Bibliographic Analysis of Oral Precancer and Cancer Research Papers from Saudi Arabia

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Abstract

Objective: Oral cancer and precancers are a major public health challenge in developing countries. Researchers in Saudi Arabia have constantly been directing their efforts on oral cancer research and have their results published. Systematic analysis of such papers is the need of the hour as it will not only acknowledge the current status but will also help in framing future policies on oral cancer research in Saudi Arabia. Method: The search string “oral cancer” OR “Oral Squamous Cell Carcinoma” OR “oral premalignant lesion” OR “oral precancer” OR “Oral Potentially malignant disorder” AND AFFIL (Saudi AND Arabia) was used for retrieval of articles from Scopus database. Various tools available in Scopus database were used for analyzing the bibliometric related parameters. Results: The search revealed a total of 663 publications based on the above query. Maximum affiliations were from King Saud University (163) followed by Jazan University (109) and then King Abdulaziz University (106). A large number of international collaborations were observed, the maximum with India (176) and the USA (127). The maximum number of articles were published in the Asia Pacific Journal of Cancer Prevention (34) followed by the Journal of Contemporary Dental Practice (33) and Journal of Oral Pathology and Medicine (19). Conclusion: Saudi researchers are directing their efforts towards the public health menace of oral cancer. However, it was also observed that some institutions have emerged as front runners in research, whereas others are contributing significantly less. The health department should encourage and take necessary steps to increase the involvement of other institutions.

Keywords: Bibliometric analysis- oral cancer- oral precancer- Saudi Arabia- scopus

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Introduction

Oral cancer is reported to be the tenth most commonly diagnosed cancer in the world, with an annual incidence of >300,000 cases. Incidence (3.29%) and mortality (5%) of oral cancer are higher in developing countries when compared with developed countries due to the combined effect of increased life expectancy, and the high or increasing levels of prevalence of cancer risk factors especially the use of smokeless tobacco (Basha et al., 2019; Ferlay et al., 2010). In the Kingdom of Saudi Arabia (KSA) oral cancer is the most common malignancy (17.6%) followed by liver (14%) and lymphoma and leukemia (13.5%). (Ferlay et al., 2010; Tandon et al., 1995; Amer et al., 1985) Among all the head and neck cancers detected yearly in KSA, oral cancer accounts for as much as 26 percent, a majority of them in advanced stage receiving palliative treatment (Gupta et al., 2014). As a result, a large number of authors have focused their efforts to cancer research.

Research work done by an individual or academic institute is published as research/original articles in popular journals. This is an important method of dissemination of knowledge so that the scientific community becomes aware of the latest developments in the scientific world (Foy et al., 2018). Research publications and academic communication in scientific journals is the most reliable gauge to measure research output of any country, or...
organization, in any specific branch of knowledge. Bibliometric studies have been carried out to assess the research productivity in different fields of knowledge. (Haq and Al Fouzan, 2018) We also believe that such analysis on important topics such as oral cancer and precancer will help in formulating appropriate guidelines at national level.

The evolution of the electronic age has led to the development of numerous medical databases on the World Wide Web, offering search facilities on a particular subject and the ability to perform citation analysis. The Scopus database was developed by Elsevier, combining the characteristics of both PubMed and Web of Science. Scopus indexes a wide range of journals and both keyword searching and citation analysis are possible. It offers a quick search, a basic search, an author search, an advanced search, and a source search (Falagas et al., 2008; Moho et al., 2007)

Saudi Arabia has been investing a huge amount and doing progressive efforts to improve the quality of higher education and research output during last two decades (Alhaider et al., 2015). Researchers in KSA have been publishing a large number of papers on the subject of oral oncology. Hence, the present study was conducted to analyze the oral precancer and cancer research published from dental schools of KSA (1984-2019) using Scopus database.

