ORIGINAL ARTICLE

Evaluation of the Psychiatric Research Output From Turkey Via Web of Science Database: A Bibliometric Analysis

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Abstract

Background: Global scientific research output is continuously accelerating. Although psychiatric scientific output is increasing, factors such as health systems, scientific programs and financial supports that vary between countries lead to varied levels of contribution. This cross sectional bibliometric study aims to analysis the articles bibliometrically which conducted by researchers from Turkey and indexed in SCI-E index of the Web of Science (WoS)database in the category of Psychiatry.

Methods: According to 2019 data, in the WoS database, journals in the Psychiatry category and indexed in the SCI-E were determined. Publications from Turkey that were published in these journals was determined. For each publication, all information relevant to the analysis was exported to Microsoft Excel and EndNote Desktop. Also, VOSviewer software was used to create a collaboration and word co-occurrence network.

Results: There were 5293 publications which have at least one author from Turkey. Only 774 articles (14.62%) were written as international collaborations. The authors from Turkey were collaborating with the researchers from 66 diffrent countries and USA was leading these countries with 420 publications (%7.93), followed by England (3.3%) and Germany (2.4), respectively. The total number of citations was 53931 for these publications (mean: 10.19±22.51). The most prolific institution is Istanbul University while the most frequently selected journal by Turkish authors is Psychiatry and Clinical Psychopharmacology.

Conclusions: Bibliometric studies are crucial in evaluating domain specific research and in planning for efficient use of limited resources. Psychiatric literature from Turkey greatly increased within the last two decades. However, international collaborations are still limited and most of the publications are in journals published in Turkey.

INTRODUCTION

The history of psychiatry is probably as old as that of humanity, although psychiatry as a science is a relatively younger branch of medicine [1]. Mental disorders in ancient times were attributed to supernatural causes and magical rituals were used in healing. Through this time, magicians and religious authorities functioned in treatment [2,3]. Acceptance of psychiatry as a branch of medicine and the onset of contemporary psychiatric practice is a much more recent phenomenon. Actual breakthroughs in psychiatric science had to wait for the emergence of psychopharmacological treatments, construction of a shared language for psychopathology by means of classification systems (e.g. Diagnostic and Statistical Manual of Mental Disorders; DSM, International Classification of Diseases; ICD, Chinese Classification of Mental Disorders, CCMD) as well as innovations in neuroscience and genetics. This period was greatly assisted by increased scholarly output [4].

Global scientific research output is continuously accelerating. According to a report released in 2015, 2.5 million research articles were published annually [5]. Zhang and colleagues [4] reported that psychiatric scientific journals published 84760 articles between 2011 – 2015, globally. According to the same authors, within the four-year period of evaluation, approximately 17000 articles were published yearly and the research output increased 1.3 times [4].

Although psychiatric scientific output is increasing, factors such as health systems, scientific programs and financial supports vary between countries leading to varied levels of contribution between countries [6,7]. Zhang and colleagues [4] reported that the most productive country (among 122) in

terms of psychiatric research output in their sample was the USA (32.7 %). United States was followed by the UK (8.6 %), Germany (6.8 %) and Canada (4.9 %). Mean number of citations were ranked as the UK (9.9/ article), the Netherlands (9.8/ article) and the USA (8.8/ article) [4]. Zhang and colleagues [4] found that 87.7 % of the research output was originated from high-income countries while countries with middle – high (11.1 %) and low – middle (1.0 %) income accounted for much less. Only 0.2 % of the research output was from low income countries. In their list, Turkey was ranked as middle – high income and listed as thirteenth in terms of research output [4]. The dramatic divide in research output across countries according to their income levels was also noted previously by Saxena and colleagues [7]. In a more recent study, Moghadami and colleagues [8] found that the USA, the UK and Germany were foremost among psychiatric research output listed in SCOPUS database. In that study, the most active institutions were the King's College in London, the Veterans' Affairs Medical Center and the Harvard Faculty of Medicine from the USA [8].

Only one aspect of scientific output may be measured by the number of articles published, however, and scientific efficiency also depends on the quality of articles published. Bibliometric analysis emerged as a novel method to evaluate various aspects of scientific output. This method depends on "bibliometrics" which is defined as application of statistical methods on scientific books, articles and other communication media [9-12]. Bibliometric analysis allows researchers to evaluate scientific output on identified subjects within selected regions, periods and by isolated individuals/ institutions. It also allows evaluations of relationships between those publications and scientific efficiency [11,12]. Bibliometric studies on psychiatric research output as well as on output of allied disciplines from Turkey are relatively limited [13-16]. Therefore, this study aims to evaluate psychiatric research output from Turkey indexed in Web of Science (WoS)and SCI – E index by means of bibliometric methods.

METHODS

Identification of articles

Using Advanced Search, from the WoS database, articles published in journals classified within the category of Psychiatry were selected (Web of Science Category, WC=Psychiatry). The journals had to be indexed in Science Citation Index – Expanded (SCI-E) database for inclusion. Meeting abstracts, proceedings papers, book chapters, book reprints and early access were excluded as document types. Study period was set as 1980 – 2019 and articles from 2020 were also excluded. "Turkey" was selected from the scroll-down menu of Countries/ Regions. At least one of the authors of articles had to be from Turkey for inclusion.

