

Original Article



The Scientific Production of Providing Health Services to the Elderly: A Scientometric Study

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Abstract

Introduction: Today, paying due attention to providing primary health services for the elderly is of high importance, and significant studies have been conducted in this regard in the world. The present study aimed to analyze the performance and drawing a scientific map of publications in the field of geriatric health services with a scientometric approach.

Methods: In this scientometric study, all the scientific outputs in the field of geriatric health services in the Science Citation Index Expanded (SCIE-Web of Science) in the period from 1980 to August 18, 2023 were included. For data analysis, biblioshiny and Excel software were used.

Results: Among 33 238 documents in the field of geriatric health services indexed in the SCIE, the most of them were original articles. The growth trend of these documents was increasing so that the lowest number is related to 1987 with two documents and the highest number is related to 2022 with 3315 documents. *BMJ Open* was the most productive journal and *Lancet* was the most cited journal in this field. Univ Toronto was the most prolific institution and Cohen AD was the most prolific author. The keywords health services research and epidemiology were the most frequent.

Conclusion: By presenting a comprehensive picture of the current state of studies in the field of geriatric health services, this study can determine the direction of future research. In addition, the findings of the present study can guide the direction and effectiveness of the research in this field.

Keywords: Bibliometrics, Geriatric health services, The Science Citation Index Expanded



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Introduction

At the beginning of the third millennium, population aging is more evident than ever as a global event (1,2). The importance of demographic changes is such that population aging is mentioned as a global emergency (3). Aging can be defined as the progressive, spontaneous, and irreversible loss of the body's physiological homeostasis due to degeneration at the level of cells, tissues, and organs, which causes an increase in mortality and chronic diseases (4). In addition, the decrease in the birth rate and the simultaneous increase in the number of elderly people have caused an increase in the dependency ratio of the elderly to the young (5). It is predicted that people aged +60 and +65 will respectively make up 21.7% and

14.7% of Iran's population in 2050 (6). In their study, Mehri et al have also estimated that people aged 60 and above will make up 31% of Iran's population in 2050 (7). At the global level, it is estimated that by 2050, there will be more than two billion people over the age of sixty, 80% of whom live in developing countries (8).

All these forecasts and the global movement from infectious diseases to chronic diseases will indicate an increase in the demand for providing health care services such as rehabilitation services and services related to disability to this age group (9,10). In general, the rapid aging of the population brings social, economic and public health problems that are difficult to solve for most countries (11). A review of the evidence shows that



significant studies have been conducted regarding the importance of providing health services for the elderly in the world (12-15). In order to provide specialized services to the elderly, it is essential that the health care system make appropriate changes in the structure and process of providing services to these patients (4).

In recent decades, the study of the aging process has attracted a lot of attention in the scientific and social environments (11). Today, scientific publications are considered as a criterion for evaluating science, and some believe that it is no longer possible to measure the level of development of countries based only on geographical extent and military power; scientific publications play a much more important role in determining the development level of societies (16). In fact, scientific progress is in the focus of economic and cultural development of a country (17) and an objective assessment of the quality of scientific publications of researchers and research organizations is vital for understanding the current status of a country and its potential for development (18). Produced sciences are published in the form of various media such as books, theses, visual and audio sources, etc., among which the information of journals and databases have a special position as the main source of information and the original sources that reflect scientific developments (19,20).

One of the methods used in examining the structure and drawing the map of sciences is scientometrics and bibliometrics. The concept of scientometrics was proposed for the first time in the Soviet Union and was used in Eastern European countries, especially Hungary (21). According to Eugene Garfield, the concepts of scientometrics and bibliometrics have a history of one hundred years (22). As a method, scientometric analysis can overcome the challenges associated with manual literature review by processing a large amount of bibliometric data. Also, this method is suitable for measuring the social impact of research outputs (23).

