%CI = 0.12,0.18) and any prior psychiatric diagnosis (b = 0.27; 95%CI = 0.24,0.30) was associated with total OCS (see Table 3).

Among the COVID-19 related IADQ risk factors, having experienced financial (OR, 1.38; 95%CI = 1.27,1.51), relational (OR, 1.43; 95%CI = 1.29,1.58), and caregiving problems (OR, 1.34; 95%CI = 1.19,1.5) due to the pandemic or lockdown measures was associated with total OCS as well as symptoms in each symptom domain; while study difficulties,

Table 3
Linear regression of socio-demographic characteristics and COVID-19 related variables on Obsessive-compulsive symptoms.

	DOCS - Contamination	DOCS -Responsibility for harm	DOCS -Unacceptable thoughts	DOCS -Symmetry/ ordering	DOCS -Total scores
	b [95%CI]	b [95%CI]	b [95%CI]	b [95%CI]	b [95%CI]
Age[a]	**−0.3* [-0.05,-0.00]**	**−0.10*** [-0.12,-0.08]**	**−0.13*** [-0.15,-0.11]**	**−0.14*** [-0.16,-0.12]**	**−0.12*** [-0.14,-0.10]**
Gender					
Men	Ref				
Women	**0.27*** [0.23,0.30]**	**0.18*** [0.14,0.21]**	**0.06** [0.02,0.09]**	0.03[-0.01,0.06]	**0.16*** [0.13,0.20]**
Education					
≥Graduate	Ref				
≤Undergraduate	**0.14*** [0.11,0.17]**	**0.19*** [0.16,0.22]**	**0.15*** [0.12,0.18]**	**0.15*** [0.12,0.18]**	**0.20*** [0.17,0.23]**
Lower education	**0.25*** [0.19,0.30]**	**0.33*** [0.28,0.39]**	**0.27*** [0.22,0.32]**	**0.31*** [0.25,0.36]**	**0.36*** [0.31,0.41]**
In a relationship	**0.04** [0.01,0.08]**	0.03 [-0.01,0.06]	**−0.03* [-0.06,0.00]**	0.01 [-0.02,0.05]	0.01 [-0.02,0.05]
Have children	**0.06*** [0.03,0.10]**	0.02 [-0.01,0.06]	0.01 [-0.03,0.05]	**0.06** [0.02,0.10]**	**0.05* [0.01,0.08]**
Region					
North	ref				
Centre	**0.05** [0.02,0.09]**	**0.05** [0.01,0.08]**	0.03 [-0.01,0.06]	0.03 [-0.00,0.07]	**0.05** [0.01,0.08]**
South	**0.31*** [0.27,0.34]**	**0.24*** [0.21,0.28]**	**0.19*** [0.15,0.22]**	**0.19*** [0.16,0.22]**	**0.28*** [0.25,0.32]**
Occupation					
Employed	ref				
Housemaker	**0.13*** [0.06,0.19]**	**0.09** [0.03,0.16]**	**0.12*** [0.05,0.18]**	**0.12*** [0.05,0.18]**	**0.14*** [0.08,0.20]**
Unemployed	**0.06 * [0.01,0.10]**	**0.08*** [0.04,0.13]**	**0.12*** [0.07,0.17]**	**0.12*** [0.07,0.17]**	**0.12*** [0.07,0.17]**
Retired	−0.00 [-0.13,0.12]	0.10 [-0.03,0.22]	**0.17** [0.04,0.29]**	**0.17** [0.04,0.29]**	**0.13* [0.01,0.26]**
Student	**−0.20*** [-0.25,-0.15]**	−0.04 [-0.09,0.01]	**0.10*** [0.05,0.15]**	−0.00 [-0.05,0.04]	−0.04 [-0.08,0.01]
Working activity change					
As usual	ref				
Discontinued	**0.10*** [0.6,0.14]**	**0.13*** [0.10,0.26]**	**0.12*** [0.08,0.24]**	**0.06*** [0.06,0.22]**	**0.13*** [0.14,0.29]**
Smart-working	**0.07 ** [0.02,0.11]**	0.04 [-0.01,0.09]	0.01 [-0.04,0.06]	0.00 [-0.05,0.05]	0.04 [-0.01,0.08]
More than usual	**0.22*** [0.14,0.30]**	**0.18*** [0.10,0.26]**	**0.15*** [0.08,0.24]**	**0.14*** [0.06,0.22]**	**0.21*** [0.14,0.29]**
Loved one's status					
Not infected, deceased or Hospitalized	ref				
Infected	0.04 [-0.03,0.1]	0.06 [-0,0.13]	0.04 [-0.02,0.11]	0.00 [-0.06,0.07]	0.05 [-0.02,0.11]
Deceased	0.06 [-0.03,0.14]	0.01 [-0.08,0.10]	0.04 [-0.05,0.13]	−0.07 [-0.16,0.02]	0.01 [-0.08,0.1]
Hospitalized	**0.21*** [0.10,0.33]**	**0.14* [0.03,0.26]**	0.11 [-0.01,0.22]	0.02 [-0.1,0.13]	**0.15* [0.04,0.26]**
Childhood Trauma	**0.08*** [0.05,0.11]**	**0.13*** [0.10,0.16]**	**0.14*** [0.12,0.17]**	**0.13*** [0.11,0.16]**	**0.15*** [0.12,0.18]**
Prior Psychiatric Diagnosis	**0.08*** [0.05,0.11]**	**0.23*** [0.20,0.26]**	**0.36*** [0.32,0.39]**	**0.18*** [0.15,0.21]**	**0.27*** [0.24,0.30]**