Analysis

For each publication, all information relevant to the analysis was exported to Microsoft Excel™ (Microsoft Corp., WA, USA) and a bibliography manager [EndNote™ Desktop, Clarivate Inc., Philadelphia, PA, USA]. The extracted information included; Author (s), Title, Source, Addresses, Times Cited, and Keywords. VOSviewer software (Version 1.6.15, Centre for Science and Technology Studies, Leiden University, The Netherlands) was used to create a collaboration and word co-occurrence network and to evaluate citation densities [17]. Descriptive analyses were used in summarizing data. Nominal data were summarized as counts and frequencies while quantitative data were summarized as means and standard deviations.

RESULTS

More than five thousand (n= 5293) articles were published in journals in the psychiatry category indexed in SCI-E section of the WoS database between 1980 – 2019 in which at least one of the authors were from Turkey. Yearly distribution of articles is illustrated in Figure 1. The majority of the articles were written by a team composed of authors solely from Turkey (n= 4519, 85.4%). Only 774 articles (14.6%) were written as international collaborations. The authors from Turkey were collaborating with the researchers from 66 diffrent countries and USA was leading these countries with 420 publications (%7.93), followed by England (3.3%) and Germany (2.4), respectively. The international collaboration map of the publications is shown in Figure 2.
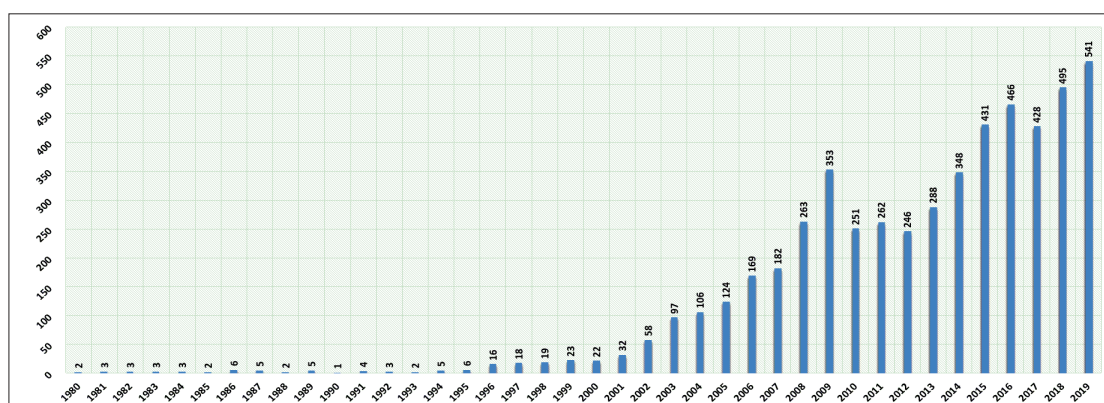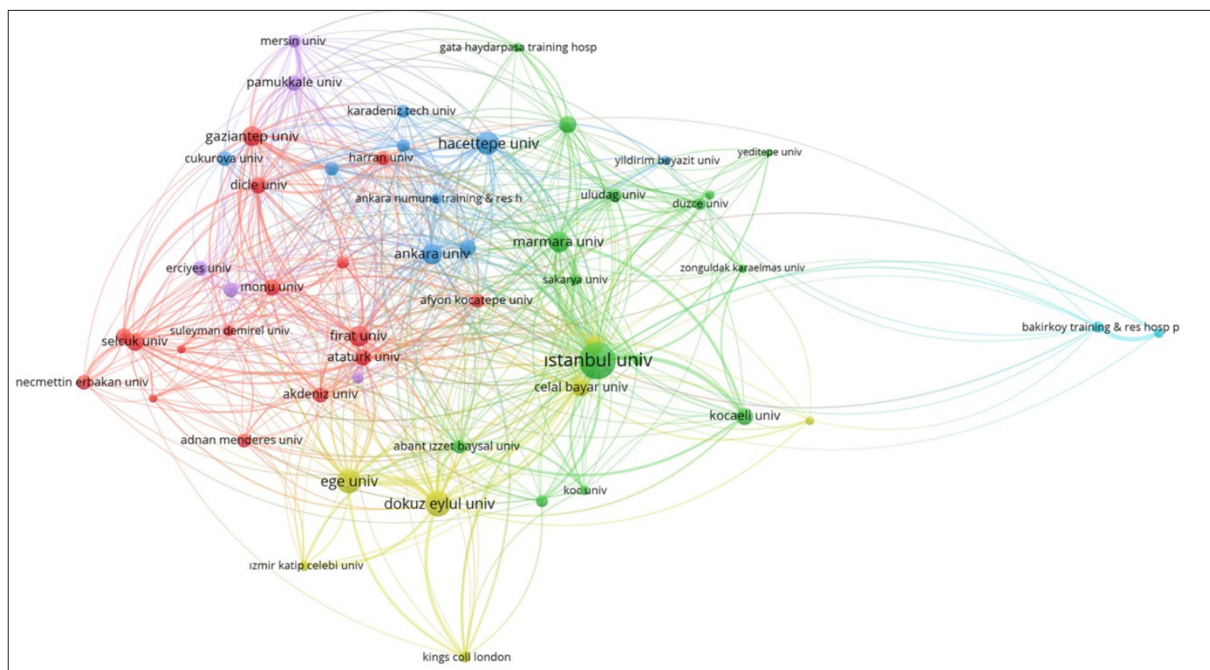