Bibliometric reviews are useful tools for evaluating and recognizing the scientific and social importance of a scientific field at certain times. In this approach, bibliometric information regarding the number of publications, number of references, average normalized citation score, H-index, etc. is evaluated and analyzed (24,25). The most common way to measure the structure of science in bibliography is to use international citation indexes such as Scopus and Web of Science (26). Identifying the most important individuals, institutions, universities, and other factors related to scientific productions and activities can open the way and lay the foundation for communication, systematic scientific collaboration, and information exchange in various fields. Given the role and importance of scientific communication in obtaining newer findings, the assessment and evaluation of scientific productions has always been the focus of bibliometric experts (27).

The review of the existing literature shows that several studies have been conducted regarding bibliometric and

scientific evaluation of various topics of aging in the world (28-30). However, no study was found on providing health services for these people using scientific or bibliometric methods. Given the importance of the aging period and its growing trend in the world and the need to provide optimal health services for these people, investigating the trends of studies conducted in the world, countries, journals, leading authors, services provided, and the citing rate of these studies can be a guide to lead and promote the effectiveness in the studies conducted by researchers interested in this field. Therefore, this study is conducted with the aim of bibliometric analysis of published scientific productions in the field of providing health services to the elderly.

Materials and Methods

The present study is an applied one and from the category of scientometric studies conducted with the aim of analyzing scientific outputs in the field of providing health services to the elderly. The research community included all scientific outputs in the field of providing geriatric health services in the Web of Science database, expanded science citation index from 1980 to August 18, 2023. Web of Science is a digital bibliometric platform known among researchers for having high quality standards (31) and has become one of the main tools for searching and evaluating different types of publications and journals (32). Therefore, in this study, Web of Science was specifically used to extract data. For this purpose, using advanced search, the following search formula was applied in the database:

TS=(aged OR elderly OR “old person*” OR “old people” OR geriatric* OR “frail elderly” OR (Elderly AND Frail) OR “Frail Elder*” OR (Elder* AND Frail) OR “Functionally-Impaired Elderly” OR (Elderly AND “Functionally-Impaired”) OR “Functionally Impaired Elderly” OR “Frail Older Adult*” OR (Adult* AND “Frail Older”) OR “Frail Older Adult” OR (“Older Adult*” AND Frail) OR gerontology) AND TS=(“health service*” OR “healthcare service*” OR “health care service”)

As a result of the search, 33 238 documents were obtained. In the following, the full bibliographic information of all the documents was downloaded and saved in the form of a plain text file from the database. As a result, the dataset used includes 67 “.txt” files, since Web of Science allows downloading up to 500 records simultaneously. Finally, the growth trend of scientific productions, the trend of received citations, productive journals, top institutions, highly cited articles, the top countries of corresponding authors, drawing the co-occurrence map of authors’ keywords and the co-authorship map of participating countries were among the analyzes that were conducted using Excel and Biblioshiny software.

Results

Main Information

Table 1 shows the main bibliometric data for documents in the field of elderly health services using Biblioshiny.

As many as 33238 documents from 2715 sources were retrieved from WOS between 1980 and August 18, 2023, most of which (29894) were original articles, followed by review studies being 1862 and proceedings papers being 600 as the most frequent respectively. The average citation per document was 27.11 citations.

Table 1. Main Information Documents in the Health Services for The Elderly Research

Description	Results
Key Information About Data	
Timespan	1980:2023
Sources (Journals, Books, etc.)	2715
Documents	33238
Annual growth rate %	16.07
Document average age	8.58
Average citations per doc	27.11
References	830060
Documents Contents	
Keywords Plus (ID)	24916
Author's keywords (DE)	33804
Authors	
Authors	126381
Authors of single-authored docs	1092
Authors Collaboration	
Single-authored docs	1189
Co-authors per doc	6.17
International co-authorships %	22.8
Types of Documents	
Article	29894
Article; book chapter	13
Article; early access	354
Article; proceedings paper	600
Article; publication with expression of concern	1
Article; retracted publication	5
Book review	5
Correction	15
Discussion	4
Editorial material	221
Editorial material; book chapter	1
Editorial material; early access	1
Letter	43
Meeting	2
Meeting abstract	167
News item	2
Note	10
Reprint	4
Review	1862
Review; book chapter	2
Review; early access	32

