

# *Analysis of the Current Status of the Study of the Dentistry History in China and Abroad Based on Big Data*

**Qian Zhang, Xin Peng\***

*Guizhou University Humanities and Medical Research Center, Zunyi Medical University, Zunyi, Guizhou Province, China*

*\*Corresponding Author*

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**Abstract:** The PUBMED and CNKI databases were used as big data sources to search for literature with the subject term or keyword “history of dentistry” in the databases. The annual number of articles, journals, authors and research topics of Chinese and foreign literature in the search results were analyzed to understand the development trend and research status of the history of dentistry in China and abroad. Through the study, we found that (1) the development peaks of the history of dentistry in China and abroad are staggered; (2) the disciplinary system of the history of dentistry in China is weak; (3) there are fewer research themes in the history of dentistry in China. These findings help us to understand the overall development trend of the history of dentistry, which leads to suggestions to accelerate the construction of a research talent team and expand the breadth and depth of research, in order to provide a reference for the future development of the discipline of the history of dentistry in China.

## **1. Introduction**

The history of dentistry is the science that describes the development of dentistry and illustrates how it relates to and is influenced by the socioeconomic structure, social ideology, and other medical and scientific developments of the time. The history of dentistry describes the scope of dentistry, including the history of prevention of oral diseases, treatment of oral diseases, and maintenance and restoration of oral health. The history of dentistry should include the history of world dentistry and the history of Chinese dentistry [1]. Due to cultural differences, development history and discipline definition, the history of world dentistry and the history of Chinese dentistry are somewhat different. This paper intends to search in Chinese and foreign databases with the theme of the history of dentistry and use the method of big data analysis to analyze the current status of the research on the history of dentistry in China and abroad, aiming to find the shortage of the research on the history of dentistry in China and draw on the useful research methods from abroad, in order to provide reference for the research on the history of dentistry.

## 2. Research Method

In this study, the literature search, data extraction and CNKI data cleaning were all done by one researcher.

PUBMED was used as the database for foreign literature, and the search formula was “History of Dentistry” [Mesh]. A total of 2822 papers were found. The Chinese literature was searched by CNKI, and the search formula was (TKA=Oral Cavity OR TKA=Teeth OR TKA=Maxillofacial) AND (TKA=History of Medicine OR TKA=History of Medical Figures OR TKA=History of Development). The total of 175 valid papers were obtained by removing the papers with irrelevant titles such as “Introduction by the Editor-in-Chief”, “Preface” and “Information”.

Import the search results into Excel and Citespace for analysis.

CNKI and Pubmed databases, which are common and authoritative databases for searching Chinese and foreign literature, were chosen as the data sources for the study. Although not all Chinese and foreign literature is included, it can still quantitatively represent the current state of research in the discipline from the perspective of big data analysis.

## 3. Results

### 3.1 Published Papers Annually



*Fig.1 Published Papers Annually Based on Pubmed*

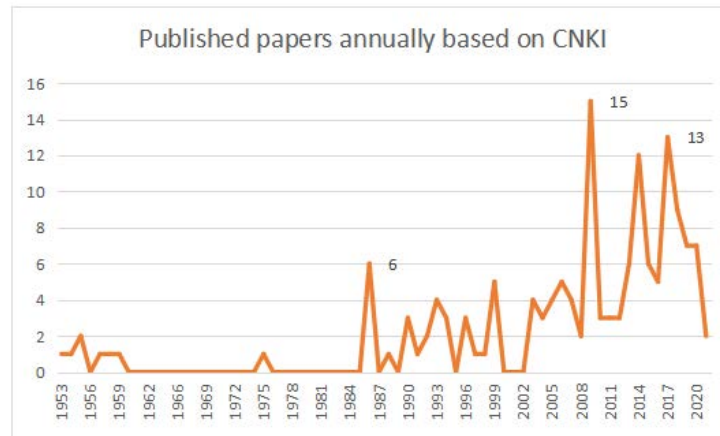


Fig.2 Published Papers Annually Based on Cnki

Based on CNKI and PUBMED databases, Chinese literature has been recorded since 1953. Foreign language literature has been recorded since 1945. As shown in Figure 1 and Figure 2, the number of foreign language literature was always higher than the number of Chinese literature. The foreign language literature reached a peak between 1965 and 1975, then gradually declined, and stabilized after entering the 21st century. The Chinese literature had only scattered studies until 1985, and started to take off after the 1990s, reaching a peak around 2010.

