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Meta-analysis

Scientometric Assessment of India's Migraine Research Publications during 2006-15

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ABSTRACT

The present study examines 579 Indian publications on "Migraine" research as covered in Scopus database during 2006-15, experiencing an annual growth rate of 17.37%, citation impact per paper of 8.32, international collaborative publication share of 9.80% and global publication share of 2.56%. The global publications share on "Migraine" came from several countries, of which the top 10 most productive countries accounted for 75.30% share of global publications output during 2006-15. A large number of Indian organizations and authors participated in Indian research on "Migraine" research during 2006-15, of which the top 15 organizations and 15 authors contributed 31.26% and 25.22% publications share and 70.50% and 23.50% citation share respectively of the Indian output and citations. Medicine, among subjects, contributed the largest publications (63.90%), followed by pharmacology, toxicology & pharmaceutics (34.72%), neurosciences (14.16%), biochemistry, genetics & molecular biology (13.64%) and chemistry (3.97%) during 2006-15. Indian publications on migraine research appeared in several journals, of which the top 15 journals contributed 32.64% share of the India's output. The top 14 highly cited papers registered 53 to 1087 citations, and together contributed 2094 citations, leading to the average citation per paper of 149.57. Concludes that there is an urgent need to frame a national policy in this area, undertake more R&D and recognize migraine research as a public health problem and allocate more healthcare funds in this area.

Key words: Migraine, Pain, Disease, Publications, India, Bibliometrics, Scientometrics.

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INTRODUCTION

Headache disorders are among the most common disorders of the nervous system and the most common patient complaints encountered in neurology practice, a fact borne out in prevalence estimates from numerous population-based studies. Headache can also be caused by or occur secondarily to a long list of other conditions, for example medication overuse headache. Headache disorders impose a recognizable burden on sufferers including sometimes substantial personal suffering, impaired quality of life and financial cost. Repeated headache attacks, and often the constant fear of the next one, damage family life, social life and employment. The long-term effort of coping with a chronic headache disorder may also predispose the individual to other illnesses. For example, depression is three times more common in people with migraine or severe headaches than in healthy individuals.[1-2]

A World Health Organization (WHO) review of global data found migraine to be one of the most prevalent health disorders worldwide, and the most frequent cause of headache consultation in the Americas, Europe, South-East Asia, and the Western Pacific. Among the 135 health conditions listed in the World Health Report 2001-Mental Health: New Understanding, New Hope, migraine was cited as 19th leading cause of years lived with disability for both males and females worldwide. Globally, it has been estimated that prevalence among adults of current headache disorder (symptomatic at least once within the last year) is 47%. Half to three quarters of the adults aged 18-65 years in the world have had headache in the last year and among those individuals, more than 10% have reported migraine. Headache on 15 or more days every month affects 1.7-4% of the world's adult population. Despite regional variations, headache disorders are a worldwide problem, affecting people of all ages, races, income levels and geographical areas. In the Global Burden of Disease Study, updated in 2004, migraine on its own was found to account for 1.3% of years lost due to disability (YLD).[1-2]

The International Classification of Headache Disorders published by the International Headache Society, classify more than 150 types of primary and secondary headache disorders. The primary headache disorders are divided into four main groups: migraine, tension-type headache, trigeminal autonomic cephalgias and a miscellaneous group. Migraine headaches are characterized by throbbing and pulsating pain caused by the activation of nerve fibers that reside within the wall of brain blood vessels traveling within the meninges. Migraines headaches are recurrent attacks of moderate to severe pain that is throbbing or pulsing and often strikes one side of the head. Other common symptoms are increased sensitivity to light, noise, and odors; and nausea and vomiting. Routine physical activity, movement, or even coughing or sneezing can worsen the headache pain. Migraines occur most frequently in the morning, especially upon waking. Some people have migraines at predictable times, such as before menstruation or on weekends following a stressful week of work. Many people feel exhausted or weak following a migraine but are usually symptom-free between attacks. A number of different factors can increase your risk of having a migraine. These factors, which trigger the headache process, vary from person to person and include sudden changes in weather or environment, too much or not enough sleep, strong odors or fumes, emotion, stress, overexertion, loud or sudden noises, motion sickness, low blood sugar, skipped meals, tobacco, depression, anxiety, head trauma, hangover, some medications, hormonal changes, and bright.[3]