Annual Publication Growth

Figure 1 shows the growth trend of scientific products in the field of elderly health services. In order to reduce the size of the chart, the years were divided into four decades. The lowest number is related to 1987 with two documents and the highest number is related to 2022 with 3315 documents. As seen in Figure 1, the number of documents has been continuously increasing. Only 38 documents were published in the first decade, followed by 1962 documents in the second decade, and 5453 documents in the third decade. In addition, in the fourth decade until 2023, the number of documents related to the field of elderly health services has increased significantly ($n = 25785$). The slope of publications is also 0.77, which is a significant value. This shows the extraordinary attention of researchers around the world to the field of geriatric health services.

Annual Total Citation per Year

Table 2 shows the number of citations of documents in the field of elderly health services per year. As can be seen, the average citation per document has been continuously growing since 1989 with ups and downs. The lowest average citation per year is 0.03 in 1984, and the highest is 4.15 in 2020. Considering that the number of citation years for 2020 was only 4 years, this mean amount of citation is a significant amount.

The Most Productive and Top Cited Journals

Figure 2 shows the 10 most productive journals out of 2715 journals for publications in the field of geriatric health services. As can be seen, *BMJ Open* with 1283 documents has been the most productive journal in publishing documents in the field of geriatric health services. It was followed by *BMC Health Services Research* with 889 documents and *PLoS One* with 858 documents.

Table 3 shows the top 10 cited journals in the field of elderly health services. According to Table 3, *Lancet* is introduced as the most influential journal in this field worldwide with 33020 citations. This journal has published 93 documents in this field since 1992 with

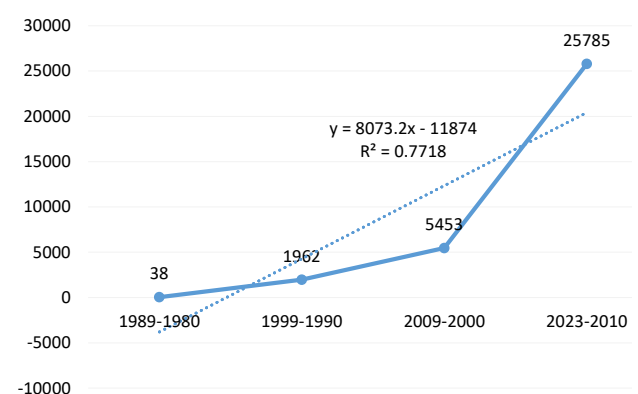


Figure 1. The Annual Publication Growth Trend of Health Services for the Elderly Research

Table 2. Annual Total Citation Per Year in the Health Services for the Elderly Research

Year	Mean Total Citation Per Article	N	Mean Total Citation Per Year	Citable Years
1980	26.67	3	0.61	44
1981	1.67	3	0.04	43
1982	4.5	6	0.11	42
1983	9.2	5	0.22	41
1984	1	3	0.03	40
1985	28.8	5	0.74	39
1986	45.33	3	1.19	38
1987	60.5	2	1.64	37
1988	24.8	5	0.69	36
1989	45	3	1.29	35
1990	10.14	7	0.3	34
1991	52.76	131	1.6	33
1992	67.78	134	2.12	32
1993	65.85	160	2.12	31
1994	62.2	163	2.07	30
1995	52.52	180	1.81	29
1996	47.11	228	1.68	28
1997	56.82	292	2.1	27
1998	48.78	318	1.88	26
1999	65.45	349	2.62	25
2000	51.81	353	2.16	24
2001	61.42	359	2.67	23
2002	76.03	409	3.46	22
2003	66.2	446	3.15	21
2004	57.36	487	2.87	20
2005	72.51	488	3.82	19
2006	52.89	584	2.94	18
2007	62.89	728	3.7	17
2008	43.06	753	2.69	16
2009	41.92	846	2.79	15
2010	36.67	905	2.62	14
2011	40.93	1,069.00	3.15	13
2012	31.71	1,253.00	2.64	12
2013	33.53	1,282.00	3.05	11
2014	33.35	1,468.00	3.34	10
2015	27.12	1,473.00	3.01	9
2016	23.93	1,666.00	2.99	8
2017	22.68	1,814.00	3.24	7
2018	19.73	1,918.00	3.29	6
2019	16.15	2,196.00	3.23	5
2020	16.61	2,613.00	4.15	4
2021	8.02	2,995.00	2.67	3
2022	2.52	3,315.00	1.26	2
2023	0.45	1,818.00	0.45	1