Figure 1. Yearly distribution of articles published in psychiatry journals indexed in Web of Science and SCI–E databases for which at least one author was from Turkey.
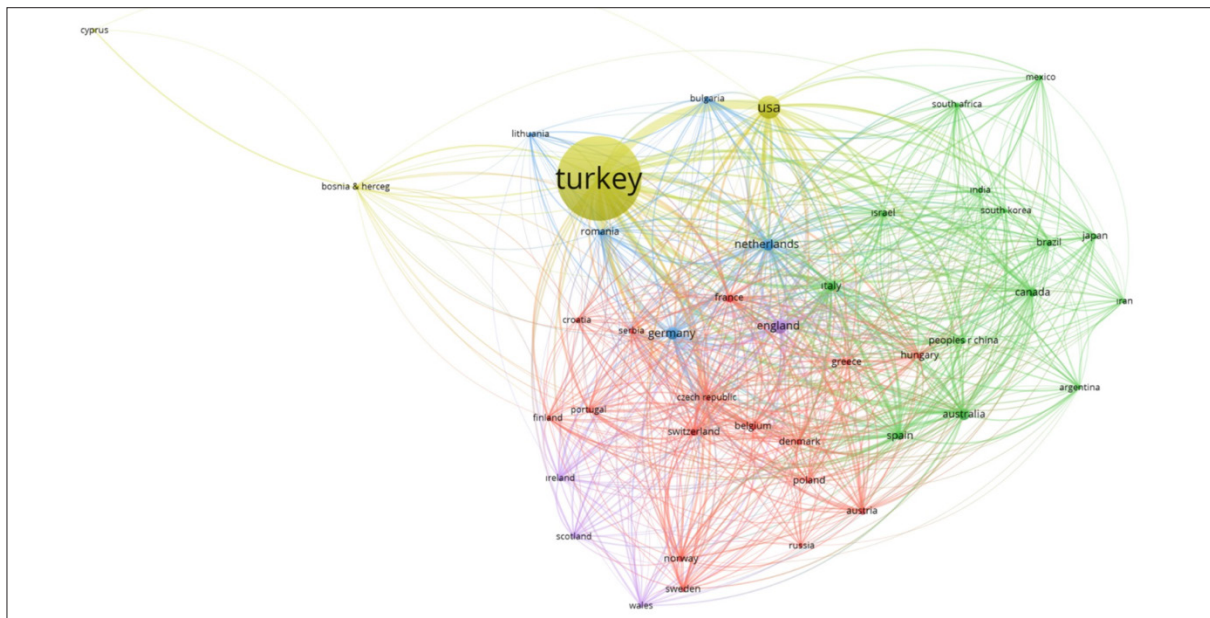
Figure 2. International collaborations observed for articles published in psychiatry journals indexed in Web of Science and SCI-E databases for which at least one author was from Turkey.

More than a hundred institutions from Turkey were sources of articles. Ten of the most prolific institutions are listed in Table 1 with institutional collaboration map illustrated in Figure 3. More than half of those institutions were from the largest cities in Turkey (Istanbul, n= 3, Izmir, n= 2, Ankara, n=2) while Elazig, Gaziantep and Manisa were represented by one institution, each. According to VOSviewer analysis, there was a total of 59350 different words in the titles and abstracts of 5293 publications. The distribution map of the 200 most frequently used words in the titles and abstracts is given in Figure 4. The colors used in this figure indicate words within the same topic cluster and distinguishing five colored clusters.

Figure 3. Institutional collaborations within Turkey observed for articles published in psychiatry journals indexed in Web of Science and SCI-E databases.

Table 1. Most prolific institutions for articles published in psychiatry journals indexed in Web of Science and SCI – E databases for which at least one author was from Turkey (Total n= 5293).

