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Suicide attempts and suicidal ideation in patients with Obsessive-Compulsive Disorder: a systematic review and meta-analysis

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Abstract

Introduction

There is controversy on the magnitude of suicide risk in OCD and on the psychopathological features that raise the risk. This systematic review and meta-analysis aims to estimate the pooled prevalence of suicide attempts and suicidal ideation (current/lifetime) in subjects with OCD and identify sociodemographic and clinical factors associated with greater risk.

Methods

We conducted a literature search in PubMed/Medline, PsycINFO, Web of Science and CINAHL databases up to June 20, 2019, according to PRISMA guidelines. Stata statistical software (Version 15) was used to obtain forest plots, execute subgroup analyses and perform univariate and multivariate meta-regressions.

Results

We found 61 eligible studies including OCD patients: 52 investigated suicide attempts and reported a pooled prevalence of 0.135 (95% CI 0.123-0.147); 26 explored current suicidal ideation and reported a pooled prevalence of 0.273 (95% CI 0.214-0.335); 22 researched lifetime suicidal ideation and reported a pooled prevalence of 0.473 (95% CI 0.397-0.548). Severity of obsessions, comorbid substance use and depressive/anxious symptoms increased the risk, whereas compulsions had a comparatively protective effect.

Limitations

Owing to the small number of studies reporting completed suicide rates, this metric was not included in the meta-analysis. The degree of heterogeneity between the studies was high.

Conclusion

Clinicians should keep in mind that one out of ten patients with OCD attempts suicide during his/her lifetime, about one third has current suicidal ideation and about half has had suicidal ideation in the past. Several clinical features are associated with increased risk and should be factored into clinical risk management.

Keywords

Obsessive-Compulsive Disorder; Suicidal Ideation; Suicide Attempts; Risk factors; Risk prevention

1 **Introduction**

2

3 Obsessive-Compulsive Disorder (OCD) is a common and relatively treatment resistant
4 neuropsychiatric disorder. OCD in many cases starts in childhood and pursues a fluctuating chronic
5 course. It has a substantial effect on the quality of life, well-being and global functioning of affected
6 individuals and their family members (Albert et al., 2017; Fineberg et al., 2019). Disability from OCD
7 is substantial, with an estimated number of 7.9 DALYs (disability adjusted life years lost) per 10,000
8 persons in Europe (Wittchen et al., 2011), and with increased rates of several indicators of labor
9 market marginalization (e.g. disability pension, long-term sickness absence, and long-term
10 unemployment) (Pérez-Vigil et al., 2019). An early onset of OCD is additionally associated with a
11 pervasive and profound decrease in educational attainment, spanning compulsory school to
12 postgraduate education (Pérez-Vigil et al., 2018), leading to calls for early clinical intervention
13 strategies to tackle the illness before it takes hold (Fineberg et al., 2019).

14

15 OCD has consistently been found to be associated with a relatively long delay in help seeking (up to
16 11 years) (Garcia-Soriano et al., 2014), and with a long duration of untreated illness (DUI), recently
17 estimated at 7 to 9 years, i.e. one of the longest among psychiatric disorders (Dell’Osso et al., 2010,
18 Albert et al., 2019, Dell’Osso et al., 2019). Longer DUI implies late intervention and predicts a poor
19 treatment response, particularly to pharmacological treatment (Albert et al., 2019; Dell’Osso et al.,
20 2010). Comorbidity with secondary depression in OCD is high (roughly 60%), and correlates with
21 duration of illness (Fineberg et al., 2013).

22

23 OCD has been traditionally thought to be unrelated with an elevated suicide risk (Coryell, 1981;
24 Goodwin et al., 1969; Kringlen, 1965). Suicide is a major preventable cause of premature death
25 worldwide, and research on factors associated with suicidal ideation and behavior in general and in
26 individuals with mental disorders is imperative. Suicidal ideation is defined as the presence of passive
27 thoughts about wanting to be dead or active thoughts about killing oneself, not accompanied by
28 preparatory behaviour (Posner et al., 2007); suicide attempts are recognized as nonfatal self-directed
29 potentially injurious behaviours with any intent to die as a result of the behaviour (Crosby et al.,
30 2011). Recent systematic reviews and meta-analyses, however, have challenged this assumption and
31 suggested that individuals with OCD, especially those suffering from chronic disabling illness, are at
32 higher risk of suicide attempts and suicidal ideation than the general population (Harris, 1997;
33 Angelakis et al., 2015; De La Vega et al., 2018; Albert et al., 2018; Albert et al., 2019a; Albert et al.,
34 2019b). Indeed, the pooled effect size of the association between suicidality (suicide attempts/suicidal

ideation/completed suicides) and a diagnosis of OCD (as compared to controls without that diagnosis) across 30 independent studies was found to be moderate to high (Hedges' $g=0.66$, 95% CI 0.49-0.82) (Angelakis et al., 2015).

However, accurate estimates of the prevalence of suicide attempts and suicidal ideation in individuals with a primary diagnosis of OCD are still lacking. Notably, a considerable variability among OCD studies was found, with rates of suicide attempts ranging from 6 to 52% and of suicidal ideation ranging from 26 to 74% (Albert et al., 2019a), as compared to approximately 0.4% and 2.1% in the general population (Borges et al., 2010). Such differences may be related both to characteristics of the OCD samples included (e.g. subjects referred to specialized centers versus those drawn from the general population) and to the methods used in capturing the data. Identification of the specific characteristics that confer greater risk of suicide in the OCD population, and thus deserve particular attention from clinicians, has substantive theoretical importance and may have practical value.

A recent *systematic review* carried out by our group of studies reporting suicidal ideation and behavior identified several candidate factors associated with suicide risk, including the severity of OCD, the symptom dimension 'unacceptable thoughts', the presence of comorbid Axis I disorders in general, the severity of comorbid depressive and anxiety symptoms, a past history of suicidality and some emotional-cognitive factors such as alexithymia and hopelessness (Albert et al., 2019a). However, this review did not use meta-analytic techniques to estimate pooled prevalence rates of suicidal ideation and suicide attempts; Moreover, we only reported factors associated with greater risk in individual studies (e.g. severity of OCD was associated with higher rates of suicidal ideation in 4 studies) without reporting the whole number of studies that examined each factor (e.g. other studies examined the potential association between suicidal ideation and the severity of OCD but did not confirm this association). As a consequence, it is impossible to draw any firm conclusion concerning the factors associated with increased risk.

The only meta-analysis performed on suicidality in OCD to date (Angelakis et al. 2015) identified a similar group of factors associated with increased suicidality in OCD. However, suicide attempts and suicidal ideation rates were analyzed together. This approach is not ideal, as suicidal thoughts and acts may be mediated by different mechanisms (neural, psychological, behavioural) and may have different risk factors. This meta-analysis had other limitations: only studies performed in adults and only case-control studies were included, the authors did not consider separately current and lifetime suicidal ideation when estimating the effect size of the association between suicidal ideation and

OCD, and they did not use meta-regression techniques to explore patient and study level factors potentially explaining heterogeneity of findings. Another limitation, and a potential source of heterogeneity, was the inclusion in the meta-analysis of studies performed in patients with primary disorders other than OCD but with comorbid OC symptoms. After this meta-analysis, much new data has emerged concerning the prevalence of suicide attempts and suicidal ideation and factors associated with increased risk.

We therefore decided to perform a systematic review *and meta-analysis* with the following aims: 1. To estimate the pooled prevalence rates of lifetime suicide attempts, current suicidal ideation and lifetime suicidal ideation in individuals with a primary diagnosis of OCD (excluding studies performed in samples of individuals with only OC symptoms – e.g. individuals with Bipolar Disorder and OC symptoms), and 2. To identify, through meta-regression and subgroup analyses, the socio-demographic and clinical factors that could explain the variability in prevalence rates, and constitute potential predictors of greater risk. We differentiated between potential predictors of suicide attempts, current suicidal ideation and lifetime suicidal ideation. Completed suicide rates were not included in the meta-analysis as there were not enough studies reporting data on completed suicide.

Methods

This systematic review and meta-analysis was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (PRISMA) (Moher et al., 2009; 2010).

Search Strategy

We conducted a literature search in PubMed/Medline, PsycINFO, Web of Science and CINAHL databases from the date of the first available article to June 20, 2019. The search terms [suicide] OR [suicidality] OR [suicide attempts] OR [suicidal ideation] OR [suicidal thoughts] were combined with [OCD] OR [obsessive*compulsive disorder] OR [obsessive*compulsive symptoms].

Article selection and review strategy

Articles were identified and assessed for eligibility by two independent reviewers (UA and LP), who independently decided which identified articles to include according to eligibility criteria (see below). In case of disagreement, a third author (GM) was consulted to mediate consensual decisions. Duplicate studies were excluded. Cross-references from the articles identified were also examined.

Unpublished studies, conference abstracts or poster presentations were not included. The database search was restricted to English language papers.

Eligibility criteria

The inclusion criteria for the studies were the following: 1) An appropriate case definition of OCD (diagnosis made through specific structured interviews and/or established international criteria); 2) Children/adolescents and/or adults; 3) Cross-sectional or prospective designs; 4) Performed in clinical samples or in the general population (epidemiological studies); 5) Employed a quantitative measure of suicidality in order to derive prevalence rates of lifetime suicide attempts, current or lifetime suicidal ideation. We excluded studies performed in patients with a primary diagnosis other than OCD (e.g. individuals with Bipolar Disorder or Schizophrenia) even when they assessed the impact of obsessive-compulsive symptoms on suicidality in these patients.

Data extraction and imputation

Two authors (LP and GC) independently extracted data from eligible studies using the same template, which allowed collection of the following information, when available: date of publication, country, latitude (North, South, international), study design (cross-sectional, longitudinal), study type (clinical, epidemiological), total sample size, gender distribution, mean age, age group (adults, children/adolescents, mixed), percentage married, years of education, percentage unemployed, diagnostic criteria for OCD, method used to diagnose OCD (clinical interview, semi-structured interview such as SCID-I (First et al., 1996; 2016) or MINI (Sheehan et al., 1998)), age at symptoms onset, age at disorder onset, duration of illness (years), severity of OCD (Yale-Brown Obsessive Compulsive Scale (Goodman et al., 1989) – Y-BOCS – total score), severity of obsessions (Y-BOCS obsessions score) and compulsions (Y-BOCS compulsions score), percentage with childhood trauma, percentage with obsessions and with compulsions, percentage with Axis I comorbidities (current and lifetime separately), percentage with mood disorders, Major Depressive Disorder, Bipolar Disorder, Anxiety Disorders, Substance Use Disorders, Alcohol Use Disorder (current and lifetime), percentage with Axis II comorbidities/Personality Disorders, severity of depressive symptoms (measured with the Hamilton Depression Rating Scale (HDRS) (Hamilton, 1960), Montgomery-Asberg Depression Rating Scale (MADRS) (Montgomery & Asberg, 1979) or Beck Depression Inventory (BDI) (Beck et al., 1996)), severity of anxiety symptoms (measured with the Hamilton Anxiety Rating Scale (HARS) (Hamilton, 1959) and Beck Anxiety Inventory (BAI) (Beck et al., 1988)), hopelessness (Beck Hopelessness Scale (BHS) (Beck, 1988)), screening tool for suicidality, family history for suicide attempts and for completed suicide.

Some articles did not report means or standard deviations (SDs) of several continuous variables (e.g. age at onset) for the entire population, but they provided these data for two independent subgroups. The following formula was used to calculate the weighted mean of continuous variables for the entire population:

$$z = \frac{n}{n+m} x + \frac{m}{n+m} y$$

where z is the mean for the entire population, x and y are the means in the two samples, n and m are the two sample sizes.

The standard deviation (sd) was obtained using the formula:

$$\sigma_z = \sqrt{\left(\frac{n}{n+m} \sigma_x\right)^2 + \left(\frac{m}{n+m} \sigma_y\right)^2}$$

where σ_z is the standard deviation of the entire population, σ_x and σ_y are the standard deviations of the two subgroups.

Appraisal of methodological quality

The methodological quality of the studies was assessed using a modified version of the Quality Assessment Tool (QAT) for Observational Cohort and Cross-Sectional (<https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools>). The tool consists of 14 items that address specific methodological issues. We excluded five items that did not fit with the nature of most studies here considered: item 5 (sample selection procedures), item 6 (exposure assessed prior to outcome measurement), item 10 (repeated measurement of the exposure), item 12 (blinded outcome measurement) and item 13 (follow-up loss rates). For each item satisfied, a point was assigned (yes=1; item not satisfied or for which no sufficient information was available=0). A sum score ranging from 0 to 9 was then calculated.

Statistical analyses

A systematic analytical approach was used to compute the pooled prevalence rates of suicide attempt, current suicidal ideation and past suicidal ideation from all eligible studies. The Stata command metaprop was used to perform meta-analyses of proportions, to derive pooled estimates, to obtain exact binomial confidence intervals and to produce forest plots. The pooled estimates were calculated after Freeman-Tukey Double Arcsine Transformation (Freeman and Tukey, 1950) to stabilize the variances. A random-effects model was selected to summarize the prevalence of suicide attempt, current suicidal ideation and past suicidal ideation, using proportions and 95% confidence intervals (CIs).

Heterogeneity was assessed using Cochran's Q test and I^2 statistic. $I^2 > 50\%$ was considered to denote substantial heterogeneity and in such cases the sources of heterogeneity were explored. Subgroup analyses by study design, latitude, type of study (epidemiological, clinical), age group (adults, adolescents, mixed) were performed to investigate heterogeneity. In addition, the effect of continuous covariates was tested by univariate random meta-regression based on the Der Simonian and Laird (1986) method. We used the method of moments to estimate the additive (between-study) component of variance τ^2 . Multivariable regression analyses were also performed to examine the combined effect of covariates on heterogeneity, and permutation tests were used to adjust the probability level for multiple testing.

In order to evaluate the influence of each study on the pooled prevalence rates, sensitivity analyses were conducted using the leave-one-out approach. The significance level was set at $p < 0.05$. All statistical analyses were performed using Stata version 15 (StataCorp, 2017. *Stata Statistical Software: Release 15*. College Station, TX) and JASP, version 0.10.1, an open source statistical software developed by the University of Amsterdam.

