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A Bibliometric Study based on Scopus Database

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Abstract

Purpose: The purpose of this study is to carry-out bibliometric analysis of publications by authors associated with Army Medical College, Pakistan using Scopus database.

Methodology: All publications, published from 1977 to 2018, by the authors affiliated with Army Medical College, Pakistan were retrieved from Scopus database. The bibliographic records of all retrieved publications were downloaded in the Microsoft Excel. The data regarding phase-wise growth of publications; citations; subject distribution; the most prolific authors and journals; and research collaboration within Pakistan and abroad were analyzed and presented in tabular form.

Findings: A total of 417 publications were found with an average of 9.92 papers per year. However, these publications were cited 2,524 times with a citation impact of 6.05 citation per year. Out of 417, 352 (68%) publications were published on Medicine. The most prolific author was Abdul Khaliq Naveed and Journal of College of Physicians and Surgeons Pakistan and Journal of Pakistan Medical Association were the most preferred journal with 84 and 82 publications respectively. The authors mostly collaborated with National University of Sciences and Technology within Pakistan and two Saudi universities outside Pakistan.

Conclusion: Escalation in scientific productivity at Army Medical College was observed during the last decade. However, there is an urgent need to amplify research activities and collaboration with international organizations manifold to respectably stand with the world.

Keywords: Bibliometrics, Army Medical College, Pakistan; Research Productivity

Introduction

The assessment of research output is one of the key performance indicators of quality education and dynamic to the development of a country. Moreover, the quantity and quality of publications produced within a country or institution are the main factors that reflect quality of health care education and practices. The estimation of the scholarly communication output of any country and institute also shows its progress that is critical to the policy-making process as well as the justification to budget allocation (Meo, Hassan, & Usmani, 2013; Shehatta, & Mahmood, 2016; Haq & Al Fouzan 2017). The academics must play a twofold role in educational set-up, firstly the teaching and the other is the research. The exceptional academics try to maintain balance in both

fields, they not only involved in the teaching and learning process but also contribute to the greater body of knowledge by conducting new research (Nathan & Shawkataly, 2019).

Pakistan is located at South Asia with 207.8 million populations. The government is spending 2.7% of the total budget on health expenditure having 0.98 physicians per 1,000 populations (CIA-Fact Book, 2019). The history of medical colleges (schools) in Pakistan dates back to 1860 when the King Edward Medical College was established in Lahore. Pakistan inherited two medical colleges after its independence in 1947 (Haq & Ullah, 2014). The latest record of Pakistan Medical and Dental Council (PMDC), an accreditation body of medical schools in Pakistan, shows that there are 114 medical colleges in the country, 44 run by the public sector and 70 operated by the private sector. There are 1,86,980 registered medical practitioners and 23,133 registered dental practitioners in Pakistan (Pakistan Medical and Dental Council, 2019). The stable political and economic condition and research-oriented education have a direct impact on the overall evolution and progress of the country. The World Bank (2019) data on researchers per million people for the year 2017 stated that there are 354 researchers in Pakistan as compare to 4,377 and 4,256 researchers in United Kingdom and United States respectively. Israel has the highest ratio of researchers with 8,250 followed by Denmark with 7,897.

Army Medical College was established on March 26, 1977 in Rawalpindi to impart undergraduate medical education as a residential institute in military setup. It was initially affiliated with Quaid-e-Azam University for the award of Bachelor of Medicine and Bachelor of Surgery (MBBS) degree until 1997. In 1998, it became the constituent college of the National University of Sciences and Technology (NUST) and Bachelor of Dental Surgery (BDS) classes were also started in the same year. Fellow of College of Physicians and Surgeons (FCPS) in Basic Medical Sciences was started in 1996 however, MPhil and PhD courses were started in 2001 (Bhatti, 2015). In 2005, it became the constituent institution of National University of Medical Sciences (NUMS). The Army Medical College possesses well-equipped class-rooms, state of the art laboratories, seminar halls, auditorium, computer labs, well-stocked library with digital and print resources and hostels for male and female students. The teaching faculty and researchers affiliated with the college have been actively contributing their valuable share in scholarly communications and literature of the world (NUMS, 2019).

