Research Status, Hotspots, and Trends on Oral Care Research in the Elderly in Mainland China Published from 2002-2022: A Bibliometric Analysis

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Research Article

Keywords: elderly, oral care, bibliometric analysis, China, nursing

Posted Date: July 27th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1869101/v1

Abstract

Background

Oral health is a key indicator of overall health, well-being and quality of life. The oral health status of the elderly will decline with age, which results in serious consequences and bring heavy medical and economic burdens to the country and society. With the aggravation of population aging process, more and more attention has been paid to the oral health problems of the elderly in mainland China, the number of studies focusing on oral care for the elderly is increasing year by year, and many research papers have been published in journals. However, no scholar has conducted bibliometric analysis in this field so far. The purpose of this study is to analyze the status, hotspots and trends of research on oral care for the elderly in mainland China in the past 20 years through bibliometrics, which aims to provide new ideas and targets for future clinical work and research.

Methods

Relevant literature from January 2002 to May 2022 were retrieved from China National Knowledge Infrastructure, Wanfang, China Science and Technology Journal Database, Web of Science, and PubMed. NoteExpress 3.5.0.9054, Co-Occurrence 12.6 and CiteSpace 6.1.R2 were used to analyze bibliometric features in terms of year of publication, journal of publication, authors, institution and keywords.

Results

A total of 716 related articles were obtained. Data analysis revealed that the number of publications shows an increasing trend over time, only 2017–2021, 309 papers were published, accounting for 43.2% of the total number of publications. A total of 238 articles were published in Science Citation Index journals or Chinese core journals, accounting for 33.2% of the total number of articles, and only a few core journals among the top 10 journals. The study of oral health-related quality of life in the elderly is a hot research topic. There is a lack of research on the elderly living in elderly care facilities.

Conclusion

The present study provides an in-depth understanding of oral care in the elderly in mainland China. The study showed the current research status, hotspots and trends of this field, and future research direction is prospected.

Introduction

Population aging is one of the significant social transformations of the 21st century which posing health care challenges for caregivers and creating an enormous global burden in social economy. As reported in

China's seventh National Census on 12 May 2021, the population aged 60 and over is 264 million, constituting 18.70% of the total population, of which the population aged 65 and over is 191 million, accounting for 13.50% of the national total population[1]. It is expected that there will be 365 million aged 65 + Chinese by 2050, a number representing 26.1% of the country's total population. In addition, of this ageing population, 115 million are expected to reach the age of 80 and 0.6 million are expected to become centenarians[2].

According to the Global Burden of Disease (GBD) study, approximately 3.58 billion people suffer from cases of oral conditions worldwide. Oral health problems remain a major neglected global public health challenge[3]. Among the most common oral diseases are dental caries, periodontal disease, and tooth loss etc., the ages between 60 and 64 tend to be peak age for having severe periodontitis. Nearly 180,000 deaths occur each year due to lip and oral cavity cancers, which rank among the top 15 most common cancers in the world[4]. Based on the data from the 4th National Oral Health Epidemiological Survey in mainland China, the prevalence of dental caries in the 65–74 age group is 98%, 90.7% had periodontal disease, including bleeding gums (82.6%), calculus (90.3%), and deep pockets (14.7%). The periodontal health and oral hygiene status of the elderly decreased significantly. The overall oral health status is not optimistic, and residents' awareness of oral health still needs to be enhanced[2, 5].

It is well documented that the prevalence and severity of oral diseases are consistently associated with socioeconomic status. In many low-income and middle-income countries, oral diseases are largely untreated due to the high cost of treatment. Besides, the lack of professional dental staff and the financial burden also exacerbate inequalities in the distribution of dental care[4]. Unlike preventive-orientated dental care in some developed countries, Chinese residents seek oral health care only when oral diseases cause pain, reflecting their relatively low real demand for dental services and do not see it as critical[6]. According to a survey, only 19% of Chinese elderly have seen a dentist within a year[7]. There are many underlying diseases in the elderly. Their oral health status will decline with the increase of age, including decreased periodontal support, tooth loss, and loss of elastic fibers etc., which partly reflects the social demand for oral care[6, 8]. A survey took place in mainland China has revealed that there are several risk factors contribute to the high prevalence of oral diseases among the elderly, including the scarcity of oral health knowledge, the low frequency of daily hygiene behaviors, and the inadequacy of oral care services. The average awareness rate of dental health among the elderly was 47.6%. It is estimated that only 30.1% of the elderly brush their teeth twice daily and only 0.8% of the elderly use dental floss[9, 10]. Untreated oral diseases can lead to substantial outcomes, which may include malnutrition, Infective endocarditis, impaired masticatory function, diabetes, decreased quality of life and affected social relationships etc. In recent years, Oral health has been written into the blueprint of "Healthy China 2030" [11].

