

A scientometric research of high-cited publications in Obsessive-Compulsive Disorders during 2012-2021

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ABSTRACT

Objective. To examine the bibliometric characteristics of high-cited publications (HCPs) on Obsessive-Compulsive Disorder (OCD).

Design/Methodology/Approach. The Scopus database was searched to identify HCPs on OCD published from 2002 to 2021. Three-hundred and ninety-five (n = 395) articles having at least 100 citations were included in the analysis. Quantitative and qualitative indicators were applied to measure and evaluate the research productivity and citation impact of authors from the most productive countries, organizations, and authors. The VOSviewer was used to visualize the collaborative interaction among the most productive countries, organizations, authors, and keywords.

Results/Discussion. The 395 HCPs published on OCD during 2012-2021 were cited 75197 times. The authors from the United States (n = 216), United Kingdom (n = 59), Netherlands (n = 37), and Canada (n = 30) were the most productive. Clinical studies accounted for the largest publications share among publication types, followed by studies focusing on treatment, epidemiology, genetics, risk factors, pathophysiology, and complications. Among important keywords besides OCD, other most common keywords were anxiety (n = 89), Cognitive Behavioural Therapy (n = 87), Clomipramine (n = 68), Fluoxetine (n = 65), and Behavioural Therapy (n = 53). The topmost productive organizations were the Harvard Medical School, USA (n = 37), Massachusetts General Hospital, USA (n = 36), Columbus University, USA (n = 28), and New York State Psychiatric Institute, USA (n = 27). The most productive authors were D. Mataix-Cols (Sweden) (n = 21), followed by B. D. Greenberg (USA) (n = 18), S. L. Rauch (USA) (n = 17) and D. J. Stein (South Africa) (n = 17). These 395 HCPs were published in 135 journals, with *The American Journal of Psychiatry* publishing many papers. Papers published in *Neuroscience and Bio-Behavioral Reviews* had the highest number of citations per paper (n = 509.0).

Conclusions. The present study suggests that most HCPs have emerged from the United States, are based on funded research, and have involved authors from more than one country.

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Originality/Value. This study presents significant results, in a more comprehensive manner, related to the high-cited publications (HCPs) on Obsessive-Compulsive Disorder (OCD).

Keywords: Obsessive-compulsive disorders; psychiatric disorders; High-cited papers; Global publications; Bibliometrics; Scientometrics.

INTRODUCTION

PAPERS with a high number of citations are considered central in research. Therefore, top and high-cited papers (HCPs) provide evidence and information about research trends and scientific progress in a specific field (Shah *et al.*, 2021). High-cited articles could provide interesting information about the contributors, articles, and topics influential in the research community during a specific period (Smith, 2008). The HCPs help identify breakthroughs in research within a given field and identify and refine the most influential research papers. High-cited articles are very different from ‘ordinary’ cited articles. Typically, they are authored by many scientists, often involving international collaboration. Over the last decades, there has been an emerging interest in using high-cited papers as indicators in research assessments (va Raan, 2020). One reason is the increasing focus on scientific excellence in science policy (va Raan, 2020). In this context, HCPs have been regarded as potential candidates for identifying and monitoring “excellent” scientific research. Lately, this was shown in a benchmarking study from the European Commission in which HCPs were used as indicators for comparing the research performance of the E.U. countries (European Commission, 2001). HCPs have also been applied as indicators in case studies of research groups (Martin & Irvine, 1983), and an explorative study by Tijssen *et al.* (2002) concluded that HCPs do represent valuable indicators for identifying “world-class” research.

Several recent studies have identified and analyzed high-cited articles on various mental health-related issues, including psychology and related psychiatric subjects, i.e., general psychology and psychiatry (Mazhari, 2013; Ho & Hartley, 2016), neuropsychology (Zhang *et al.*, 2020), pain and depression (Du *et al.*, 2020), autism spectrum disorder (Hussain *et al.*, 2020), mental health (Mamdapur *et al.*, 2021) and psychosomatic research (Shah *et al.*, 2021). However, to the best of our knowledge, no comprehensive study of the top-cited articles in the

field of obsessive-compulsive disorder (OCD), except one study by Parmar *et al.* (2019), is available. This study used the Google Scholar database to analyze the high-cited articles ($n = 100$) on OCD as of July 2018. The original research articles were classified into descriptive/epidemiology, mechanism, management, scale/measurement, imaging, and medical psychiatry. The citations suggest that clinical trials/management, epidemiology, and neuroimaging were the most researched areas in OCD research. However, in this fast-evolving area of research, it is crucial to understand the HCPs on OCD. In this study, we employ bibliometric methods to analyze the various bibliometric parameters of high cited papers on OCD.

METHODOLOGY

Any kind of publication was identified, retrieved, and downloaded from the Scopus database (<https://www.scopus.com>) using a well-defined search strategy on 30.12.2021. The search strategy used the keyword “Obsessive-Compulsive Disorder” in the field tag “Title” (Article Title) for the search and retrieval. Subsequently, the search was limited to publication years 2002 to 2021. The search carried out on the topic yielded 8042 global records. Of the total 8042 publications on OCD, only 395 (4.90%) papers received 100 (T.C. ≥ 100) or more citations. The variables we considered were titles, authors, year of publication, affiliations, type of document, fields of interest, funding sources, keywords, citation frequency, etc.

The data of 395 HCPs records were exported from the Scopus database to an Excel and CSV file for further analysis. VOSviewer software tool was used to construct and visualize bibliometrics networks on authors, countries, institutions, and keywords. Some network graphs were generated through biblioshiny too. Selected bibliometric indicators were applied to study the status and citation impact of the most productive journals, countries, organizations, and authors. Institutional collaboration was generated by defining a threshold of the top 30 institutions.

RESULTS

Table 1 and Figure 1 show the number of HCPs published from 2002 to 2021. In 2002, there were 33 HCPs, and they slowly increased in a

few years and reached the highest value of 50 in 2005. In the subsequent years, a lower number of HCPs was found. Of the 395 HCPs from 2002 to 2021, 334 were published from 2002 to 2011.

| Year | T.P. | TC | CPP | Year | T.P. | TC | CPP |
|------|------|-------|--------|------|------|-------|---------|
| 2002 | 33 | 5653 | 171.30 | 2012 | 11 | 2089 | 189.91 |
| 2003 | 32 | 6178 | 193.06 | 2013 | 16 | 2755 | 172.19 |
| 2004 | 45 | 9151 | 203.36 | 2014 | 13 | 2497 | 192.08 |
| 2005 | 50 | 10185 | 203.70 | 2015 | 9 | 1320 | 146.67 |
| 2006 | 42 | 8765 | 208.69 | 2016 | 5 | 684 | 136.80 |
| 2007 | 35 | 5659 | 161.69 | 2017 | 4 | 551 | 137.75 |
| 2008 | 38 | 7715 | 203.03 | 2018 | 1 | 148 | 148.00 |
| 2009 | 16 | 3106 | 194.12 | 2019 | 1 | 108 | 108.00 |
| 2010 | 25 | 5721 | 228.84 | 2020 | 0 | 0 | 0.000 |
| 2011 | 18 | 2803 | 155.72 | 2021 | 1 | 109 | 109.00 |
| | 334 | | | | 395 | 75197 | 190.372 |

Table 1. Distribution of HCP by Publication Year.