Results

The PRISMA flowchart of studies selected and included in the systematic review and meta-analysis is provided in Figure 1. Table 1 summarizes the characteristics of the 61 studies included in the meta-analysis. The majority of studies were conducted in Europe ($N=15$, 24.6%) and Brazil ($N=13$, 21.3%); only 6 in the USA (9.8%). Four (6.6%) were multicenter studies. Twelve studies (19.7%) included individuals with OCD from the general population (epidemiological studies), while the vast majority included clinical samples of subjects with a diagnosis of OCD referring to specialized centers. Only 5 studies (8.2%) were prospective. The gender distribution was equal across the studies, except for 2 that included only females (Tavares, et al., 2012; Moreira et al., 2013). The mean age of the study samples ranged between 11.9 (Storch et al., 2015) and 43.3 (Dell'Osso et al., 2015); four studies (6.6%) included only adolescents (Apter et al., 2003; Barzilay et al., 2018; Jaisoorya et al., 2015; Storch et al., 2015) with only two of them (Storch et al., 2015 and Barzilay et al., 2018) investigating suicidality in children (from 7 and 11 years respectively). Most studies included only adults (at least 18 years of age), while a minority included both adolescents and adults (e.g. age range 15-80 as in the Khosravani et al., 2017b study).

Figures 1 about here

Table 1 about here

The most widely used tools for assigning a diagnosis of OCD were the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and the Mini International Neuropsychiatric Interview (MINI). Only in 4 (6.6%) studies no semi-structured interview was used and the diagnosis was made according to DSM-III, DSM-IV, DSM-5 or ICD criteria (Chia, 1996; Dell’Osso et al., 2018; Hantouche et al., 2003; Sidorchuk et al., 2019). Suicidality was assessed using different instruments, only some of which were specifically designed to inquire about suicidality (e.g. Beck Suicide Intent Scale - SIS (Beck et al., 1974), Childhood Suicide Potential Scale – CSPS (Pfeffer et al., 2000), Suicide Probability Scale – SPS (Cull, 1988), Scale for Suicidal Ideation – SSI (Beck et al., 1979), Suicidal Ideation Questionnaire-Jr. – SIQ-JR (Reynolds, 1987)); 20 studies (32.8%) used open-ended questions as part of the clinical interview to obtain information about lifetime suicide attempts or suicidal ideation, or not validated specifically designed questionnaires. Only two studies (Chaudhary et al., 2017; Gupta et al., 2014) used the Columbia Suicide Severity Rating Scale (C-SSRS) (Posner et al., 2011), a specific instrument which allows the dimensional analysis of suicidal ideation, its severity and suicidal behaviors. The study quality (assessed with the QAT modified) was relatively homogeneous, as shown in Table 2. None of the studies had a low quality in data reporting (QAT scores of 3-4), while the majority (N=51, 83.6%) had moderate-high quality (QAT scores ≥ 7).

Table 2 about here

Suicide attempts

Of the 52 studies identified, 41 investigated suicidality in individuals referred to clinical centers, while 11 investigated subjects with OCD drawn from the general population (epidemiological studies). The overall random-effects pooled prevalence of suicide attempts was 0.135 (95% CI 0.123-0.147). The forest plot of the studies sorted by year is shown in Figure 2. The random-effect meta-analysis of suicide attempts rates revealed a large heterogeneity among studies, $I^2=92.4\%$, with 7 studies exceeding the upper boundary of the confidence interval of the pooled estimate (Angst et al., 2004; Kamath et al., 2007; Khosravani et al., 2017a, 2017b; Kim et al., 2016; Peles et al., 2009; Torres et al., 2006). The studies with the highest rates of suicide attempts (52% and 86%) (Khosravani et al., 2017a and 2017b) were both conducted in Iran. Supplemental Figure 1 shows the combined estimates of pooled prevalence rates when each of the studies was excluded in turn (sensitivity analyses using

the leave-one-out approach). Omitting the study of Khosravani et al. 2017b changed the pooled prevalence from 0.135 to 0.125. Subgroup analyses showed that the study design (cross-sectional or prospective), the type of study (clinical or epidemiological), the age group (adults only, adolescents only, mixed) and the latitude category did not account significantly for the observed heterogeneity.

Figure 2 about here

Univariate meta-regression analyses carried out on the subsets of studies for which the covariate of interest was available showed that increased rates of suicide attempts were significantly and positively associated with Y-BOCS obsessions subscale score (24 studies, $b=0.047$, $se(b)=0.023$, $p=0.04$, $R^2=10.65\%$) (Figure 3), increased rates of substance use disorders (12 studies, $b=0.342$, $se(b)=0.087$, $p<0.001$, $R^2=86.88\%$) (Figure 4) and severity of depression assessed using the MADRS (3 studies, $b=0.026$, $se(b)=0.012$, $p=0.027$, $R^2=100\%$).

Figure 3 about here

In a multivariable meta-regression analysis conducted on 24 studies, Y-BOCS obsessions had a positive association with suicide attempts ($b=0.068$, $se(b)=0.025$, $p=0.006$) and Y-BOCS compulsions a negative association ($b=-0.047$, $se(b)=0.021$, $p=0.026$). These two variables accounted for 16.9% of the variance among studies.

Figure 4 about here

Current suicidal ideation

The overall random-effects pooled prevalence of current suicidal ideation in the 26 studies included in the meta-analysis was 0.273 (95% CI 0.214-0.335), with a very large heterogeneity $I^2=98\%$ (Figure 5). Supplemental Figure 2 shows the sensitivity analyses using the leave-one-out approach. This analysis showed that none of the studies affected significantly the pooled prevalence estimate. Subgroup analysis revealed significant study variations among countries ($p<0.001$) with a higher prevalence in Southern (0.30, 95% CI 0.23-0.37) vs. Northern countries (0.21, 95% CI 0.14-0.30) (Figure 6), but no variations between design, type of study and age groups.

Figure 5 about here

Figure 6 about here

1 Univariate meta-regression analyses revealed that a higher prevalence of current suicidal ideation was
2 associated with being married (15 studies, $b=0.752$, $se(b)=0.366$, $p=0.040$, $R^2=27.33\%$)
3 (Supplemental Figure 3), having a lower education (12 studies, $b=-0.073$, $se(b)=0.028$, $p=0.009$,
4 $R^2=37.57\%$) (Supplemental Figure 4), higher Y-BOCS obsessions subscale score (13 studies,
5 $b=0.074$, $se(b)=0.036$, $p=0.038$, $R^2=26.26\%$) (supplemental Figure 5), lower rates of aggressive
6 obsessions (5 studies, $b=-0.875$, $se(b)=0.431$, $p=0.042$, $R^2=37.8\%$) and pathological doubts (4
7 studies, $b=-1.179$, $se(b)=0.514$, $p=0.022$, $R^2=88.55\%$), a lower proportion with poor insight (3
8 studies, $b=-1.297$, $se(b)=0.530$, $p=0.015$, $R^2=90.91\%$), a lower proportion with lifetime mood
9 disorders (4 studies, $b=-0.277$, $se(b)=0.096$, $p=0.004$, $R^2=100\%$), and with lifetime Major Depression
10 (6 studies, $b=-1.0438$, $se(b)=0.518$, $p=0.044$), and higher levels of anxiety as measured with the BAI
11 (7 studies, $b=0.039$, $se(b)=0.016$, $p=0.017$, $R^2=34.99\%$).
12

13 In a multivariable meta-regression analysis conducted on 13 studies, Y-BOCS obsessions had a
14 positive association with current suicidal ideation ($b=0.127$, $se(b)=0.037$, $p=0.001$) and Y-BOCS
15 compulsions a negative association ($b=-0.146$, $se(b)=0.047$, $p=0.002$). These two variables accounted
16 for 45.1% of the variance among studies.
17

18 *Lifetime suicidal ideation*

19 In the 22 studies identified, the overall random-effects pooled lifetime prevalence was 0.473 (95%
20 CI 0.397-0.548) and was very heterogeneous $I^2=98.4\%$ among studies (Figure 7). Supplemental
21 Figure 6 shows sensitivity analyses using the leave-one-out approach. This analysis showed that none
22 of the studies affected significantly the pooled prevalence estimate. No differences between type of
23 study, design, age group and countries were found in subgroup analyses.
24

25 *Figure 7 about here*

26
27 Univariate meta-regressions indicated that a higher prevalence of lifetime suicidal ideation was
28 associated with lower education (8 studies, $b=-0.114$, $se(b)=0.042$, $p=0.007$, $R^2=100\%$),
29 unemployment (14 studies, $b=0.268$, $se(b)=0.118$, $p=0.023$, $R^2=2.35\%$) (Figure 8), lower rates of
30 aggressive obsessions (6 studies, $b=-0.979$, $se(b)=0.222$, $p<0.001$, $R^2=92.85\%$), sexual obsessions (4
31 studies, $b=-1.335$, $se(b)=0.224$, $p<0.001$, $R^2=97.35\%$), and religious obsessions (4 studies, $b=-1.396$,
32 $se(b)=0.131$, $p<0.001$, $R^2=100\%$), lower rates of hoarding obsessions (4 studies, $b=-0.929$,
33 $se(b)=0.358$, $p=0.009$, $R^2=97.44\%$), lower rates of ordering/arranging compulsions (5 studies, $b=-$
34 2.121 , $se(b)=1.025$, $p=0.039$, $R^2=74.59\%$), lower rates of lifetime comorbid anxiety disorders (3
35 studies, $b=-1.612$, $se(b)=0.449$, $p<0.001$, $R^2=100\%$), higher rates of lifetime alcohol use disorders (5

studies, $b=1.273$, $se(b)=0.349$, $p<0.001$, $R^2=100\%$), personality disorders (3 studies, $b=1.132$, $se(b)=0.263$, $p<0.001$, $R^2=100\%$), and family history of suicide (5 studies, $b=8.343$, $se(b)=3.529$, $p=0.018$, $R^2=73.74\%$).

Figure 8 about here

In a multivariable meta-regression analysis conducted on 10 studies, Y-BOCS obsessions had a positive association with lifetime suicide ideation ($b=0.09$, $se(b)=0.044$, $p=0.041$) and Y-BOCS compulsions a negative association ($b=-0.119$, $se(b)=0.049$, $p=0.016$).

Table 3 about here

Discussion

This meta-analysis of 61 independent studies confirms previous evidence that patients with OCD are at risk of suicide attempts and suicidal ideation. The review of Angelakis and colleagues (2015) challenged for the first time the historical prejudice that OCD is not a disorder characterized by high risk of suicide and the pooled effect size of the association between OCD and suicidality was estimated to be moderate to high (Hedges' g for suicide attempts: 0.64 and for suicidal ideation: 0.86), although exhibited high heterogeneity (Angelakis et al., 2015). Our meta-analysis builds upon their results and for the first time provides accurate estimates of the prevalence of suicide attempts and suicidal ideation in individuals with a primary diagnosis of OCD.

At least one patient out of ten with OCD attempts suicide during his/her lifetime (pooled prevalence rate 0.13), while nearly half of individuals with OCD have suicidal ideation (pooled prevalence rate of current suicidal ideation: 0.27; pooled prevalence rate of lifetime suicidal ideation: 0.47). These rates are significantly higher than expected in the general population: for example, in the World Health Organization (WHO) World Mental Health (WMH) Survey, in which 108705 adults from 21 countries were interviewed, 12-month prevalence estimates of suicide ideation, plans, and attempts are 2.0%, 0.6%, and 0.3%, respectively, for developed countries and 2.1%, 0.7%, and 0.4%, respectively, for developing countries (Borges et al., 2010).

The clinical implication of these results is that psychiatrists should keep in mind that patients with OCD are at a relatively high risk of suicidal behaviour and this should be actively inquired about,

1 including suicidal ideation, plans, personal history of previous suicide attempts. Active inquiry is
2 essential, as it is possible that many individuals would not spontaneously report suicidality as OCD
3 is known to be associated with secrecy and shame (Weingarden & Renshaw, 2015) (and this may
4 have contributed to the historical prejudice that OCD was not at risk). Clinicians should therefore pay
5 specific attention to eliciting communications of suicidal intentions, ranging from direct statements
6 of intention to die by suicide to indirect ones (e.g. selling things or cleaning out an office or a bedroom
7 incongruously). Indeed, a recent meta-analysis suggests that some kind of suicide communication
8 occurs in about half of the individuals who eventually die by suicide (Pompili et al., 2016). We were
9 not able to include completed suicide rates in the quantitative analyses, as such data in OCD are scant.
10 However, two prospective cohort studies identified by our literature search found that the odds of
11 completed suicide over the period of follow-up (9.7 and 44 years, respectively) is significantly higher
12 than expected (OR 3.02 and 9.83) (Meier et al., 2016; Fernandez de la Cruz et al., 2017), supporting
13 our results. Indeed, the incidence of death by suicide in the 44-year study period was as high as 1.48%
14 (Fernandez de la Cruz et al., 2017), about ten times greater than in the matched controls and not far
15 from the risk of other psychiatric disorders such as Bipolar Disorder (10 to 30 times higher than the
16 general population) (Dome et al., 2019). Presumably, a long duration of illness, which increases the
17 risk of socio-functional impairment and secondary depression, and a long duration of untreated
18 illness, which is an unfavorable prognostic factor, increase suicide risk in OCD. Regrettably, we were
19 not able to quantitatively explore this association due to the shortage of studies reporting information
20 on duration of illness/untreated illness and suicidality.

21
22 In our meta-analysis, a large heterogeneity was found among studies (I^2 between 92.4 and 98.4%).
23 Rates of suicide attempts, for example, varied from 2% (Chia et al., 1996) to 86% (Khosravani et al.,
24 2017b). Moreover, the majority of patients with OCD did not have current or lifetime suicidal
25 ideation, nor did they attempt suicide in their lifetime. This implies that differentiating the risk among
26 patients by identifying predictors of suicidality is of foremost clinical importance and could result in
27 improving our ability to screen subjects at greater risk needing more intensive and careful monitoring
28 so as to allocate clinical resources accordingly. Our second aim was therefore to identify, with meta-
29 regression and subgroup analyses, which socio-demographic and clinical factors explain the
30 variability in prevalence rates, and could be associated with greater risk of suicide attempts and
31 suicidal ideation. These factors should be included in any clinical assessment of suicidal risk.

32
33 Subgroup analyses showed that the study sample (clinical or community samples) did not account
34 significantly for the observed heterogeneity in prevalence rates of suicide attempts or suicidal

ideation, suggesting that the risk of suicide in OCD is not only confined to individuals referred to specialized, tertiary centers (presumably with more severe or longstanding OCD). The type of obsessive-compulsive symptomatology expressed by participants did, however, explain some of the heterogeneity in the prevalence rates of suicidal ideation: aggressive, sexual and religious obsessions (the so-called “taboo thoughts” dimension) was associated with lower suicidal ideation rates (possible protective factors). Another possible protective factor was the lifetime presence of comorbid Anxiety Disorder.