Bibliometrics was first proposed by British intelligence scientist Pritchard in 1969. It is a quantitative analytic technique based on a range of characteristics of literature, such as the number of articles, authors, institutions, year of publication, and keywords etc. Bibliometrics uses mathematical and

statistical methods to reveal research status and development trends in certain areas of research. In recent years, there has been widespread use of it in nursing research[12, 13].

Relevant stakeholders must increase their efforts to address the oral health needs of the elderly. In recent years, more and more attention has been paid to the oral health problems of the elderly in mainland China, the number of studies focusing on oral care for the elderly is increasing year by year, and many research papers have been published in journals. However, research status and hot spots on oral care in the elderly in mainland China are rarely reported. Therefore, in order to fill this gap, we conducted a bibliometric analysis to probe into the research status, hotspots and future trends of oral care research focusing on the elderly in mainland China, for providing reference for the continuous promotion and improvement of this field.

Materials And Methods

Data Sources and study selection

First, we searched articles published in three Chinese databases including China National Knowledge Infrastructure (CNKI, https://www.cnki.net/), Wanfang (https://www.wanfangdata.com.cn/index.html) and China Science and Technology Journal Database (VIP, http://www.cqvip.com/) from January 01, 2002 to May 20, 2022, with the subject terms “aged” AND “oral cavity” AND “nursing”. Inclusion criteria were as follows: (1) Chinese language; (2) literature published from January 01, 2002 to May 20, 2022; (3) studies relevant to oral care in the elderly in mainland China. Exclusion criteria were as follows: (1) literature without keywords; (2) non-nursing literature; (3) conferences, announcements, dissertations and other publications. Second, article searches were conducted in Web of Science databases and PubMed with “elderly OR elders OR elderly people OR aged OR older adults” AND “oral cavity OR dental OR mouth” AND “care OR nursing OR nurse OR nursing care” AND “China or Chinese” as the subject terms. Inclusion criteria were as follows: (1) English language; (2) literature publication year from January 01, 2002 to May 20, 2022; (3) studies relevant to oral care in the elderly; (4) authors were from mainland China and the studies were conducted in mainland China. We excluded articles that did not meet the inclusion criteria, as well as conferences, patents, and other publications.

Data Analysis

NoteExpress 3.5.0.9054 software was used to establish a literature reading database. Imported all bibliographies of retrieved Chinese and English articles into NoteExpress, excluded duplicate literature, and filtered the articles by reading titles, abstracts and keywords. Then, we exported the retained article bibliographies to Microsoft Office Excel 2019. COOC 12.6[26] is a bibliometric and scientific graphing software package developed by the Chinese XueShuDianDi Team. We created a new sheet in Excel that only contains author information, and used COOC to extract data from the sheet to plot the author distribution chart. CiteSpace[14] was developed by Dr. Chaomei Chen of Drexel University to visualize bibliometric analysis, which is based on JAVA programming language and is widely used to analyze the hotspots and new trends in a research field. It uses bibliometrics method and data mining algorithm

integration to draw a visualization map and establish the association between nodes to analyze the co-occurrence relationship and co-citation relationship among research objects.

In this study, COOC was used to convert the format of Chinese language articles which can be recognized and analyzed in CiteSpace. All English language publications data was sent to citation manager in PubMed, stored in NBIB format in input folder, next converted to Web of Science format that can be recognized in CiteSpace. Taking “Institution” and “Keyword” as network nodes to plot the related graphs with nodes of institution, keywords and time zone graph of keywords etc. to conduct bibliometric analysis. CiteSpace was configured with the following parameters: time from January 2002 to May 2022, years per slice for 1 year. Other parameters were set to default values. CiteSpace automatically generated visualization plots based on the node selection, and adjusted the nodes within the visualization window as necessary.

Results

Annual distribution of publications

The process of data selection is shown in Fig. 1. Of the 7073 articles preliminary screened, a final analysis of 716 articles was conducted. As seen in Fig. 2, it shows the details of temporal distribution and trends of oral care in the elderly in mainland China over the past two decades. There is generally an upward trend in the volume of Chinese-language articles, among which the number of articles published in 2018 reached a peak of 70, accounting for 9.8% of all literature. In contrast, the overall publication volume of English-language publications tends to be stable and low, with the first article published in 2008. The data in 2022 can’t reflect the publication of the whole year.