The two major types of migraine are: (a) Migraine with aura, previously called classic migraine, includes visual disturbances and other neurological symptoms. Individuals may temporarily lose part or all of their

vision and (b) Migraine without aura, or common migraine, is the more frequent form of migraine. Symptoms include headache pain that occurs without warning and is usually felt on one side of the head, along with nausea, confusion, blurred vision, mood changes, fatigue, and increased sensitivity to light, sound, or noise. The other types of migraine include: (c) Abdominal migraine mostly affects young children and involves moderate to severe pain in the middle of the abdomen with little or no headache; (d) Basilar-type migraine mainly affects children and adolescents. It occurs most often in teenage girls and may be associated with their menstrual cycle; (e) Hemiplegic migraine is a rare but severe form of migraine that causes temporary paralysis-sometimes lasting several days-on one side of the body prior to or during a headache; (f) Menstrual-related migraine affects women around the time of their period, although most women with menstrual-related migraine also have migraines at other times of the month; (g) Migraine without headache is characterized by visual problems or other aura symptoms, nausea, vomiting, and constipation, but without head pain; (h) Ophthalmologic migraine an uncommon form of migraine with head pain, along with a droopy eyelid, large pupil, and double vision that may last for weeks, long after the pain is gone, (i) Retinal migraine is a condition characterized by attacks of visual loss or disturbances in one eye and (j) Status migrainosus is a rare and severe type of acute migraine in which disabling pain and nausea can last 72 hours or longer.[3]

Literature Review

There is no specific scientometric study on migraine research in the past. However, there are few studies undertaken by scholars from different countries on pain research. Among such studies, Leao, Aquarone and Rother[4] analyzed 47 articles (involving 258 authors) addressing pain research published in indexed journals by professionals affiliated to a Research Institute of a non-for-profit general hospital of the city of São Paulo, from 2008 to 2011. Migraine (25.7%) and headache (14.9%) were most studied sub-themes, and epidemiological designs were the most observed (47%). Sapunar, Kostit, Bano, Ferhatovi and Puljak[5] evaluated number and type of Croatian publications in the field of pain research and to compare it with similar publications in Austria. The authors studied the number of publications, their impact factors and type of collaborations. Publications of Croatian authors in the field of pain research were compared with identical dataset comprising articles published by researchers from Graz, Austria, because of its comparable scientific production. From 1998 to 2011, scientists from Croatian institutions published 194 pain-related articles compared to 187 articles published by their peers from Graz. Onyeka and Chukwuneke[6] studied the African pain research spectrum over the last 10 years, by analyzing 228 articles from 25 African countries published in 129 different journals. The authors identify the trends in the number of publications from different countries; identify the currently unexplored areas of pain research. Zhang, Yu, Chu and Dai[7] analyzed 3683 publications related to headache research covered in PubMed in 2011 and analyzed country-wise and sub-field wise. Major emphasis in pain research research was on migraine research. Therapy, pathophysiology and etiology were the hot spots in research. Mogil, Simmonds and Simmonds[8] analysed 4525 research papers published in journal Pain from its inception till the end of 2007 (32 years). The authors studied the characteristics of the pain research, subjects of study and clinical features of publications. Chuang and Ho[9] studied highly cited articles in pain research published from 1900 to 2011. Their total number of papers and international collaboration statistics were presented for countries, institutions and authors.

OBJECTIVES

The main objectives of this study are to study the performance of Indian research on "Migraine" during 2006-15, based on publications output, as indexed in Scopus database. In particular, the study focuses on the following objectives: (i) To study the growth of world and Indian research output and its distribution by type of publication; (ii) To study the contribution & citation impact of top 10 most productive countries; (iii) To study the share of international collaboration publications in India's output and share of leading collaborative countries; (iv) To study the distribution of Indian research output by broad subject areas; (v) To study the publication productivity and citation impact of leading Indian organizations and authors; and (vi) To study the leading media of communication and the characteristics of high cited papers.