Institution	N	%
Istanbul University	542	10.24%
Dokuz Eylul University	268	5.06%
Ege University	236	4.46%
Hacettepe University	230	4.35%
Marmara University	177	3.34%
Ankara university	172	3.25%
Fırat University	161	3.04%
Gaziantep University	148	2.80%
Uskudar University	128	2.42%
Celal Bayar University	118	2.23%
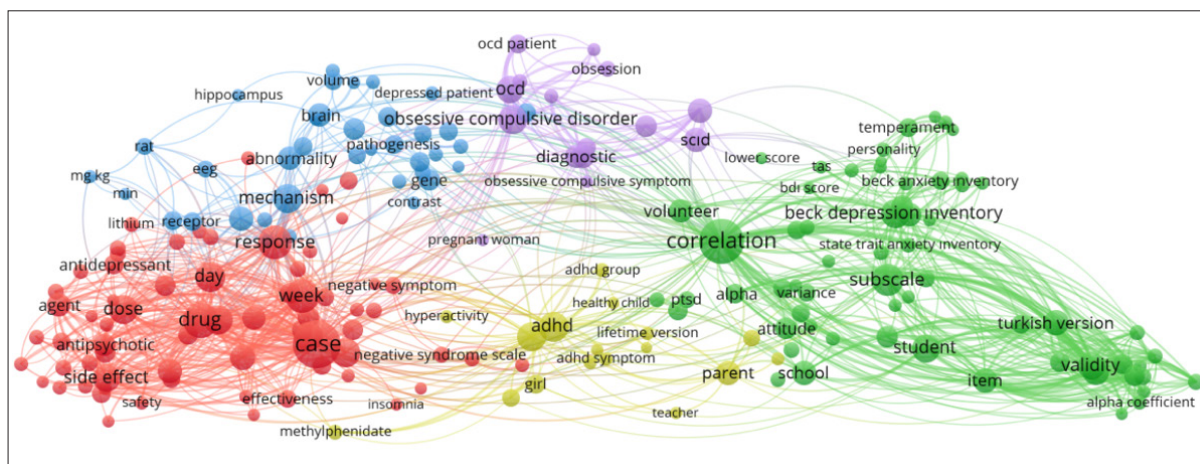
Figure 4. Word co-occurrence network of articles published in psychiatry journals indexed in Web of Science and SCI-E databases for which at least one author was from Turkey [according to titles and abstracts].

Those articles were published in more than 100 journals. The twenty journals most frequently selected by Turkish authors are listed in Table 2. Psychiatry Clin Psychopharmacol (16.53 %), Anadolu Psikiyatri Derg (16.44 %) and Prog Neuro-Psychopharmacol Biol Psychiatry (3.63 %) were most frequent outlets for Turkish authors. When the fact that Bulletin of Clinical Psychopharmacology changed its name to Psychiatry and Clinical Psychopharmacology in 2016 was considered, that journal emerged as the most frequent outlet for Turkish authors (i.e. n= 875, 16.53 %, Table 2).

Table 2. Most frequently selected 20 psychiatry journals for articles indexed in Web of Science and SCI – E databases for which at least one author was from Turkey (Total n= 5293)

Journal	N	%
Psychiatry Clin Psychopharmacol*	875	16.53%
Anadolu Psikiyatri Derg	870	16.44%
Prog Neuro-Psychopharmacol Biol Psychiatry	192	3.63%
Psychiatry Res	186	3.51%
Epilepsy Behav	158	2.99%
Neurol Psychiatr Brain Res	144	2.72%
Compr Psychiat	139	2.63%
Neuropsychiatr Dis Treat	115	2.17%
J Child Adolesc Psychopharmacol	110	2.08%
J Clin Psychopharmacol	107	2.02%
Int J. Psychiat Clin	104	1.97%
J Affect Disord	104	1.97%
Psychiatry Clin Neurosci	94	1.78%
Nord J Psychiatr	82	1.55%
Arch Psychiatr Nurs	76	1.44%
Perspect Psychiatr Care	69	1.30%
Clin EEG Neurosci	66	1.25%
Psychiatry Investig	66	1.25%
Gen Hosp Psych	65	1.23%
J Neuropsychiatr Clin Neurosci	62	1.17%

* Bulletin of Clinical Psychopharmacology renamed Psychiatry and Clinical Psychopharmacology in 2017

More than fifty-thousand citations were made (n= 53931) to the 5293 articles prior to January 2020. Mean number of citations was calculated as 10.19±22.51. More than half of the articles (n= 3779, 71.4%) received at least one citation. Most frequently cited twenty-five articles [18-42] were listed in Table 3, while twenty-five journals most frequently cited were listed in Table 4 and illustrated in Figure 5.

Table 3. Top 25 most cited articles published in psychiatry journals indexed in Web of Science and SCI – E databases for which at least one author was from Turkey (1980 – 2019).