Note: TP: Total high-cited publications; T. C.: Total citations; CPP: Citations per paper.

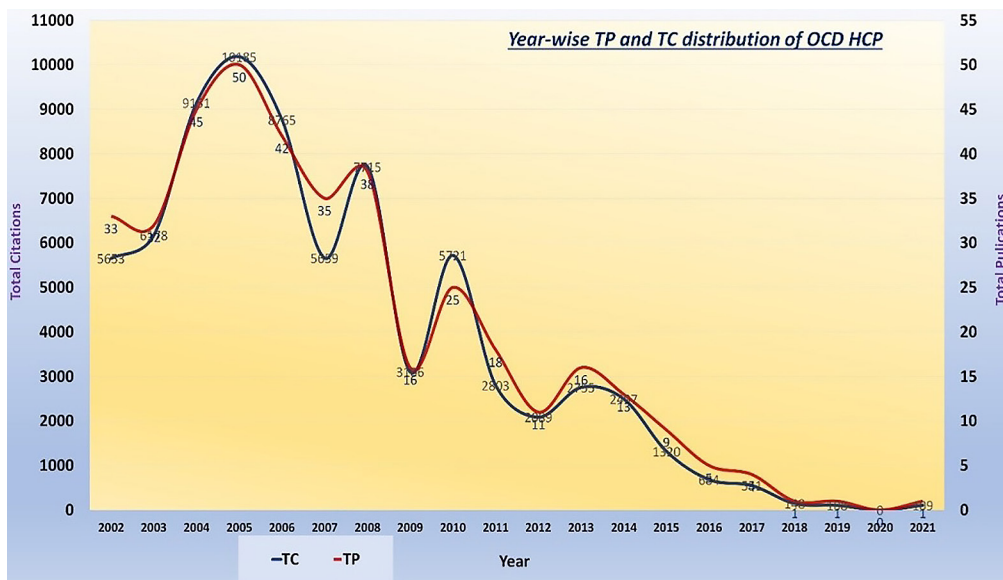


Figure 1. Year-wise publications and total citations distribution of HCPs during 2002-2021.

Of the 395 HCPs, 289 papers received 100-200 citations, 62 papers were cited 201-300 times, 23 papers were cited 301-400 times, eight papers were cited 401-500 times, 12 papers were cited 501-1000 times, and one paper was cited more than 1000 times (Table 2). These 395 HCPs were cited 75197 times, averaging 190.37 citations per paper (CPP). Most papers (322) are published as research articles, followed by 68 reviews, three as conference

papers, and one each as letters and an editorial. Among 395 HCPs, 210 papers were based on controlled studies and 31 on comparative and case-controlled studies. Thirty papers involved meta-analysis, 26 were follow-up studies, 21 were systematic reviews, 16 were self-reports, 13 were case reports, 11 involved descriptions of procedures, and 2 were cross-sectional studies.

Of the 395 papers, 173 were based on funded research from different funding agencies. The

leading funding agencies supporting high-cited research along with their output are the National Institute of Mental Health, USA (104 papers), the National Institute of Health, USA (63 papers), U.S. Department of Health & Human Service (39 papers), Medical Research Council (24 papers), National Alliance for Research on Schizophrenia and Depression (18 papers), National Centre for Research Resources (17 papers), National Institute of Neurological Disorders and Stroke (16 papers), Wellcome Trust, National Institute of Drug Abuse and Eli Lilly & Company (8 papers each), Medtronics (7 papers), National Health and Medical Research Council, Ministry of Education, Culture, Sports, Science & Technology, Japan, GlaxoSmithKline (6 papers each), Canadian Institutes of Health Research and Japan Society for the Promotion of Science (5 papers each), etc.

Of the 395 HCPs, 254 focused on the adult population, 122 were focused on adolescents, 81 on children, and 43 on the aged population. Of the 395 HCPs, 98 papers reported clinical trials, 52 reported randomized control trials and 45 controlled clinical trials. Further analysis showed that 259 HCPs focussed on clinical studies, 125 focused on treatment studies, 34 each focused on epidemiology and genetics, 21 were directed on risk factors, 20 were directed on pathophysiology, and four papers were primarily on complications. There was an overlap in output among these studies. Among treatment studies, Cognitive Behavioural Therapy was discussed in 87 studies, followed by Behavioural Therapy (53 papers), Psychotherapy (29 papers), Combined Modality Therapy (26 papers), Psycho-pharmacotherapy (18 papers), and Transcranial magnetic stimulation (TMS)(13 papers), etc.

| S. No | Citation Range | Number of Papers | Share of Papers | Number of Citations | Share of Citations |
|--------------|----------------|------------------|-----------------|---------------------|--------------------|
| 1 | 100-200 | 289 | 73.16 | 39348 | 52.34 |
| 2 | 201-300 | 62 | 15.70 | 15151 | 20.15 |
| 3 | 301-400 | 23 | 5.82 | 7833 | 10.42 |
| 4 | 401-500 | 8 | 2.03 | 3534 | 4.70 |
| 5 | 500-1000 | 12 | 3.04 | 7975 | 10.61 |
| 6 | 1001-1332 | 1 | 0.25 | 1332 | 1.77 |
| Total | | 395 | 100 | 75173 | 100 |

Table 2. Distribution of number of HCP by citation range.

MOST SIGNIFICANT KEYWORDS

The frequency of appearance of essential keywords can be directly or indirectly used to gauge research activity and trends in a research field. Either independently or combined with other keywords, keywords represent different concepts and ideas. We identified 48 significant keywords appearing in HCPs on OCD, with a frequency of appearance varying from 6 to 350. The most significant frequency of occurrence (n = 350) was observed for OCD, followed by anxiety (n = 89), Cognitive Behavioural Therapy (n = 87), Clomipramine (n = 68), Fluoxetine (n = 65), and Behavioural Therapy (n = 53).