h-index (66), g-index (93) and m-index (2.063). After that, *JAMA-Journal of the American Medical Association* with 19301 citations and *Pediatrics* with 19133 were recognized as the second and third most cited journals. It is worth noting that most of the 10 most cited journals were from the first and second decades of publications in this field. The highest h-index (n=74) was related to *Pediatrics* journal.

Most Relevant Affiliations

The top 10 institutions in terms of the number of documents are shown in Figure 3. As can be seen, Univ Toronto is the most productive institution in publishing documents in the field of geriatric health services in the world with 1576. It is followed by Univ Melbourne ranked second with 1136, and Univ Sydney ranked third with 1104.

The Most Relevant Authors

In total, 126381 authors have published 33238 documents in the field of geriatric health services in different countries. Table 4 shows the top 10 authors based on the number of documents. In addition to the number of documents, four citation indices, h-index, g-index, and m-index, were used in the comparison of top authors. As can be seen, Cohen A.D. was the most productive author in this field in terms of the number of documents with 101 documents, 2653 citations, and h-index 27, followed by Chodick G. with 73 documents and Konig H.H. with 64 documents who were ranked second and third respectively. It is worth mentioning that all the top 10 authors were old authors in this field.

The Most Relevant Countries by Corresponding Authors

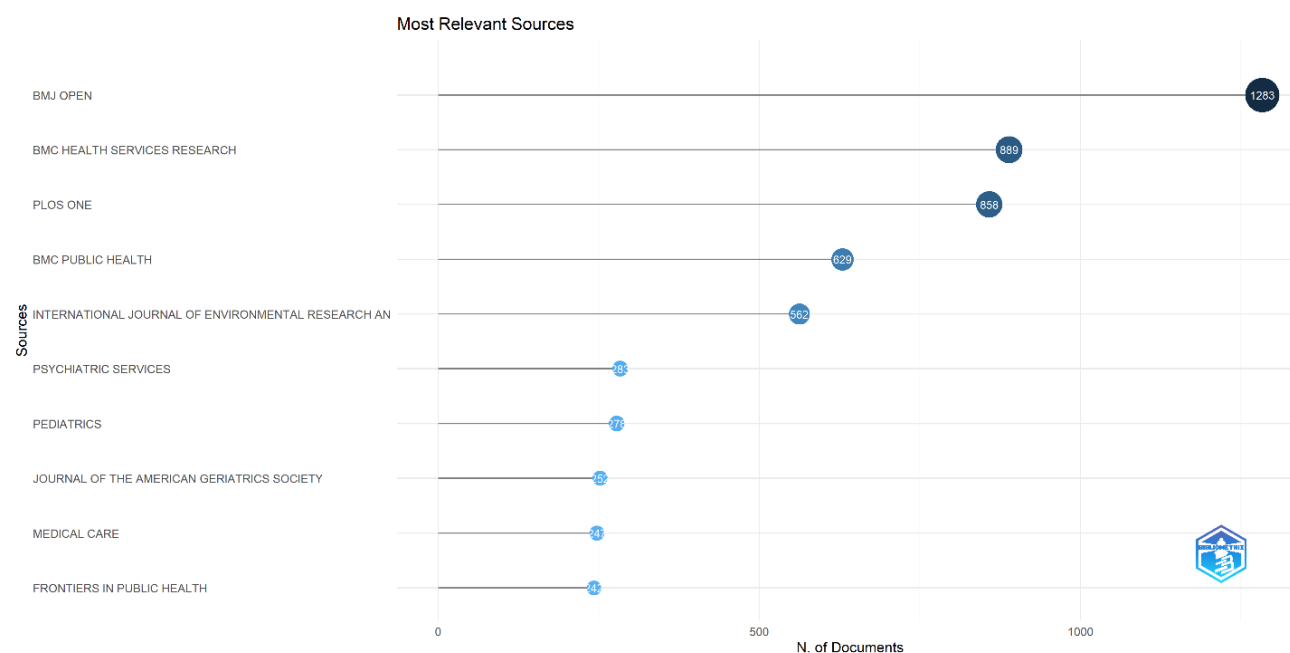
The countries of the top corresponding authors are reviewed in Figure 4. Figure 4 indicates that corresponding authors are mostly found in the United States. United Kingdom (n=4957), Australia (n=3329), Canada (n=2068), and China (n=1547) were ranked in the top five corresponding author countries. In addition, Italy was the ninth country with the number of corresponding authors who conducted studies in the field of geriatric health services.