Distribution of journals and authors

The 716 papers were published in a total of 240 journals, including 28 nursing journals, taking up 11.7%. All 19 English language literature were published in Science Citation Index journals. 219 Chinese language articles were published in 76 kinds of Chinese core journals, occupying 30.6% of the total literature. Table 1 shows the top 10 journals publishing oral care literature for the elderly in mainland China from 2002 to 2022, of which only a few are core journals. 716 articles involving a total of 1452 authors, of which the author with the largest number of articles was Qiwei Gong, who published 7 articles in total, accounting for 1.0% of the total number of articles. Figure 3 shows the Nightingale Rose Chart of the distribution of the top 20 authors of both Chinese and English literature.

Table 1
Top 10 journals with the highest number of published articles.

No.	Journal	Number	Percentage, %
1	Electronic Journal of General Stomatology	41	5.7
2	Chinese Journal of Geriatric Dentistry	36	5.0
3	China Health Care Nutrition	28	3.9
4	Modern Nurse	19	2.7
5	Guide of China Medicine	16	2.2
6	Journal of Qilu Nursing	13	1.8
7	Health guide	13	1.8
8	Medical Information	13	1.8
9	World Latest Medicine Information	12	1.7
10	Nursing Journal of Chinese People's Liberation Army	11	1.5

Distribution of issuing institutions

Figure 4, 5 depict the map of institutional networks of Chinese and English literature, respectively. The analysis of addresses shows that 14 papers lack authors' addresses so only 702 papers are used in this section.

In Fig. 4, the top three Chinese language publishing institutions are the General Hospital of the People's Liberation Army (published 18 articles, accounting for 2.5% of the total), the Affiliated Stomatological Hospital of Nanjing Medical University (published 10 articles, accounting for 1.4% of the total), and the Affiliated Stomatological Hospital of Medical School of Nanjing University (published 7 articles, accounting for 1.0% of the total), respectively. The rest institutions have one to six publications.

In Fig. 5, the top three English language publishing institutions are School of Nursing, Fudan University (published 4 articles, accounting for 0.6% of the total), West China Hospital of Stomatology, Sichuan University (published 2 articles, accounting for 0.3% of the total), and Hospital of Stomatology, Guanghua College of Stomatology, Sun Yat-Sen University (published 2 articles, accounting for 0.3% of the total), respectively. Besides, research collaborations have been conducted by some mainland Chinese institutions with international institutions, such as Rory Meyers College of Nursing New York University, Duke University School of Nursing and College of Dental Science, and Radboud University Nijmegen Medical Centre. According to the time bar at the top of Fig. 5, School of Nursing, Fudan University has been cooperating with other institutions since 2015, which means it is an active cooperative institution in the field of oral care research in the elderly.

Keywords Co-occurrence

Table 2 and Fig. 6 show the top 20 high-frequency keywords and the co-occurrence graph of keywords in articles published in Chinese language on oral care for the elderly from 2002 to 2022, respectively. Based on the frequency and centrality of keyword co-occurrences, “oral care”, “oral health education” and “tooth extraction” were the hot keywords in Chinese language publications. In addition, in Fig. 6, the color of annual rings corresponds to the timeline at the top of the figure, although the diameter of the annual ring of periodontitis, mental nursing, quality of life and oral health care is small, the outer ring is orange, which indicates that these keywords are receiving more and more attention in recent years.

Table 2
Distribution of the top 20 high-frequency keywords in Chinese language publications.

No.	Keyword	Frequency	Centrality	No.	Keyword	Frequency	Centrality
1	the elderly	152	0.12	11	prosthodontics	28	0.09
2	elderly patients	133	0.21	12	periodontitis	25	0.05
3	nursing	128	0.16	13	oral	23	0.19
4	oral care	97	0.55	14	oral cancer	22	0.07
5	old age	95	0.11	15	quality of life	21	0.06
6	mental nursing	48	0.16	16	oral health care	19	0.04
7	nursing intervention	32	0.08	17	oral disease	18	0.12
8	tooth extraction	31	0.24	18	diabetes	17	0.42
9	oral health education	28	0.3	19	perioperative period	15	0.31
10	oral health	28	0.2	20	complete denture	14	0.04

Table 3 and Fig. 7 show the top 6 high-frequency keywords and the co-occurrence graph of keywords in articles published in English language on oral care for the elderly from 2002 to 2022, respectively. It can be seen by combining the frequency and centrality of keyword co-occurrence that the hot keywords in English language publications were “risk factor”, “tooth loss”, “oral health”, “quality of life” and “older adult”.

Table 3
Distribution of the top 6 high-frequency keywords in English language publications.

