An Investigation on Lithium Dental-Implants for Biomedical applications

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Abstract

Lithium is one of the most used metals for implants. The review analysis had been conducted to understand the active authors, organizations, journals, and countries involved in the research domain of "Lithium dental-implants". All published articles related to "Lithium dental implants" from "Scopus", were analyzed using the Meta Analysis to develop analysis tables and visualization maps. This article had set the objective to consolidate the scientific literature regarding "Lithium dental-implants" and also to find out the trends related to the same. The leading journal of this research domain was the Journal of Prosthetic Dentistry. The most active country was Germany. The leading organization engaged in the research regarding Lithium dental implants was the University of Zurich, Switzerland. The most active author who had made valuable contributions related to Lithium dental implants was Kern M., Joda T, and Ozcan .M.

Keywords: Lithium, Dental-implants, Material engineering, Review analysis, Meta Analysis,

1. Introduction

An engineered medical device to replace a missing or damaged biological structure is known as an implant. Different types of metals and materials are used to create implants. Lithium-doped biological-derived hydroxyapatite coatings can improve the mechanical characteristics and other properties of the implant. Lithium metal had diversified applications in the medical field, especially in dentistry.

Dental crowns fabricated with Lithium disilicate can have a long survival level and the Fabrication of dental crowns with Lithium disilicate is an important medical application of Lithium metal. Lithium-based dental crowns had long term survival.

Material engineering and surface engineering can play a significant role in improving the performance and life of Lithium dental–implants along with measures for reducing toxicity and hypersensitivity of the metal implants. Future research can also be on surface coatings by using, metal implants using Lithium. This review analysis will be a useful platform for future researchers by realizing the top researchers, organizations, and countries involved in research regarding Lithium dental implants.

This article is arranged into four sections. The first section is the introduction, followed by the discussion of the methodology by which the research was conducted. The third section deals with results and discussion. The fourth section deals with the conclusion. The following research objectives and research questions were framed for conducting review analysis systematically.

1.1 Research Objectives

a) To consolidate the literature regarding Lithium dental-implants
b) To find out the trends related to research in Lithium dental-implants

1.2 Research Questions

a) Who are the active researchers working on Lithium dental implants?
b) Which are the main organizations and countries working on Lithium dental implants?
c) Which are the main journals on Lithium dental implants?

2. Research Methodology

Scopus files had been used for this article. For the article selection, the Boolean used was TITLE-ABS (Lithium dental implant). All the tables in this paper were created by using Microsoft Excel and Meta Analysis. Grammarly was used for spelling and grammar checks. Mendeley was used for article review and citation. This paper had been inspired by review analysis in its presentation style, analysis, and methodology from the works.

3. Results and discussion

3.1 Results

This first round of search produced an outcome of 219 documents, in four languages, out of which 210 documents were in English. The classification of document categories is shown in Table 1. For improving the quality of the analysis, we had selected only the peer-reviewed articles and all other documents had not been considered. Thus after using filters "Article" and "English" the second round search produced an outcome of 188English articles (both open access and others) and had been used to conduct review analysis and visualization using Meta Analysis. The English research articles in this domain since 1990 had been shown in Table1.Co-authorship analysis of top authors had been shown in Table1. For a better presentation of the analysis, the parameters used were the minimum number of documents of an author as three and the minimum number of citations of authors as one. This combination plotted the map of31authors, in 12clusters. The overlay visualization map of co-authorship analysis plotted in Table1, points out the major researchers with their strong co-authorship linkages and clusters involved. The citation analysis of top authors had been shown in table 1, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of an author as one and the minimum citations of an author as one.

Table 1: Highlights of most active authors

Description	Authors	Documents	Citations	Average citations per documents	Link strength
Authors with the highest publication,	Kern M	9	130	14.4	36
Authors with the highest citations	Joda T.	5	189	38	13
Authors with the highest links	Ozcan M.	7	127	18	39

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrences of a keyword as50. This combination plotted the map of 24thresholds, in three clusters. The overlay visualization of co-occurrence analysis of keywords has been shown in Table2.The leading organizations engaged in research on "Lithium dental implants" had been found out by the volume of publications and citation analysis, the parameters used are the minimum number of documents of an organization as one and the minimum number of citations of organizations as one. The leading organizations

in the research regarding "Lithium dental-implants", with the highest number of publications and citations, were the University of Zurich, Switzerland(Refer to table 2).

Table 2: Highlights of the most active organization

Organizations	Country	Documents	Citations	Average Citations per document
University of Zurich	Switzerland	10	149	14.9

Co-authorship analysis of the countries engaged in the research on "Lithium dental implants" had been shown in Table3. The overlay visualization map of co-authorship analysis plotted in Table3, points out the main countries with their strong co-authorship linkages and clusters involved. The citation analysis of top countries had been shown in table 3, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of a country as one and the minimum citations of the country as one.

Table 3: Highlights of Active Countries

Description	Country	Documents	Citations	Link strength
The country with the leading publication, citations, and co-authorship links	Germany	45	574	22

The most active country in this research domain was Germany, with the leading number of publications, links, and citations.

Link analysis and citation analysis were used to identify the most active journal in this research domain. We have taken the parameters of the minimum number of documents of a journal as one and the minimum number of citations of a journal as one for the link analysis and citation analysis. Highlights of the most active and relevant journals related to "Lithium dental-implants" are shown in table 4. Table 4shows the journal activity of this research domain through parameters of publication volume, citations, and co-authorship linkages.

Table 4: Analysis of journal activity

Description	Journal details	Documents	Citations	Average citations per documents	Links
Journal with the highest publications, citations, and links	Journal of Prosthetic Dentistry	25	343	13.7	79

From the above discussion regarding the review patterns in the research regarding Lithium dental implants, this research had observed a gradual increase in research interest regarding Lithium dental implants from the starting of the millennium, and the momentum is going on positively. This points out the relevance and potential of this research domain (Refer to Table 2).The most active authors in this research domain were Kern M., Joda T, and Ozcan .M with the highest publication, citations, and co-authorship links respectively(Refer to table 1).The overlay analysis of top countries researching Lithium dental implants indicates that Germany was the leading country relating to the highest number of publications, citations, and co-

authorship links(Refer to Table 5). The top journal of this research domain was identified as the Journal of Prosthetic Dentistry. From these wide sources of information, researchers can focus on top journals where they can identify the most relevant and highly cited articles regarding Lithium dental–implants.

4. Conclusion

Lithium dental implants was an interesting research domain and the most active journals related to this research domain were Journal of Prosthetic Dentistry. The most active country was Germany. The leading organization engaged in the research regarding Lithium dental implants was the University of Zurich, Switzerland. The most active author who had made valuable contributions related to Lithium dental implants was Kern M., Joda T and Ozcan .M This research domain offers a new avenue for researchers and future research can be on innovations in Lithium dental-implants.

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