	Title	Year	Journal	NC	PY
1	Antioxidative enzyme activities and lipid peroxidation in major depression: alterations by antidepressant treatments [23]	2001	J Affect Disord	477	25.11
2	The International Society for Bipolar Disorders [ISBD] Task Force Report on Antidepressant Use in Bipolar Disorders [34]	2013	Am J Psychiatry	305	43.57
3	Major depressive disorder is accompanied with oxidative stress: short-term antidepressant treatment does not alter oxidative-antioxidative systems [35]	2007	Hum Psychopharmacol	298	22.92
4	Increased serum tumor necrosis factor-alpha levels and treatment response in major depressive disorder [36]	2003	Psychopharmacology [Berl]	259	15.24
5	Magnetic Resonance Spectroscopy Studies of Glutamate-Related Abnormalities in Mood Disorders [41]	2010	Biol Psychiatry	257	25.70
6	Neuropsychological testing of cognitive impairment in euthymic bipolar disorder: an individual patient data meta-analysis [26]	2013	Acta Psychiatr Scand	248	35.43
7	Effect of treatment on serum brain-derived neurotrophic factor levels in depressed patients [30]	2005	Eur Arch Psychiatry Clin Neurosci	243	16.20
8	WHO Study on the reliability and validity of the alcohol and drug use disorder instruments: overview of methods and results [37]	1997	Drug Alcohol Depend	228	9.91
9	The indices of endogenous oxidative and antioxidative processes in plasma from schizophrenic patients The possible role of oxidant/antioxidant imbalance [20]	2002	Prog Neuropsychopharmacol Biol Psychiatry	225	12.50
10	The effect of chronic antidepressant treatment on serum brain-derived neurotrophic factor levels in depressed patients: a preliminary study [22]	2005	Prog Neuropsychopharmacol Biol Psychiatry	206	13.73
11	Evidence that the activities of erythrocyte free radical scavenging enzymes and the products of lipid peroxidation ape increased in different forms of schizophrenia [31]	2001	Mol Psychiatry	192	10.11
12	Deletions of NRXN1 [Neurexin-1] Predispose to a Wide Spectrum of Developmental Disorders [27]	2010	Am J Med Genet B Neuropsychiatr Genet	189	18.90
13	Suicide attempt and self-mutilation among Turkish high school students in relation with abuse, neglect and dissociation [42]	2003	Psychiatry Clin Neurosci	188	11.06
14	Relationship between major depression and heart rate variability. Clinical consequences and implications for antidepressive treatment [19]	2002	Psychiatry Res	187	10.39
15	Evidence for theory of mind deficits in euthymic patients with bipolar disorder [25]	2005	Acta Psychiatr Scand	181	12.07
16	Social functioning, theory of mind and neurocognition in outpatients with schizophrenia; mental state decoding may be a better predictor of social functioning than mental state reasoning [24]	2006	Psychiatry Res	179	12.79
17	Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students [28]	2015	J Behav Addict	176	35.20
18	TDP-43 accumulation in inclusion body myopathy muscle suggests a common pathogenic mechanism with frontotemporal dementia [38]	2008	J Neurol Neurosurg Psychiatry	171	14.25
19	Fronto-limbic brain structures in suicidal and non-suicidal female patients with major depressive disorder [33]	2007	Mol Psychiatry	162	12.46
20	Sex and gender-related differences in alcohol use and its consequences: Contemporary knowledge and future research considerations [29]	2015	Drug Alcohol Depend	153	30.60
21	Treatment-Resistant Schizophrenia: Treatment Response and Resistance in Psychosis [TRRIP] Working Group Consensus Guidelines on Diagnosis and Terminology [32]	2017	Am J Psychiatry	153	51.00
22	Sleep disturbances and suicidal behavior in patients with major depression [18]	1997	J Clin Psychiatry	152	6.61
23	Neurochemical alterations of the brain in bipolar disorder and their implications for pathophysiology: A systematic review of the in vivo proton magnetic resonance spectroscopy findings [40]	2006	Prog Neuropsychopharmacol Biol Psychiatry	152	10.86
24	Brain-derived neurotrophic factor [BDNF] changes in the serum of depressed women [21]	2006	Prog Neuropsychopharmacol Biol Psychiatry	151	10.79
25	Efficacy of Antimanic Treatments: Meta-analysis of Randomized, Controlled Trials [39]	2011	Neuropsychopharmacology	148	16.44

NC: Number of Citations, **PY:** Average Citations Per Year
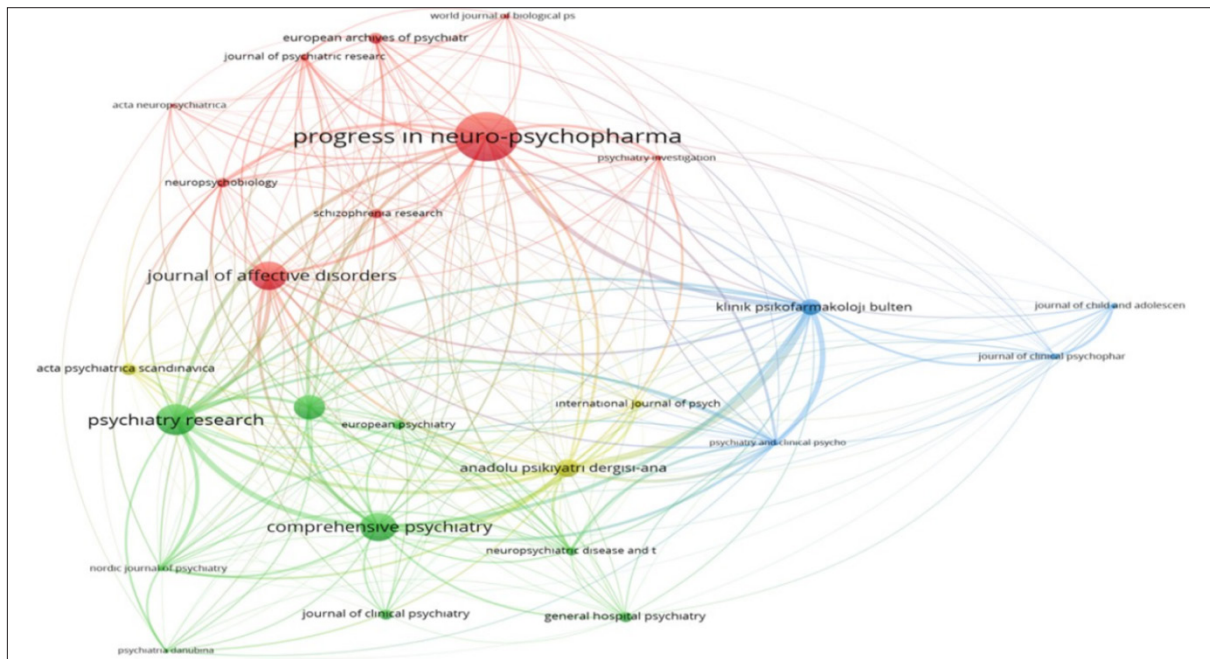
Figure 5. Relationships between most frequently cited journals which were indexed in Web of Science and SCI–E databases and which published articles for which at least one author was from Turkey.