In contrast, an increased prevalence of suicide attempts was associated with (in order of decreasing magnitude) higher severity of obsessions, lower severity of compulsions, presence of comorbid substance use disorders and higher severity of depressive symptoms. Higher severity of obsessions was also associated with higher prevalence rates of lifetime/current suicidal ideation. However, increased suicidal ideation, either current or lifetime, was also associated with additional factors: lower education, higher unemployment rates, lifetime alcohol use disorders, personality disorders, family history of completed suicide. Of these, poor education, being unemployed, and a family history of suicide are known to be associated with suicide risk in several other Axis I disorders.

Several studies have reported that a family history of suicide attempts or completed suicide is common in individuals with OCD, with rates ranging from 11.5% to 27.1% for family history of suicide attempts and from 8.9% to 16.1% for family history of completed suicide (see Albert et al., 2019a). As we were unable to investigate completed suicide rates in individuals with OCD, we could not test the extent to which a family history of completed suicide would increase the risk for completed suicide. However, the present meta-analysis suggests that a family history of completed suicide only (and not a family history of both attempts and completed suicide combined) explains some of the heterogeneity of the rates of suicidal ideation (this variable accounted for 73.74% of the variance among studies). Interestingly, however, family history of completed suicide was not associated with suicide attempts. Nevertheless, a family history of completed suicide represents another common risk factor predicting suicidality in OCD.

Comorbid personality disorders and alcohol/substance use disorders may also be viewed as risk factors for suicidality. Angelakis and colleagues (2015), for example, indicated that subjects with comorbid Axis I disorders in general had higher suicidality rates. We investigated the contribution of specific diagnoses, finding that only substance/alcohol use disorders and personality disorders increased the risk of suicidal ideation or attempts. A recent nation-wide, prospective, register-based

study of patients with severe mental illness (Schizophrenia, Bipolar Disorder, Unipolar Disorder and Personality Disorders) found a 2-to-3-fold increased risk of completed suicide or suicide attempts in subjects with comorbid substance use disorders (Østergaard et al., 2017). The population-based study performed in Sweden by Fernandez de la Cruz and others (2017) confirmed that having a Substance Use Disorder or a Personality Disorder increased the risk of dying by suicide or attempting suicide also among individuals with OCD. Clinicians should therefore actively inquire about consumption of alcohol and/or illicit substances in individuals with OCD in order to select people in need of closer monitoring for prevention of suicidality.

Addictive behaviors and substance abuse in OCD may reflect poorer impulse control, which may independently raise the risk of suicidal behaviors. In a preliminary study, increased attentional impulsivity, measured through the Barratt Impulsiveness Scale, and poorer reward-based decision making, measured through the Cambridge Gambling Task, were identified in a subsample of patients with OCD and comorbid Alcohol Use Disorder compared to a non-comorbid subgroup (Anger O. et al., 2016). OCD is a disorder already known to be associated with poor impulse control (Chamberlain et al., 2016) and poor impulse control has been linked to suicidality in affective disorders such as Major Depression Disorder and Bipolar Disorder (Pompili et al., 2008).

The role of impulsivity in suicidal behaviours within the OCD population therefore merits further study. A recent study (Liaugaudaite V. et al., 2020) investigating suicidal behaviour in patients with depression and anxiety found that neurocognitive deficits in specific executive function domains such as impulsive decision making and risk taking, but not executive planning or set-shifting, measured through the Cambridge Neuropsychological Test Automated Battery (CANTAB) (Robbins et al., 1994), differentiated those with suicidal ideation. In OCD, abnormalities in the Cambridge Gambling Task have been inconsistently found (Cavedini et al., 2002; Chamberlain et al., 2007) and perhaps when present could indicate a more impulsive subgroup, with a greater risk of suicidal behaviour. If substantiated in OCD, findings such as these could be of great clinical relevance and could hypothetically constitute trans-diagnostic markers of suicidality. For example, clinical application of instruments such as the Barratt Impulsiveness Scale (Patton et al., 1995) or even the Cambridge Gambling Task (Robbins, 1994) could potentially help identify those with higher risk of suicidality.

As to other comorbidities, we replicated the finding of a previous large epidemiological study (Fernandez de la Cruz et al., 2017) that lifetime diagnosis of comorbid Anxiety Disorder has a protective effect against suicidal behaviours. In the aforementioned study, the protective effect of

Anxiety Disorders was against deaths by suicide, whilst in our meta-analysis it applies to suicidal ideation. The reason why the presence of an Anxiety Disorder is protective is unclear but could hypothetically be related to high trait levels of harm avoidance typically associated with the presence of an Anxiety Disorder diagnosis (Rettew et al., 2006). However, on the contrary, we also found that the severity of comorbid anxiety symptoms (BAI total score) was related to higher suicidal ideation. Moreover, the severity of depressive symptoms was also associated with a higher suicide attempt rate, also confirming the results of the previous meta-analysis (Angelakis et al., 2015). From a clinical point of view, in assessing suicide risk, it would seem more important to examine the severity of comorbid affective or anxiety symptoms (state measures) than the lifetime presence of a comorbid disorder (trait measures), in order to identify individuals at greater risk of suicidal ideation. For future research, a scale such as the STAI (Spielberg et al., 2019) might be particularly suitable for measuring the two distinct concepts of state anxiety and trait anxiety and their respective relationship with suicidal ideation in OCD.

Intriguingly, according to our meta-regression analyses, the severity of obsessions and compulsions significantly accounted for the variability in prevalence rates of suicidal ideation and attempts, but in an opposite direction (higher rates in patients with more severe obsessions and lower rates in patients with more severe compulsions). How can we explain this seemingly paradoxical finding? Converging evidence from brain imaging studies in patients with OCD has identified dysfunction in specific neuronal circuits (Mataix-Cols et al., 2004, Fineberg et al., 2018). Recent research has therefore turned to explore neuromodulation such as deep brain stimulation (DBS) and non-invasive alternatives including rTMS and dTCS as treatment for non-responders to standard psychotherapy or pharmacotherapy. Emerging evidence from a recent study of DBS (Tyagi et al., 2019) suggests that stimulating the ventro-medial (“affective”) cortico-striatal tract or the lateral orbito-fronto-striatal (“cognitive”) loop may differentially modulate OCD outcomes, with the former being particularly effective at improving comorbid depressive symptoms and the latter improving deficits in executive function involving cognitive inflexibility.

As obsessions and compulsions have opposite independent effects on suicidality, we may put forward the hypothesis that they are elicited by different underpinning neurocircuits. More specifically we suggest that obsessions are more closely related to ventral “affective” neurocircuitry that modulates the emotional regulation of impulse control, whereas compulsions may be more closely linked to the cognitive cortico-striatal tracts that control executive functions. Indeed, the presence of compulsions may indicate relatively impaired executive function that could somehow interfere in a protective way

1 with the expression of suicidal behaviour. If substantiated, e.g. via further translational neuroscience
2 research, these findings may have implications for the individualised treatment of suicidal behaviours
3 in OCD.

4
5 In summary, our results clearly suggest that patients with obsessions are at higher risk than those with
6 predominantly compulsions and should be treated more cautiously. Individuals with obsessions may
7 respond better to therapies targeting “affective” mechanisms, and in the case of neuromodulation this
8 may be particularly relevant for choosing the target site. Clinicians should therefore inquire about the
9 overall severity of the disorder when assessing an individual with OCD, but remember to specifically
10 evaluate the severity of obsessions and compulsions separately, as severe obsessions could be an
11 OCD-specific marker of suicidality.

12
13 As to the specific effect of different obsessive-compulsive dimensions on suicide attempts and
14 suicidal ideation rates, controversies emerge from the literature; individual studies suggested that the
15 unacceptable thoughts dimension (aggressive, sexual and religious obsessions) is associated with
16 greater risk for suicidal ideation (Balci & Sevincok, 2010; Torres et al., 2011; Kim et al., 2016;
17 Velloso et al., 2016; Khosravani et al., 2017) and for suicide attempts (Velloso et al., 2016;
18 Khosravani et al., 2017). However, in our meta-regression analyses we found no effect on suicide
19 attempts rates of aggressive, sexual or religious obsessions, and again intriguingly a protective effect
20 of these dimensions on suicidal ideation. Although we could not examine separately the effect of the
21 fear of losing control and committing suicide or harming self on suicide rates (in clinical practice it
22 may be difficult to differentiate between suicidal ideation and obsessive thoughts about committing
23 suicide), we suggest that individuals who present with aggressive obsessions (including those with
24 obsessions about committing suicide) should not be viewed per se as at greater risk of giving in to the
25 urge. However, our conclusions on the effect of these obsessive-compulsive dimensions on suicidal
26 behaviours are based upon a small number of studies and therefore the results should be interpreted
27 cautiously.

28
29 To date, there are no established treatments for reducing suicidality in OCD. Indeed, the only agents
30 known to be reliably effective in reducing suicidality are lithium (in Affective Disorders) and
31 clozapine (in Schizophrenia). Flupentixol has also been found to reduce suicidal and para-suicidal
32 behaviors in one study investigating patients with Personality Disorders (Montgomery et al., 1982).
33 For other disorders such as OCD, preventive strategies primarily involve identifying predictors of
34 suicidality and intervening on modifiable risk factors. In our review, we found only one small

randomized controlled trial investigating the effects of an intervention on risk factor modification in patients with OCD. In this study, a one-session intervention targeting ‘anxiety sensitivity cognitive concerns’ proved to be effective in reducing ‘anxiety sensitivity’ and such changes mediated positive changes in suicidality at one-month follow-up (Raines et al., 2015). Unfortunately, no other studies assessed or proposed similar interventions via targeting other risk factors.

Limitations and strengths

The main limitation of our study is that we could not include completed suicide rates in the meta-analysis due to the small number of studies reporting this type of information. The most updated and large epidemiological study (Fernandez de la Cruz et al., 2017), indeed, found that individuals with OCD had an increased risk of dying by suicide in a 44-year study period (unadjusted OR: 9.83, incidence rate: 1.48%). It may be that, as seen in studies of affective disorders (Hawton et al., 2005), factors associated with suicide attempts and suicidal ideation are different from those predicting completed suicide. Future prospective studies are needed to address this specific issue and progress from hypotheses generated through tests of association to confirmatory analyses with specific reference to the OCD population.

Despite establishing strict criteria for the inclusion of studies in the meta-analysis, a large heterogeneity was found in both prevalence rates of suicide attempts and suicidal ideation that to some extent limits our confidence in the findings. However, by performing several subgroup and meta-regression analyses, we identified various factors that explain this heterogeneity and that we were then able to integrate into our interpretation of results.

Another limitation, which contributed to the heterogeneity of results, is the use of different instruments to assess suicide attempts and suicidal ideation in several of the studies included in the meta-analysis. Twenty studies (32.8%) used open-ended questions as part of the clinical interview to obtain information about lifetime suicide attempts or suicidal ideation, or not validated specifically designed questionnaires. Some of the studies used a single item of a more complex rating scale (e.g. the HAM-D) and only 2 studies (Chaudhary et al., 2017; Gupta et al., 2014) used the Columbia Suicide Severity Rating Scale (C-SSRS), a specific instrument which allows the dimensional analysis of suicidal ideation, its severity and suicidal behaviors. Moreover, the vast majority of studies included were cross-sectional (only 8.2% used a prospective design); combined with the lack of use of specific instruments, this can make the estimate of suicide attempts or suicidal ideation rates in that specific study unreliable. The lack of a shared nomenclature to define suicide related terms is a

common issue in studies investigating suicidal ideation and behaviours, as well as the lack of lethality assessment of attempts. Future studies with a longitudinal design and proper definition of suicide phenomena (Silverman et al., 2007a; Silverman et al., 2007b) should further investigate this subject in OCD in order to advance suicide research and prevention.

We did not pre-register the protocol of this meta-analysis on the International Prospective Register of Systematic Reviews Prospero (Center for Reviews and Dissemination, University of York), because they recently introduced a new rule of accepting only reviews whose data extraction has not yet started.

Last, our bibliographic search was carried over eleven months ago and therefore it is likely that new studies have been published in the meantime and been missed in our quantitative analyses. Therefore, we decided to re-run our search and found that only one study investigating suicidality in OCD (Benatti et al., 2020) was published in this period of time. The aim of this study was to characterize suicidal behaviours (suicidal ideation and suicide attempts) among patients with OCD and OCTD (Obsessive-Compulsive Tic-related Disorder). No differences between groups were found in terms of ideation (OCTD: 23.7%, OCD: 25.4%), while attempts rates were significantly higher in individuals with OCTD (16%) compared to individuals with OCD (13.3%). These results are very similar to our pooled prevalence rates and considering also the large number of studies we obtained in our meta-analysis and whose data we analysed, we have confidence that the impact of this one study on the overall results would be negligible.

Despite these limitations, our meta-analysis has several strengths; it includes a large number of individual studies (N=61), both clinical and epidemiological ones, most of good quality, performed in individuals of all ages with a primary diagnosis of OCD. Only two studies investigated suicidality in children with OCD and we have identified this lack of data as an evidence gap that needs to be filled with future research. Moreover, to examine the potential contribution to suicidality of several generic/transdiagnostic factors, OCD-specific factors and comorbidities, we considered separately factors potentially contributing to increasing suicide attempts and those contributing to suicidal ideation.

Conclusions

Our study builds upon previous results and clearly shows that individuals with OCD are at significant risk for attempting suicide and having suicidal ideation. Approximately 50% of subjects with OCD

1 are exposed to the risk of suicidal ideation and 13% of them attempt suicide during their lifetime.
2 Clinicians are therefore recommended to inquire about several potential predictors (i.e. severity of
3 obsessions versus compulsions, comorbid substance use disorders, low educational level,
4 unemployment, family history of completed suicide, severity of comorbid depressive and anxiety
5 symptoms) as red flags that may identify patients at greater risk.

6

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1 ***Declaration of competing interests:***

2 Prof. Naomi A. Fineberg declares that in the past 3 years she has held research or networking grants
3 from the ECNP, UK NIHR, EU H2020, MRC, University of Hertfordshire; she has accepted travel
4 and/or hospitality expenses from the BAP, ECNP, RCPsych, CINP, International Forum of Mood and
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6 she has received payment from Taylor and Francis and Elsevier for editorial duties. In the past 3
7 years, she has accepted a paid speaking engagement in a webinar sponsored by Abbott. Previously,
8 she has accepted paid speaking engagements in various industry supported symposia and has recruited
9 patients for various industry-sponsored studies in the field of OCD treatment. She leads an NHS
10 treatment service for OCD. She holds Board membership for various registered charities linked to
11 OCD. She gives expert advice on psychopharmacology to the UK MHRA and NICE.