No.	Keyword	Frequency	Centrality
1	oral health	6	0.24
2	older adult	6	0.13
3	tooth loss	4	0.27
4	quality of life	3	0.25
5	risk factor	2	0.28
6	dental status	2	0.01

Burst Terms

Figure 8 shows the top 20 keywords with the strongest citation burst in both Chinese and English language published articles on oral care in the elderly in mainland China. In Chinese language publications, the burst keywords in the beginning included “the elderly”, “nursing”, “tooth extraction”, and “oral disease”. Burst keywords including “periodontitis”, “nursing efficacy”, “influence factor”, “quality of life”, “satisfaction”, “high quality nursing” and “oral health” have been bursting since 2018, of which the keywords of “periodontitis”, “nursing efficacy” and “influence factor” have a long burst time of 5 years. It’s worth noting that the burst intensity of “quality of life” reached 6.22, indicating that the oral health related quality of life of the elderly has received the highest attention and is a hot research area. In English language publications, “tooth loss” burst the earliest and lasted the longest, plus the burst intensity, verifying its importance and popularity during 2008 to 2015. "Quality of Life" has continued to burst with the highest intensity since 2021, which is consistent with the conclusion drawn from data of Chinese language publications.

Keywords Time zone diagram

Figure 9 shows the distribution of keywords over time in Chinese language articles, it can be seen that there are different concerns in different periods. Hence, the evolution of oral care research for the elderly in mainland China can be divided into three development stages: basic initial stage, prosperous stage and new stage.

Basic initial stage (2002–2003): At this stage, oral care research for the elderly was in the initial development stage, the research was messy and not systematic.

Prosperous stage (2004–2014): During this period, the study of oral care for the elderly gradually increased, and the research direction began to diversify. Researches were approximately spread out from the aspects of mental nursing, health education, oral health related quality of life, oral nursing intervention etc.

New stage (2015-): In this phase, the research of oral care for the elderly is gradually deepening and meticulous in mainland China. During this period, mental nursing, health education and oral care intervention are still issues that need to be concerned. However, different from the past, in-depth analysis of its research problems has been done in the new era. That is to say, from the perspectives of satisfaction, application effect and compliance etc., the improvement situation of various nursing interventions on oral health and oral health related quality of life of the elderly is specifically explored.

Figure 10 shows the distribution of keywords over time in English language articles. The research on oral care in the elderly started relatively late, the first English literature was published in 2008, there was a period of stagnation between 2011 and 2015, we divided the study into two stages for analysis.

Phase one (2008–2011): In this phase, a total of three articles were published, and the research content was relatively scattered.

Phase two (2015-): In this phase, the number of published papers has increased significantly, and research contents have become more abundant, focusing not only on the oral health problems of the elderly, but also on the nutritional status, masticatory function, cognitive dysfunction and quality of life of the elderly, comprehensively discuss the field of oral care for the elderly in a multi-dimensional and multi-level way.

Discussion

The results of this paper showed that the research content of published articles is varied. For example, some scholars have constructed sensitive index of nursing quality in elderly oral outpatient department, some scholars have constructed oral care programs for elderly patients with oral cancer during perioperative period based on Delphi method, some scholars have summarized the best evidence on oral management for the elderly. Other researches mainly involve comprehensive nursing intervention, mental nursing, and oral health education etc. for the elderly suffering from oral cancer or periodontitis and other diseases. For example, the application of high-quality nursing, continuous nursing, integrated medical and nursing mode, clinical nursing pathways and comfortable nursing to improve oral health outcomes and oral health-related quality of life of elderly patients. It is worth noting that “quality of life” is a hot research field in both Chinese and English literature. In recent years, there are also many international scholars have carried out researches on oral health-related quality of life of the elderly[15–18], which represents a new trend in future research. However, there were only 3 papers focused on the elderly living in elderly care facilities, only accounting for 0.4% of the total published papers. The elderly who live in elderly care facilities for a long time are at greater risk of oral diseases due to cognitive dysfunction, comorbidity and terminal palliative state. Oral health care for the elderly in elderly care facilities is generally inadequate worldwide[19, 20], research has shown that older adults with cognitive dysfunction are becoming the main body of elderly care facilities accompanied by chronic psychiatric and behavioral abnormalities[21]. Hence, it may be considered to shift the research focus to oral care for the elderly living in elderly care facilities in the future, and standardized assessment of oral health knowledge, attitude and

behavior, in combination with the current situation of oral health of the elderly, to explore a comprehensive nursing intervention that is suitable for the clinical situation in accordance with in mainland China's national conditions and can improve the oral health outcome of the elderly in elderly care facilities scientifically and effectively.