Table 4. Most frequently cited psychiatry journals for articles indexed in Web of Science and SCI – E databases for which at least one author was from Turkey (Total n= 5293).

Journal*	N	Citations
Prog Neuropsychopharmacol Biol Psychiatry	192	5073
Psychiatry Res	186	3174
Compr Psychiat	139	2937
J Affect Disord	104	2931
Psychiatry Clin Neurosci	94	2509
Anadolu Psikiyatri Derg	870	1861
Psychiatry Clin Psychopharmacol	614	1613
Acta Psychiatr Scand	27	1232
Eur Arch Psych Clin Neurosci	28	1174
Gen Hosp Psych	65	1059
J Clin Psychiatry	25	1057
Eur Psychiat	55	1014
Schizophr Res	41	969
Neuropsychobiology	26	961
Neuropsychiatr Dis Treat	115	899
Int J Psychiat Clin	104	799
J Psychiatr Res	31	759
J Clin Psychopharmacol	107	618
J Child Adolesc Psychopharmacol	110	582
Nord J Psychiatr	82	566

* Journal abbreviation names are given according to the ISO format

Most commonly cited articles concerned mood disorders (n= 16) and especially depression (n= 10). Oxidative stress and suicidality in depression were evaluated in two studies, each while neurotrophic factors in depression were evaluated in three studies. Other studies concerned oxidative stress in schizophrenia (n=2), neuropsychological features of bipolar disorders (n= 2), magnetic resonance findings in mood disorders (n= 2), treatment of bipolar disorders (n= 2) and alcohol/ substance use disorders (n= 2, Table 3). Most of the frequently cited studies were published in 2005 and 2006 (n= 3, each) and the majority of the frequently cited studies were published from 1997 to 2015 (n=24, 96.0 %).

The most commonly cited journals which published the evaluated articles were Prog Neuropsychopharmacol Biol Psychiatry (9.4 %), Psychiatry Res (5.9 %), Comprehensive Psychiatry (5.5%), J Affect Disord (5.4 %) and Psychiatry Clin Neurosci (4.7 %). Rate of citations to Anadolu Psikiyatri Dergisi – Anatolian Journal of Psychiatry and Klinik Psikofarmakoloji Bülteni – Bulletin of Clinical Psychopharmacology were found to be 3.5 % and 3.0 %; respectively.

Using the VOSviewer software, it was found that more than six thousand key words (n= 6745) were used in the evaluated articles. The most commonly used key words were "depression" (n= 496, 7.4%), "schizophrenia" (n= 470, 7.0%), and "bipolar disorder" (n= 299, 4.4%). Most commonly used keywords according to their clusters is illustrated in Figure 6. Most frequent citations according to authors' institutions were listed as Istanbul University (n= 7298, 13.5%), Ege University (n= 3729, 6.9%) and Dokuz Eylul University (n= 3681, 6.8%). Top twenty-five author institutions according to number of citations is illustrated in Figure 7.
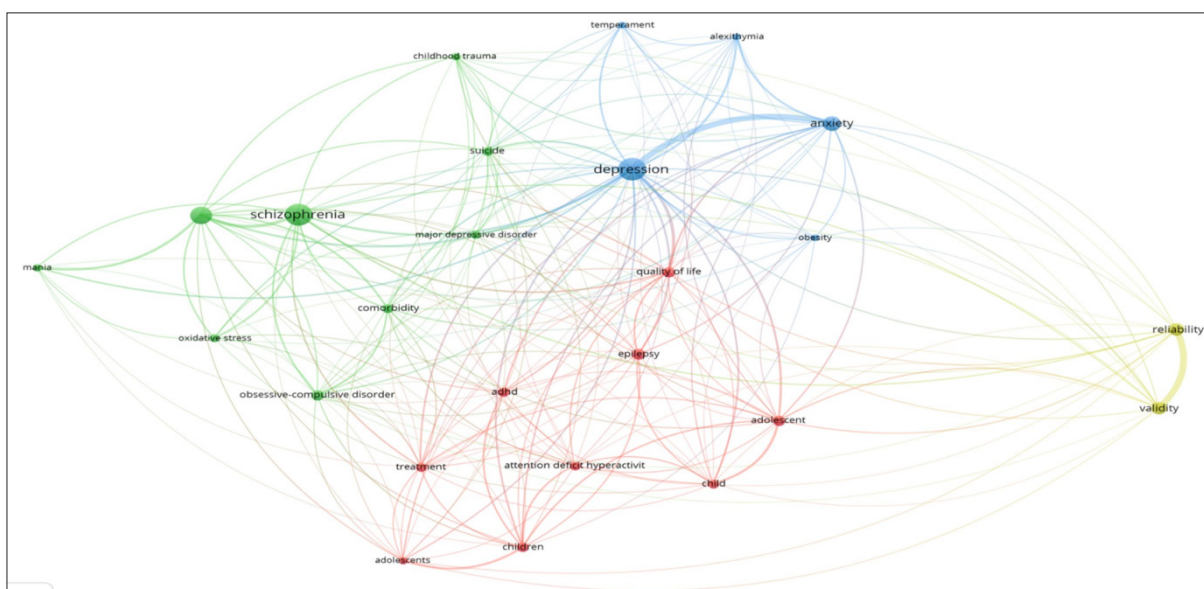