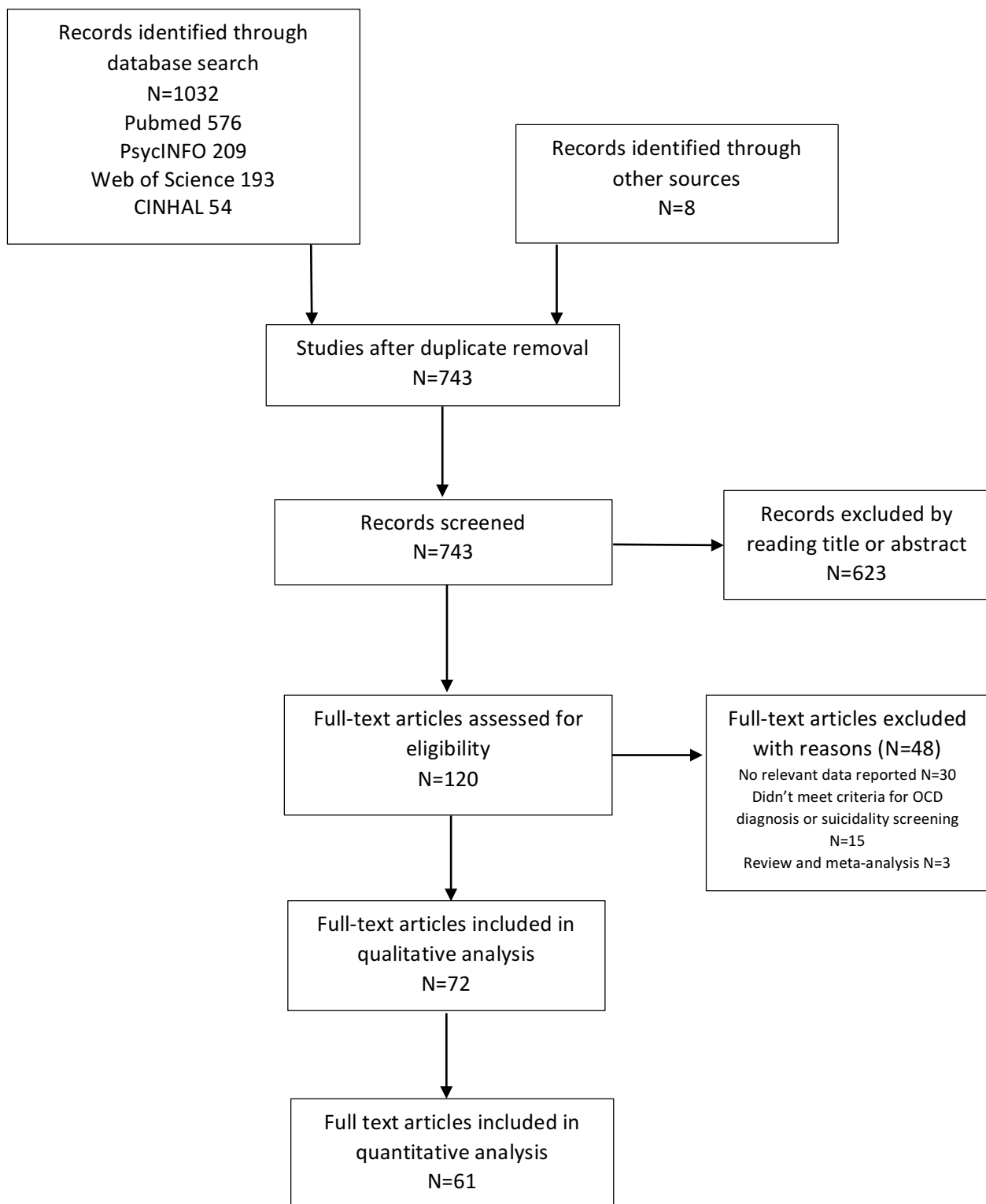
12 Prof. Umberto Albert declares that in the past 3 years has been a consultant and/or a speaker for
13 Angelini, Neuraxpharm, Janssen Cilag, Lundbeck, Innova Pharma.

14 Prof. Giuseppe Maina declares that in the past 3 years has been a consultant and/or a speaker for
15 Janssen Cilag, Otsuka, Angelini, Lundbeck, Boheringer, Innova Pharma.

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1 Figure 1: Flow Chart of studies included in the meta-analysis
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1 Table 1 – Descriptive characteristics of studies included in the meta-analysis (N=61).
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Study	Country	Study Design	Screening Tool for OCD	Screening Tool for Suicidality	Mode of Suicidality	Target Population	OCD Sample Size N	Men (%)	Age (years)
Aguglia et al. (2017)	Italy	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Hamilton Anxiety Rating Scale (HARS) and 17-items Hamilton Depression Rating Scale (HDRS) - Time and methods of suicide attempts systematically assessed as part of clinical interview	Lifetime suicide attempts	Individuals with OCD and Y-BOCS ≥ 16	104	59.62	M = 35.9 (SD = 14.0)
Alonso et al. (2010)	Spain	Prospective cohort	Structured Clinical Interview for DSM-IV Axis I Disorders-Clinician Version (SCID-CV), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Item 3 of the Hamilton Depression Rating Scale (HDRS), Beck Suicide Intent Scale (SIS)	Suicide attempts & Current suicidal ideation	Individuals with OCD	218	57.34	M = 31.3 (SD = 10.8) Range: 18-65
Angst et al. (2004)	Switzerland	Prospective cohort	Structured Psychopathological Interview and Rating of the Social Consequences for Epidemiology (SPIKE)	Open-ended question as part of clinical assessment	Suicide attempts	General population	111	49.55	n/r
Angst et al. (2005)	Switzerland	Prospective cohort	Structured Psychopathological Interview, Rating of the Social Consequences for Epidemiology (SPIKE)	Open-ended question as part of clinical assessment	Suicide attempts	General population	32	75.00	n/r
Apter et al. (2003)	France	Cross-sectional	Schedule for Affective Disorders and Schizophrenia – Childhood Version (K-SADS)	Childhood Suicide Potential Scale (CSPS)	Suicide attempts (past 6-month)	Adolescents from an inpatient unit	40	70.00	M = 16.44 (SD = 2.06)
Ay et al. (2018)	Turkey	Cross-sectional	OCD diagnosis criteria from DSM-5, Yale-Brown Obsessive-Compulsive Scale (Y-BOCS)	Suicide Probability Scale (SPS), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI)	Suicide attempts	Individuals with OCD	67	47.76	M = 30.19 (SD = 9.06) Range: 18-65
Balci et al. (2010)	Turkey	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicidal Ideation (SSI)	Suicide attempts & Current suicidal ideation	Individuals with OCD and Y-BOCS score ≥ 16	44	22.73	M = 34.72 (SD = 8.35)
Barzilay et al. (2018)	USA	Cross-sectional	Structured screening interview (GOASSESS) based on the Schedule for Affective Disorders and Schizophrenia – Childhood Version (K-SADS)	Direct question as part of the screening interview	Lifetime suicidal ideation	General population adolescents	2697	41.38	M = 15.8 (SD = 2.7) Range: 11-21
Batterham et al. (2017)	Australia	Cross-sectional	Online questionnaire based on DSM-5 diagnostic criteria	Online questionnaire specific items	Suicide attempts (past 30 days) & Current suicidal ideation	Adult social media users from the general population	447	n/r	n/r
Blanco-Vieira et al. (2019)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–	Open-ended question as part of clinical interview	Suicide attempts	Individuals with OCD	955	41.88	M = 33 Range: 18-82

			Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY- BOCS)						
Brakoulias et al. (2017)	International study	Cross- sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID- I), Mini International Neuropsychiatric Interview – plus version (MINI), Anxiety Disorder Interview Schedule for DSM-IV – lifetime version (ADIS), Yale– Brown Obsessive–Compulsive Scale (Y-BOCS)	Specifically designed clinical survey	Suicide attempts & Current suicidal ideation	Individuals with OCD	3711	49.15	M = 35.2 (SD = 11.9)
Breet et al. (2019)	South Africa	Cross- sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID- I), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY- BOCS)	Specific item of the Disability Profile, suicide subsection of the Diagnostic Interview for Genetic Studies (DIGS 2.0)	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	496	48.19	M = 34.83 (SD = 11.82) Range: 18-75
Brown et al. (2018)	USA	Cross- sectional	Mini International Neuropsychiatric Interview (MINI), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS)	Suicide item of the Beck Depression Inventory (BDI-II)	Current suicidal ideation	Treatment-seeking adults	124	n/r	n/r
Chakraborty et al. (2012)	India	Cross- sectional	Mini International Neuropsychiatric Interview (MINI), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS)	Module C of the Mini International Neuropsychiatric Interview (MINI)	Suicide attempts	Individuals with OCD and Y-BOCS score ≥ 16	200	53.00	M = 29.97 (SD = 9.52)
Chaudhary et al. (2017)	India	Cross- sectional	International Classification of Desease, 10 th edition criteria (ICD- 10), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS)	Columbia Suicide Severity Rating Scale (C-SSRS)	Suicide attempts & Current suicidal ideation	Individuals with OCD	50	60.00	n/r
Chia (1996)	Singapore	Cross- sectional	DSM-III criteria	open question clinical interview	Suicide attempts	Individuals with OCD	283	58.30	n/r
Cho et al. (2016)	South Korea	Cross- sectional	Korean version of the Composite International Diagnostic Interview (K-CIDI)	Specifically designed structured interview	Suicide attempts & Lifetime suicidal ideation	General population	40	n/r	Range: 18-64
De Berardis et al. (2014)	Italy	Cross- sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID- I), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS)	Scale for Suicidal Ideation (SSI)	Suicide attempts	Individuals with OCD and Y-BOCS ≥ 16	79	54.43	M = 28.7 (SD = 8.0) Range: 18-44
De Berardis et al. (2015)	Italy	Cross- sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID- I), Yale–Brown Obsessive– Compulsive Scale (Y-BOCS)	Scale for Suicidal Ideation (SSI)	Suicide attempts & Current suicidal ideation	Individuals with OCD and Y-BOCS ≥ 16	104	50.00	M = 32.1 8 (SD = 8.0) Range: 18-45
Dell'Osso et al. (2013)	International Study	Cross- sectional	Mini International Neuropsychiatric Interview	Module C of the Mini International Neuropsychiatric Interview (MINI)	Suicide attempts	Individual with OCD	376	39.89	M = 42.7 (SD = 12.8)

			(MINI), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)						
Dell'Osso et al. (2015)	International Study	Cross-sectional	Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	n/r	Suicide attempts	Individuals with OCD	483	39.96	M = 43.3 (SD = 13.1)
Dell'Osso et al. (2017)	International Study	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Clinical interview	Suicide attempts	Individuals with OCD	425	42.35	M = 42.9 (SD = 12.6)
Dell'Osso et al. (2018)	Italy	Cross-sectional	DSM-5 diagnostic criteria for OCD	To-be-validated questionnaire	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	132	48.48	M = 37.4 (SD = 13.4)
Dhyani et al. (2013)	India	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicidal Ideation (SSI), Beck Hopelessness Scale (BHS)	Suicide attempts & Current suicidal ideation	Individuals with OCD	52	65.38	Range: 18-45
Dominigues-Castro et al. (2019)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Specifically designed questionnaire	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	955	41.88	M = 35.8 (SD = 12.5)
Dos Santos-Ribeiro et al. (2016)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Assessment package	Suicide attempts & Current suicidal ideation	Individuals with OCD	1001	43.16	M = 34.81 (SD = 12.7)
Fernandez de la Cruz et al. (2016)	Sweden	Cross-sectional	International Classification of Diseases, 8 th , 9 th , or 10 th edition criteria (ICD-8, -9, or -10)	Data collected from hospital admission reports or national cause of death registers	Suicide attempts	Individuals with OCD	36788	43.48	n/r
Fontenelle et al. (2012)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI)	Suicide attempts, Current & Lifetime suicidal ideation	Individuals with OCD	957	43.05	M = 34.7 (SD = 11.1)
Gentil et al. (2008)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI)	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	630	43.65	n/r

Goodwin et al. (2002)	USA	Cross-sectional	National Anxiety Disorders Screening Day survey (NADSD)	National Anxiety Disorders Screening Day survey (NADSD)	Current suicidal ideation	General Population	3069	30.99	n/r
Gupta et al. (2014)	India	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders – Clinician Version (SCID-CV), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicidal Ideation (SSI), Columbia Suicide Severity Rating Scale (C-SSRS)	Suicide attempts, Current & Lifetime suicidal ideation	Individuals with OCD	130	53.85	M = 31.6 (SD = 9.4) Range: 18-60
Hantouche et al. (2003)	France	Cross-sectional	DSM-IV diagnostic criteria for OCD	Specifically designed self-assessment questionnaire	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	574	43.90	M = 35.5 (SD = 9.16)
Hollander et al. (1996)	USA	Cross-sectional	Diagnostic Interview Schedule (DIS)	Diagnostic Interview Schedule (DIS)	Suicide attempts	General Population	406	34.24	n/r
Hung et al. (2010)	Taiwan	Cross-sectional	DSM-IV diagnostic criteria for OCD, Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Beck Scale for Suicidal Ideation (BSS), Beck Depression Inventory II (BDI-II), Beck Anxiety Inventory (BAI)	Current suicidal ideation	Individuals with OCD	128	64.06	M = 33.21 (SD = 7.52) Range: 15-55
Jaisoorya et al. (2015)	India	Cross-sectional	Self-administered questionnaire based on the Clinical Interview Schedule – Revised (CIS-R) and the Composite International Diagnostic Interview (CIDI)	Specific items as part of the survey	Suicide attempts & Lifetime suicidal ideation	General population students (High school)	61	70.49	M = 15.5 (SD = 1.5) Range: 12-18
Jaisoorya et al. (2017)	India	Cross-sectional	Self-administered questionnaire based on the Clinical Interview Schedule – Revised (CIS-R) and the Composite International Diagnostic Interview (CIDI)	Specific items as part of the survey	Suicide attempts, Lifetime suicidal ideation & Suicidality	General population students (College)	164	37.20	Range: 18-25
Kamath et al. (2007)	India	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicide Ideation (SSI)	Suicide attempts, Current & Lifetime Suicidal ideation	Individuals with OCD	100	59.00	M = 27.03 (SD = 9.92)
Khosravani et al. (2017)	Iran	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders - Patient Version (SCID-P), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Obsessive-Compulsive Scale (DOCS)	Scale for Suicide Ideation (SSI), clinical interview for previous suicide attempts	Suicide attempts & Current suicidal ideation	Individuals with OCD	60	48.33	M = 33.87 (SD = 12.7) Range: 18-75
Khosravani et al. (2017b)	Iran	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders – Patient Version (SCID-P), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicide Ideation (SSI), clinical interview for previous suicide attempts	Suicide attempts & Current suicidal ideation	Individuals with OCD and at least one lifetime suicide attempt	70	50.00	M = 35.43 (SD = 11.79) Range: 15-80
Kim et al. (2016)	South Korea	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders - Patient Version (SCID-P), Yale–Brown	Scale for Suicide Ideation (SSI), clinical interview for previous suicide attempts	Suicide attempts & Current	Individuals with OCD	81	61.73	M = 28.3 (SD = 6.41)