The quantitative analysis of publications is known as bibliometrics, the application has been applied on the published work of the author(s), group(s), institutes, country, region and world as a whole for targeted period or a subject etc. It is a combination of mathematics and statistics. The method also study helps to find the publication tendency, preferred areas of research, and frequently used journals and other citational metrics. (Latif, 2015; Haq & Fouzan 2017). Kumar (2019) argued that the vital indicators of bibliometric studies provide support in recruiting and promoting the faculty.

Different databases have been used to measure the publications trends and bibliometric parameters. Web of Science of Institute of Scientific Information, Scopus of Elsevier and PubMed are frequently used for this purpose. For the present study the Scopus Elsevier has been used because it is a multidisciplinary commercial database with comprehensive coverage of worldwide research publications (Bakri, et al. 2015). It provides bibliographical information, abstracts and various bibliometric parameters.

The main objective of this paper is to carry-out bibliometric analysis of publications of authors associated with Army Medical College, published from 1977 to 2018, using Scopus database. Moreover, this paper is aimed to analyze the different bibliometric aspects of publications such as phase-wise growth of publications; citations count; subject distribution; the most prolific authors, frequently used journals; and research collaboration within Pakistan and abroad.

Literature Review

Many bibliometric studies have been conducted on the assessment of research output of authors and institutions in Pakistan. Mushtaq, Abid and Qureshi (2012) calculated the research contribution of medical universities and colleges in Pakistan produced from 2007 to 2010. The data was collected from the Higher Education Commission (HEC) of Pakistan. HEC maintains the list of publications by Pakistani authors and indexed in the Journal Citation Report (JCR) of the Institute of Scientific Information (ISI), Web of Science. The study revealed that out of 129 HEC recognized universities, 24 universities produced 5,889 publications in various disciplines of medical sciences. Almost a quarter of publications (n=1,447; 24.57%) have been created by the researchers affiliated with University of Karachi followed by Aga Khan University (n=1258; 21.36%), University of the Punjab (n=1,061; 18.61%) and National University of Sciences and Technology (NUST) (n=404; 6.86%). More than fifty percent publications were generated by the researchers (n=3108; 52.77%) that belonged to Karachi, followed by Lahore (n=1,244; 21.12%) and Islamabad (n=455; 7.72%). Javed, Ahmed & Khahro (2020) evaluated the research output of 17 universities for the period of ten years from 2008 to 2017, geographically located in Islamabad, the capital city of Pakistan. The data for this study has been extracted from Elsevier-Scopus database and a total of 36,577 documents were found comprising the 34% of total country's research output. COMSATS University and Quaid-e-Azam University (QAU) were found most productive with 10,229 (28%) and 10,017 (27%) publications respectively. More than half of the research produced by two universities, NUST stood on third (n=6,899; 19%). The citation analysis showed that research produced by QAU received a maximum number of citations (n=1,12,859) with an average of 11.27 citations per document. The evaluation of public and private sector universities showed the research produced by public sector universities has been much higher as compared to private sector universities. Study also analyzed the authorship patterns and preference of journals by different universities. Riaz and Naveed (2019) carried out the scientometric analysis of NUST documents published during 2004-2018. A total of 4,876 publications were found with an average of 325.06 publications per year. These publications received 36,217 citations with the citation impact of 7.42 and 64 articles were awarded h-index scale.

Army Medical and Dental Corps of Pakistan has been publishing Pakistan Armed Forces Medical Journal (PAFMJ) since 1956, however, its editorial office was shifted to Army Medical College in 1989. Most of the researchers from Army Medical College are publishing their research papers in PAFMJ. Saleem et al. (2018) conducted a bibliometric analysis of documents published in PAFMJ from 2011 to 2015. A total of 749 documents were published and maximum (186, 24.83%) documents were published in the year 2015 and a pattern of three-author was found preferred (n=214; 28.57%). Most of the articles were published on Pathology (n=83; 11.08%), followed by Surgery (n=82; 10.90%) and Medicine (n=79; 10.59%).