### 3.2 Journal Analysis

Table 1 Ranking of The Number of Articles Published in English Journals Based on Pubmend Search

Journal name	number
J Hist Dent	141
Br Dent J	139
Bull Hist Dent	134
Zahnarztl Mitt	94
J Am Dent Assoc	87
Dent Hist	70
Stomatologiia (Mosk)	57
Ned Tijdschr Tandheelkd	52
J Am Coll Dent	45
Zahnarztl Prax	42

Table 2 Ranking of The Number of Articles Published in Chinese Journals Based on Cnki Search

Journal name	number
Chinese Journal of Stomatology	12
Chinese Journal of Practical Stomatology	10
Acta Anthropologica Sinica	8
China Journal of Oral and Maxillofacial Surgery	7
Chinese Journal of Dentistry	7
Stomatology	7
Journal of Comprehensive Stomatology	5
Journal of Practical Stomatology	5
Chinese Journal of Medical History	4
Journal of Clinical Stomatology	4

Statistically, the top 10 journals in terms of foreign language publication are shown in *Table 1*, and the top 10 journals in terms of Chinese language publication are shown in *Table 1* and *Table 2* shows that among the top 10 journals in terms of foreign language publication, all ten are journals in the direction of dentistry (dental) medicine, and three of them are specialized in the history of dentistry (dental) medicine. As seen in *Table 2*, among the top 10 journals in terms of the number of articles published in Chinese, there are 8 journals specializing in dentistry, one journal specializing in the history of medicine, and one journal specializing in the direction of human archaeology, but no journal specializing in the history of dentistry.

### 3.3 Analysis of Research Institutions and Authors

*Table 3 Ranking of Foreign Language Authors' Publications Based on Pubmed Search*

Name	Institution	Number of papers
Gysel, C	Université de Paris	57
Ring, M E	School of Dental Medicine, State University of New York	52
Hoffmann-Axthelm, W	Westdeutsche Kieferklinik	26
HOFFMANN, K F	Heidelberg University	24
FOLEY, G P	Dr. Samuel D. Harris National Museum of Dentistry	21

*Table 4 Ranking of Chinese Authors' Publications Based on Cnki Search*

Name	Institution	Number of papers
Gang Li	Air Force Medical University	12
Dacheng Zhou	Beijing Stomatological Hospital	10
Jinling Shao	Air Force Medical University	9
Hong Zhu	Jilin University	7
Quanchao Zhang	Jilin University	5

There were 278 authors based on CNKI, including 15 authors with 3 or more articles and 6 authors with 5 or more articles. There were 1937 authors based on PUBMED, including 77 authors with 5 or more articles and 30 authors with 10 or more articles. The top 5 authors are shown in *Table 3* and *Table 4*. As shown in *Table 3*, two of the top 5 authors are from the United States, two are from Germany, and one is from France. *Table 4* shows that there was a high degree of institutional overlap among the authors of Chinese publications, indicating that there are fewer academic institutions in China for related research.

### 3.4 Research Topics

The English literature data based on Pubmed retrieval was imported into Citespace, and the keywords of the literature were clustered and analyzed, and a total of six clusters were obtained. In such knowledge graphs, the smaller the number is, the more keywords are contained in the clusters, and each cluster is composed of multiple closely related words. The cross size represents the keyword frequency, and the lines represent the connection between keywords. The more obvious connecting lines between nodes represent, the stronger degree of association between different keywords [2]. Cluster 1: History of medicine in the direction of oral health education, oral surgery, dental implants, dental carving, military dentistry and women dentists; Cluster 2: History of medicine and medical manuscripts on tooth eruption and extraction in ancient and medieval religious medicine, medical celebrities, medical art, dental tools and public oral health; Cluster 3: History of dentists and medical institutions in modern research on endodontics and TMJ; Cluster 4: Medical research and academic journal research on oral systemic diseases, dental caries, restorative dentistry and materials in oral health; Cluster 5: Dental school, dental practice, postgraduate

education and dental ethics research and state dental education research in dental education; Cluster 6: Medical original research on complete and partial dentures.