Materials and Methods

A retrospective observational study was conducted in the dental college of Jazan University, KSA. The research documents produced by the researchers of various dental colleges in KSA were browsed using bibliometric indicators from Elsevier’s Scopus database. Scopus is an abstract and citation database launched by Elsevier in 2004. It covers nearly 40,503 titles from approximately 12,000 publishers, of which approximately 34,000 are peer-reviewed journals in varied fields: social sciences, life sciences, physical sciences, and health sciences. Scopus’ ‘Source Browse’ and ‘Source List’ are refreshed and updated three times per year. To ensure high-quality standards, the journals covered in the Scopus database are reviewed each year. For the present study, the search string “oral cancer” OR “oral squamous cell carcinoma” OR “oral premalignant lesion” OR “oral precancer” OR “Oral Potentially malignant disorder” AND AFFIL (Saudi AND Arabia ) was used for retrieval of articles. Boolean operators were used as the present systematic analysis of bibliometrics was a subject related inquiry. ‘Affiliation match’ option was explored to find out any possibility of multiple affiliations of a single university. The data obtained were sorted by year of publication, document type, journal name, author name, affiliation, source of funding, collaboration with other countries and universities, and subject. Various data analysis tools available in Scopus database were used for analyzing the various parameters.

Results

The search revealed a total of 663 publications over a period of 35 years. It can be observed that the publication productivity on oral cancer and precancer has seen a remarkable rise in the last decade (Figure 1). Only 7.5% of the total documents were published from the year 1984 to 2009. However, since 2010, the number of publications has increased manifolds. The years 2018 and 2016 were the most productive with 132 and 104 publications respectively. The total number of citations received by the 663 publications were 7403 with h index of 39.

Based on the document type, it was observed that about 72% (n=480) of the documents were original articles, and approximately 20% (n= 124) were review articles. The remaining were Editorials (21; 3.17%), Book Chapters (16; 2.41%), Letters (9; 1.36%), Article in Press (6; 0.9%), Conference Papers (3; 0.45%), and Short Surveys (2; 0.3%) (Table 1).

The manuscripts were published in 153 different journals. The maximum number of articles (n=34) were published in the Asia Pacific Journal of Cancer Prevention followed by Journal of Contemporary Dental Practice (33), and, Journal Of Oral Pathology And Medicine (19). In addition, there were a large number of journals where
The publications were also sorted based on international institutional affiliations. The top twelve contributing institutions are listed in Table 4. The highest number of publications (69) were from King Saud University, followed by Jazan University and King Abdulaziz University. It is interesting to note that more than half the publications were from these twelve institutions.

The publications were also sorted based on international source titles. The 663 publications were authored by 160 researchers. The 663 publications were authored by 160 researchers.
collaboration. Saudi researchers worked together with researchers from 65 other countries. However, the maximum number of collaborations were with Indian authors (176) followed by United States (127) and Egypt (76) (Table 5).

The 663 papers on oral cancer and precancer were published under 25 different departments/subjects. The maximum articles were authored by the Medicine Department followed by Biochemistry, Genetics and Molecular Biology, and, Dentistry (Table 6).

Finally, the source of funding for the various research papers was examined. Of the 663 publications, only 293 papers declared any funds/grants. The highest number of funds were from the Ministry of Education, Kingdom of Saudi Arabia (39).

| S.no. | Author Name | Affiliation | Number | Percentage |
|-------|-------------|-------------|--------|------------|
| 1     | Patil, S.   | Department of Maxillofacial Surgery and Diagnostic Sciences, Division of Oral Pathology, College of Dentistry, Jazan University, Jazan, Saudi Arabia | 69     | 10.41      |
| 2     | Sarode, S.C. | Department of Oral Pathology and Microbiology, Dr. D. Y. Patil Dental College and Hospital, Dr. D. Y. Patil Vidyapeeth, Pune, India | 43     | 6.49       |
| 3     | Sarode, G.S. | Department of Oral Pathology and Microbiology, Dr. D. Y. Patil Dental College and Hospital, Dr. D. Y. Patil Vidyapeeth, Pune, India | 39     | 5.88       |
| 4     | Javed, F.   | Department of Orthodontics, Eastman Institute for Oral Health, University of Rochester, New York, United States | 22     | 3.32       |
| 5     | Awan, K.H.  | College of Dental Medicine, Roseman University of Health Sciences, Utah, South Jordan, United States of America | 19     | 2.87       |
| 6     | Al-Maweri, S.A. | Department of Oral Medicine and Diagnostic Science, Al Farabi Colleges, Riyadh, Saudi Arabia | 14     | 2.11       |
| 7     | Tarakji, B. | Department of Oral and Maxillofacial Sciences, AL-Farabi Colleges of Dentistry and Nursing, Riyadh, 11691, Saudi Arabia | 13     | 1.96       |
| 8     | Warnakulasuriya, S. | Department of Oral Medicine, King’s College London and WHO Collaborating Centre for Oral Cancer, London, United Kingdom | 13     | 1.96       |
| 9     | Divakar, D.D. | Dental Biomaterials Research Chair, Dental Health Department, College of Applied Medical Sciences, King Saud University, Riyadh, Saudi Arabia | 10     | 1.51       |
| 10    | Gadball, A.R. | Government Medical College Nagpur | 10     | 1.51       |
| 11    | Kamal, M.A. | King Fahd Medical Research Center, King Abdulaziz University, Jeddah, Saudi Arabia | 10     | 1.51       |
| 12    | Khurshid, Z. | Department of Prosthodontics and Dental Implantology, College of Dentistry, King Faisal University, Al-Hofuf, Saudi Arabia | 10     | 1.51       |