These 48 significant keywords (along with their frequency of occurrence) could be broadly divided in following categories: (i) Treatment: Cognitive Behavioural Therapy (n = 87), Behavioural Therapy (n = 53), Psychotherapy

(n = 29), Combined Modality Therapy (n = 26), Psycho-pharmacotherapy (n = 18), Transcranial Magnetic Simulation (n = 13), Acceptance and Commitment Therapy (n = 10); Pharmacotherapy: Clomipramine (n = 68), Fluoxetine (n = 65), Sertraline (n = 54), Paroxetine (n = 53), Citalopram (n = 36), Haloperidol (n = 25), Neuroleptic Agents (n = 24), Venlafaxine (n = 22), Risperidone (n = 22), Antidepressant Agents (n = 16), Antipsychotic Agents (n = 16), Escitalopram (n = 13), Olanzapine (n = 13), Quetiapine (n = 10); Imaging: Magnetic Resonance Imaging (MRI) (n = 48), Neuroimaging (n = 48), Brain Mapping (n = 43), Functional MRI (n = 42), NMR Imaging (n = 39), Diagnostic Imaging (n = 6); Comorbidity or Associated Disorders or symptoms: Anxiety (n = 89), Depression (n = 43), Gilles De La Tourette's Syndrome (n = 26), Generalized Anxiety Disorder (n = 15), Cognitive Deficits (n = 15), Attention

Deficit Disorder (n = 12), Schizophrenia (n = 11), Autism (n = 10), Eating Disorders (n = 8), Bipolar Disorder (n = 2), Gastrointestinal Disease (n = 2) (Figure-2). The major conglomerate of

the figure-2 indicates the high interrelations of the keywords that comprise it. In contrast, the cluster located at the edges of the map indicates a lower interrelation of the said keywords.

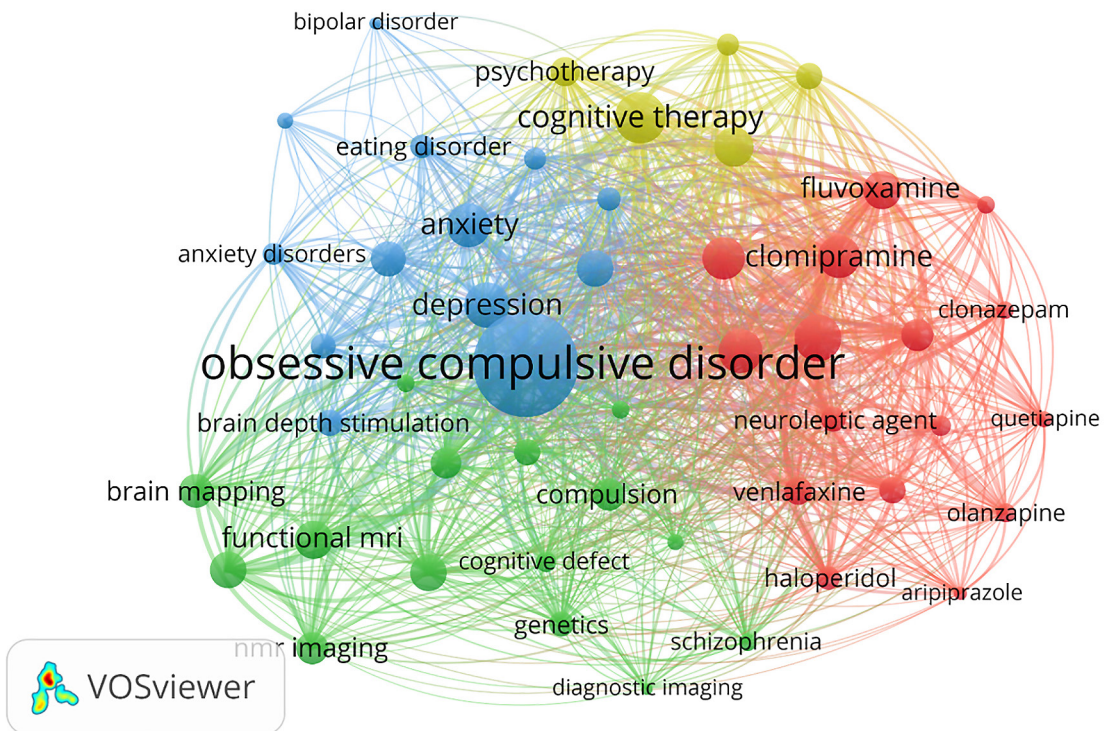


Figure 2. Network visualization of co-occurrence of top 48 keywords.

Figure 2 shows the co-occurrence network for the most frequently used keywords. Each keyword is demonstrated by a circle, where its diameter and size illustrate the frequency of the keyword, and its colour reflects the most frequently topics in the field. The larger the circle, the higher the frequency of occurrence of the specific keyword, and the smaller the distance between two keywords/circles, the higher the co-occurrence of the terms. Colors indicate clusters of closely related terms. Cluster analysis based on 48 keyword co-occurrence identified four significant clusters (red, green, blue, and mustard). The main keyword, “obsessive-compulsive disorder” was situated in the blue cluster and was highly connected with keywords from other clusters)

The list of 48 keywords, as observed in four clusters are as follows:

(i) First Cluster (in Red Colour)(16 keywords); Antidepressant Agents, Aripiprazole,

Citalopram, Clomipramine, Clonazepam, Escitalopram, Fluoxetine, Fluvoxamine, Haloperidol, Neuroleptic Agent, Olanzapine, Paroxetine, Quetiapine, Risperidone, Sertraline, and Venlafaxine.

(ii) (ii) Second Cluster (Green Colour) (15 keywords): Attention Deficit Disorder, Autism, Brain Mapping, Cognitive Defect, Compulsion, Genetics, Gilles De La Tourette’s Syndrome, MRI, Mental Disease, Neuroimaging, and NMR Imaging;

(iii) (iii) Third Cluster (in Green Colour)(9 keywords): Antipsychotic Agents, Anxiety, Bipolar Disorders, Brain Depth Stimulation, Cognitive Behavioural Therapy, Deep Brain Stimulation, Depression, Eating Disorders and Generalized Anxiety Disorders;

(iv) (iv) Fourth Cluster (in Mustard Colour) (2 keywords): Psycho Therapy, Cognitive Therapy. A word cloud mapping of these 48 keywords is depicted in Figure 3.

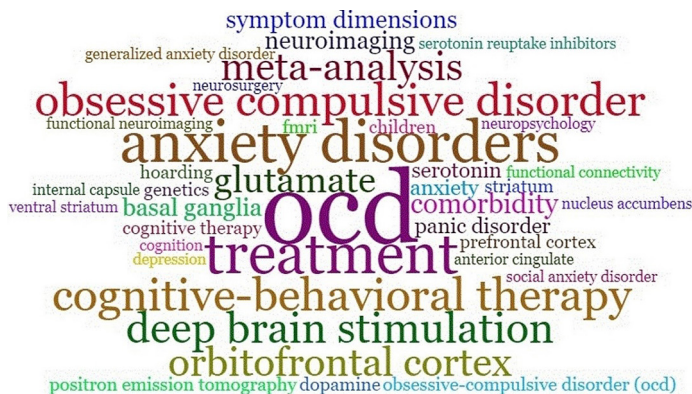


Figure 3. Word cloud map of top 48 keywords.