Figure 6. Relationships between most commonly used key words published in psychiatric journals which were indexed in Web of Science and SCI–E databases for which at least one author was from Turkey
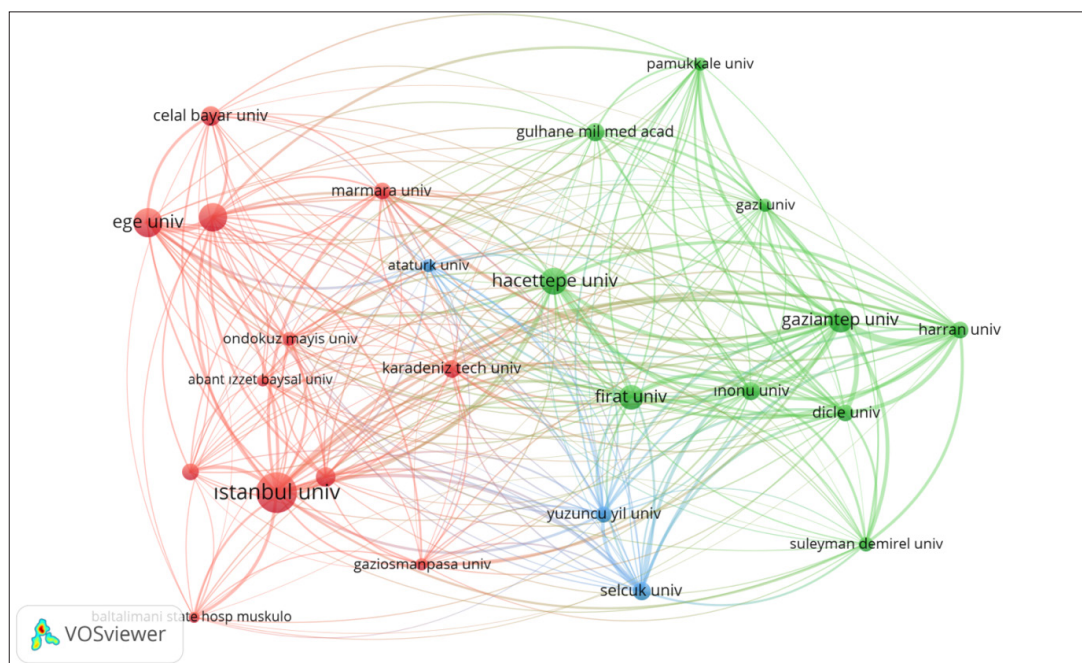

Figure 7. Relationships between most commonly cited authors' institutions for articles published in psychiatric journals which were indexed in Web of Science and SCI-E databases and for which at least one author was from Turkey

DISCUSSION

This study aimed to evaluate psychiatric research output from Turkey indexed in WoS and SCI – E index by means of bibliometric methods. All articles published between 1980 – 2019 for which at least one of the authors was from Turkey were eligible for inclusion. As a result, we found that more than five thousand articles were published with a significant increase after 2000 (Figure 1 and Table 3). The majority of articles were written by a team composed solely of Turkish authors and only more than one-tenth were written as international collaborations. Most prolific authors were from Istanbul, Dokuz Eylul and Ege Universities. Most common outlets for publications were Psychiatry Clin Psychopharmacol, Anadolu Psikiyatri Derg and Prog Neuro-Psychopharmacol Biol Psychiatry. More than fifty-thousand citations were made to the articles prior to January 2020. Mean number of citations was calculated as 10.19±22.51. More than half of the articles (71.4%) received at least one citation. Most frequently cited articles addressed mood disorders (especially depression). Most frequently cited articles were published in Prog Neuropsychopharmacol Biol Psychiatry, Psychiatry Res and Comprehensive Psychiatry. Most frequently cited institutions were Istanbul University, Ege University and Dokuz Eylul University.

It is known that science has developed over the course of thousands of years with the contributions of numerous scientists [43]. As a result of scientific and technological innovations, the number of scientific articles published, are increasing daily, especially in the last hundred years. However, psychiatry and allied disciplines display an even greater increase in scientific output [44,10] compared to other disciplines. Larivière and Grant [10] conducted a bibliometric analysis of 366322 articles from 20 countries published between 1980 – 2007 and reported that articles on mental health and disorders increased four-fold within the study period. Evaluations of temporal trends in psychiatric studies from Turkey demonstrated a significant increase in output within the last two decades (Figure 1). Accordingly, we could find 22 articles from Turkey indexed in WoS and SCI-E databases for the year 2000 which increased to 541 for the year 2019 (i.e. an increase of 24.6 times). This elevation may reflect the increased use of web-based services for publication and collaborations among clinicians as well as the introduction of electronic publication services [45,46]. The increase in the number of Turkish higher education institutions within the last two decades as well as the importance of international publications for academic tenure in our country may also have contributed to this finding [47]. Regardless of this increase; Larivière and Grant [10] reported that psychiatric scientific output of Spain, France, South Korea, Japan and Turkey still lagged behind what is expected of those countries when their total scientific output was evaluated.