[a] Age is standardized and reversed; *p < .05; **p < .01; ***p < .001.

Table 4

Logistic regression of Covid-19 related stressful events and mental health outcomes on Obsessive-compulsive symptoms.

	DOCS - Contamination	DOCS -Responsibility for harm	DOCS -Unacceptable thoughts	DOCS -Symmetry/ordering	DOCS -Total scores
	OR [95%CI]	OR [95%CI]	OR [95%CI]	OR [95%CI]	OR [95%CI]
COVID-19 stressful life events					
Economic problems	**1.31*** [1.2,1.43]**	**1.35*** [1.24,1.48]**	**1.34*** [1.22,1.46]**	**1.28*** [1.17,1.41]**	**1.38*** [1.27,1.51]**
Job problems	1.01 [0.93,1.08]	1.05 [0.97,1.14]	1.04 [0.95,1.12]	1.03 [0.95,1.12]	1.04 [0.97,1.13]
Study difficulties	0.99 [0.91,1.07]	**1.2*** [1.11,1.31]**	**1.39*** [1.28,1.51]**	**1.37*** [1.26,1.49]**	**1.28*** [1.18,1.39]**
Housing problems	1.1 [0.94,1.28]	**1.35*** [1.16,1.57]**	**1.24** [1.06,1.45]**	**1.22** [1.05,1.43]**	**1.22** [1.05,1.41]**
Relational problems	**1.18** [1.06,1.3]**	**1.35*** [1.22,1.49]**	**1.57*** [1.42,1.74]**	**1.49*** [1.34,1.65]**	**1.43*** [1.29,1.58]**
Health problems	1.12 [0.96,1.3]	**1.43*** [1.23,1.67]**	**1.73*** [1.49,2.02]**	**1.42*** [1.22,1.66]**	**1.52*** [1.31,1.77]**
Loved one's health problems	1.06 [0.92,1.21]	1.14 [0.99,1.32]	1.05 [0.91,1.21]	1.06 [0.92,1.23]	1.12[0.98,1.29]
Caregivers problems	**1.39*** [1.23,1.56]**	**1.37*** [1.22,1.54]**	**1.33*** [1.18,1.5]**	**1.34*** [1.19,1.51]**	**1.34*** [1.19,1.5]**
PHQ	**1.3*** [1.19,1.41]**	**1.81*** [1.65,1.97]**	**2.12*** [1.94,2.31]**	**1.79*** [1.64,1.96]**	**1.96*** [1.8,2.13]**
GAD	**1.99*** [1.81,2.19]**	**3.2*** [2.92,3.51]**	**2.88*** [2.62,3.16]**	**2.13*** [1.94,2.34]**	**3.03*** [2.76,3.33]**
ISI	**1.89*** [1.66,2.15]**	**1.67*** [1.48,1.89]**	**1.93*** [1.7,2.19]**	**1.73*** [1.54,1.95]**	**2.12*** [1.86,2.42]**
PSS	**1.15** [1.06,1.26]**	**1.39*** [1.27,1.51]**	**1.29*** [1.18,1.42]**	1.07 [0.98,1.17]	**1.31*** [1.2,1.43]**