GEOGRAPHICAL DISTRIBUTION OF HCPs

The 395 HCPs papers on OCD emerged from authors from 57 countries worldwide. The authors from the top 16 countries published 8 to 216 papers (Table-3). In contrast to publication productivity, authors from Italy (1709.31 and 8.98), South Africa (256.57 and 1.35), and Spain (244.77 and 1.29) achieved comparatively higher and above average (239.41 and 1.24) CPP and relative citation index (RCI) among the authors of top 16 most productive countries. On further

analysis of the first country (i.e., where the major part of the research work was undertaken), authors from the USA, U.K., and the Netherlands had above average (23.37 papers) number of publications. In contrast to publication productivity, authors from South Africa (671.71 and 3.53), Spain (237.14 and 1.25), the U.K. (236.34 and 1.24), France (223.56 and 1.17), and Germany (207.39 and 1.09) comparatively achieved the comparatively higher average (203.63 and 1.07) CPP and RCI among the top 16 most productive countries.

| S. No. | Name of the Country | Total Count | | | | First Country Count | | | TCL (NOC) |
|--------|--|-------------|---------------|---------------|-------------|---------------------|--------------|---------------|-----------|
| | | T.P. | TC | CPP | RCI | TP | TC | CPP | |
| 1 | United States | 216 | 43274 | 200.34 | 1.05 | 185 | 37081 | 200.44 | 119(14) |
| 2 | United Kingdom | 59 | 12393 | 210.05 | 1.10 | 38 | 8981 | 236.34 | 74(14) |
| 3 | Netherlands | 37 | 7068 | 191.03 | 1.00 | 26 | 4939 | 189.96 | 61(14) |
| 4 | Canada | 30 | 6113 | 203.77 | 1.07 | 18 | 3015 | 167.50 | 51(12) |
| 5 | Germany | 27 | 5249 | 194.41 | 1.02 | 18 | 3733 | 207.39 | 52(13) |
| 6 | Australia | 23 | 3876 | 168.52 | 0.89 | 16 | 2349 | 146.81 | 39(12) |
| 7 | Brazil | 20 | 3025 | 151.25 | 0.79 | 11 | 1613 | 146.64 | 37(11) |
| 8 | France | 14 | 2795 | 199.64 | 1.05 | 9 | 2012 | 223.56 | 31(12) |
| 9 | Italy | 13 | 22221 | 1709.31 | 8.98 | 8 | 1163 | 145.38 | 26(9) |
| 10 | South Africa | 14 | 3592 | 256.57 | 1.35 | 7 | 4702 | 671.71 | 41(12) |
| 11 | Israel | 13 | 2359 | 181.46 | 0.95 | 6 | 1125 | 187.50 | 24(10) |
| 12 | Spain | 13 | 3182 | 244.77 | 1.29 | 7 | 1660 | 237.14 | 15(9) |
| 13 | Belgium | 10 | 2115 | 211.50 | 1.11 | 6 | 1122 | 187.00 | 8(6) |
| 14 | Sweden | 10 | 1871 | 187.10 | 0.98 | 6 | 889 | 148.17 | 119(14) |
| 15 | South Korea | 9 | 1255 | 139.44 | 235.41 | 7 | 961 | 137.29 | 74(14) |
| 16 | Japan | 8 | 1086 | 135.75 | 0.71 | 6 | 812 | 135.33 | |
| | Total | 516 | 121474 | 235.41 | 1.24 | 374 | 76157 | 203.63 | |
| | Global Total | 395 | 75173 | 190.31 | 1.00 | 395 | 75197 | 190.37 | |
| | Share of top 16 countries in global total | | | | | 94.68 | | | |

Table 4. Top 15 link strength combinations between the top 15 countries/territories.

Note: TP = Total papers; TC = Total citations; CPP = Citations per paper; RCI = Relative citation index; TCL = Total collaborative linkages; NOC = Number of countries.

COLLABORATION AMONG THE TOP 15 COUNTRIES

Figure 4 shows the level of collaboration between authors of the top 15 countries. The figure shows that there are three clusters (with the USA in the center of the network). The colors in Figure 4 distinguish between different clusters (a cluster is a set of closely related nodes). VOSviewer uses the clustering technique. The weight of that item determines In-network visualization, the size of the circle of an item. The higher the weight of an item, the more significant the item's circle. The first cluster (in Red Colour) has countries such as the USA, U.K., South Korea, Spain, and Japan; Second Cluster (In Blue Colour) has countries such as the USA, Sweden, Belgium, France, and Germany and Third Cluster (In blue colour) have countries such as USA, Canada, South Africa, India, Switzerland, Turkey, Mexico, and Israel. The thickness of links between the countries and their distance represents the degree of their research collaboration. The bigger the diameter of a collaborative network node and its font size, its weight in the research collaboration. The collaborative linkages among authors of the top 15 countries are shown in Figure 4 and Table-4. Total collaborative link strength (TCL) is used here as another indicator to represent the collaboration intensity of the particular countries). The

total collaborative linkages among authors from top countries varied from 8 to 119, and individual country-to-country linkages varied from 1 to 14 (Table-4). The authors of the USA, U.K., and Netherlands have the highest collaboration intensity (TCL = 119, 74, and 61) among the top 15 countries. Among the top 15 collaborative link strength combinations, the number of authors from the USA was 11, and the authors from the U.K. were 3.

| Countries in Collaboration | Link Strength |
|----------------------------|---------------|
| USA-U.K. | 14 |
| USA-Canada | 14 |
| USA-Spain | 13 |
| U.K.-Netherlands | 13 |
| USA-Germany | 12 |
| USA-Brazil | 11 |
| USA-Australia | 9 |
| USA-South Africa | 9 |
| USA-Netherlands | 8 |
| USA-Italy | 8 |
| USA-France | 7 |
| USA-Israel | 7 |
| U.K.-South Africa | 7 |
| U.K.-Germany | 6 |
| Netherland-South Africa | 6 |

Table 4. Top 15 link strength combinations between the top 15 countries/territories.