METHODOLOGY

The study retrieved and downloaded the publication data of the world and of 10 most productive countries (including India) on "MIgraine" from the Scopus international multidisciplinary bibliographical and citation database (http://www.scopus.com) for 10 years during 2006-15. The keywords "Migraine" was used in "Abstract, Title and Keyword" tag and restricting it to the period 2006-15 in "date range tag" was used for searching the global publication data and this become the main search string. When the main search string with restricted to 10 most productive countries in "country tag", as shown below for India below , the publication data on 10 most productive countries were obtained. When the main search string is further restricted to "subject area tag", "country tag", "source title tag", "journal title name" and "affiliation tag", we got information on distribution of publications by subject, collaborating countries, organization-wise and journal-wise, etc. For citation data, open citation window is used, where citations are counted from the date of publication till March 2016.

TITLE-ABS-KEY(migraine) AND PUBYEAR > 2005 AND PUBYEAR < 2016

TITLE-ABS-KEY(migraine) AND PUBYEAR > 2005 AND PUBYEAR < 2016 AND (LIMIT-TO(AFFILCOUNTRY,"India"))

Analysis

The global and Indian research output on migraine research consisted of 22658 and 579 publications during 2006-15, which increased from 2131 and 23 to 2168 to 69 publications from 2006 to 2015, registering annual average publication growth rate of 0.35% and 17.37%. India's global publication share on migraine research was 2.56% during 2006-15, which increased from 1.73% to 3.34% from 2006-10 to 2011-15. The average citation per paper registered by Indian publications on migraine research was 8.32 during 2006-2015, which decreased from 13.01 to 6.01 from 2006-10 to 2011-15 (Table 1). Of the total Indian publications on migraine research, 69.60% (403) appeared as articles, 21.07% (122) as review papers, 4.84% (28) as letters, 2.07% (7) as editorials and others such as article in press, short surveys, books and book chapters less than 1.0% during 2006-15.

India's share of international collaborative papers on migraine research was 9.80% during 2006-15, which decreased from 11.5% to 9.0% from 2006-10 to 2011-15. (Table 1) Among the leading foreign collaborating partner countries in international collaborative research, the largest share (60.0%, 36 papers) came from USA, followed by U.K. (26.7%, 16 papers), Italy, Germany and Norway (each 11.7%, 7 papers), China (10.0%, 6 papers), Australia, Brazil and Canada (each 8.3%, 5 papers), etc during 2006-15.

Global Publications and Share of Top 10 Most Productive Countries

The global share of top 10 most productive countries on migraine research consisted of 17062 publications, accounting for 75.30% share of world output during 2006-15, which increased from 74.38% to 76.16% from 2006-10 to 2011-15. The global publication share of top 10 most productive countries on migraine research individually varied from 2.56% to 31.82%, with maximum share (31.82%) coming from USA, followed by Italy (9.14%), Germany (7.87%), U.K. (7.37%), Spain, Canada and France (from 3.36% to 4.33%), Netherland, Turkey and India (from 2.56% to 2.77%) from 2006-15. The global publication share increased highest by 1.61% in India, followed by Italy (1.17%), USA (0.97%), Turkey (0.77%), U.K. (0.54%) and Canada (0.02%), as against decrease by 1.65% in Spain, Germany (1.58%), France (0.05%) and Netherlands (0.02%) from 2006-10 to 2011-15 (Table 2).

Subject-Wise Distribution of Publications

The publications output was classified according to Scopus bibliographical database subject classification. The largest share of publications (63.90%) was classified under medicine, followed by pharmacology, toxicology & pharmaceutics (34.72%), neurosciences (14.16%), biochemistry, genetics & molecular biology (13.64%) and chemistry (3.97%) during 2006-15. The publication activity has increased in pharmacology, toxicology & pharmaceutics (from 27.75% to 38.14%), biochemistry, genetics & molecular biology (from 8.90% to 15.98%), as against decrease in medicine (from 71.73% to 60.05%), neurosciences (from 19.37% to 11.60%) and chemistry (from 6.81% to 2.58% from 2006-10 to 2011-15. Chemistry registered the highest citation impact per paper (13.13), followed medicine (8.92), biochemistry, genetics & molecular biology (8.52), pharmacology, toxicology & pharmaceutics (8.18) and neurosciences (7.37) during 2006-15 (Table 3).