Table 5 shows the number, proportion and frequency of publications related to the field under study by country and the status of single-country publications (SCP) or multi-country publications (MCP).

When the countries of corresponding authors were analyzed, the United States ranked first with 7333 articles (f=0.221). Table 5 shows that most studies in the United States were written by authors from one country (n=6350), but 983 studies were co-authored by authors from other countries. The number of studies in the field of geriatric health services in the United States was about 1.5 times more than the number of articles in the United Kingdom, which was ranked second.

Table 3. Top 10 Highly Cited Journals Based on Health Services for the Elderly Research

Element	h-index	g-index	m-index	TC	NP	PY-start
Pediatrics	74	123	2.313	19133	278	1992
Lancet	66	93	2.063	33020	93	1992
Medical Care	64	119	1.455	16094	247	1980
JAMA-Journal of The American Medical Association	55	64	1.667	19301	64	1991
BMC Health Services Research	55	74	2.391	14533	889	2001
Journal of the American Geriatrics Society	55	97	1.31	11239	252	1982
Psychiatric Services	55	90	1.897	10597	283	1995
PLOS ONE	53	83	3.313	15159	858	2008
American Journal of Public Health	53	92	1.205	9031	130	1980
BMC Public Health	52	75	2.261	12203	629	2001

**Figure 2.** Top 10 Most Productive Journals for Health Services for the Elderly Research

Highly Cited Papers

Table 6 shows 20 highly cited studies in the field of health services for the elderly. According to Table 6, the study conducted by Richardson et al is the most cited article in the field of elderly health services with 4092 citations and 1023 citations per year. This study, published in *JAMA* in 2020, describes the clinical characteristics and outcomes of patients suffering from COVID-19 hospitalized in a US health care system (33). The study conducted by Brazier et al with 3187 citations is the second most cited study. This study was published in *British Medical Journal* in 1992 with the aim of testing the acceptability, validity, and reliability of the short form of the Health Survey Questionnaire 36 (SF-36) and comparing it with the Nottingham Health Profile. The SF-36 is a new instrument for measuring health perception in a general population. It is easy to use, acceptable to patients, and meets strict criteria for reliability and validity (34).

The third most cited study is the one conducted by Burge et al. This study was conducted in 2007 to project

the fracture burden and costs of osteoporosis in the United States by sex, age group, race/ethnicity, and fracture type from 2005 to 2025, and to predict the rapid growth of the disease burden among nonwhite populations. In this study, it is predicted that by 2025, fractures and annual costs will have increased by almost 50%. The fastest growth is estimated for 65-to-74-year-old individuals with an increase of >87%. An increase of nearly 175% is predicted for Hispanic subpopulations and other populations (35). This study was published in *Journal of Bone and Mineral Research* and has received 2732 citations so far.

Temporal analysis of the most frequent keywords

In Table 7, some of the most frequently used keywords of the authors that are used in the studies in the field of geriatric health services are listed. For example, the keywords “health services research”, “epidemiology”, “health services”, “mental health”, and “COVID-19” are all highly repeated keywords that have been used in studies of the field of health services for the elderly.