Iqbal, Mahmood and Iqbal (2018) examined the research contribution of Pakistani researchers to the ISI Web of Science database from 1981 to 2015. Although the Quaid-i-Azam University was on the first rank in publications growth (n=8863; 11.86%) followed by the University of Karachi (n=6645; 8.89%), however, highest citation impact was found of National Centre of Physics with 13.04 citation per documents. In the analysis of international research collaboration, the highest citation impact (43.11 citations per paper) was found with the researchers of John Hopkin University, USA and highest number of research collaboration (n=1172) were found with King Saud University, Saudi Arabia. The maximum number of publications have been written on subjects of Physical and Life Sciences, followed by Clinical, Pre-Clinical & Health. Farooq et al. (2018) described the research contribution of Pakistani authors in the energy sector

published from 1990 to 2016. The Scopus database was used to collect the relevant data and a total of 991 articles written by 2,139 authors belonged to 213 research organizations were found. These publications have been cited by 10,238 times with an average of 10.33 citations per paper and 60% of articles were produced with international research collaboration. The researchers from United States were found on the top in collaboration followed by United Kingdom, China and Malaysia. Most of the articles (n=150) were published in journal "Renewable and Sustainable Energy Reviews" and Shahbaz M. of COMSATS found to be a most productive author with 35 papers, and COMSATS found to be a productive institution, 17 authors of this institute produced 184 papers followed by the NUST and Quaid-e-Azam University with 107 and 94 papers respectively. Meo, Almasri and Usmani (2013) surveyed the research growth on medical sciences by Pakistan during the period of 1996 to 2012. A total of 25,604 papers were produced on various subjects of medical sciences. The maximum papers (n=16539; 65%) were written on Medicine and minimum number of research papers were found on dentistry (n=55; 0.21%). This study also pointed out that 85 and 13 Pakistani journals were indexed in SJR and Web of Science respectively. Bashir (2013) assessed the research output of Pakistan from 1996 to 2010 and data was retrieved from Scopus based SCImago Journal and Country Rank (SCR). Pakistan produced 38,274 documents, there was slow growth of publications from 1996 to 2000 with an average of 1,057 papers per year, however, rapid progress was found during 2006-2010 with an average of 4,863 papers per year. The share of Pakistan in global research output was 0.32%, while United States was on top with 22.83%, followed by China (7.93%) and United Kingdom (6.58%).

Haq and Fouzan (2017) carried out a bibliometric analysis of research output of King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia. They used ISI Web of Science database. They found that a total of 775 documents were produced during eleven years from 2005 to 2015. Most of the papers were written on Medicine (n=119; 15.35%). Ahmed and Al-Reyaee (2019) analyzed the 801 Scopus indexed documents of Al-Jouf University, Saudi Arabia published from 2006 to 2017. These documents were cited 3,631 times with an average of 4.53 citations per paper. M. K. Alam was found as a most productive author with 41 publications and National Research Centre, Cairo, Egypt was found as top of the research collaborative institution with 62 documents. Al-Fouzan, Haq, and Al-Fouzan (2019) examined the 2,010 documents produced by the authors of Al-Imam Mohammad ibn Saud Islamic University, Saudi Arabia published during 2009 to 2018 with citation impact of 6.26. The majority of research was conducted on the theme of Engineering, followed by Computer Science, and Physics & Astronomy. King Saud University was found on top rank in research collaborative institution and Dr. L. El Mir was found as the a most productive author with 115 publications.