			Obsessive–Compulsive Scale (Y-BOCS), Dimensional Obsessive-Compulsive Scale (DOCS)		suicidal ideation				
Mahasuar et al. (2011)	India	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Scale for Suicide Ideation (SSI), Hamilton Depression Rating Scale (HDRS)	Suicide attempts	Individuals with OCD and at least one lifetime maniac episode	91	72.53	M = 29.0 (SD = 5.84)
Maina et al. (2006)	Italy	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Item 3 of the Hamilton Depression Rating Scale (HDRS)	Current suicidal ideation	Individuals with OCD and Y-BOCS ≥ 16	167	48.50	M = 35.46 (SD = 12.1)
Maina et al. (2007)	Italy	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Item 3 of the Hamilton Depression Rating Scale (HDRS)	Suicide attempts & Current suicidal ideation	Individuals with OCD and Y-BOCS ≥ 16	116	52.59	M = 35.0 (SD = 9.42)
Moreira et al. (2013)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Beck Depression Inventory II (BDI-II), Beck Anxiety Inventory (BAI)	Suicide attempts & Lifetime suicidal ideation	Women with OCD	455	0.00	M = 34.9 (SD = 8.5)
Peles et al. (2009)	Israel	Cross-sectional	Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Structured questionnaire	Suicide attempts	Individuals with OCD	67	50.75	n/r
Phillips et al. (2007)	USA	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I and II Disorders (SCID-I and -II), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Semi-structured interview	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD or BDD	250	43.60	M = 39.3 (SD = 10.7)
Sallet et al. (2010)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Beck Depression Inventory II (BDI-II), Beck Anxiety Inventory (BAI)	Suicide attempts	Individuals with OCD	815	41.72	M = 34.9 (SE=1.51)
Saraf et al. (2017)	India	Cross-sectional	Mini International Neuropsychiatric Interview (MINI), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Open question as part of clinical interview	Suicide attempts	Individuals with OCD	171	66.67	M = 28.9 (SD = 9.52) Range: 16-65
Sareen et al. (2005)	Netherlands	Prospective cohort	Computerized version of the Composite International Diagnostic Interview (CIDI)	Items from the Composite International Diagnostic Interview (CIDI)	Suicide attempts & Lifetime suicidal ideation	General population	61	n/r	n/r
Sidorchuk et al. (2019)	Sweden	Prospective cohort	International Classification of Diseases, 8 th , 9 th , or 10 th edition criteria (ICD-8, -9, or -10)	Swedish national registers	Suicide attempts	General population	21.859	42.41	n/r

Skapinakis et al. (2019)	Greece	Cross-sectional	Clinical Interview Schedule – Revised (CIS-R)	Specific items of the Greek Psychiatric Morbidity Survey	Current suicidal ideation	General population	83	37.35	Range: 18-70
Storch et al. (2015)	USA	Cross-sectional	Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime (K-SADS-PL), Children’s Yale–Brown Obsessive–Compulsive Scale (CY-BOCS), CY-BOCS Symptom Checklist	Suicidal Ideation Questionnaire – JR (SIQ-JR)	Current suicidal ideation	Youth with OCD	54	61.11	M = 11.87 (SD = 3.22) Range: 7-17
Storch et al. (2017)	USA	Cross-sectional	Yale–Brown Obsessive–Compulsive Scale – Self Report (Y-BOCS-SR), Obsessive Compulsive Inventory – Revised (OCI-R)	Columbia Suicide Severity Rating Scale (C-SSRS)	Current suicidal ideation	Individuals with OCD	101	44.55	M = 31.07 (SD = 28.30)
Tavares et al. (2012)	Brazil	Cross-sectional	Mini International Neuropsychiatric Interview (MINI)	Mini International Neuropsychiatric Interview (MINI)	Suicidality	Postpartum Women	48	0.00	n/r
Torres et al. (2006)	Britain	Cross-sectional	Clinical Interview Schedule – Revised (CIS-R)	Composite International Diagnostic Interview (CIDI)	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	114	39.47	Range: 16-74
Torres et al. (2007)	Brazil	Cross-sectional	DSM-IV diagnostic criteria for OCD, Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Specifically designed questionnaire	Suicide attempts, Current & Lifetime Suicidal ideation	Individuals with OCD	50	44.00	M = 36.5 (SD = 12.18) Range: 17-65
Torres et al. (2011)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Specifically designed questionnaire	Suicide attempts, Current & Lifetime Suicidal ideation	Individuals with OCD	582	43.64	M = 34.74 (SE=0.52)
Torres et al. (2013)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Specifically designed questionnaire	Suicide attempts, Current & Lifetime Suicidal ideation	Individuals with OCD	955	41.88	M = 35.8 (SD = 12.4)
Torresan et al. (2013)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)	Specifically designed questionnaire	Suicide attempts & Lifetime suicidal ideation	Individuals with OCD	858	41.26	M = 35.4 (SD = 12.1) Range: 18-77
Velloso et al. (2016)	Brazil	Cross-sectional	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-	Specifically designed questionnaire	Suicide attempts &	Individuals with OCD	548	45.99	M = 34.3 (SD = 11.3)

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			I), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS), Dimensional Yale–Brown Obsessive–Compulsive Scale (DY-BOCS)		Current suicidal ideation				
Viswanath et al. (2012)	India	Cross-sectional	Mini International Neuropsychiatric Interview – plus version (MINI), Yale–Brown Obsessive–Compulsive Scale (Y-BOCS)	Mini International Neuropsychiatric Interview – plus version (MINI)	Suicide attempts & Current suicidal ideation	Individuals with OCD	545	60.92	M = 29.3 (SD = 10.6)

Note: M = mean; SD = standard deviation; n/r = not reported

1 Table 2 –Quality assessment of studies included in the meta-analysis (N=61)
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Study	1	2	3	4	7	8	9	11	14	Score
Aguglia et al. (2017)	1	1	1	1	1	0	1	1	1	8
Alonso et al. (2010)	1	1	1	1	1	0	1	1	1	8
Angst et al. (2004)	1	1	1	1	1	1	1	0	0	7
Angst et al. (2005)	1	1	1	1	1	1	1	0	1	8
Apter et al. (2003)	1	1	1	1	0	1	1	1	1	8
Ay et al. (2018)	1	1	1	1	1	1	1	1	1	9
Balci et al. (2010)	1	1	1	1	1	1	1	1	1	9
Barzilay et al. (2018)	1	1	1	1	1	1	1	1	1	9
Batterham et al. (2017)	1	1	0	1	0	0	1	1	1	6
Blanco-Vieira et al. (2019)	1	1	1	1	1	1	1	1	0	8
Brakoulas et al. (2017)	1	1	1	0	1	0	1	1	0	6
Breet et al. (2019)	1	1	1	1	1	1	1	1	1	9
Brown et al. (2018)	1	1	1	1	1	0	1	1	1	8
Chakraborty et al. (2012)	1	1	1	1	1	1	1	1	1	9
Chaudhary et al. (2017)	1	1	1	1	1	0	1	1	1	8
Chia (1996)	1	1	1	1	1	0	1	0	0	6
Cho et al. (2016)	1	1	1	1	1	1	1	1	1	9
De Berardis et al. (2014)	1	1	1	1	1	1	1	1	1	9
De Berardis et al. (2015)	1	1	1	1	1	1	1	1	1	9
Dell'Osso et al. (2013)	1	1	1	1	1	1	1	1	1	9
Dell'Osso et al. (2015)	1	1	1	1	1	1	1	0	0	7
Dell'Osso et al. (2017)	1	1	1	1	1	0	1	0	1	7
Dell'Osso et al. (2018)	1	1	1	0	1	0	1	1	0	6
Dhyani et al. (2013)	1	1	0	1	1	1	1	1	0	7
Dominigues-Castro et al. (2019)	1	1	1	1	1	1	1	1	1	9
Dos Santos-Ribeiro et al. (2016)	1	1	1	1	1	1	1	1	0	8
Fernandez de la Cruz et al. (2016)	1	1	1	1	1	1	1	1	1	9
Fontenelle et al. (2012)	1	1	1	1	1	1	1	1	0	8
Gentil et al. (2008)	1	1	1	1	1	1	1	1	1	9
Goodwin et al. (2002)	1	1	0	1	1	0	1	1	0	6
Gupta et al. (2014)	1	1	1	1	1	0	1	1	1	8
Hantouche et al. (2003)	1	1	1	0	1	1	1	1	0	7
Hollander et al. (1996)	1	1	1	1	1	1	1	1	0	8
Hung et al. (2010)	1	1	1	1	1	1	1	1	1	9
Jaisoorya et al. (2015)	1	1	0	1	1	0	1	1	0	6
Jaisoorya et al. (2017)	1	1	0	1	1	1	1	1	1	8
Kamath et al. (2007)	1	1	1	1	1	0	1	1	0	7
Khosravani et al. (2017)	1	1	1	1	1	1	1	1	1	9
Khosravani et al. (2017b)	1	1	1	1	1	0	1	1	1	8
Kim et al. (2016)	1	1	1	1	1	0	1	1	1	8
Mahasuar et al. (2011)	1	1	1	1	1	1	1	1	1	9
Maina et al. (2006)	1	1	1	1	0	0	1	1	1	7
Maina et al. (2007)	1	1	1	1	1	1	1	1	1	9
Moreira et al. (2013)	1	1	1	1	1	1	1	1	1	9
Peles et al. (2009)	1	1	1	1	1	1	1	1	1	9
Phillips et al. (2007)	1	1	1	0	1	1	1	1	1	8
Sallet et al. (2010)	1	1	1	1	1	1	1	1	0	8
Saraf et al. (2017)	1	1	1	1	1	0	1	0	0	6
Sareen et al. (2005)	1	0	1	0	1	0	1	1	1	6
Sidorchuk et al. (2019)	1	1	1	1	1	0	1	1	1	8
Skapinakis et al. (2019)	1	1	1	1	0	1	1	1	1	8
Storch et al. (2015)	1	1	1	1	0	0	1	1	0	6
Storch et al. (2017)	1	1	1	1	0	0	1	1	0	6
Tavares et al. (2012)	1	1	1	1	1	0	1	1	1	8

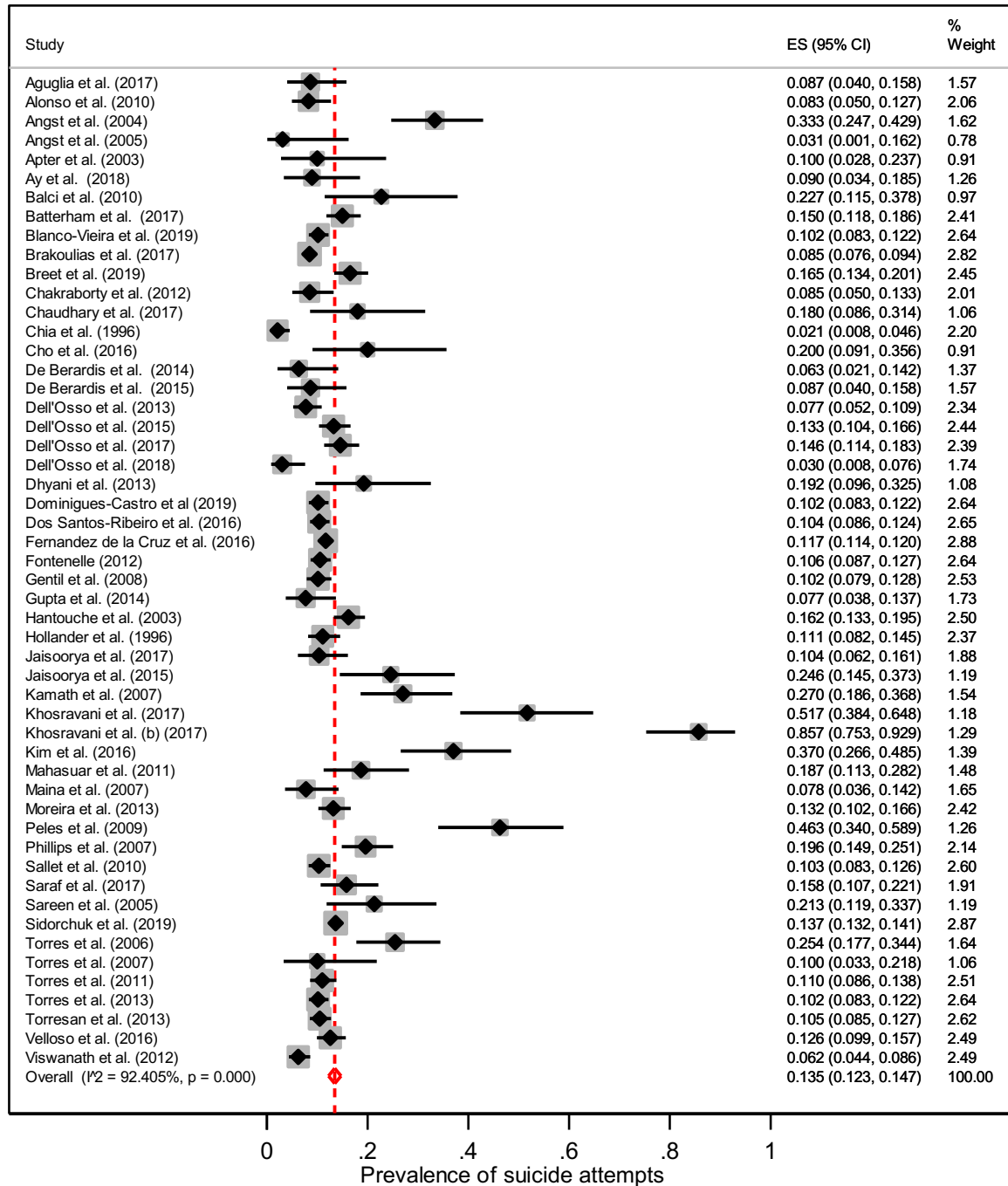
Torres et al. (2006)	1	1	1	1	1	1	1	1	1	1	19
Torres et al. (2007)	1	1	1	1	1	0	1	1	1	1	8
Torres et al. (2011)	1	1	1	1	1	1	1	1	1	1	9
Torres et al. (2013)	1	1	1	1	1	1	1	1	1	1	9
Torresan et al. (2013)	1	1	1	1	1	1	1	1	1	1	9
Velloso et al. (2016)	1	1	1	1	1	0	1	1	1	1	8
Viswanath et al. (2012)	1	1	1	1	1	1	1	1	1	1	9