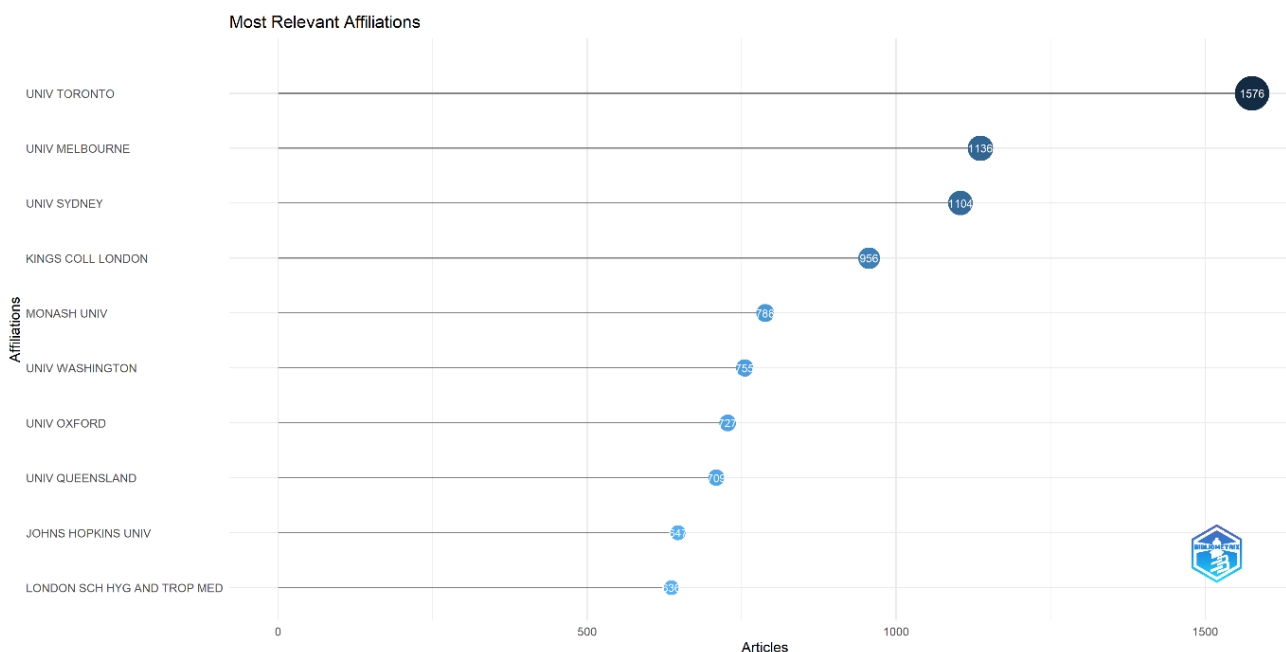


Figure 3. Most Relevant Affiliations

Table 4. The Most Relevant Authors for Health Services for the Elderly Research

Element	h-index	g-index	m-index	TC	NP	PY-start
Cohen A.D.	27	48	1.421	2653	101	2005
Chodick G.	18	35	0.857	1356	73	2003
Konig H.H.	18	28	0.9	949	64	2004
Wang Y.	16	27	0.593	820	62	1997
Comaneshter R.D.	19	26	1.583	975	61	2012
Hickie I.B.	26	41	1.13	1739	60	2001
Amital H.	18	26	1.636	832	52	2013
Li Y.	17	49	0.944	2465	51	2006
Kurdyak P.	19	28	1.357	880	49	2010
Shalev V.	17	31	0.81	1062	49	2003

TC, Total Citations; NP, Number of publications; PY, Published Year

Additionally, Figure 5 provides an overview of the top words in terms of frequency of occurrence. This figure shows some of the identified research foci, which include terms such as “depression”, “primary care”, “public health”, “elderly”, and “primary health care”.