Sub-Fields of Migraine Research

The largest number and share of research was focused on Migraine without Aura (46 papers, 7.94% share), followed by Migraine with Aura (44 papers, 7.60% share), Ophthalmologic Migraine (19 papers, 3.28% share), Hemiplegic Migraine (12 papers, 2.07% share), Retinal Migraine (7 papers, 1.21% share), Abdominal Migraine and Basilar-Type Migraine (3 papers, 0.52% share each), and Menstrual- Related Migraine and Status Migrainosus (1 paper, 0.17% share each) during 2006-15. The publication share has increased in Migraine without Aura (from 7.85% 7.99%), Ophthalmologic Migraine (from 3.14% to 3.35%), Abdominal Migraine and Basilar-Type Migraine (from 0.0% to 0.52% each) and Menstrual- Related Migraine and Status Migrainosus (from 0.0% to 0.26%), as against decrease in Migraine with Aura (from 10.47% to 6.19%), Hemiplegic Migraine (from 2.09% to 2.06%) and Retinal Migraine (from 2.09% to 0.77%) from 2006-10 to 2011-15 (Table 4).

Significant Keywords

Thirty six significant keywords (Table 5) have been identified in the migraine literature, which throw light on the nature of research carried out in this area

Contribution and Citation Impact of Most Productive Organizations

The top 15 organizations on "Migraine" research individually contributed 6 to 27 publications and together they contributed 181 publications (31.26% publications share) which accounted for 4817 citations (70.50% citation share) during 2006-15. A scientometric profile of top 15 most productive organizations is shown in Table 6. Five organizations contributed more than the average productivity per paper (12.07) of all organizations: Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (27 papers), National Institute of Mental Health & Neurosciences, Bangalore (19 papers), All India Institute of Medical Sciences, New Delhi (18 papers), Postgraduate Institute of Medical Sciences, Chandigarh (17 papers) and Vivekanda Institute of Medical Sciences, Kolkata (14 papers) during 2006-15. Two organizations received more than the average citations per paper (18.76) of all organizations: All India Institute of Medical Sciences, New Delhi (68.0) and Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (47.96) during 2006-15.

Four organizations received more than the average h-index (6.13) of all organizations: Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow (27), Baroda Medical College (12), All India Institute of Medical Sciences, New Delhi and National Institute of Mental Health & Neurosciences, Bangalore (7 each) during 2006-15. Four organizations registered more than average share (8.29%) of international collaborative papers of all organizations: Panjab University, Chandigarh (42.86%), National Institute of Mental Health & Neurosciences, Bangalore (31.58%), Dr Ram Manohar Lohia Hospital, New Delhi (28.57%) and Lilavati Hospital & Research Center, Mumbai (22.22%) during 2006-15.

Contribution and Citation Impact of Most Productive Authors

The top 15 authors on "Migraine" research individually contributed 6 to 14 publications and together they contributed 146 publications (25.22% publications share) which accounted for 1132 citations (23.50% citation share) during 2006-15. A scientometric profile of top 15 most productive authors is shown in Table 7. Seven authors contributed more than the average productivity per paper (9.73) of all authors: A.Chakravarty and S.Prakash (14 papers each), K.Ravishankar, J.Kaita and R.Gupta (13 each), U.K.Mishra (12 papers) and M.S.Bhatia (10 papers) during 2006-15. Eight authors received more than the average citations per paper (7.75) of all authors: V.Lal (11.33), S.Pradhan (10.0), G.Gururaj (9.50), U.K.Mishra (9.42), J.Kaita (8.69), S.Prakash (8.50), M.S.Bhatia and S.K.Bhoi (8.30 each) during 2006-15.Four authors received more than the average h-index (5.0) of all authors: U.K.Mishra and J.Kaita (7 each), S.Prakash and R.Gupta (^ each) during 2006-15. Four authors registered more than average share (8.22%) of international collaborative papers of all authors: G.Gururaj (83.33%), G.B.Kulkarni (33.33%), K.Ravishankar (23.08%) and R.Gupta (15.38%) during 2006-15.