	1	2	3	4	7	8	9	11	8
									4
% positive answers	100,0	98,4	91,8	91,8	90,2	60,7	100,0	90,2	70,5

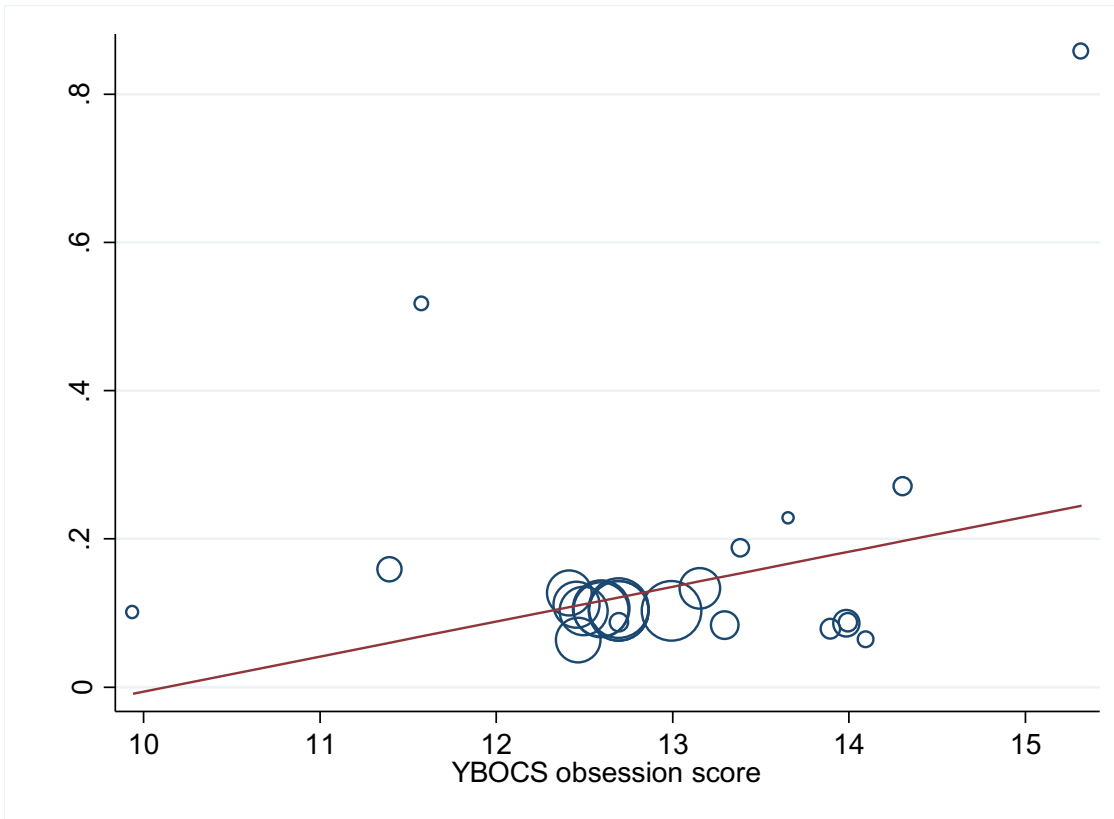
Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (modified, 9 items)

1. Was the research question or objective in this paper clearly stated?
2. Was the study population clearly specified and defined?
3. Was the participation rate of eligible person at least 50%?
4. Were all the subjects selected or recruited from the same or similar populations (including the same time-period)?
Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants?
7. Was the timeframe sufficient so that one could reasonably expect to see an association between OCD and suicide attempts/suicidal ideation if existed? *1=lifetime history of suicide attempts or suicidal ideation.
8. Did the study examine different levels of the OCD as related to suicide attempts/suicidal ideation (e.g. categories of OCD – with/without tic disorders, degree of insight – OCD symptoms, depressive symptoms)?
9. Were OCD diagnoses clearly defined, valid, reliable, and implemented consistently across all study participants?
11. Were suicide attempts/suicidal ideation clearly defined, valid, reliable, and implemented consistently across all study participants? *1=assessed by structured or semi-structured clinical interview or by questionnaires?
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between OCD diagnoses and suicide attempts/suicidal ideation?

Figure 2 – Forest plot of the prevalence of lifetime suicide attempts in individuals with OCD.
Random-effects meta-analysis.

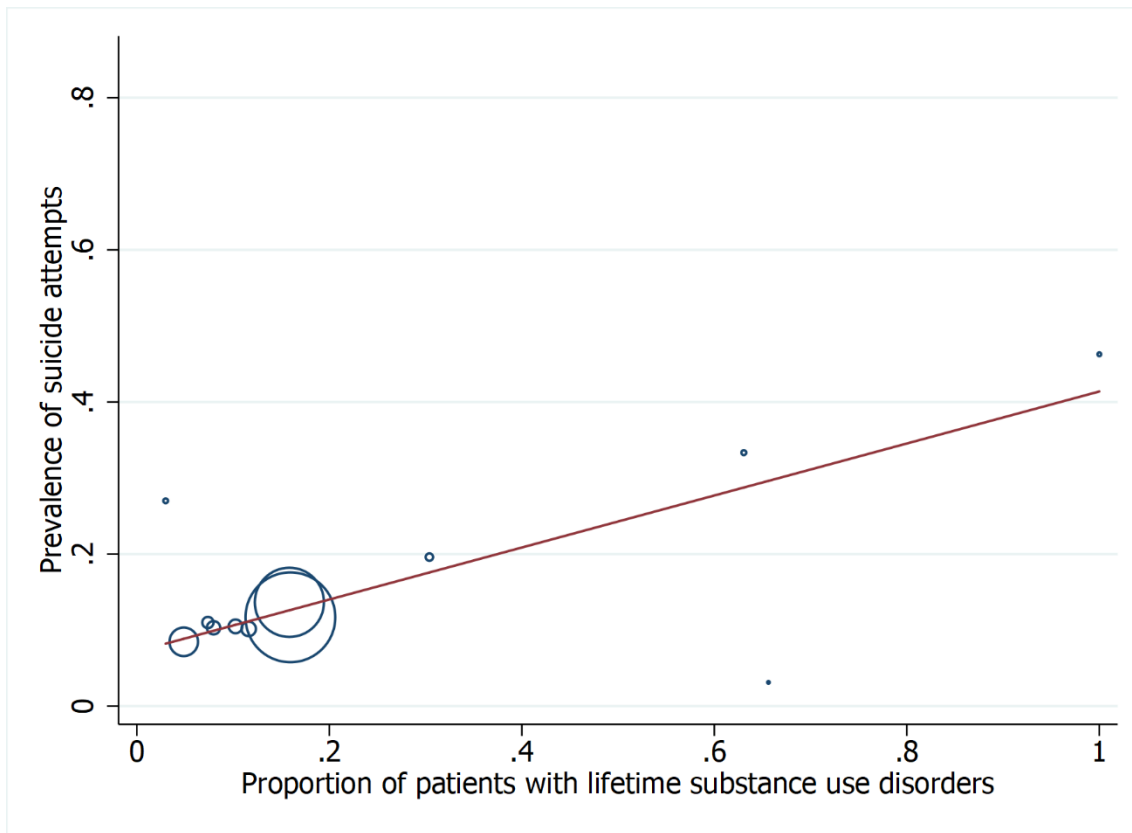


1 Figure 3 – Scatter plots showing the significant association between the prevalence of suicide
2 attempts (y axis) and the severity of obsessions, measured with the Y-BOCS obsession score (x axis).
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1 Figure 4 – Scatter plot showing the significant association between the prevalence of suicide attempts
2 (y axis) and the proportion with comorbid substance use disorders (x axis).
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1 Figure 5 – Forest plot of the prevalence of current suicidal ideation in individuals with OCD. Random-
2 effects meta-analysis.
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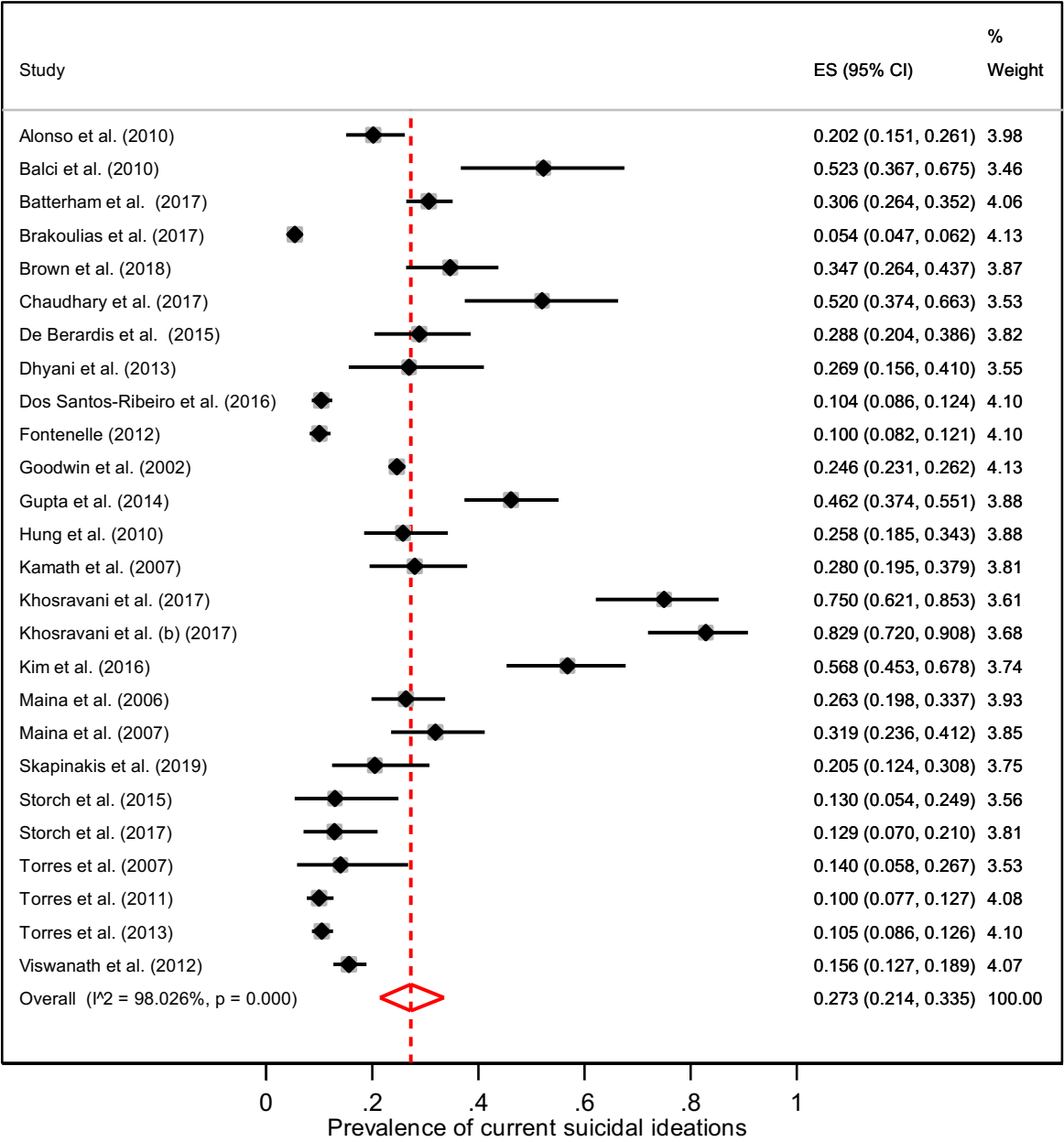
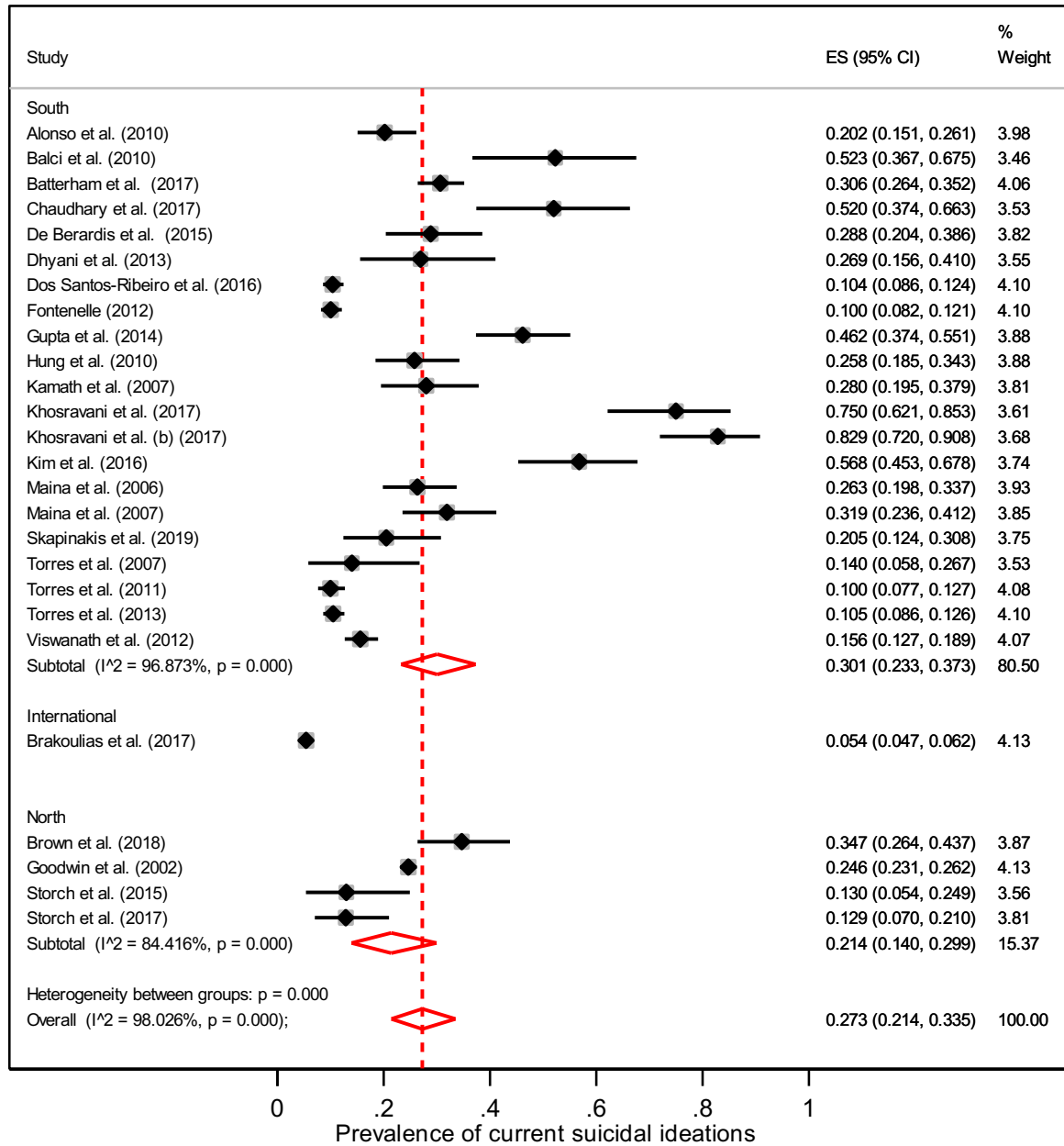
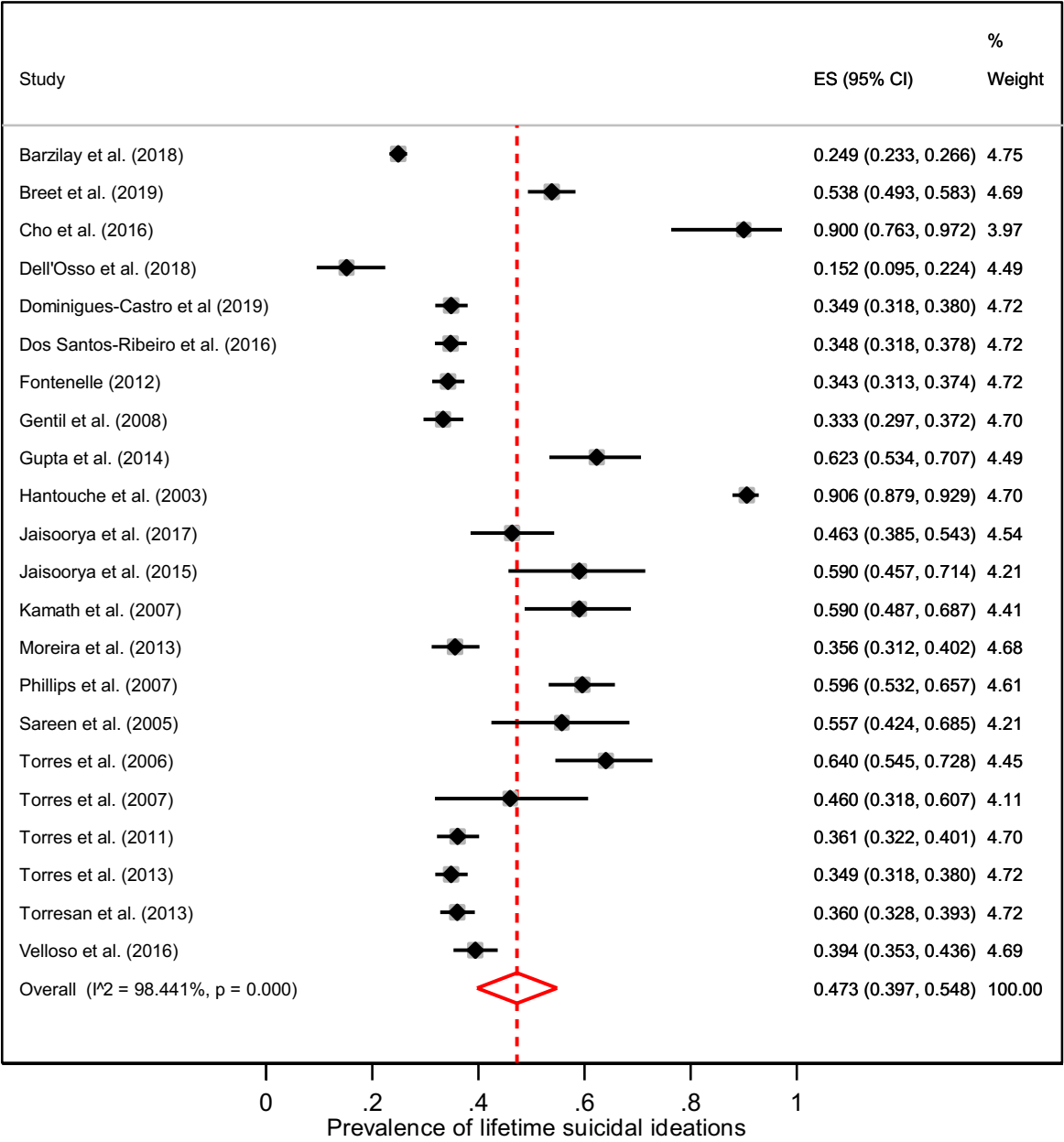