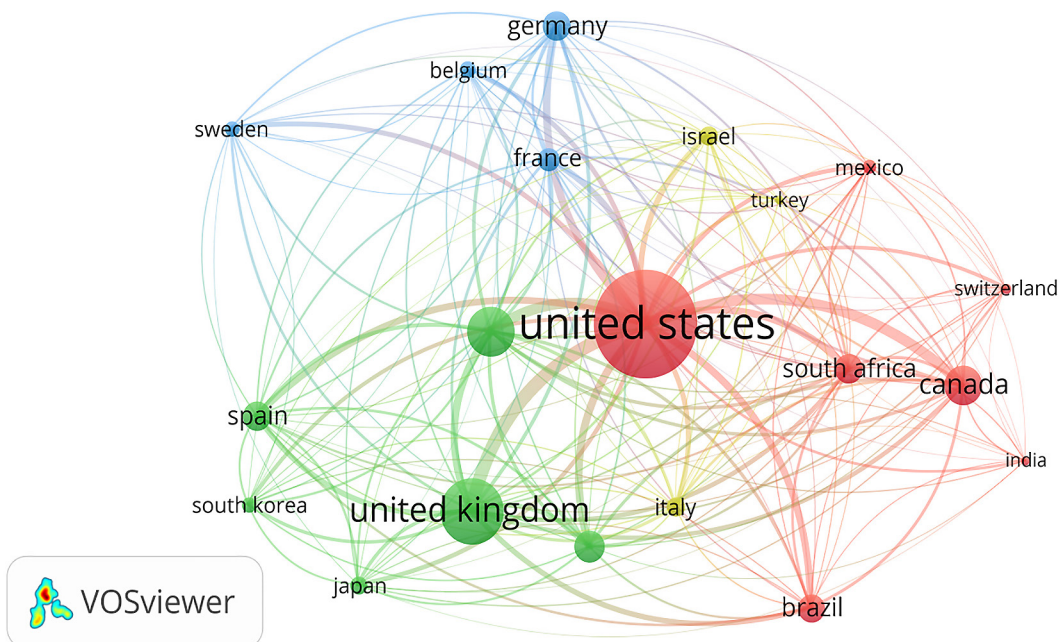


Figure 4. Network-visualisation of international collaborative linkages among top 16 countries.

INSTITUTIONAL DISTRIBUTION

At the institutional level, the 395 HCPs on OCD involved authors from 691 organizations

worldwide (Table-5). Among the top 30 most productive organizations, 20 are in the USA, four in the Netherlands, 3 in the U.K., and one in Brazil and Canada.

| S. No | Name of the Organizations | Total Count | | | | First Organization Count | | | | TCL (NOO) |
|----------------------------------|--|-------------|--------------|---------------|-------------|--------------------------|--------------|---------------|-------------|----------------|
| | | T.P. | TC | CPP | RCI | TP | TC | CPP | RCI | TCL |
| 1 | Harvard Medical School, USA | 37 | 7940 | 214.59 | 1.13 | 9 | 2003 | 222.56 | 1.17 | 129(20) |
| 2 | Massachusetts General Hospital, USA | 36 | 6689 | 185.81 | 0.98 | 16 | 3313 | 207.06 | 1.09 | 104(15) |
| 3 | Columbia University, USA | 28 | 4269 | 152.46 | 0.80 | 7 | 1048 | 149.71 | 0.79 | 94(14) |
| 4 | New York State Psychiatric Institute, USA | 27 | 4408 | 163.26 | 0.86 | 6 | 1320 | 220.00 | 1.16 | 73(11) |
| 5 | King's College London, U.K. | 27 | 5432 | 201.19 | 1.06 | 12 | 2113 | 176.08 | 0.92 | 25(8) |
| 6 | The Warren Alpert Medical School, USA | 22 | 5064 | 230.18 | 1.21 | 2 | 118 | 59.00 | 0.31 | 68(9) |
| 7 | Yale School of Medicine, USA | 20 | 4198 | 209.90 | 1.10 | 10 | 2681 | 268.10 | 1.41 | 38(7) |
| 8 | McLean Hospital, USA | 17 | 3550 | 208.82 | 1.10 | 1 | 115 | 115.00 | 0.60 | 55(7) |
| 9 | University of Florida, USA | 17 | 3849 | 226.41 | 1.19 | 9 | 1653 | 183.67 | 0.96 | 7(4) |
| 10 | University of California, Los Angeles, USA | 17 | 2694 | 158.47 | 0.83 | 7 | 1302 | 186.00 | 0.98 | 45(9) |
| 11 | Yale Child Study Centre, USA | 15 | 3464 | 230.93 | 1.21 | 9 | 2497 | 277.44 | 1.46 | 129(20) |
| 12 | Butler Hospital, Brown University, USA | 14 | 3443 | 245.93 | 1.29 | 5 | 1146 | 229.20 | 1.20 | 104(15) |
| 13 | University of Cambridge, U.K. | 15 | 3876 | 258.40 | 1.36 | 11 | 3357 | 305.18 | 1.60 | 94(14) |
| 14 | Icahn School of Medicine at Mount Sinai, USA | 13 | 3705 | 285.00 | 1.50 | 7 | 1169 | 167.00 | 0.88 | 73(11) |
| 15 | The University of Michigan, Ann Arbor, USA | 13 | 2412 | 185.54 | 0.97 | 6 | 1260 | 210.00 | 1.10 | 25(8) |
| 16 | University Medical Centre, Utrecht, Netherlands | 13 | 2345 | 180.38 | 0.95 | 10 | 1853 | 185.30 | 0.97 | 68(9) |
| 17 | University of Toronto, Canada | 13 | 3184 | 244.92 | 1.29 | 6 | 1136 | 189.33 | 0.99 | 38(7) |
| 18 | National Institute of Mental Health, USA | 13 | 2664 | 204.92 | 1.08 | 4 | 573 | 143.25 | 0.75 | 55(7) |
| 19 | Amsterdam UMC Vrije University, Netherlands | 12 | 4165 | 347.08 | 1.82 | 2 | 280 | 140.00 | 0.74 | 7(4) |
| 20 | University of Sao Paulo, Brazil | 12 | 1894 | 157.83 | 0.83 | 7 | 954 | 136.29 | 0.72 | 45(9) |
| 21 | University of Pennsylvania, USA | 11 | 3527 | 320.64 | 1.68 | 6 | 2695 | 449.17 | 2.36 | 129(20) |
| 22 | Vegas College of Physicians & Surgeons, USA | 11 | 1654 | 150.36 | 0.79 | 2 | 224 | 112.00 | 0.59 | 104(15) |
| 23 | Amsterdam UMC-University of Amsterdam Academic Medical Centre, Netherlands | 11 | 2184 | 198.55 | 1.04 | 4 | 1061 | 265.25 | 1.39 | 94(14) |
| 24 | John Hopkins University, USA | 10 | 1572 | 157.20 | 0.83 | 6 | 881 | 146.83 | 0.77 | 73(11) |
| 25 | Jane & Terry Semel Institute of Neuroscience & Human Behaviour, USA | 10 | 1489 | 148.90 | 0.78 | 4 | 538 | 134.50 | 0.71 | 25(8) |
| 26 | Mayo Clinic, USA | 10 | 2244 | 224.40 | 1.18 | 6 | 1347 | 224.50 | 1.18 | 68(9) |
| 27 | David Geffen School of Medicine at UCLA, USA | 10 | 1411 | 141.10 | 0.74 | 3 | 424 | 141.33 | 0.74 | 38(7) |
| 28 | University of Hertfordshire, U.K. | 10 | 1852 | 185.20 | 0.97 | 0 | 0 | 0 | 0 | 55(7) |
| 29 | University of Melbourne, Australia | 9 | 1738 | 193.11 | 1.01 | 6 | 801 | 133.50 | 0.70 | 7(4) |
| 30 | Royal Netherland Academy of Arts & Sciences, Netherlands | 8 | 1608 | 201.00 | 1.06 | 0 | 0 | 0.00 | 0.00 | 45(9) |
| Total of 30 organizations | | 481 | 98524 | 204.83 | 1.08 | 383 | 83828 | 218.87 | 1.15 | |
| Global total | | 395 | 75197 | 190.37 | 1.00 | 395 | 75197 | 190.37 | 1.00 | |
| 96.96 | | | | | | | | | | |