Medium of Communication

Of the 579 Indian publications on "Migraine" research during 2006-15, 575 publications appeared in journals, 2 each in books and conference proceedings during 2006-15. The top 15 journals together contributed 189 publications, which accounted for 32.64% share of the total publication output during 2005-14. The publication share of 15 journals in total Indian publication output has decreased from 44.50 during 2006-10 to 26.80% during 2011-15. The largest number of publications (20) has appeared in *Neurology India*, followed by *Annals of Indian Academy of Neurology* and *Journal of Headache & Pain* (19 publications each), *Headache* (17 publications, *Cephalalgia* (16 publications), *International Journal of Pharmacy & Pharmaceutical Science* (14 publications, etc during 2006-15 (Table 8).

High Cited Papers

There were 14 high cited papers (1 paper with citation of 1087, 2 papers in citation range 121 to 148 and 11 papers in citation range from 53 to 84) which together received 2094 citations, accounting for average citation per paper of 149.57.Of the 14 high cited papers (8 articles and 6 reviews), 6 were single institution papers, 4 national collaborative and 4 international collaborative. The 14 high cited papers have appeared in

Table 1: Annual Growth of Publications and Citations of Indian Migraine Research during 2006-15

Publication Year	World	India					
	TP	TP	TC	ACPP	ICP	%ICP	%TP
2006	2131	23	480	20.87	6	26.1	1.08
2007	2055	20	377	18.85	1	5.0	0.97
2008	2215	35	288	8.23	4	11.4	1.58
2009	2302	45	762	16.93	5	11.1	1.95
2010	2344	68	578	8.50	6	8.8	2.90
2011	2238	66	390	5.91	3	4.5	2.95
2012	2311	93	1547	16.63	10	10.8	4.02
2013	2479	95	212	2.23	8	8.4	3.83
2014	2418	65	154	2.37	6	9.2	2.69
2015	2168	69	29	0.42	11	15.9	3.18
2006-10	11047	191	2485	13.01	22	11.5	1.73
2011-15	11614	388	2332	6.01	35	9.0	3.34
2006-15	22658	579	4817	8.32	57	9.8	2.56

TP=Total papers; TC=Total citations; ACPP=Average Citations Per Paper; ICP=International Collaborative Papers.

Table 2: Global Publication Output and Share of Top 10 Most Productive Countries on Migraine Research during 2006-15

Name of the Country	Number of Publications			Global Share of Publications		
	2006-10	2011-15	2006-15	2006-10	2011-15	2006-15
USA	3460	3750	7210	31.32	32.29	31.82
Italy	944	1128	2072	8.55	9.71	9.14
Germany	959	825	1784	8.68	7.10	7.87
U.K.	784	887	1671	7.10	7.64	7.37
Spain	571	409	980	5.17	3.52	4.33
Canada	371	392	763	3.36	3.38	3.37
France	374	387	761	3.39	3.33	3.36
Netherlands	307	321	628	2.78	2.76	2.77
Turkey	256	358	614	2.32	3.08	2.71
India	191	388	579	1.73	3.34	2.56
Total of 10 countries	8217	8845	17062			
Total of the World	11047	11614	22658			
Share of 10 countries in world output	74.38	76.16	75.3			

Table 3: Subject-Wise Distribution of Publications on "Migraine" during 2006-15

Name of the Subject	No. of Papers			Share of Papers			TC	ACPP	HI
	2006-10	2010-15	2006-15	2006-10	2010-15	2006-15			
Medicine	137	233	370	71.73	60.05	63.90	3299	8.92	22
Pharmacology, toxicology & pharmaceutics	53	148	201	27.75	38.14	34.72	1644	8.18	22
Neurosciences	37	45	82	19.37	11.60	14.16	604	7.37	14
Biochemistry, genetics & molecular biology	17	62	79	8.90	15.98	13.64	673	8.52	11
Chemistry	13	10	23	6.81	2.58	3.97	302	13.13	7
Total of India	191	388	579	100.00	100.00	100.00			

TC=Total Citations; ACPP=Average Citation Per Paper; HI=h-index.