By studying the relationships between terms in the literature, the Keywords Co-occurrence Network can be used to better understand the components and structure of knowledge in a scientific field. As shown in Figure 6, placing keywords together in a cluster increases the likelihood that the keywords reflect the same topic. As seen in Figure 6, this network consists of three red, blue, and green clusters. The red cluster contains 10 keywords such as “mental health”, “depression”, “children”, and “adolescent”. The second cluster is blue and contains 21 keywords such as “health services research”, “health services”, “public health”, “elderly”, and “primary health

care”. Finally, the third cluster is green and contains 18 keywords including “epidemiology”, “COVID-19”, “primary care”, “prevalence”, and “mortality”.

Collaboration Network of Countries

Figure 7 shows the collaboration network of the participating countries in research in the field of elderly health services. As can be seen, the network consists of two clusters. Countries that have collaborated more are shown in a cluster. The first cluster is red and includes 34 countries such as USA, United Kingdom, Australia, Canada, China, Brazil, Israel, Japan, and Iran. The most collaboration in the red cluster is between the United States and the United Kingdom and then between United Kingdom and Australia.

The second cluster is blue and has 16 countries, such as Spain, Germany, Italy, the Netherlands, Norway, Sweden and France, which have collaborated together.

Discussion

This study was conducted with the aim of determining scientific productions in the field of health services for the elderly by a bibliometric method. The results of this study showed that the scientific production of geriatric health services has enjoyed significant growth. Most of the studies in this field have been published in the form of original articles, reviews, and conferences. This field has enjoyed a 16.07% annual growth in scientific production; the lowest scientific productions in this field were related to 1987 and the highest related to 2022. These studies are the result of the collaboration of several authors, with an average of 6 authors per article. The rate of international collaboration among researchers in this field was also about 23%. Various studies in the field of geriatrics such as the mental well-being of the elderly (36), pain research

