A Review on use of ML in Implants

Sanjay Pratap Singh Chauhan, Associate Professor, Department of Computer Science & Engineering, Galgotias University

Abstract

Magnesium 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 "Magnesium-implants". All published articles related to "Magnesium-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 "Magnesium-implants" and also to find out the trends related to the same. The leading Journals were were Acta Biomaterialia. The most active country was China. The leading organization engaged in the research regarding Magnesium-implants was the Chinese Academy of Sciences, China. The most active author who had made valuable contributions related to Magnesium-implants was Zhang X and Witte.F.

Keywords: Magnesium-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. The Bio-compatibility of Magnesium and its biodegradability had been helpful for diversified medical applications. Magnesium implants in Hemangioma treatment (Altintas, Cokneseli, and Cetinkale, 1984);

The high degradation rate and poor antibacterial properties are the main drawbacks of magnesium implants(Atrens, Liu, and Zainal Abidin, 2011). There are pieces of evidence that the Cyto-compatible and antibacterial coating layer on magnesium implants can improve the performance of implants. Similarly, the high concentration of metals in body fluids, toxicity, and allergy of metals should also be considered in the cases of bio-implants.

Material engineering and surface engineering can play a significant role in improving the performance and life of Magnesium–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 Magnesium. This Review analysis will be a useful platform for future

researchers by realizing the top researchers, organizations, and countries involved in research regarding Magnesium-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 Magnesium-implants
    b) To find out the trends related to research in Magnesium-implants

1.2 Research Questions

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

2. Research Methodology

Scopus files had been used for this article. For the article selection, the Boolean used was TITLE-ABS (Magnesium 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 2525 documents, in thirteen languages, out of which 2439 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 1761English 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 1935 had been shown in Figure 1.
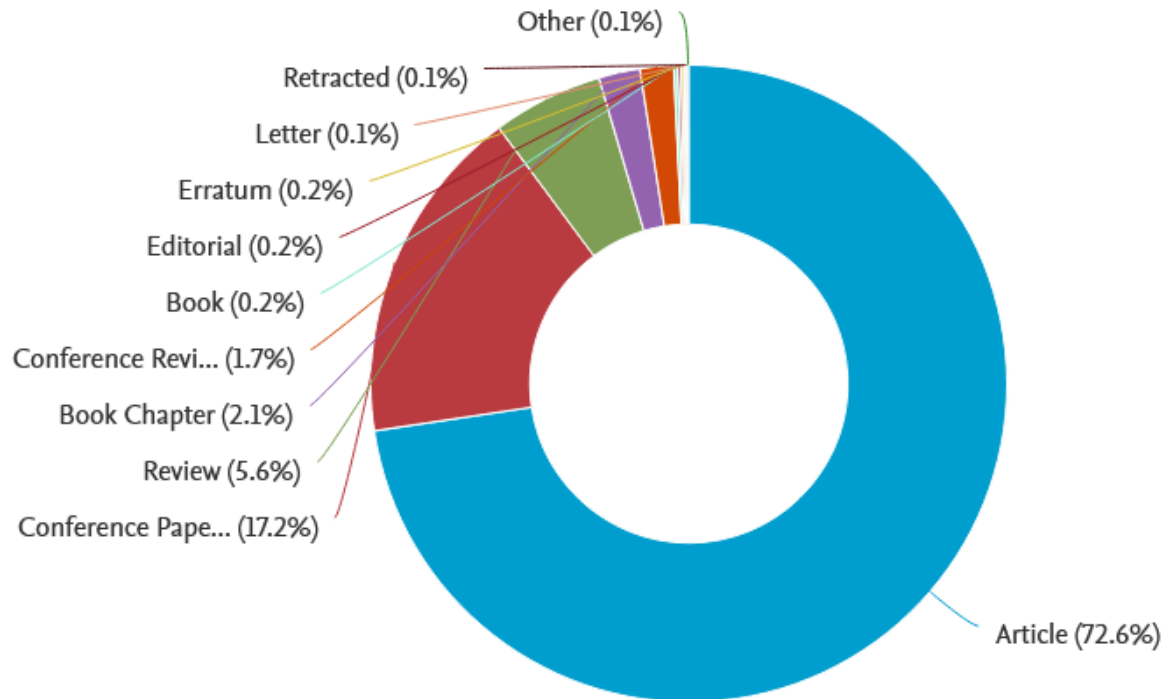
Figure 1: Classification of the documents on "Magnesium-implants