Parabhoi and Sahu (2019) presented the bibliometric assessment of publications created by the authors of Himachal Pradesh University Shimla during the period of 1972 to 2015. A total of 2,238 documents were found and the share of research articles consisted of 88% and Chauhan G.S. was found a most productive author with 136 papers. Study showed that there has been a constant increase in the number of publications and the authors of this university preferred to write on *Science and Technology* as compared to *Social Sciences*. Kumar and Kumar (2018) provide the research growth of Jaypee University of Information Technology. The university was established in 2002 and produced more 2500 publications. A slightly more than half of the research (n=1302) were indexed in Scopus database. These publications received 4,956 citations with an average of 3.81 citation per paper. Another article published in 2005, quantified the research output of Indian Medical College (IMC) for the period of 2009 to 2013. A total of 207 papers were published and 84 (41%) articles were indexed in the Scopus database. Most of the articles (n=124) were related to the Pre-Clinical group while the other 83 articles were clinical. A total of 589 authors were found with an average of 2.84 authors per article. IMC research was published in 61 journals and the

"International Journal of Pharma and Bio-Sciences" was found a most preferred journal with 24 publications (Mishra, Sahu, Brahma, & Mahapatra, 2015).

Meera and Sahu (2014) analyzed the 2,557 research publications produced by the authors of University College of Medical Science (UCMS), University of Delhi for 1975 to 2013. More than one-fourth (25.6%) of the publications followed the collaboration pattern of three-author and "Indian Pediatric" was found a most preferred journal with 187 publications. The authors of UCMS made research cooperation with the researchers of 37 countries, USA was on the top, followed by UK and Nepal. Maharana, & Sethi, (2013) presented the research profile of Sambalpur University, India for the period of 2007 to 2011. The Web of Science database was used to track the publication growth. A total of 170 papers were contributed by 707 authors with an average of 4.16 authors per paper and these papers received 541 citations with an average of 3.18 citations per paper. The analysis of authorship patterns found that four author collaboration produced 50 (29.41%) papers and Chemistry emerged a most favorite area of research with 47 publications followed by Physics (n=41) and Astronomy and Astrophysics (n=18). This study also examined the degree of collaboration and Bradford's law on the distribution of core journals. Baskaran (2013) evaluated the publication output of Alagappa University, India for a period of 13 years from 1999-2011. The data of publications were retrieved from the Web of Science database and a total of 776 publications were found with an average of 60 research papers per year. The continuous growing tendency and remarkable growth found as there were 31 publications in 1999 and the number of publications was reached on 97 in the year 2011. Most of the papers were written on Material Science (n=257, 20.18%) followed by Physics (n=208; 16.33%) and Chemistry (n=163; 12.80%). Central Electrochemical Research Institute was found a most prolific institute with 129 (16.62%) publications. The authors of Alagappa University collaborated with the researchers of 20 countries and South Korea was on the first rank with 97 publications, followed by Taiwan (n=84), and Mexico (n=24). Benamer, Bredan, & Bakoush (2009) evaluated the 417 scientific research papers indexed on PubMed, produced by Libyan medical schools during the period of 1988 to 2007. Most of the publications (n=348; 60%) were created by the authors affiliated to Al-Arab Medical University Benghazi followed by Al-Fateh Medical University Tripoli (n=103; 30%). The study revealed that the number of publications has been reduced and suggested that the government should formulate research policy, provide adequate funds and monitor these activities regularly. Saudi Medical Journal published most of the articles (n=23) followed by Eastern Mediterranean Health Journal (n=22) and 41% articles were published in the journals that had no impact factor. There were only two authors who produced ten or more than ten papers. Overall very low research productivity was found by Libyan authors in PubMed indexed journals.

Methodology

All publications produced by the authors affiliated with Army Medical College, Pakistan were retrieved from Scopus-Elsevier database on July 3, 2019 at the library of College of Dentistry, King Saud bin Abdulaziz University for Health Sciences, Saudi Arabia. Scopus organizes all the research items published by the authors affiliated with Army Medical College under the affiliation ID 60056649, the same was used to limit our search results to this specific institution. The timespan of publications from the inception of Army Medical College i.e., 1977 to 2018 was selected. The bibliographical records and summary were downloaded in Microsoft Excel format for further examination of the various bibliometric indicators set in the objectives of the study. The data were analyzed and presented in tabular form.

Limitations of the Study

This study is limited to the Scopus indexed publications, therefore, publications published in other journals / sources are not included in this study. The year 2019 was still on going, so the publications of this year were excluded.