PHQ, Patient Health Questionnaire; GAD, Generalized Anxiety Disorder scale; ISI, Insomnia severity Index; PSS, Perceived Stress Scale; RSA, Resilience Scale For Adults; DOCS, Dimensional Obsessive Compulsive Scale.
*p < .05; **p < .01; ***p < .001.

housing problems, and health problems were associated with all the OCD outcomes except for Contamination symptoms (total OCS: OR, 1.28; 95%CI = 1.18,1.39; OR, 1.22; 95%CI = 1.05,1.41; OR, 1.52; 95% CI = 1.31,1.77, respectively). Regarding the association between the selected mental health outcomes and OCS, depressive symptoms (OR, 1.96; 95%CI = 1.8,2.13), anxiety symptoms (OR, 3.03; 95%CI = 2.76,3.33), and insomnia (OR, 2.12; 95%CI = 1.86,2.42) were associated with total OCS and OCD symptom domains, while PSS was associated with total OCS (OR, 1.31; 95%CI = 1.2,1.43) and OCD domains except for Symmetry/Ordering symptoms (see Table 4).

4. Discussion

In this web-based study, we assessed the prevalence rates of OCS in a large general population sample exposed to the COVID-19 epidemic first wave and related lockdown measures in Italy. To the best of our knowledge, this is the first study investigating the magnitude of OCS in the context of the COVID-19 pandemic in Italy on such a large general population sample. Coherently with previous preliminary reports worldwide (Grant et al., 2021; Guzick et al., 2021), results showed high endorsement rates of OCS in the general population during the first weeks of national lockdown, which correspond to the peak of the COVID-19 health emergency in Italy. Moreover, OCS were associated with self-reported symptoms of depression, anxiety, insomnia, and high perceived stress, as well as with a number of related risk factors including experiencing different stressful events (i.e., working, financial, educational, relationship, health, caregiving, or housing problems) due to the pandemic or lockdown measures.

In the current investigation, clinically relevant OCS were reported by almost 40% of the respondents. Similarly, high prevalence rates of OCD symptoms were found in a general population sample during the first three months of the COVID-19 pandemic in Germany (23.8% and 27.8%) (Jelinek et al., 2021). Compared to an online prospective cohort study in a sample of Chinese medical students (Ji et al., 2020), we found a higher rate of OCS in the initial stage of the pandemic. However, the current OCS prevalence was lower than those reported by two investigations on Canadian (Abba-Aji et al., 2020) and Chinese (Tian et al., 2020) samples in the early stage of the pandemic, i.e., 60.3% and more than 70%, respectively. Such disparities could be due to methodological

differences in assessment tools, sample size, and sample characteristics. It is also possible that other variables, such as cultural differences, may contribute to different endorsement rates of OCS across countries. Moreover, data collection's timing and geographical location have been suggested as critical factors in the interpretation of contrasting results among studies (Guzick et al., 2021). In this respect, Italy was one of the most severely impacted countries at the early stage of the pandemic; at the time of data collection, an unprecedented national lockdown of unknown duration was enforced for the first time in Europe. Therefore, the immediate psychological impact of such a particularly severe and unexpected scenario should be taken into account when interpreting the current high OCS endorsement rates. Accordingly, during the first epidemic wave, higher rates of self-reported symptom worsening were found in clinical samples of individuals with OCD in two Italian investigations compared to other studies with similar methods (see Guzick et al., 2021, for a recent review).