Co-authorship analysis of top authors had been shown in Table 3. For a better presentation of the analysis, the parameters used were the minimum number of documents of an author as 20and the minimum number of citations of authors as one. This combination plotted the map of29authors, in fiveclusters. The overlay visualization map of co-authorship analysis plotted in Table3, 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, citations, and links	Zhang X	49	1986	40.5	366
Authors with the highest citation	Witte.F	23	6951	302.2	151

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrences of a keyword as200. This combination plotted the map of 32 thresholds, in two clusters. The overlay visualization of co-occurrence analysis of keywords has been shown in Table2.The leading organizations engaged in research on "Magnesium-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 "Magnesium-implants", with the highest number of publications and citations, were the Chinese Academy of Sciences, China (Refer to table 2).

Table 2: Highlights of the most active organization

Organizations	Country	Documents	Citations	Average Citations per document
Chinese Academy of Sciences	China	104	5150	49.5

Co-authorship analysis of the countries engaged in the research on "Magnesium-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	China	561	18479	182

The most active country in this research domain was China, with the highest 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 "Magnesium-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	Acta Biomaterialia	120	8105	67.5	2341

From the above discussion regarding the Review patterns in the research regarding Magnesium-implants,this research had observed a gradual increase in research interest regarding Magnesium-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 author in this research domain was Zhang Xand Witte. F with the highest publication and co-authorship links; citations respectively(Refer to table 1).The overlay analysis of top countries researching Magnesium-implants indicates that China was the leading country relating to the highest number of publications, citations, and co-authorship links(Refer to Table 5). The top journals of this research domain were identified as Acta Biomaterialia. From these wide sources of information, researchers can focus on top journals where they can identify the most relevant and highly cited articles regarding Magnesium–implants.

4. Conclusion

Magnesium-implants was an interesting research domain and the most active journals related to this research domain were Acta Biomaterialia.The most active country was China. The leading organization engaged in the research regarding Magnesium-implants was the Chinese Academy of Sciences, China. The most active author who had made valuable contributions related to Magnesium-implants was Zhang X and Witte. Fwith the highest publication and co-authorship links, and citations respectively. This research domain offers a new avenue for researchers and future research can be on innovations in Magnesium-implants.

References

1. Altintas, M., Cokneseli, B. and Cetinkale, O. (1984) 'Magnesium implants in hemangioma treatment', *Cerrahpasa Tip Fakultesi Dergisi*, 15(4), pp. 548–552.
2. Atrens, A., Liu, M. and Zainal Abidin, N. I. (2011) 'Corrosion mechanism applicable to biodegradable magnesium implants', *Materials Science and Engineering B: Solid-State*

Materials for Advanced Technology, 176(20), pp. 1609–1636. doi: 10.1016/j.mseb.2010.12.017.

3. Farhat, T. *et al.* (2013) 'Research in congenital heart disease: A comparative Review analysis between developing and developed countries', *Pediatric Cardiology*, 34(2), pp. 375–382. doi: 10.1007/s00246-012-0466-6.

4. Cook, S. D., Klawitter, J. J. and Weinstein, A. M. (1981) 'The influence of implant elastic modulus on the stress distribution around LTI carbon and aluminum oxide dental implants', *Journal of Biomedical Materials Research*, 15(6), pp. 879–887. doi: 10.1002/jbm.820150612.

5. Cook, S. D., Weinstein, A. M. and Klawitter, J. J. (1982) 'Parameters affecting the stress distribution around LTI carbon and aluminum oxide dental implants', *Journal of Biomedical Materials Research*, 16(6), pp. 875–885. doi: 10.1002/jbm.820160612.

6. Cook, S. D., Weinstein, A. M. and Klawitter, J. J. (1983) 'The retention mechanics of LTI carbon, carbon-coated aluminum oxide, and uncoated aluminum oxide dental implants', *Journal of Biomedical Materials Research*, 17(5), pp. 873–883. doi: 10.1002/jbm.820170514.

7. Curran, J. A. (2012) 'Nanocrystalline oxide coatings on Al, Ti & Mg: The state of the art in plasma electrolysis', in *National Association for Surface Finishing Annual Conference and Trade Show 2012, SUR/FIN 2012*. Las Vegas, NV, pp. 211–225.

8. Daley, B. *et al.* (2004) 'Wear debris from hip or knee replacements causes chromosomal damage in human cells in tissue culture', *Journal of Bone and Joint Surgery - Series B*, 86(4), pp. 598–606. doi: 10.1302/0301-620x.86b4.14368.

.