Table 4: Distribution of Papers by Type of Migraine Research during 2006-15

Type of Migraine	TP			%TP			TC	ACPP	HI
	2006-10	2011-15	2006-15	2006-10	2011-15	2006-15			
Migraine without Aura	15	31	46	7.85	7.99	7.94	298	6.48	10
Migraine with Aura	20	24	44	10.47	6.19	7.60	374	8.50	11
Ophthalmologic Migraine	6	13	19	3.14	3.35	3.28	87	4.58	5
Hemiplegic Migraine	4	8	12	2.09	2.06	2.07	107	8.92	4
Retinal Migraine	4	3	7	2.09	0.77	1.21	37	5.29	3
Abdominal Migraine	0	3	3	0.00	0.77	0.52	3	1.00	1
Basilar-Type Migraine	0	3	3	0.00	0.77	0.52	3	1.00	1
Menstrual- Related Migraine	0	1	1	0.00	0.26	0.17	0	0.00	0
Status Migrainosus	0	1	1	0.00	0.26	0.17	1	1.00	0
Total of the country	191	388	579						

Table 5: List of Significant Keywords in Migraine Literature during 2006-15

Name of Keyword	Frequency	S.No	Name of Keyword	Frequency
Migraine	406	19	Migraine with aura	42
Headache	160	20	Diarrhea	37
Migraine disorders	106	21	Placebo	36
Drug efficacy	76	22	Ibuprofen	35
Nausea	65	23	Photophobia	30
Drug formulation	63	24	Zolmtriptan	30
Drug safety	55	25	Amitriptyline	28
Pain	54	26	Drug structure	28
Hypertension	51	27	Insomnia	27
Drug delivery system	49	28	Drug screening	25
Depression	48	29	Seizure	24
Diabetes mellitus	47	30	Skin diseases	24
Epilepsy	47	31	Alzheimer disease	23
Migraine without aura	46	36	Obesity	23
Drug release	45	33	Anxiety	21
Topiramale	45	34	Cardiovascular disease	21
Tension headache	44	35	Opthalmolegic migraine	19
Propranolol	40	36	Stroke	17

13 journals, of which the largest *number (2) was published in AAPS PharmaSciTech and 1 paper each in Asian Journal of Andrology, Headache, Journal of Clinical Neurology, Journal of Clinical Pharmacology, Journal of Controlled Release, Journal of Ethno pharmacology, Journal of Urology, The Lancet, Neurology, Recent Patents on Drug Delivery & Formulation, Tetrahedron and Trends in Molecular Medicine.* The 14 high cited papers involve 18 Indian organizations, of which the highest number of papers (3) are published by M.S.University of Baroda, 2 papers by Centre for Cellular & Molecular Biology, Hyderabad and 1 paper each by Post-graduate Institute of Medical Education & Research, Chandigarh, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, , Maulana Azad Medical College, Delhi, SMS Medical College & Hospital, Jaipur, Vector Control Research Center, Pondicherry, Institute of Nuclear Medicine & Allied Sciences, Delhi, Sambalpur University, University of Rajasthan, Jaipur, Dr H.S.Gour University, Sagar, Hamdard University, Jivraj Hospital, Ahmedabad, , KLE Society Hospital, Belgaum, Pancea Biotech Ltd, Mumbai, Betty Cowan Research and Innovation Center, Ludhiana, Glenmark Research Center, Mumbai and Shri Ramnath Singh Mahavidalaya, Bhind,

SUMMARY

The migraine research from India consisted of 579 publications during 2006-15, which increased annually from 23 to 69 from 2006 to 2015, having annual average publication growth rate of 17.37%. India's publication share in global publication output was 2.56% during 2006-15, increasing from 1.73% to 3.34% from 2006-10 to 2011-15. Indian

Table 6: Profile of Top 15 Most Productive Organizations on "Migraine" Research during 2006-15