Results

Chronological distribution of publications

A total of 417 publications were found under the authorship affiliated with Army Medical College in a target period with an average of 9.92 papers per year. A total of forty-two years' period has been divided into four phases (Table-1), the first phase is comprised of 12 years while the other three phases are consisting on ten years each. Only three papers were found in the early 12 years in Scopus indexed journals, whereas 23 (5.51%) papers were traced in the next ten years from 1989 to 1998. The slow growth of publications has been revealed during the initial two phases. There were 77 (18.48%) papers produced during the span of 1999 to 2008. The remarkable growth of publications (n=314; 75.29%) was found during the last phase from the year 2009 to 2018 with an average of 31.4 publications per year. Overall there is a growing tendency in the final phase but fluctuation is visible in a number of publications as seen in Figure-1.

Table 1: Phase-Wise Growth of publications (n=417)

Phase	Duration	Publications	Percentage
1.	1977-1988	3	0.71%
2.	1989-1998	23	5.51%
3.	1999-2008	77	18.46%
4.	2009-2018	314	75.29%

Research type

The examination of publications type divulges that most of the authors like to write original research articles (n=381; 91.36%), followed by review articles (n=14; 3.35%) and letter to editors (n=10; 2.39%). Five editorial, four conference papers, two scholarly notes and one book chapter have also been produced by the researchers of Army Medical College.

Figure 1; Distribution of publications by years
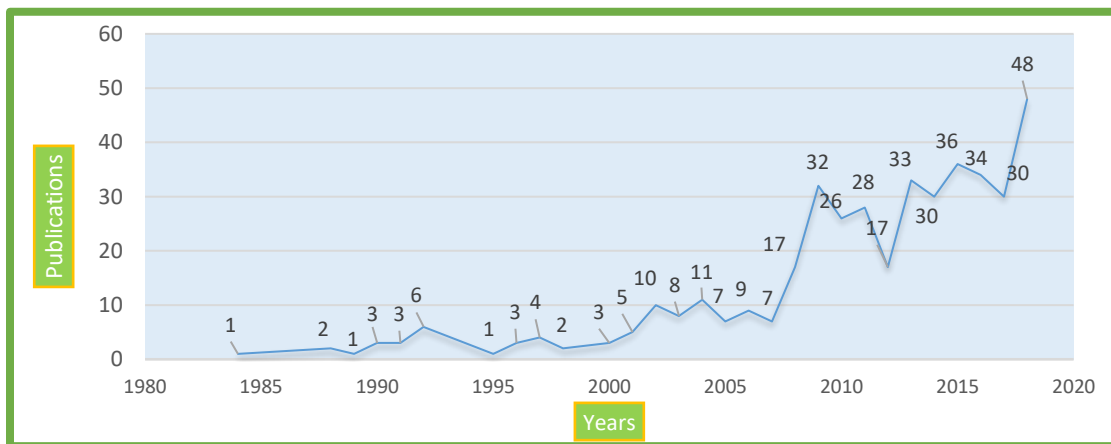
Citation analysis

The citation analysis exposes that 417 publications have been cited by 2,524 times with a citation impact of 6.05 citations per paper. There were 24 H-Index publications by Army Medical College thereby, 24 publications got citations varying from maximum 112 to minimum 24 and 83 (19.90%) publications achieved i10-Index.

Documents by subject area

Scopus database segregated all publications affiliated to Army Medical College by subject and most and least preferred areas of research are ranked in Table-2. Scopus database usually allocates one subject to one publication but sometimes it assigns two subjects to one publication, so 417 publications were allotted 518 subjects. Majority of publications have been carried out on the subject of Medicine (n=353; 68.16%) followed by Biochemistry, Genetics &Molecular Biology (n=35; 6.75%) and Pharmacology, Toxicology & Pharmaceutics (n=25; 4.82%). The least chosen areas of research are related to non-medical sciences but there is a need to conduct more research on Dentistry (n=9; 1.73%), Health professionals (n=6; 1.15%) and Neuroscience (n=6; 1.15%).