Table 5. Institutional Distribution of HCPs on “Obsessive-Compulsive Disorders” by Total Count and by First Organization Count. **Note:** TP = Total papers; TC = Total citations; CPP = Citations per paper; RCI = Relative citation index; TCL = Total collaborative linkages; NOO = Number of organizations

COLLABORATION AMONG THE TOP 30 ORGANIZATIONS

Collaboration between different organizations is a crucial factor in developing scientific production in any area of knowledge. The total collaborative linkages among these 30 organizations varied from 1 to 129,

and individual organization-to-organization collaborative linkages ranged from 1 to 28 (Table-6 and Figure-5). The Harvard Medical School, USA Massachusetts General Hospital, USA, and Columbia University, USA had the highest collaboration intensity (TCL = 129,104 and 94) among the top 30 organizations.

| Name of Organizations in Collaboration | Link Strength |
|---|---------------|
| Harvard Medical School, USA - Massachusetts General Hospital, USA | 28 |
| Columbia University, USA-New York State Psychiatric Institute, USA | 23 |
| Harvard Medical School, USA - McLean Hospital, USA | 16 |
| The Warren Alpert Medical School, USA - Butler Hospital, Brown University, USA | 11 |
| Harvard Medical School, the USA - The Warren Alpert Medical School, USA | 10 |
| Massachusetts General Hospital, USA - McLean Hospital, USA | 10 |
| Yale School of Medicine, USA - Yale Child Study Centre, USA | 9 |
| Harvard University- New York State Psychiatric Institute, USA | 9 |
| Harvard University, USA-Columbia University, USA | 9 |
| Columbia University, USA- The Warren Alpert Medical School, USA | 9 |
| Columbia University, USA - Vegelos College of Physicians & Surgeons, USA | 9 |
| New York State Psychiatric Institute, USA - Vegelos College of Physicians & Surgeons, USA | 9 |
| University of California, Los Angles, USA - University of California, Los Angles, USA | 8 |
| Massachusetts General Hospital, USA - John Hopkins University, USA | 7 |
| The Warren Alpert Medical School, USA - McLean Hospital, USA | 7 |

Table 6. Top 15 link strength combinations between the top 15 organizations.

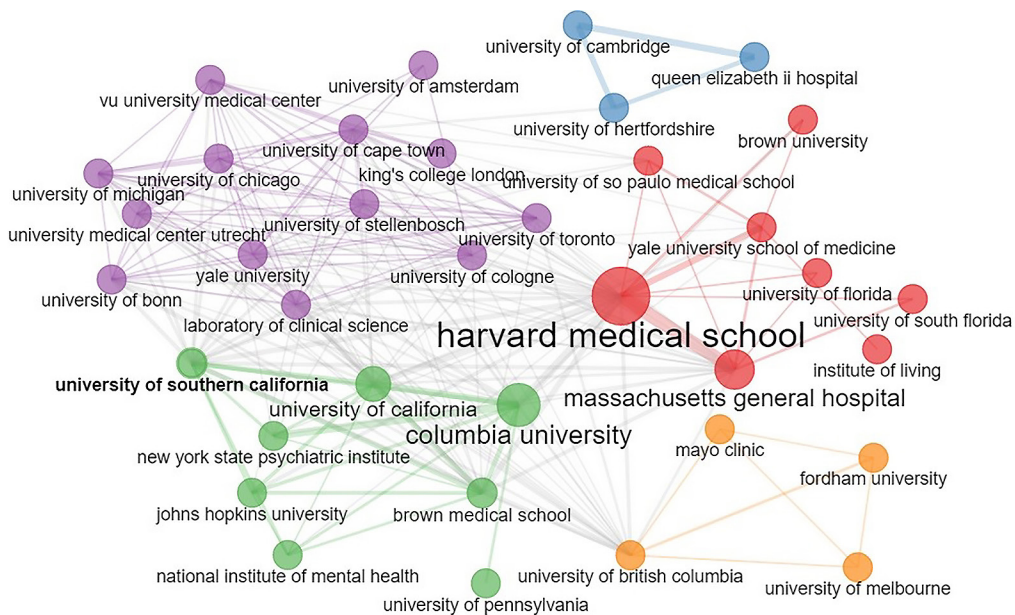


Figure 5. Visualization of collaborations network of top 30 organizations (Each node indicates the number of publications, with the size of the node corresponding to the number of publications. The strength of the lines between the two institutions is directly related to the size of their collaboration. From the figure, it is evident that there are 5 clusters. The colours in Figure 5 are used to distinguish between different clusters (a cluster is a set of closely related nodes).

AUTHORS DISTRIBUTION

The 395 HCPs on OCD involved 1897 authors worldwide. Table 4 illustrates the top 30 most productive authors (Table-7). The first author of a

paper is usually the author who has undertaken a significant part of the research work. The distribution of the 395 HCPs based on the first organization count was also studied. The 395 HCPs papers by the first country involved 310 authors (Table 7).