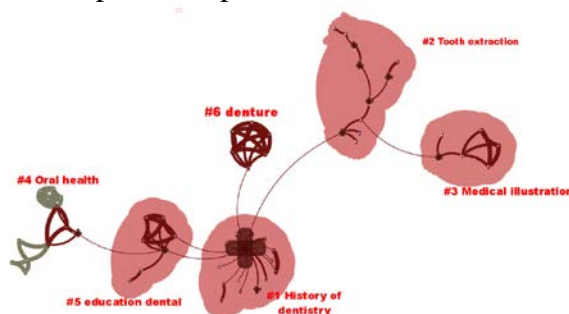


Fig.3 Literature Subject Cluster Analysis on Pubmed

The Chinese literature on the history of dentistry retrieved based on CNKI database was scattered due to the small volume of literature. The research topics were not clustered. The key words of Chinese literature based on CNKI database were standardized and combined with synonyms and near-synonyms, and the high-frequency key words are shown in Table 5.

Table 5 High-Frequency Keywords of Chinese Literature Based on Cnki Search

Key words	Number
Stomatology	57
History of Medicine	41
Ancient Books on Chinese Medicine	34
Stomatological Medicine Education	28
Oral Diseases	28
Ancient	25
Archaeology	12
Oral and maxillofacial surgery	11
Oral materials	9
Modern times	7

It can be seen that the Chinese literature keywords focus on the history of medicine in ancient China, especially oral diseases in Chinese medicine. In addition, Chinese authors also paid more attention to the history of dental education, archaeology and oral materials.

## 4. Discussion

### 4.1 Staggered Peaks in the Development of the History of Dentistry in China and Abroad

The annual publication of foreign language history of dentistry literature was at the peak of development from 1965 to 1975, after which the number of publications declined rapidly. 1995 was followed by a slight recovery and then gradually stabilized. The number of publications in the history of dentistry in Chinese has always been lower than that in foreign languages, but the annual publications have been on an upward trend, which indicates that although the discipline of the history of dentistry in China started late and developed slowly. It gradually increased during 1980-2010 and gradually stabilized after 2010.

The peak of foreign language history of dentistry journals in 1960s was due to the rapid development of science and continuous economic prosperity after the end of World War II, which promoted the development of dentistry. The establishment of dentistry discipline gradually matured and academic journals of sub-discipline emerged, such as the first professional academic journal of history of dentistry *Bulletin of the history of dentistry* was published in 1953. At this time in China,

the discipline of dentistry was just established in the 1950s. After the reform and opening up in the 1980s, the history of dentistry gradually began to be studied by absorbing foreign research experience. From the perspective of big data, the history of dentistry in China is currently in the slow rise of the beginning, and has not yet ushered in the peak of development. There is a certain lag and staggering phenomenon compared with developed countries.

#### 4.2 Weak Disciplinary System of the Dentistry History in China

The development of scientific research into an independent discipline is marked by the need for independent research content, mature research methods, and a standardized disciplinary system. If we look at the history of dentistry as a discipline, there is no doubt that there is independent research content and mature research methods. Moreover, there are also standardized disciplinary institutions in the international arena, such as institutes, departments and societies for the history of dentistry. However, there is no special history of dentistry society in China. Only a few universities have history of dentistry departments and researchers. From the viewpoint of researchers, there are fewer professionals engaged in the study of history of dentistry in China. From the data the author gained, it can be seen that there were only 6 authors with more than 5 medical history papers; from the viewpoint of published journals, there were no specialized journals on the history of dentistry in China, and most of the journal papers on the history of dentistry were published in comprehensive journals of dentistry; while there were many professional journals on the history of dentistry in foreign language journals. Therefore, the research system of the history of dentistry in China is still in its infancy and has not developed into an establishment.

This is related to the development environment of Chinese dentistry, which emphasizes practice and light on theory. dentistry in China is a new discipline established since liberation, and has experienced more than seventy years of development, from the development of pure clinical dentistry, to the parallel development of clinical dentistry and basic dentistry, to nowadays, both clinical dentistry and basic dentistry in China have been developed significantly, we need to pay more attention to the development of humanistic dentistry, and transform the biomedical model to the biopsychosocial medical model. We need to pay more attention to the development of humanistic dentistry and change the biomedical model to the biopsychosocial medical model to meet the needs of Chinese people for high-quality medical care. The history of dentistry, as an important component of the medical humanities, needs to be emphasized and developed.

Although the history of medicine has been increasingly emphasized in China, and many colleges and universities have offered the history of medicine as a course, in dentistry education, the teaching of the history of dentistry has not been developed in most higher dentistry faculties, vocational and technical colleges and secondary health schools [3]. What's more, these schools lack professional teachers who have received systematic education in dentistry history. This makes many students unaware of the subject of its history, further leading to the lack of history of dentistry education. This makes many dentistry students unaware and unaware of the subject of history of dentistry, which further leads to the lack of history of dentistry talents. This indicates that there is still room for improvement in our dentistry education, and there is an urgent need to replenish the research talents in the history of dentistry.