Name of the Organization	TP	TC	ACPP	HI	ICP	%ICP
Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow	27	1295	47.96	27	1	3.70
National Institute of Mental Health & Neurosciences, Bangalore	19	116	6.11	7	6	31.58
All India Institute of Medical Sciences (AIIMS), New Delhi	18	1224	68.00	7	1	5.56
Postgraduate Institute of Medical Sciences (PGIMER), Chandigarh	17	133	7.82	4	0	0.00
Vivekanda Institute of Medical Sciences, Kolkata	14	100	7.14	5	0	0.00
University College of Medical Sciences, Delhi	12	85	7.08	5	0	0.00
Baroda Medical College	12	108	9.00	12	0	0.00
Maulana Azad Medical College, Delhi	11	109	9.91	4	0	0.00
Lilavati Hospital & Research Center, Mumbai	9	27	3.00	3	2	22.22
Chhatrapati Shahuji Maharaj Medical College, Lucknow	8	24	3.00	3	0	0.00
SMS Pharma Research Center, Hyderabad	7	19	2.71	3	0	0.00
Dr Ram Manohar Lohia Hospital, New Delhi	7	18	2.57	1	2	28.57
Panjab University, Chandigarh	7	84	12.00	4	3	42.86
Indian Institute of Chemical Technology, Hyderabad	7	19	2.71	3	0	0.00
Punjabi University, Patiala	6	35	5.83	4	0	0.00
Total of 15 organizations	181	3396	18.76	6.13	15	8.29
Total of India	579	4817				
Share of 15 organizations in India's total output	31.26	70.5				

TP=Total Papers; TC=Total Citations; ACPP=Average Citation Per Paper; ICP=International Collaborative Papers; HI=h-index.

Table 7: Profile of Top 15 Most Productive Authors on "Migraine" Research during 2006-15

Name of the Author	Affiliation of the Author	TP	TC	ACPP	HI	ICP	%ICP
Chakravarty	Vivekanda Institute of Medical Sciences, Kolkata	14	100	7.14	5	0	0
S. Prakash	Smt B,K, Shah Medical Institute & Research Center, Piperia, Baroda	14	119	8.50	6	0	0
K. Ravishankar	Jaslok & Lilavati Hospital, Mumbai	13	63	4.85	5	3	23.08
J. Kaita	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	13	113	8.69	7	0	0
R. Gupta	Himalayan Institute of Medical Sciences, Dehradun	13	94	7.23	6	2	15.38
U. K. Mishra	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	12	113	9.42	7	0	0
M.S. Bhatia	University College of Medical Sciences, Delhi	10	83	8.30	5	0	0
S. Pradhan	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	9	90	10.00	5	0	0
B.M. Mittal	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	8	60	7.50	5	0	0
S.K. Bhoi	Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow	10	83	8.30	5	0	0
V. Lal	Postgraduate Institute of Medical Sciences, Chandigarh	6	68	11.33	4	0	0
K. Ravikumar	Indian Institute of Chemical Technology, Hyderabad	6	19	3.17	3	0	0
G.B. Kulkarni	National Institute of Mental Health & Neurosciences, Bangalore	6	37	6.17	4	2	33.33
G. Gururaj	National Institute of Mental Health & Neurosciences, Bangalore	6	57	9.50	4	5	83.33
Mukherjee	Vivekanda Institute of Medical Sciences, Kolkata	6	33	5.50	4	0	0
	Total of 15 authors	146	1132	7.75	5	12	8.22
	Total of India	579	4817				
	Share of 15 authors output in India's total	25.22	23.5				

Table 8: List of Top 15 Most Productive Journals on "Migraine" Research, 2005-14

Name of the Journal	Number of Papers		
	2006-10	2011-15	2006-15
Neurology India	11	9	20
Annals of Indian Academy of Neurology	5	14	19
Journal of Headache & Pain	10	9	19
Headache	13	4	17
Cephalalgia	12	4	16
International Journal of Pharmacy & Pharmaceutical Science	2	12	14
Research Journal of Pharmaceutical, Biological & Chemical Sciences	0	12	12
International Journal Pharma & Biosciencesi	1	10	11
International Journal of Pharmaceutical Science. Review & Research	3	7	10
Journal of Clinical & Diagnostic Research	0	10	10
Journal of Association of Physicians of India	1	9	10
Asian Journal of Pharmaceutical & Clinical Research	8	1	9
International Journal of Pharmatech Research	5	3	8
BMJ Case Reports	7	0	7
Research Journal of Pharmacy & Technology	7	0	7
Total of 15 journals	85	104	189
Total of India	191	388	579
Share of 15 journals in India's total output	44.5	26.8	32.64