Table 3. Most Productive Authors for Oral Precancer and Cancer Research Papers from Saudi Arabia

| S.No. | Affiliation | Number | Percentage |
|-------|-------------|--------|------------|
| 1     | King Saud University | 163 | 24.58 |
| 2     | Jazan University | 109 | 16.44 |
| 3     | King Abdulaziz University | 106 | 15.98 |
| 4     | Dr. D.Y.Patil Dental College & Hospital | 47 | 7.08 |
| 5     | King Faisal Specialist Hospital and Research Centre | 33 | 4.97 |
| 6     | Taibah University | 26 | 3.92 |
| 7     | King Saud University College of Applied Medical Sciences | 26 | 3.92 |
| 8     | Imam Abdulrahman Bin Faisal university | 25 | 3.77 |
| 9     | King Saud University College of Science | 23 | 3.46 |
| 10    | Umm Al Qura University | 23 | 3.46 |
| 11    | Al Qassim University | 23 | 3.46 |
| 12    | King Khalid University | 22 | 3.31 |

Table 4. Top Ten Institutional Affiliations for Oral Precancer and Cancer Research Papers from Saudi Arabia
of papers were funded by King Saud University (44), followed by King Faisal University (22) and then King Abdulaziz University (15).

**Discussion**

The present study aimed to quantify the oral precancer and cancer research published from Saudi Arabia (1984-2019) based on keyword search conducted on the Scopus database. The results of the search were sorted based on year of publication, document type, journal name, author name, affiliation, source of funding, collaboration with other countries and universities, and subject. It was encouraging to note the interest that investigators from KSA have shown in cancer and pre-cancer research. Oral cancer prevalence in KSA has been reported to range from 21.6% to 68.6% (Basha et al., 2019; Ferlay et al., 2010). Numerous studies have listed the use of Shamma, a form of smokeless tobacco, to be associated with the aforementioned high incidence of oral cancer. (Amer et al., 1985; Alsanosy, 2014; Brima, 2016) Not unexpectedly, oral cancer research is being extensively encouraged in all institutions in KSA.

Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals, books, and conference proceedings. All journals covered in the Scopus database are reviewed each year to ensure that high-quality standards are maintained. Scopus also offers author profiles which cover affiliations, several publications and their bibliographic data, references, and details on the number of citations each published document has received (Meho et al., 2007; Falagas et al., 2008). Hence, in the present study, the Scopus database was used for retrieval of information.

The extensive literature search revealed that no previous studies have been carried out to evaluate the growth of research on oral cancer and pre-cancer in KSA. It can be observed from the present study that the number of publications from KSA on the subject of oral cancer and pre-cancer has multiplied substantially over the past decade. A similar study was conducted by Ikram U1 Haq et al., (2017) to evaluate the growth of publications on oncology produced by King Saud bin Abdulaziz University for Health Sciences up to December 2015. They reported that there are 45 articles written on the subject of oncology in 19 different journals from KSAUHS. Another study compared the citation performance of cancer research in four Nordic countries: Denmark, Finland, Norway, and Sweden. The study covered articles, obtained through Medline, published during 1978-82. Sweden contributed most cancer articles followed by Denmark. Luukkonen-Gronow, (1988) Another study was conducted by Foy et al., (2018) to provide a descriptive overview of the global research activity on Oral Erythroplakia and Leukoplakia over the past decades. A total of 5,098 published items (articles or reviews) were identified. Also, the USA, India and the United Kingdom were identified as the most prominent countries and contributed to 22%, 11% and 8% of publications respectively.