Table -2; Distribution of publications by subjects (n=518)

Rank	Subjects	Publications (%)
1.	Medicine	353 (68.16%)
2.	Biochemistry, Genetics & Molecular Biology	35 (6.75%)
3.	Pharmacology, Toxicology & Pharmaceutics	25 (4.82%)
4.	Immunology & Microbiology	16 (3.08%)
5.	Social Sciences	14 (3.08%)
6.	Materials Science	12 (2.31%)
6.	Nursing	12 (2.31%)
7.	Dentistry	9 (1.73%)
8.	Engineering	7 (1.35%)
8.	Environmental Science	7 (1.35%)
9.	Agricultural & Biological Sciences	6 (1.15%)
9.	Health Professions	6 (1.15%)
9.	Neuroscience	6 (1.15%)
10.	Computer Science	3 (0.57%)
11.	Arts & Humanities	2 (0.38%)
11.	Chemical Engineering	2 (0.38%)
11.	Chemistry	2 (0.38%)
12.	Physics & Astronomy	1 (0.19%)

Productive researchers

A total of 241 authors contributed in 417 documents, among these number the collaborating researchers belong to organizations, other than Army Medical College are also included. The Scopus database has indexed all contributing authors with their affiliated address. If one of the authors is affiliated to Army Medical College, this publication will be indexed under Army Medical

College ID. The list of 20 productive authors, contributed 10 and more than 10 documents are shown in Table-3. Abdul Khalid Naveed was found the most prolific with 39 publications followed by Dilshad Ahmed Khan and Mahammad Aslam with 26 and 24 publications respectively.

Table-3; Productive authors

Rank	Authors' Name	Number of Publications
1	Abdul Khaliq Naveed	39
2	Dilshad Ahmed Khan	26
3	Muhammad Aslam	24
4	Farooq Ahmed Khan and Azhar Mubarik	18 each
5	Ayas Hussain Qureshi and Amir Rashid	17 each
6	Muhammad Mazhar Hussain and Javaid Usman	16 each
7	Shahid Jamal and Amina Nadeem	15 each
8	Kulsoom Farhat	14
9	Khadija Qamar	13
10	Aliya Hisam, Muhammad Kaleem, Saleem Ahmed Khan and Tehmina Munir	12 each
11	Iftikhar Ahmed Malik and Sajid Mushtaq	11
12	Anwar Kamal Pasha and Midrar Ullah	10

Distribution of Journals

A total of 417 publications of Army Medical College researchers was published in 138 sources/journals. Slightly more than half (n=211; 50.59%) of the documents published in four reputed local Pakistani journals as shown in Table-4. These four journals are indexed in globally recognized databases like PubMed, Web of Science and Scopus. Most of the documents (n=84; 20.14%) were published in Journal of the College of Physicians and Surgeons Pakistan, followed by 82 (19.66%) documents in Journal of the Pakistan Medical Association and 24 (5.75%) published in Pakistan Journal of Medical Sciences. Sixty percent (n=254) of the documents have been published in the top eight journals, all published from Pakistan. This shows the patriotic spirit of the researchers of Army Medical College and strong faith in local journals. There are 109 (78.98%) journals with one publication each and 13 (9.42%) journals with two publications each.

Table-4 List of frequently used Journals

Rank	Name of Journal	Publications
1	Journal of the College of Physicians and Surgeons Pakistan	84
2	Journal of the Pakistan Medical Association	82
3	Pakistan Journal of Medical Sciences	24
4	Journal of Ayub Medical College Abbottabad – JAMC	21
5	Medical Forum Monthly	11
6	Pakistan Journal of Pharmaceutical Sciences	11
7	Rawal Medical Journal	11
8	Journal of Postgraduate Medical Institute	10
9	Asian Pacific Journal of Cancer Prevention	6