publications on migraine research registered an average citation impact per paper of 8.32 during 2006-2015, which decreased from 13.01 to 6.01 from 2006-10 to 2011-15. The share of international collaborative publications in India's output was 9.80%, which decreased from 11.5% to 9.0% from 2006-10 to 2011-15. USA contributed the largest share (60.0%) among India's international collaborative publications during 2006-15, followed by U.K. (26.7%), Italy, Germany and Norway (11.7% each), China (10.0%), Australia, Brazil and Canada (8.3% each), etc during 2006-15. The global publications share on "Migraine" came from several countries, of which the top 10 most productive countries accounted for 75.30% share of global publications output during 2006-15. The largest global publication share(31.82%) was contributed by USA, followed by Italy (9.14%), Germany (7.87%), U.K. (7.37%), Spain, Canada and France (from 3.36% to 4.33%), Netherland, Turkey and India (from 2.56% to 2.77%) from 2006-15. The global publication share increased in India, Italy, USA, Turkey, U.K and Canada, as against decrease in Spain, Germany, France and Netherlands from 2006-10 to 2011-15. Medicine, among subjects, contributed the largest publications (63.90%), followed by pharmacology, toxicology & pharmaceutics (34.72%), neurosciences (14.16%), biochemistry, genetics & molecular biology (13.64%) and chemistry (3.97%) during 2006-15. The publication activity has increased in pharmacology, toxicology & pharmaceutics, biochemistry, genetics & molecular biology, as against decrease in medicine, neurosciences and chemistry from 2006-10 to 2011-15. Chemistry registered the highest citation impact per paper (13.13), followed medicine (8.92), biochemistry, genetics & molecular biology (8.52), pharmacology, toxicology & pharmaceutics (8.18) and neurosciences (7.37) during 2006-15. Among the types of migraine research, the largest share of papers was contributed on Migraine without Aura (7.94% share), followed by Migraine with Aura (7.60% share), Ophthalmologic Migraine (3.28% share), Hemiplegic Migraine (2.07% share), Retinal Migraine (1.21% share), etc. A large number of Indian organizations and authors participated in Indian research on "Migraine" research during 2006-15, of which the top 15 organizations and 15 authors contributed 31.26% and 25.22% publications share and 70.50% and 23.50% citation share respectively of the Indian output and citations. Indian publications on migraine research appeared in several journals, of which the top 15 journals contributed 32.64% share of the India's output, decreasing from 44.50% during 2006-10 to 26.80% during 2011-15. The top 14 highly cited papers registered 53 to 1087 citations, and together contributed 2094 citations, leading to the average citation per paper of 149.57. Amongst 14 high cited papers (8 articles and 6 reviews), 6 were single institution papers, 4 national collaborative and 4 international collaborative. The 14 high cited papers have appeared in 13 journals.

SUGGESTIONS AND CONCLUSION

Headache disorders are a public-health concern given the large amount of associated disability and financial costs to society. As headache disorders are most troublesome in the productive years (late teens to 50s), estimates of their financial cost to society – principally from lost working hours and reduced productivity – are massive. Yet, many of those troubled by headache do not receive effective care. Appropriate treatment of headache disorders requires professional training of health professionals, accurate diagnosis and recognition of the condition, appropriate treatment with cost-effective medications, simple lifestyle modifications, and patient education. Lack of knowledge among health-care providers is the principal clinical barrier. Worldwide, on average only four hours of undergraduate medical education are dedicated to instruction on headache disorders. Headache disorders are not perceived by the public as serious since they are mostly episodic, do not cause death, and are not contagious. The low consultation rates in developed countries may indicate that many sufferers are unaware that effective treatments exist. 50% of people with headache are estimated to be self-treating. Many governments, seeking to constrain health-care costs, do not acknowledge the substantial burden of headache on society. They might not recognize that the direct costs of treating headache are small in comparison with

the huge indirect-cost savings that might be made (e.g., by reducing lost working days) if resources were allocated to treat headache disorders appropriately. WHO recognized the burden of migraine disorders in the early 2000's and in partner with non-governmental organization carried out a Global Campaign against Headache, initiated in 2004, with an aim to raise awareness of headache disorders, but also, to improve the quality of headache care and access to it worldwide. WHO also published the Atlas of headache disorders in 2011 describing the burden due to headache disorders and resources available to reduce them?.

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