Judging from the year of publication, mainland Chinese researchers began researching oral care for the elderly in 1998, while international scholars have been conducting research on this subject since the 1950s[22–24]. Although the number of articles on oral care for the elderly is increasing year by year in mainland China, the number of articles published in the English databases is far less than the number in the Chinese databases nevertheless. More than half of the articles are published in non-core journals, scholars do not pay enough attention to the academic influence of articles. Based on this, it is important that scholars should pay attention to strengthening scientific research exchanges and cooperation with international institutions, achieve the globalization of scientific research, strive to create more opportunities for sharing research results with international scientific colleagues to enhance China's global influence in the field of oral care for the elderly.

Cooperative research is a kind of research method with complementary advantages. On the one hand, a high rate of co-author and degree of cooperation can reflect the good spirit of cooperation among authors. On the other hand, it can also reflect the degree of interdisciplinary intersection of the papers, the breadth of the fields involved and the depth of academic research[25]. The results of this study show that most of the institutions publishing literature are located in developed regions such as Guangdong Province, Beijing, Jiangsu Province and Shanghai, with large differences between regions and only a few cooperative networks are formed. This kind of barriers to cooperation may affect the further development of research. Therefore, breaking the regional restrictions, strengthening the academic exchanges between different regions, supporting the common progress of areas where oral care for the elderly is backward, and improving the oral health status of the elderly are the problems that need to be solved urgently at present.

According to a study investigating access to dental care among the elderly in China[6], a significant difference was found between patients with rural resident insurance and lower socioeconomic levels and those with urban resident insurance and higher socioeconomic levels, this kind of separation of the dental system from other health care systems is similar to the situation in the United States[2]. Therefore, in the future, the proportion of the uninsured should be further reduced, the dental care infrastructure should be improved, and the provision of affordable dental care for the elderly should be ensured.

Limitations

The limitations of this study are as follows. Firstly, this study only searched the published literature on oral care research in the elderly in mainland China collected in various databases in the past 20 years. Since the first article was published in 1998, the findings of this study cannot comprehensively reflect the development process of this field. Secondly, we conducted a general orientation analysis of the included

papers, but without a more in-depth content analysis. The research types, research quality, methods, and research findings of those articles remain unknown.

Conclusions

To sum up, although the research on oral care for the elderly in mainland China has been widely carried out nationwide, it still faces many challenges. Oral nursing is a combination of stomatology and nursing. With the rapid development of stomatology, the requirements for nurses have continuously increased. However, oral nursing in mainland China started relatively late, which has a huge gap with stomatology. What’s more, a series of systems for oral nursing talent education, training and certification have not been formed yet. In the future, the academic exchanges and cooperation between nurses, dental specialists, psychotherapists and other multidisciplinary talents can be further strengthened, make concerted efforts to develop innovative consciousness to improve the oral care quality and nursing satisfaction of the elderly. At the same time, it is possible to strengthen the professional training of oral care knowledge and skills for nurses, establish the oral specialty nursing education model, formulate the performance appraisal system, and build a professional oral care team to meet the diversified service needs of the elderly. Finally, by introducing evidence-based nursing, we can construct and constantly improve the oral care quality evaluation system for the elderly in line with mainland China's national conditions, objectively monitor the oral care quality of the elderly, deeply explore the causes of disease-related adverse events, carry out effective quality control of each key nursing link, actively respond to population aging and committed to the development of oral health.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The original data supporting the conclusions of this paper will be provided by the authors without reservation.

Declaration of Competing Interest

The authors declare that they have no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions

JWZ, YQW, LJZ jointly determined the conception and design of the study, article retrieval and data analysis were WYC and MTQ, written by JWZ, and LJZ, YQW were responsible for the revision of the paper. All authors read and approved the final manuscript.

Acknowledgements

The authors thank Shanghai Geriatric Nursing Management Quality Control Center, where this study was entirely conducted.

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Figures

Figure 1

Flow chart for article selection

Figure 2

Annual number of articles published in Chinese and English.

Figure 3

Nightingale rose chart of the distribution of the top 20 authors.

Figure 4

Distribution of Chinese-language institutional publications of oral care research in the elderly in mainland China.

Figure 5

Distribution of English-language institutional publications of oral care research in the elderly in mainland China.

Figure 6

Keywords co-occurrence graph of articles published in Chinese language.

Figure 7

Keywords co-occurrence graph of articles published in English language.

Figure 8

Keyword burst graph of articles published in Chinese and English language.

Figure 9

Keywords Time zone diagram in articles published in Chinese.

Figure 10

Keywords Time zone diagram in articles published in English.