In addition, we need to learn from advanced experiences and methods. For example, the official website of the American Dental Association (ADA) includes the history of dentistry as a special category, dividing it into five topics: ancient origins, the beginnings of the profession - the Middle Ages, the development of the profession - the 18th century, the progress of science and education -19th century, and innovations in technology and techniques -20th century [4]. It provides common problems in the history of dentistry and a list of books on the history of dentistry as an open,



authoritative and easily searchable source for dentists and the general public to study. This is worthy of our reference in the information age, which can make the research results of the history of dentistry more easily disseminated, more acceptable, and more influential, which is conducive to the development of the history of dentistry and even the career of dentistry.

### 4.3 Fewer Research Topics in the History of Chinese Dentistry

From the perspective of big data, foreign literature not only studied a wider range of topics, but also became systematic and deeper. On the contrary, the Chinese literature studied fewer topics and was not systematic. From the clustering results, the themes in the foreign literature are comprehensive, and some of them are influenced by cultural factors, such as studies in the foreign literature on the influence of theology [5] (e.g., Apollonia, the god of dental pain), skin color [6], and gender [7] on dentistry in the history of the development of dentistry, and studies on the causes and effects of the divergence of Western dentistry and mainstream medicine [8]. In China, due to the different historical and cultural backgrounds and social development history, such factors have not been studied. In addition, although Chinese dentistry has developed rapidly, it has only been developed for more than seventy years. Some topics have undergone a complete establishment in developed countries, but are still emerging disciplines or have not been developed significantly in China, which are even more unavailable in medical history studies, such as the history of the development of pediatric dentistry [9], the history of the development of regenerative dentistry [10], the history of the development of military dentistry [11], the history of dentistry medical ethics and bill development [12] and dentistry health insurance development studies, etc., have been studied in detail in the history of subdivided topics in foreign literature, while no such historiographical studies have been seen in Chinese literature.

In the history of dentistry figures, Chinese literature is rare in terms of a complete three-dimensional study of it. In contrast, the proportion of biographical reviews and depictions of historical dentistry figures in foreign language literature far exceeds that of Chinese literature. This may be due to the late establishment of modern Chinese dentistry discipline. Chinese traditional medicine is concerned with the holistic nature, mostly focusing on the changes and regression of the overall human disease, and no special oral disease experts emerged, only the knowledge and understanding of oral diseases. The historical figures who promoted the development of modern oral (dental) medicine mostly emerged in foreign countries. For example, there are several articles in the foreign literature focusing on Pierre Fauchard, G.V Black, etc. In Chinese literature, most of them focus on the study of oral diseases in ancient Chinese medical books. However, some of the authors or their life and deeds are unknown, and only texts are circulated, so there are more studies on ancient literature and cultural relics in Chinese literature. The proportion is higher than that in foreign literature, while there are less studies on the history of medical figures, only some studies on the pioneers who introduced modern dentistry to China, such as Lin Ze and Situ Bo.

Therefore, the research direction of Chinese and foreign dentistry history literature has its own focus, but in general the breadth of our dentistry history research is narrower and not deep enough. This is certainly due to objective reasons such as the late establishment of modern dentistry in China and the absence of the concept of dentistry in ancient times, but it still suggests that Chinese dentistry medical historians need to pay attention to the broader world of the history of dentistry.

## 5. Conclusion

As the discipline of the history of medicine continues to be emphasized, the history of dentistry, as an important branch of the history of medicine, has also continued to develop significantly. Internationally, the top medical journal *The Lancet* has published several papers on the history of

dentistry in recent years, focusing on the history and development of dentistry [13] and prosthodontics [14], indicating that the history of dentistry has been increasingly valued in recent years. Therefore, Chinese dentistry historians need to focus on more aspects of the development of dentistry, such as the valuable patriotism and humanistic spirit core embodied by Chinese dentistry figures, and the changing gender ratio of Chinese dentistry medical workers. It is also necessary to conduct timely reviews and summaries of emerging disciplines in order to promote their development. By expanding the breadth of research on the history of dentistry and intersecting multiple disciplines, we can deepen the depth of research on the discipline of the history of dentistry, improve the understanding of stomatologists on the discipline of dentistry, and strengthen their own medical humanistic qualities, thus promoting the quality of medical services and the development of the dentistry career.

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