In the present analysis, Asian Pacific Journal of Cancer Prevention tops among the other journals with 34 research papers. The journal was launched in 2000 as the official publication of the Asia Pacific Organization for Cancer Prevention. Journal provides a forum for communication and propagation of original and innovative research findings that have relevance to understanding the etiology, progression, treatment, and survival of patients. The journal is known for the highest standards of research communication within the cancer sciences community across Asia as well as globally.

Impact factor is very important measure that rank the journal based on the number of citations and usually it designate the reputation of the journal. Among the journals targeted for publishing papers, some of the articles have published in best five impact factor journals such as Cancer Metabolism (IF: 20), Annals of Oncology (IF: 13.92), Biosensors and Bioelectronics (IF: 9.5), Cancer Research (IF: 9.13) and Cancer Letters (IF: 6.4). Other important journals are Cancer (IF: 6.1), British Journal of Cancer (IF: 5.9), Biomolecules (IF: 5.6), Biomolecules (IF: 4.6) and Bioinformatics (IF: 4.5).

Alhaider et al. (2015) measured the pharmaceutical research publication from KSA during 2001-2010. The international collaboration share was 40.55%. The international collaboration share was 40.55%. The international collaboration share was 40.55%. They reported that King Saud University was the most productive organization with 690 publications (49.75%). This finding is similar to that of the present study where we observed that the maximum affiliations were from King Saud University. Shehata and Mahmood (2016) conducted a bibliometric analysis of publications produced by the researchers of KSA during 1980-2014 with data from Thomson Reuters Web of Science. King Saud University reported 30.85% of the publications.

In the present study, less than half the papers declared any source of funding for research. As lack of grants is a major deterrent to good quality research, this is an area of concern and should be further investigated (Hegde et al., 2017) The researchers should be made aware of the various agencies that are available to fund oral cancer research.

Researchers turn to citation tracking to find the most influential articles for a particular topic and to see how often their own published papers are cited. Citations are assumed to gauge the actual recognition of a piece of work and its tangible impact at the international research front in

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Table 6. Subject-Wise Distribution of the Publications on Oral Precancer and Cancer from Saudi Arabia

| Sr. no. | Subject Area                        | Number |
|---------|-------------------------------------|--------|
| 1       | Medicine                            | 337    |
| 2       | Biochemistry, Genetics and Molecular Biology | 240    |
| 3       | Dentistry                           | 168    |
| 4       | Pharmacology, Toxicology, and Pharmaceutics | 85     |
| 5       | Chemistry                           | 45     |
| 6       | Agricultural and Biological Sciences | 32     |
| 7       | Chemical Engineering                | 30     |
| 8       | Engineering                         | 30     |
| 9       | Materials Science                   | 29     |
| 10      | Environmental Science               | 19     |
the short term (Luukkonen-Gronow, 1988). KSA has been at the forefront of biomedical research in the past decade. The authorities have been directing resources and funds towards research in universities. It is encouraging to note the increase in the number of publications, collaborations, and the reach of Saudi research globally (Haq et al., 2018; Latif, 2015; Tadmouri et al., 2019).

The present paper was utilized only the Scopus database, but future researchers may include the bibliographic citations from Google Scholar and Web of Science databases. Also, the present research was quantitative. A more comprehensive qualitative evaluation of the papers published on specific subjects should be conducted. The papers published in the journals that were not indexed in Scopus were automatically excluded from the present analysis. It is quite possible that some impactful research could be published in such non-indexed journals that could change the results of present analysis. However, based on the reputation and scientific community acceptance, non-inclusion of such papers will not dilute the scientific value of the present paper.

In conclusion, as reflected in the present paper, Saudi researchers showed significant awareness about oral cancer research. Institutions such as King Saud University, Jazan University and King Abdulaziz University are front-runners in oral cancer and pre-cancer research. Other university’s contributions are comparatively very less. The health department should encourage and take necessary steps to increase the involvement of other institutions. This can be done by creating special funding schemes for the research on oral cancer and precancer and encouraging inter-institutional collaborations with the front-runner institutions. Use of single database and lack of quality analysis of the papers are the limitations of the present study. Future studies should focus on comparative analysis among different databases and identification of the level of evidences using proper scales. We also recommend similar analysis across the globe so that one could understand the top knowledge producing countries in the field of oral precancer and cancer.

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