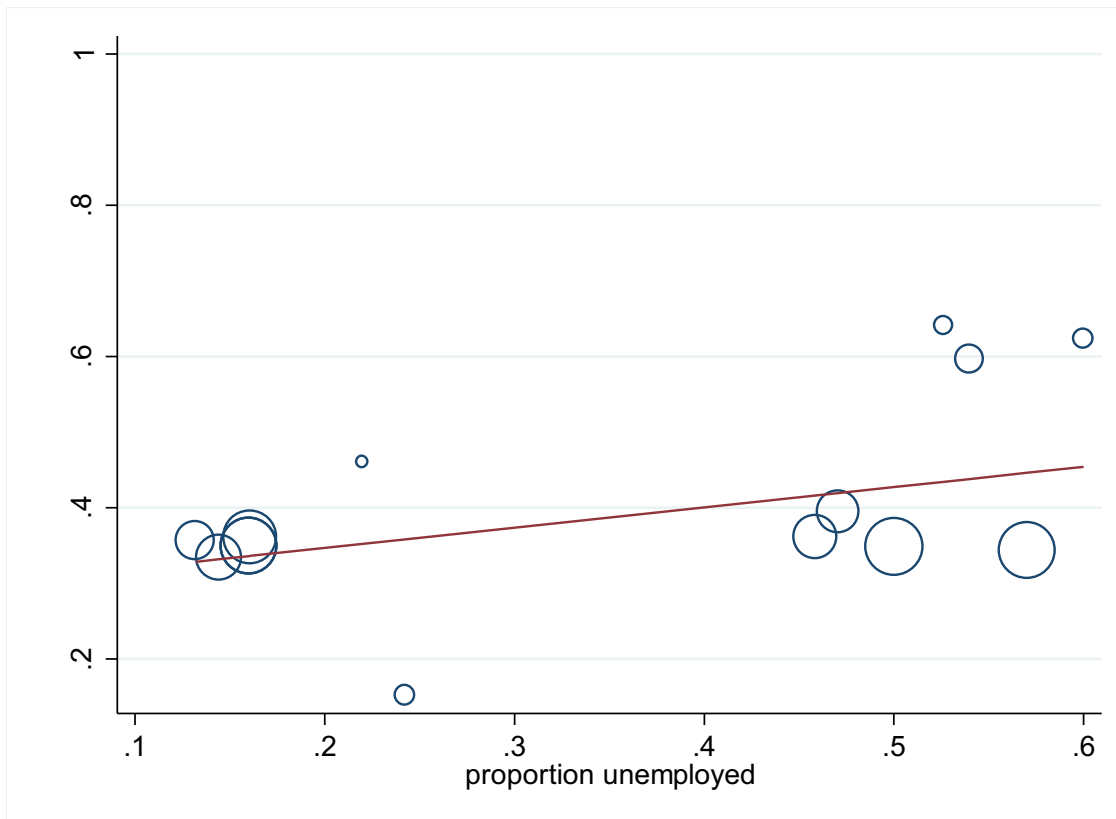
Figure 6 – Subgroup analysis of pooled prevalence of current suicidal ideation by country. Random-effects meta-analysis.



1 Figure 7– Forest plot of the pooled prevalence of lifetime suicidal ideation in individuals with OCD.
 2 Random-effects meta-analysis.
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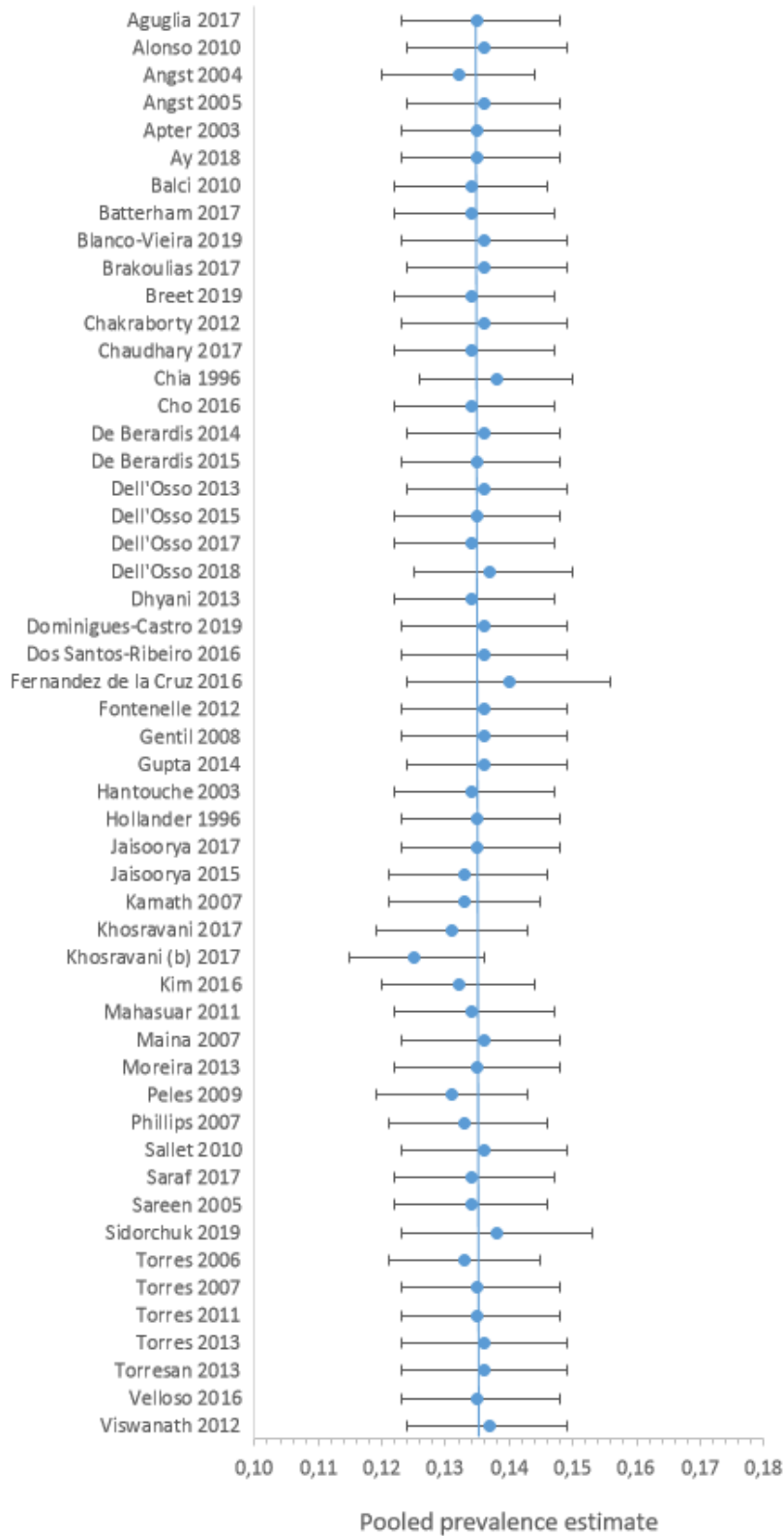


1 Figure 8 – Scatter plot showing the significant association between the prevalence of lifetime suicidal
2 ideation (y axis) and the proportion unemployed (x axis).
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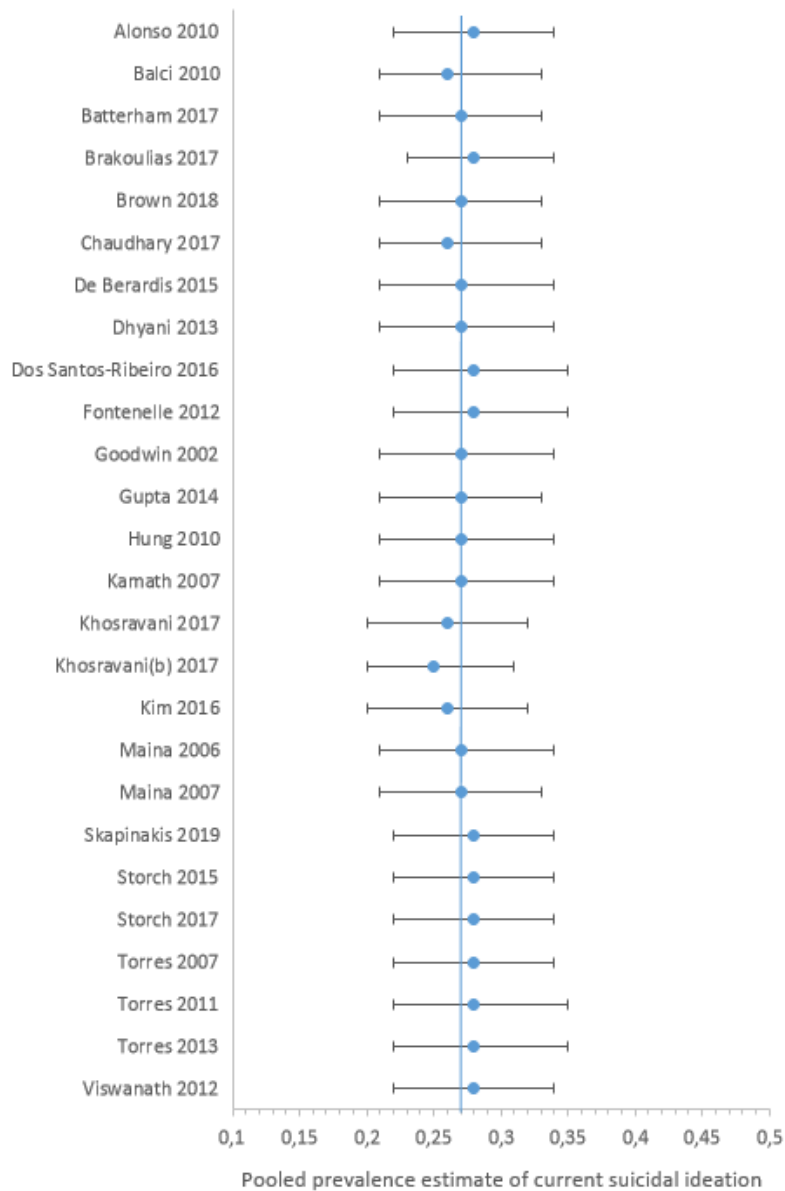