| S. No | Author Name | Affiliation | T.P. | Total Count | | | | First Author Count | | | |
|-------|----------------|--|------|-------------|--------|------|----|--------------------|--------|------|----------|
| | | | | TC | CPP | RCI | TP | TC | CPP | RCI | TCL(NOA) |
| 1 | Matrix-Cols D | Karolinska Institute, Sweden | 21 | 4717 | 224.62 | 1.18 | 7 | 2081 | 297.29 | 1.56 | 6(3) |
| 2 | Greenberg BD | Brown Medical School, USA | 18 | 4453 | 247.39 | 1.30 | 3 | 1278 | 426.00 | 2.24 | 60(8) |
| 3 | Rauch SL | Harvard Medical School, USA | 17 | 3406 | 200.35 | 1.05 | 3 | 469 | 156.33 | 0.82 | 44(7) |
| 4 | Stein DJ | University of Cape Town, South Africa | 17 | 4396 | 258.59 | 1.36 | 2 | 386 | 193.00 | 1.01 | 27(7) |
| 5 | Denys D | University of Amsterdam, Netherlands | 16 | 3004 | 187.75 | 0.99 | 7 | 1379 | 197.00 | 1.03 | 11(3) |
| 6 | Rasmussen SA | Brown Medical School, USA | 16 | 3386 | 211.63 | 1.11 | | | | | 41(6) |
| 7 | Miguel EC | University of Sao Paulo Medical School, Brazil | 15 | 2849 | 189.93 | 1.00 | 2 | 305 | 152.50 | 0.80 | 26(7) |
| 8 | Abramowitz JS | University of Pennsylvania, USA | 15 | 3134 | 208.93 | 1.10 | 6 | 1293 | 215.50 | 1.13 | 7(1) |
| 9 | Simpson HB | New York State Psychiatric Institute, USA | 15 | 2906 | 193.73 | 1.02 | 4 | 616 | 154.00 | 0.81 | 15(3) |
| 10 | Storch EA | University of Florida, USA | 15 | 2303 | 153.53 | 0.81 | 9 | 1347 | 149.67 | 0.79 | 25(4) |
| 11 | Robbins T.W. | University of Cambridge, UK | 14 | 3579 | 255.64 | 1.34 | | | | | 31(4) |
| 12 | Fineberg NA | University of Hertfordshire, U.K. | 14 | 3323 | 237.36 | 1.25 | | | | | 26(5) |
| 13 | Foa E.B. | University of Pennsylvania, USA | 14 | 2852 | 203.71 | 1.07 | 1 | 672 | 672.00 | 3.53 | 22(4) |
| 14 | Murphy DL | National Institute of Mental Health, Maryland | 13 | 2658 | 204.46 | 1.07 | | | | | 47(7) |
| 15 | Piacentini J | University of California, Los Angeles, USA | 13 | 1995 | 153.46 | 0.81 | 3 | 440 | 146.67 | 0.77 | 42(8) |
| 16 | Pauls DL | Harvard Medical School, USA | 12 | 2083 | 173.58 | 0.91 | 2 | 527 | 263.50 | 1.38 | 56(9) |
| 17 | Sahakian BJ | University of Cambridge, UK | 12 | 3995 | 332.92 | 1.75 | | | | | 31(4) |
| 18 | Goodman WK | Mount Sinai School of Medicine, USA | 12 | 3076 | 256.33 | 1.35 | 1 | 238 | 238.00 | 1.25 | 20(4) |
| 19 | Leckman JF | Yale University, USA | 12 | 3049 | 254.08 | 1.33 | | | | | 4(2) |
| 20 | Rauch S | Massachusetts General Hospital, USA | 12 | 2335 | 194.58 | 1.02 | 2 | 269 | 134.50 | 0.71 | 0(0) |
| 21 | Next G | John Hopkins University, USA | 11 | 1898 | 172.55 | 0.91 | | | | | 37(5) |
| 22 | Murphy TK | University of Florida, USA | 11 | 1741 | 158.27 | 0.83 | | | | | 22(4) |
| 23 | Hollander E | Icahn Scholl of Medicine at Mount Sinai, USA | 10 | 2244 | 224.40 | 1.18 | | | | | 7(2) |
| 24 | William S | Massachusetts General Hospital, USA | 9 | 1711 | 190.11 | 1.00 | 1 | 302 | 302.00 | 1.59 | 8(3) |
| 25 | Gilan CM | University of Cambridge, U.K. | 9 | 3295 | 366.11 | 1.92 | 4 | 768 | 192.00 | 1.01 | 7(2) |
| 26 | Chamberlain SR | University of Cambridge, UK | 8 | 3170 | 396.25 | 2.08 | 6 | 2691 | 448.50 | 2.36 | 20(3) |

| S. No | Author Name | Affiliation | T.P. | Total Count | | | | First Author Count | | | |
|--|--------------|--|--------------|--------------|---------------|-------------|--------------|--------------------|---------------|-------------|-----------|
| | | | | TC | CPP | RCI | TP | TC | CPP | RCI | TCL(NOAA) |
| 27 | Liebowitz MR | Columbia University, USA | 8 | 2094 | 261.75 | 1.37 | | | | | 12(2) |
| 28 | Stewart SE | University of British Columbia, Canada | 8 | 1515 | 189.38 | 0.99 | 4 | 571 | 142.75 | 0.75 | 16(4) |
| 29 | Lochner C | Stellenbosch University, South Africa | 8 | 1199 | 149.88 | 0.79 | 4 | 517 | 129.25 | 0.68 | 15(4) |
| 30 | Geffken GR | University of Florida, USA | 8 | 1462 | 182.75 | 0.96 | | | | | 18(3) |
| Total of 30 authors | | | 383 | 83828 | 218.87 | 1.15 | 383 | 83828 | 218.87 | 1.15 | |
| The global total of authors | | | 395 | 75197 | 190.37 | 1.00 | 395 | 75197 | 190.37 | 1.00 | |
| Share of top 30 authors in global total | | | 96.96 | | | | 96.96 | | | | |

Table 7. Authors distribution of HCPs on “Obsessive-Compulsive Disorders” by total count and by first organization count. **Note:** TP = Total papers; TC = Total citations; CPP = Citations per paper; RCI = Relative citation index; TCL = Total collaborative linkages’ NOA = Number of authors.

COLLABORATION AMONG THE TOP MOST PRODUCTIVE AUTHORS

The total collaborative linkages among these 30 authors varied from 0 to 60, and individual author-to-author collaborative linkages ranged from 1 to 12. It was observed that the B. D. Greenberg (Harvard Medical School, USA), D. K. Pauls (Harvard Medical School, USA) and Pauls DL (National Institute of Mental Health, USA) had the highest number of collaboration linkages (TCL = 60, 56, and 47). The top 15 collaborative link strength combinations between the top 30 authors showed the collaborative link strength between B.D. Greenberg and S. A. Rasmussen (Brown Medical School, USA) was the highest (Table 8).

| Name of authors | TLS |
|------------------------------------|-----|
| B.D. Greenberg - S.A. Rasmussen SA | 12 |
| Robbins T.W. - Sahakian BJ | 11 |
| Storch EA - Murphy TK | 10 |
| Robbins TW - Fineberg NA | 9 |
| Greenberg BD - Pauls DL | 8 |
| Greenberg BD - Nesadt G | 8 |
| Murphy DL - Nesadt G | 8 |
| Storch EA - Geffken GR | 8 |
| B.D. Greenberg - Rauch S L | 8 |
| N.A. Fineberg - Sahakian BJ | 8 |
| Rauch S L - Rasmussen SA | 7 |
| Greenberg BD - Piacentini J | 7 |
| Rauch S L - Pauls DL | 7 |
| Stein, D. J - Lochner, C | 7 |
| Simpson, H. B - Foa, E. B | 7 |

Table-8. Top 15 link strength combinations between the top 15 authors.

JOURNAL DISTRIBUTION

The top 30 journals published 3 to 32 papers and 66.08% and 68.23% share, respectively, of the total publications and citations. *The American Journal of Psychiatry* was the most productive. In terms of citations impact, *Neuroscience and Bio-behavioural Reviews* topped the list with a CPP of 509.0, followed by *American Journal of Human Genetics* (434.67), *Archives of General Psychiatry* (301.93), *Brain* (264.0), *Molecular Psychiatry* (258.31), and *American Journal of Psychiatry* (252.22) (Table-9).