Regarding the OCD symptom dimensions, symptoms in the contamination domain were the most prevalent outcome in this study, with more than half of the sample reporting above the cut-off scores in the Contamination subscale. At the time of the COVID-19 epidemic burden, it is reasonable to hypothesize that the intense focus on preventive measures such as personal hygiene and social distancing may have significantly reinforced or triggered obsessional thoughts concerning this symptom dimension. Therefore, the experience of intrusive and highly distressing obsessional thoughts concerning contamination, typically accompanied by washing/cleaning compulsion, may be particularly sensitive to the probability of contagion. While epidemiological data suggest that a substantial proportion of the general population experience moderately interfering OCS, contamination/cleaning symptoms are relatively infrequent (2%) relative to the other OCD dimensions in the community (Fullana et al., 2010). Therefore, the rapid spread of contagion at the early stage of the health emergency may have dramatically risen the magnitude of such symptoms in the general population, suggesting that OCS, particularly in the contamination domain, were disproportionately affected by the pandemic. Notably, during the timeframe corresponding to the contagion peak in Italy, social distancing and personal hygiene were stressed as principal defense strategies against an unknown viral disease with no available therapeutic protocol or vaccination. Along with this reasoning, in this study

the impact of COVID-19 contextual risk factors on contamination symptoms was lower compared to the other OCD symptom dimensions; this finding probably reflects a specific independent effect of the health emergence on the contamination symptom domain.

Coherently with previous reports on the impact of the pandemic on mental health outcomes (e.g. (Rossi et al., 2021; Wang et al., 2020), OCS were associated with contextual risk factors such as experiencing stressful events, i.e., financial problems, educational difficulties, housing, relational, health and caregiving difficulties specifically due to the pandemic or lockdown measures. Collectively, these findings confirm the relevant psychosocial impact of COVID-19 related events due to both the health emergency itself and the associated restrictive measures. Experiencing stressful life events due to the pandemic at personal and social levels may therefore represent a risk for the endorsements of mental health symptoms across domains; however, the particularly high rates of OCS in this study also suggest a specific effect of the pandemic and restrictive measures on symptom domains related to OCD.

Consistent with previous investigations, female gender (Ahmed et al., 2021; Fontenelle et al., 2021) and younger age (Moreira et al., 2021) were associated with a higher risk for OCS. However, associations between male gender, higher education level, age over 60, and OCS have also been reported (Abba-Aji et al., 2020). Moreover, a history of childhood trauma and any prior psychiatric diagnosis were associated with symptoms in the OC domain. Further elucidating the specific implication of these variables could be therefore of great importance for subsequent targeted intervention strategy for global mental health related to COVID-19 in both the general population and vulnerable groups.

This study has several limitations. Although essential to timely collect a large sample, the web-based sampling technique relying on voluntary recruitment may have introduced several potential biases such as self-selection bias as suggested by the large disproportion in the gender ratio. In addition, the lack of pre-covid mental health assessment represents another limitation of the study. Moreover, this survey was based on self-report instruments that could only suggest a mental disorder and may return different rates compared to interview-based measures. For these reasons, rates of mental health outcomes should be interpreted with caution.

Nevertheless, the large sample size and the sampling timeframe around the pandemic peak provide an important set of data to evaluate the acute impact of the early stage of the pandemic on the Italian population's mental health. Our results indicate high endorsement rates of OCS in the Italian general population exposed to the first COVID-19 epidemic wave, potentially elicited by the immediate psychological impact of the severe pandemic scenario in Italy. Future research is needed to track the evolution of OCD symptoms trajectories over time. It is conceivable that while most individuals will display a resilient response, a minor percentage of individuals will experience a persistent condition with clinically relevant OCS throughout the pandemic. These findings warrant further long-term monitoring of symptoms related to OCD in the population with the potential to inform structured interventions aimed to mitigate the impact of the pandemic on mental health.

Contributors

FP: methodology, data curation, formal analysis, writing – editing and review, VS: methodology, data curation, writing – original draft, GDA: writing – editing and review, TBJ: writing – editing and review, AR: writing – editing and review, AS: writing – editing and review, RR: conceptualization, data curation, writing – editing and review, GDL: conceptualization, supervision.

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