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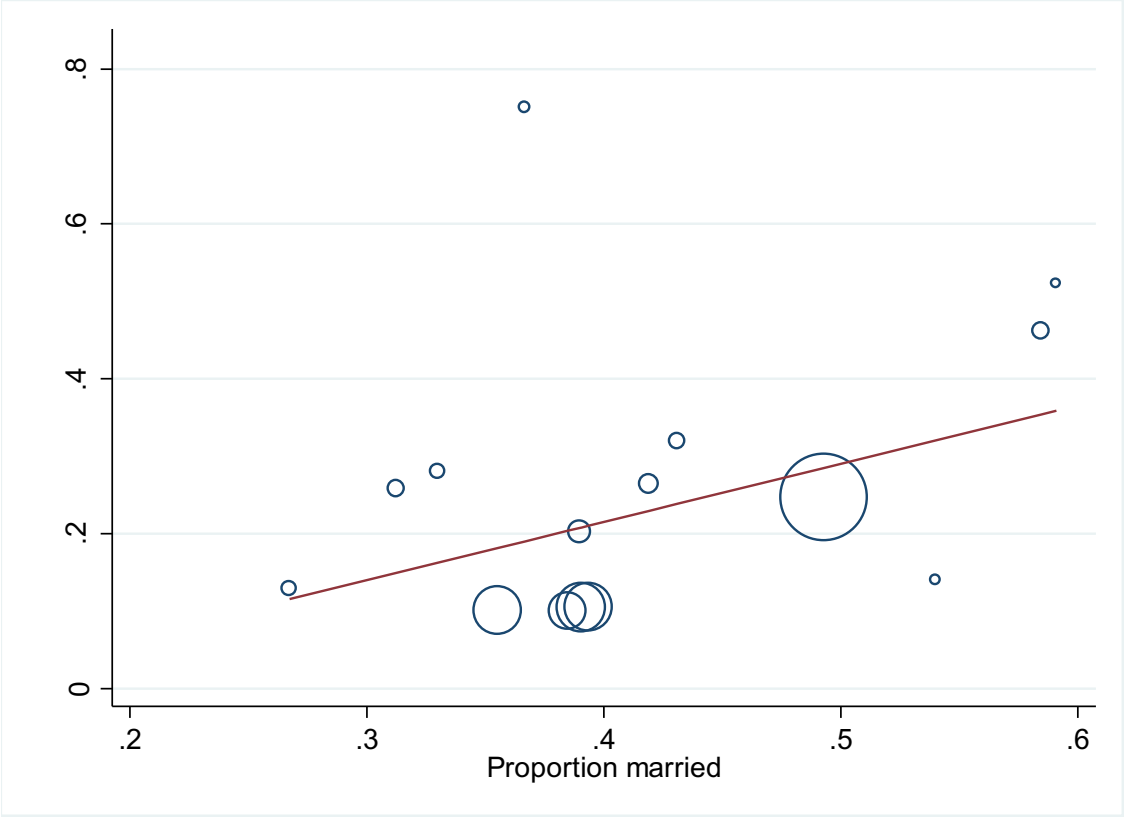
1 Supplemental Figure 1 – Sensitivity analyses showing the pooled prevalence estimates of lifetime
 2 suicide attempts when each single study was excluded in turn.
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1 Supplemental Figure 2 – Sensitivity analyses showing the pooled prevalence estimates of current
2 suicidal ideation when each single study was excluded.
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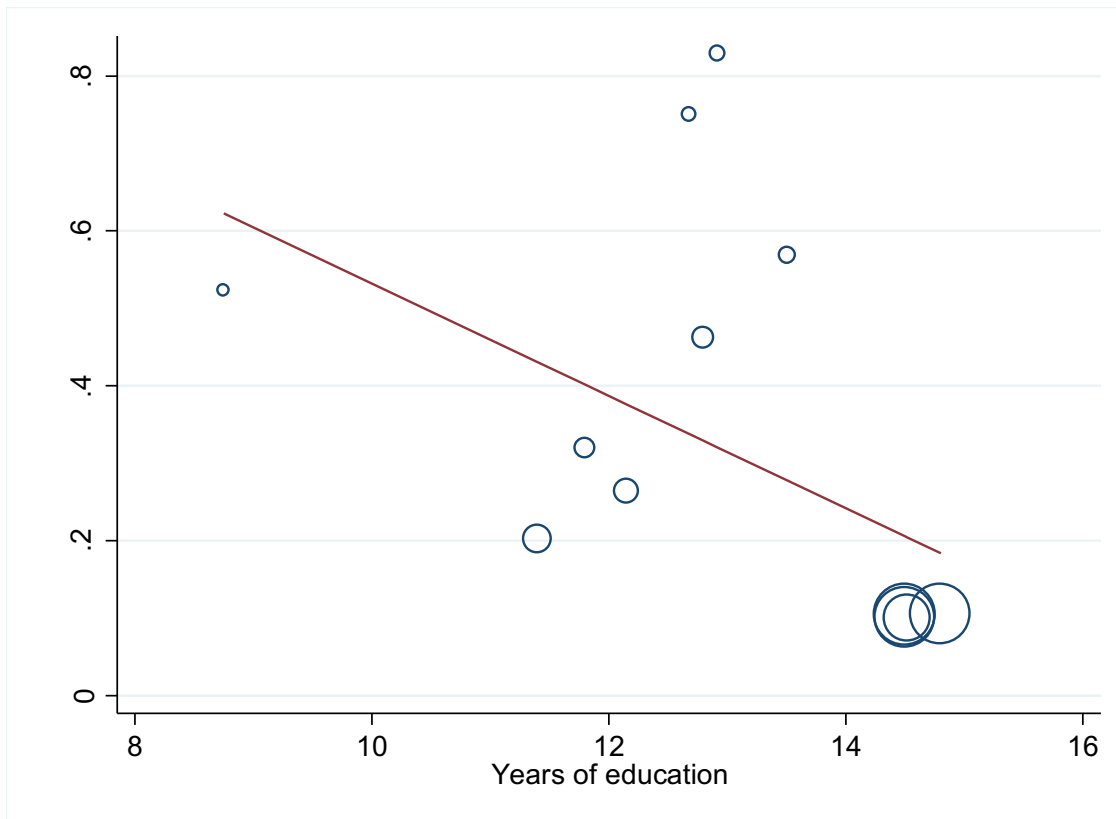


1 Supplemental Figure 3 – Scatter plot showing the significant association between current suicidal
2 ideation (y axis) and marital status (x axis).
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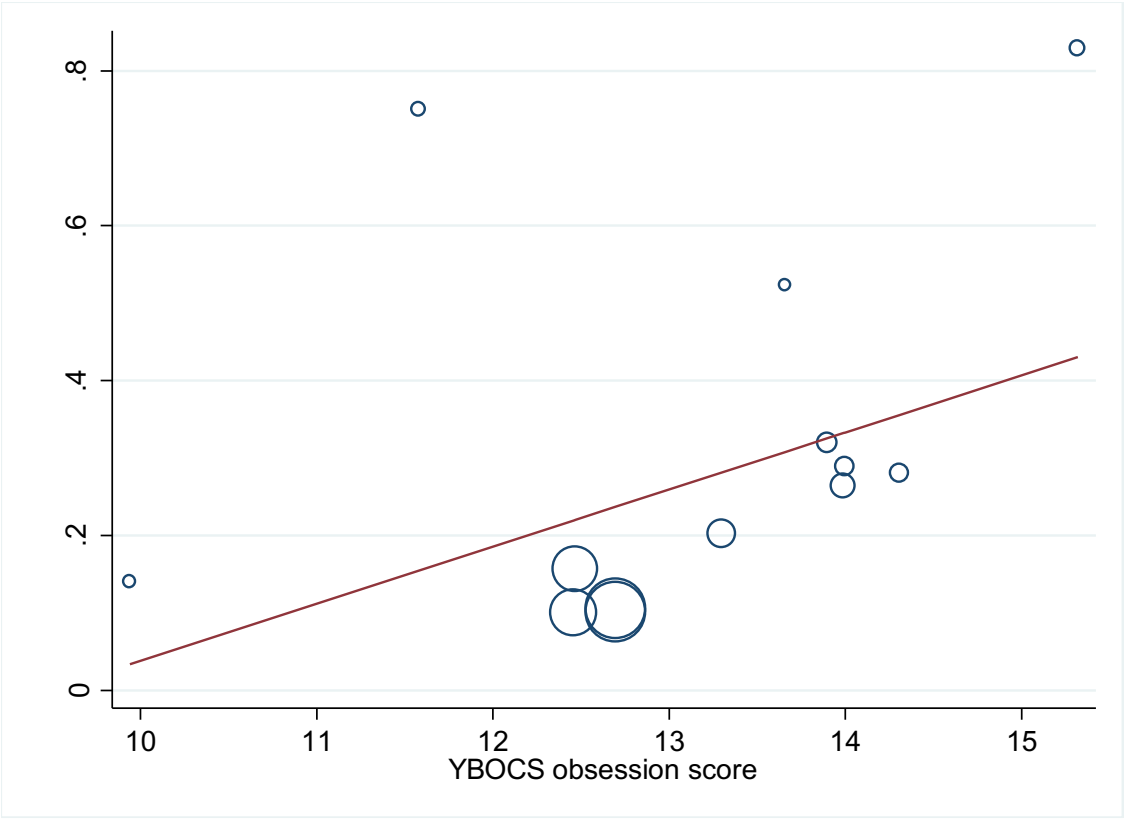


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1 Supplemental Figure 4 – Scatter plot showing the significant association between current suicidal
2 ideation (y axis) and years of education (x axis).
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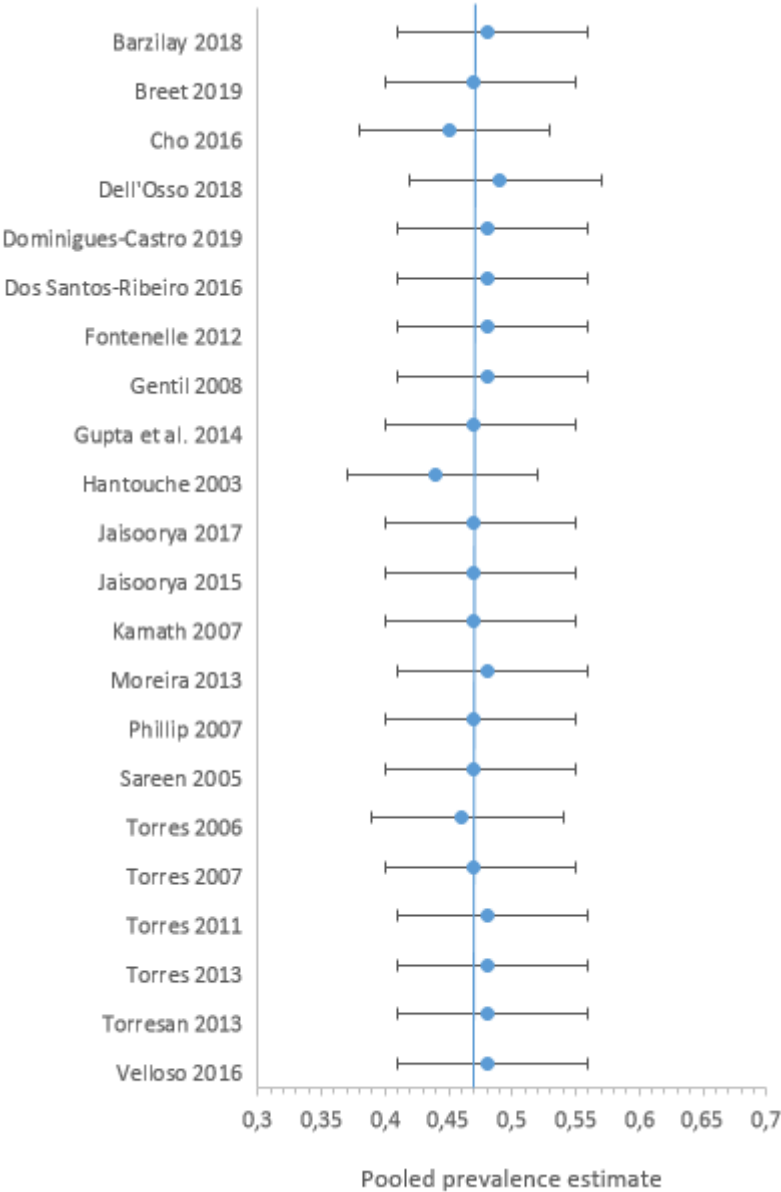


1 Supplemental Figure 5 – Scatter plots showing the significant positive association between current
2 suicidal ideation rates (y axis) and the severity of obsessions as measured with the Y-BOCS obsession
3 score (x axis).
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1 Supplemental Figure 6 – Sensitivity analyses showing the pooled prevalence estimates of lifetime
2 suicidal ideation when each single study was excluded in turn.
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