10	Dental Materials and Health Information and Libraries Journal	4 each
11	Dental Materials Journal, Malaysian Journal of Microbiology, Plos One, Saudi Medical Journal, Toxicology and Industrial Health	3 each
12	International Information and Library Review, International Journal of Dermatology, Iranian Journal of Basic Medical Sciences, Iranian Journal of Public Health, Journal of Pakistan Association of Dermatologists, Malaria Journal, Meta Gene, Molecular Immunology, Pakistan Journal of Medical and Health Sciences, Pakistan Paediatric Journal, Postgraduate Medical Journal, Spinal Cord, Tropical Doctor	2 each
13	138 Journals with one publication each	1 publication each

Research Collaboration

The researchers affiliated to Army Medical College collaborated with the researchers of 155 institutions / organizations within Pakistan and abroad. out of 155, only one paper each has been collaborated with 43 organizations. National University of Sciences and Technology (NUST), Islamabad is found top priority with 139 publications, followed by Combined Military Hospital(s) with 41 publications, and Riphah International University with 28 publications. Military Hospital Rawalpindi and Armed Forces Institute of Pathology, Rawalpindi stands on fourth rank with 21 publications each.

Table-5; Top research collaborating institutions/organizations at national level

Rank	Collaborating Institutions	Publications
1	National University of Sciences and Technology, Islamabad	139
2	Combined Military Hospitals, Pakistan	41
3	Riphah International University, Islamabad	28
4	Military Hospital, Rawalpindi and Armed Forces Institute of Pathology, Rawalpindi	21 each
5	Foundation University Medical College, Islamabad	15
6	Institute of Biomedical and Genetic Engineering, Islamabad	13
7	Quaid-i-Azam University, Islamabad and COMSATS Institute of Information Technology, Islamabad	11 each
8	University of Health Sciences, Lahore and University of the Punjab, Lahore	8 each
9	Pakistan Air Force Hospitals, Islamabad and Shifa College of Medicine, Islamabad	7 each
10	Wah Medical College, Wah and Rawal Institute of Medical Sciences, Rawalpindi	6 each

The researchers of Army Medical College have been collaborating internationally, among the top ten international institutions, five belong to United States, three from United Kingdom, two from Saudi Arabia and one from Germany (Table-6). Eleven papers have been published with the research collaboration of King Saud University, Saudi Arabia.

Table-6; Top research collaborative institutions/organization at international level

S.No.	Institutions	Publications
1	King Saud University, Saudi Arabia	11
2.	Imam Abdulrahman bin Faisal University, Saudi Arabia	7
3.	University of Manchester, England	7
4.	University of Sheffield, England	5
5.	Harvard Medical School, United States	3
6.	Tufts University School of Medicine, United States	3
7.	University of Minnesota, Twin Cities, United States	3
8.	Friedrich Schiller Universität Jena, Germany	2
9.	University College London – UCL, England	2
10.	Uniformed Services University of the Health Sciences, United States	2
11.	Walter Reed Army Institute of Research, United States	2

Discussion

The innovative scientific research plays an important role in the development of the country and obligatory for sustainable developments. The continues medical research has a direct impact to the well- being of the community, improving the living standard of masses and decrease the burden of diseases (Haq & Al Fouzan 2017). There has been an escalation in scientific productivity at Army Medical College for the last decade. However, the assessment of present situation of medical research generally at Army Medical College and particularly at Pakistan in global perspective, we must say, there is an urgent need to amplify research activities manifold to respectably stand with the world. The concert efforts are required by Army Medical College leadership and editorial team to index PAFMJ in the reputed databases to enhance the visibility of their research. They should acquire the services of professional medical editors and review the guidelines in term of evaluation of journal.

Army Medical College has been imparting quality medical education for the last four decades and produced thousands of graduates, serving the community of Pakistan Army particularly and a nation on a larger scale. The researchers of Army Medical College have been publishing valuable medical research, although the start was steady, the promising growth of research publications (n=314; 75.29%) was found in the last phase of the year 2009 to 2018. The overall citation impact is 6.05. The writers of Army Medical College collaborated more with national authors as compared to international authors, there is a need to enhance scientific collaboration with international institutions. This research collaboration is in the interest of institution and country, which provides them ample chances to boost research outlook.