Despite the ubiquity of web-based services for collaboration as well as the endorsement of the international collaborations by The Scientific and Technological Research Council of Turkey; the majority of the publications we evaluated included intra-national groups of authors. Along with global research output, international collaborations are also increasing. In study, international collaborations in mental health research was reported to increase to 22.0% for the year 2011 (vs. 3.0% in 1980) [48]. Larivière and Grant reported that Israel, Brazil and Turkey displayed significantly less international collaboration compared to their scientific output and this may reflect the regional dominance of those countries for mental health research [10]. Two studies conducted on scientific output from Turkey reported that although international collaborations were increasing, Turkish authors still chose intra-national colleagues for collaborations over international ones [49,50]. Our results may also support the need for supporting international collaborations of Turkish psychiatrists, child and adolescent psychiatrists and psychologists.

Most prolific as well as the most cited institutions in our study were Istanbul University, Dokuz Eylul University and Ege University. The leading one is located in Istanbul while the remainder are located in Izmir. Both Istanbul and Izmir are located in the western part of Turkey and are major communication, technology and service hubs. This may have increased their scientific output.

The most common journals chosen by Turkish authors for psychiatric research in our study were Psychiatry Clin Psychopharmacol (The journal name Bulletin of Clinical Psychopharmacology changed to Psychiatry and Clinical Psychopharmacology in 2016), Anadolu Psikiyatri Derg and Prog Neuro-Psychopharmacol Biol Psychiatry. The first two journals are located in Turkey which may have affected the authors' choices. Most frequently cited journals in our study were Prog Neuro-Psychopharmacol Biol Psychiatry (IF= 4.3), J Affect Disord (IF= 4.1) and Psychiatry Res (IF= 2.2) which may expected from their impact factors.

The mean number of citations per article in our study was 10.19±22.51. Igoumenou and colleagues [44] reported that articles from the USA received the highest number of citations (mean 11.5), followed by the Netherlands (mean 11.4), Canada (mean 9.8) and the UK (mean 9.7). The average number of citations in our study was lower than the USA and the Netherlands while it was higher than Canada and the UK. However, this figure is only correct for the studies we evaluated and Turkish scientific output in mental health as well as total citations received in this domain were repeatedly reported as low in the past [4,8,10]. Besides, the high mean number of citations in our study may be related to the wide time interval. However, Igoumenou et al. [44] examined only the articles that published between the years 2005-2009. Scientific impact is favorably affected by specialization in a niche topic, structured/ informative abstracts, greater number of references, longer/ detailed reports, inclusion of study design in the title as well as being published as open access [48,51]. Therefore, citations to mental health research from Turkey may be increased by considering those factors as well as increasing international and intra-national collaborations.

Most common keywords for studies evaluated in our research were "depression", "schizophrenia" and "bipolar disorder". This may reflect the fact that depression is the commonest psychiatric disorder globally. Global research output on bipolar disorder is rapidly increasing within the last quarter century although literature on this disorder is still patchy compared to that on schizophrenia [52,53]. Research output on schizophrenia is also increasing but its share in total psychiatric output is reducing (from 5.2% to 2.6% within the last 50 years) [54]. Larivière and colleagues [48] found that research areas varied between countries. According to their results, bipolar and obsessive compulsive disorders were more frequently foci of research from Turkey and that Turkish research output mostly focused on journals covering clinical observations. The last observation may be explained by the greater clinical experience of Turkish clinicians and their lack of access to sophisticated neuroimaging tools [48].

Our results should be evaluated within their limitations. Firstly, we evaluated studies only from 1980 to 2019 and our results may not be valid for other dates. Secondly, we included studies indexed in WoS and SCI-E databases and not inclusion of other databases may have affected our results. Thirdly, we did not use formal network analysis in evaluating relationships between institutions, journals and keywords [55]. Using formal network analysis methods may have allowed us to determine central and peripheral nodes and strengths of connections as well as separate clusters. Finally, it is known that not all publications in the field of psychiatry are published only in journals scanned in the category of psychiatry. This issue is one of the important limitations of our study.

CONCLUSION

Bibliometric studies are crucial in evaluating domain specific research and in planning for efficient use of limited resources. This study aimed to evaluate the contribution of Turkish researchers to the psychiatric literature, to determine gaps in research and increase awareness of researchers. Psychiatric literature from Turkey greatly increased within the last two decades. However, international collaborations are still limited and most of the publications were in journals published in Turkey. Citations to studies may also be increased further. Higher education institutions and training hospitals in Turkey may consider interventions to ease both intra-national and international collaborations between researchers focusing on psychiatry. Also, Turkish journals publishing psychiatric research may consider using recent innovations such as social networking etc. to increase global awareness of research from Turkey.

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