DISCUSSION

Over the years, increasing interest in understanding the profile of HCPs to assess the ongoing research on a particular topic. HCPs are considered potential candidates for identifying and monitoring “excellent” scientific research. There is a lack of analysis of HCPs on OCD. The only previous study evaluated the profile of 100 HCPs on OCD using Google Scholar (Parmar *et al.*, 2019). The major limitation of this study was limiting the analysis to 100 HCPs and using Google scholar, which picks up citations of any kind, rather than restricting the citations in the scientific research. In this background, the present study evaluated the top 395 HCPs on OCD by using the Scopus database.

The present study shows that about two-thirds of the HCPs were based on funded

| S. No | Journal Name | Country | T.P. | TC | CPP |
|---|---|-------------|--------------|--------------|--------|
| 1 | American Journal of Psychiatry | USA | 32 | 8071 | 252.22 |
| 2 | Biological Psychiatry | USA | 25 | 4591 | 183.64 |
| 3 | Journal of Clinical Psychiatry | USA | 20 | 2899 | 144.95 |
| 4 | Molecular Psychiatry | U.K. | 16 | 4133 | 258.31 |
| 5 | Archives of General Psychiatry | USA | 14 | 4227 | 301.93 |
| 6 | Behaviour Research and Therapy | U.K. | 14 | 2070 | 147.86 |
| 7 | Clinical Psychology Review | USA | 13 | 2782 | 214.00 |
| 8 | Journal of the American Academy of Child and Adolescent Psychiatry | USA | 11 | 1976 | 179.64 |
| 9 | Journal of Anxiety Disorders | U.K. | 9 | 1416 | 157.33 |
| 10 | Depression and Anxiety | USA | 9 | 1262 | 140.22 |
| 11 | Neuropsychopharmacology | USA | 7 | 1354 | 193.43 |
| 12 | Psychiatry Research - Neuroimaging | Ireland | 7 | 1073 | 153.29 |
| 13 | Progress in Neuro-Psychopharmacology and Biological Psychiatry | USA | 7 | 997 | 142.43 |
| 14 | Journal of Consulting and Clinical Psychology | USA | 6 | 1221 | 203.50 |
| 15 | Acta Psychiatrica Scandinavica | U.K. | 6 | 1031 | 171.83 |
| 16 | JAMA Psychiatry | USA | 6 | 921 | 153.50 |
| 17 | Psychological Medicine | U.K. | 6 | 915 | 152.50 |
| 18 | Comprehensive Psychiatry | U.K. | 6 | 886 | 147.67 |
| 19 | Psychiatry Research | USA | 6 | 855 | 142.50 |
| 20 | American Journal of Medical Genetics Part B. Neuropsychology and Genetics | USA | 6 | 877 | 146.17 |
| 21 | International Journal of Neuro-psychopharmacology | UK | 5 | 855 | 171.00 |
| 22 | Journal of Affective Disorders | Netherlands | 5 | 642 | 128.40 |
| 23 | Journal of Neurosurgery | USA | 4 | 739 | 184.75 |
| 24 | Neuroscience and Bio-behavioural Reviews | U.K. | 3 | 1527 | 509.00 |
| 25 | American Journal of Human Genetics | USA | 3 | 1304 | 434.67 |
| 26 | JAMA-Journal of the American Medical Association | USA | 3 | 501 | 167.00 |
| 27 | Brain | USA | 3 | 792 | 264.00 |
| 28 | Neuroimage | USA | 3 | 512 | 170.67 |
| 29 | European Psychiatry | U.K. | 3 | 464 | 154.67 |
| 30 | Pediatrics | USA | 3 | 412 | 137.33 |
| Total of top 30 journals | | | 261 | 51305 | |
| Global total | | | 395 | 75197 | |
| Share of top 30 journals in global total | | | 66.08 | 68.23 | |

Table 9. Top 30 journals publishing HCPs on Obsessive-Compulsive Disorders.

Note: TP = Total high-cited papers; TC = Total citations; CPP = Citations per paper.

research. This could be understood from different perspectives. It is possible that funded study mainly focuses on novel topics, is often multicentric, and has an adequate sample size. This possibly increases the chance of citations of the papers. We cannot compare this finding with the previous study on HCPs in OCD, as that study did not focus on this parameter.

Of the 395 HCPs, 254 were focused on the adult population, 122 on adolescents, 81 on children, and 43 on the aged population. This distribution is understandable because OCD often starts in childhood and adolescence and

continues for the majority of adulthood and later in older age. In terms of topics, the present study reveals that most of the studies focused on clinical issues, with many of them concentrate on treatment-related aspects. Further, among the treatment studies, many studies have concentrated on non-pharmacological management. This was also reflected in the common keywords in the literature. This distribution reflects the importance of psychotherapeutic interventions in patients with OCD. HCPs on the interventions suggest that the intervention studies receive more attention than those on

OCD. Other keywords which have emerged in HCPs focus on neurobiology and comorbidity associated with OCD. The previous analysis of HCPs on OCD also showed that most papers were clinical trials or focused on management (Parmar *et al.*, 2019).

Regarding the geographical distribution of the HCPs, most of the HCPs emerged from Western countries, especially the USA. Further, the assessment of collaboration among the researchers' contribution to the HCPs suggests that research emerging with the USA being one of the countries leads to HCPs. Among the top 30 most productive organizations, 20 are in the USA, four in the Netherlands, 3 in the U.K., and one in Brazil and Canada. The Harvard Medical School USA, Massachusetts General Hospital USA, and Columbia University USA had the highest collaboration intensity among the top 30 organizations in terms of institutes. The previous analysis also showed similar trends for the predominance of HCPs emerging from the USA (Parmar *et al.*, 2019). Similar to the previous analysis, the present study also showed that papers from the United Kingdom form the second-largest HCPs, as reported in the previous study (Parmar *et al.*, 2019). However, compared to the previous study, in the present study, papers emerging from the Netherlands formed the third-largest number of HCPs.

In terms of journal distribution, the previous study showed that the most significant number of HCPs was published in the *Archives of General Psychiatry*, followed by the *American Journal of Psychiatry*, *Journal of the American Academy of Child and Adolescent Psychiatry*, and *Biological Psychiatry* (Parmar *et al.*, 2019). In contrast to the previous study present study shows that the *American Journal of Psychiatry* was the most productive journal for HCPs. This difference could be attributed to the selection method of HCPs in the present and previous studies.

To conclude, the present study suggests that 395 papers on OCD have received more than 100 citations. Most papers focus on clinical aspects of OCD, especially psychotherapeutic and pharmacological treatment. Large proportions of these papers have emerged from the United States, are based on funded research, and have involved authors from more than one country.

Contribution statement

Conceptualization: B. M. Gupta and Sandeep Grover.

Data curation, visualization: Mallikarjun Kapp Kappi.

Investigation, methodology, writing-original draft, and project administration: B. M. Gupta.

Writing-review and editing: B. M. Gupta, Sandeep Grover, and Mallikarjun Kapp Kappi.

Conflict of interest

The authors declare that there is no conflict of interest.

Statement of data consent

The data generated during the development of this study has been included in the manuscript. ●

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