The development of every branch of knowledge including medical and health sciences depend on solid evidence, sharing of one's findings of experiments through scholarly communication. The analysis of academic publications has been considered as vital aspects of excellence (Meo, et al. 2014). Research activities in every field of knowledge have been increasing since 2002 at Pakistan, after the restructuring of HEC, formerly known as University Grant Commission (UGC). HEC after its inception initiated national digital library project to provide access to online scholarly publications and books to the universities and research institutions in Pakistan. Government also increased the budget allocation for the higher education institutions

which remarkably amplified the research output (Warraich, & Tahira, 2009; Bashir, 2013). Meo, Almasri and Usmani (2013) stated that the remarkable growth in the field of higher education was observed during the period of 2003 to 2008. During this period, 51 new universities and degree awarding higher education institutions were established and 18 new campuses of already existing universities were also started in different corners of Pakistan.

Quantifying the research publications and measuring their metrics have become a major indicator of determining the ranking of an institute or a university in contrast to its peers. There are different ranking organizations in the world as The Academic Ranking of World Universities, Times Higher Education, and Quacquarelli Symonds, that are evaluating the higher education institutions based on several pointers, publications output is one of the critical parameters. The process of funds allocation for research by government and other funding agencies has been based on the quantity and quality of research output (Kumar, 2019).

The research in the field of medical and health sciences has been imperative for the well-being of the whole human race because healthy nations could play their positive role in the development of the world. So, we can say that the development of the health care delivery system of a country can be depended on quality medical education the excellent research output (Haq & Midrar 2014). One of the prime motives of medical education at college level is to develop critical thinking skills among the young doctors. Analytical thinking has developed human mind to find out the suitable solutions and invent new methods of treatment. Once the habit of conducting research has been inculcated in early career by the college authorities and faculty, this would be sustained to rest of the life. There is no bibliometric study has been found in Pakistan to assess the publication output of medical college. Mushtaq, Abid and Qureshi (2012) inspected the data of 5,889 publications of 24 medical universities of Pakistan for the period of 2007 to 2010. An average of 246 papers were produced by each medical university during the four years, that means an average of 61.5 papers per year have been created by one university. Iqbal, Mahmood and Iqbal (2018) assessed that most of the research that was produced by Pakistani authors has been on subjects of the Physical & Life Sciences followed by the Clinical, Pre-Clinical & Health. Bashir (2013) disclosed the miserable picture of Pakistani research in global perspective, the share of Pakistan research was just 0.32% during the period of 1996 to 2010 based on SJR.

As we observed in literature review that most of the bibliometric study used the publications record indexed in various databases like Web of Science, Scopus and PubMed. Web of Science and Scopus are subscription-based commercial databases, but PubMed is open access source. Haq, Elahi and Dana (2019) inspected the PubMed indexed research publications on medical microbiology by the authors affiliated to Pakistan. A total of 333 papers were published from 2013 to 2017. The Aga Khan University found a most productive institute with 35 publications based on the affiliated address of first author. Nasir and Ahmed (2018) reported the global research growth on Zika Virus and found 3,384 papers were published during 2008 to 2017 and the Pakistani researcher produced 44 (0.71%) papers.

The present case-study of research publications of one medical college having remarkable history reveals that although the scholarly activities have been increased in last decade but there is still room for improvement. There is a need to do realistic efforts to align the research course with the curriculum and students should have some publications before going to practical life. There are some further prerequisites that can enhance the number of publications includes incentives, research grants for conferences and provision of special time for research to faculty.

Conclusion

An attempt has been made to evaluate the research growth of Army Medical College, one of the primer medical institute of Pakistan, over the period of forty years. The remarkable progress has been found after the twitch of 21st century. It has been found through review of literature that institutional-based bibliometric study are not being conducted frequently in Pakistan as compared to the rest of the world. This study helps the researchers to carry out the similar case study at their respective institutions. The result of present report highlights the preferred and least preferred areas of research and other statistical indicators of publications, that helps to revisit the research policies, decision-making process and further allocation of funds.

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