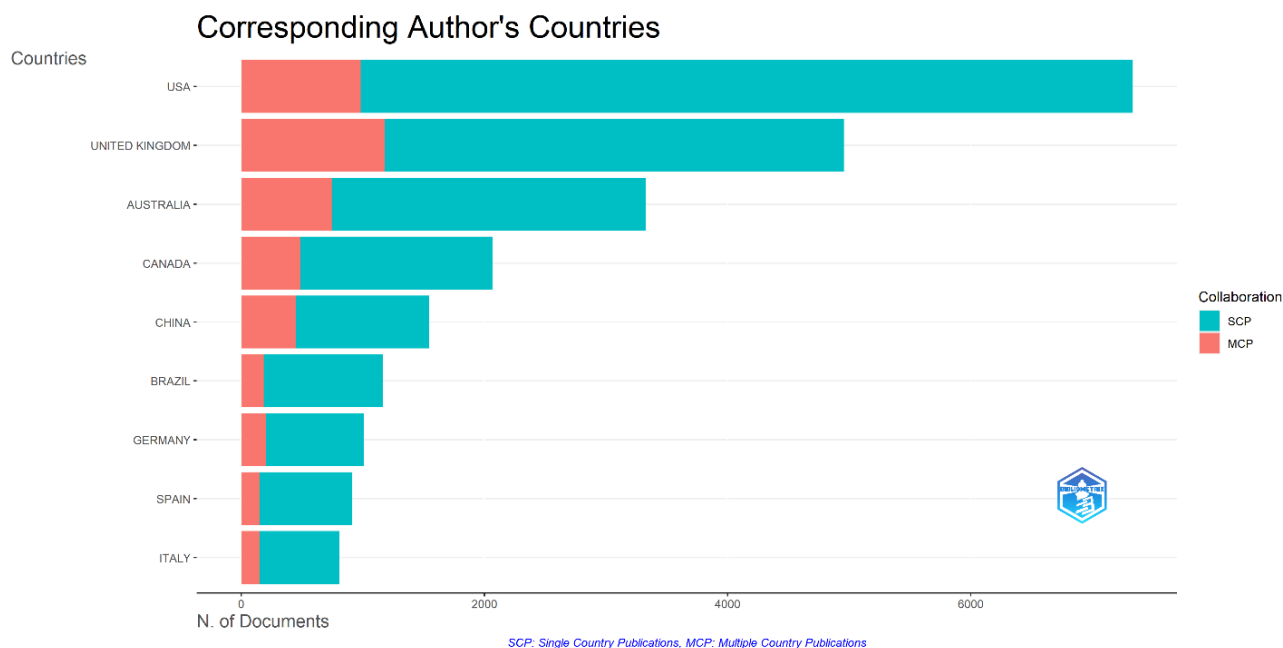


Figure 4. Corresponding Authors' Countries Representing Inter-country (MCP) Collaboration and Intra-country (SCP) Collaboration. Abbreviations: MCP, multi-country publications; SCP, single-country publications

Table 5. Corresponding author's countries

Country	Articles	SCP	MCP	Frequency (f)	MCP Ratio
USA	7333	6350	983	0.221	0.134
United Kingdom	4957	3776	1181	0.149	0.238
Australia	3329	2586	743	0.1	0.223
Canada	2068	1585	483	0.062	0.234
China	1547	1097	450	0.047	0.291
Brazil	1165	980	185	0.035	0.159
Germany	1010	807	203	0.03	0.201
Spain	913	765	148	0.027	0.162
Italy	805	653	152	0.024	0.189

Abbreviations: MCP, multi-country publications; SCP, single-country publications.

(37), hip fracture (38,39), cardiovascular diseases (40), and nursing care of the elderly (41) have shown significant growth in terms of scientific productions; this is in line with the results of the present study. In connection with the results of this study, one of the new measures in the field of geriatric health services is the use of artificial intelligence in providing health services to the elderly. The study conducted by Wang et al showed that studies in this field have increased significantly over the recent years (42).

On average, each paper received 27.11 citations. The lowest citation rate was related to 1984 and the highest citation was related to 2020. The results showed that from 1991 to 2014, the citation of geriatric health service articles has faced successive increases and decreases, which has had a decreasing trend since 2015. The reason for the growth of scientific productions in the field of providing health services to the elderly can be due to the movement of the world community towards the reduced

young population due to lifestyle changes. Factors such as economic reasons have affected the low willingness of young people to get married and have children, and this has led the world society to aging and the challenges of caring for the elderly population. In relation to the results of this study, the annual average of citations to articles on anesthesia for the elderly in the study conducted by Büyükçoban et al was 10.53, which was lower than the average of citations to articles on geriatric health services in the present study. However, both of these studies have shown an increase in scientific production and citations in the field of aging (43).

Reviewing the studies conducted in this field showed that most articles on health services for the elderly were published in journals like BMJ Open, BMC Health Services Research, and PLoS One. In terms of impact factor (IF = 3.7) and CiteScore (6.00), PLoS One is in the second and third quartiles of Web of Science and Scopus journals, respectively. Reviewing the other journals also shows that these journals have had significant validity. This shows that the prestigious journals of the world are more inclined to publish articles in the field of geriatrics due to its increasing importance in today's world. Journals such as Pediatrics with an impact factor of 8 have also published articles in the field of geriatrics; reviewing the scope of this journal shows that it has published articles in the field of geriatrics in relation to public health. Geriatric health service articles published in Lancet had the highest number of citations received. However, the Pediatrics had a higher H-index than the other journals publishing these articles. In other words, Lancet, JAMA, and Pediatrics are among the most influential journals for providing geriatric health services. Contrary to the results of the present study, the study conducted by Soytaş indicated that the

Table 6. The Most Cited Health Services for the Elderly Articles

Paper	DOI	Total Citations	TC Per Year	Normalized TC
Richardson S, 2020, JAMA-J AM MED ASSOC	10.1001/jama.2020.6775	4092	1,023.00	246.35
Brazier J.E, 1992, BMJ-BRIT MED J	10.1136/bmj.305.6846.160	3187	99.59	47.02
Burge R, 2007, J BONE MINER RES	10.1359/JBMR.061113	2732	160.71	43.44
Berkman N.D, 2011, ANN INTERN MED	10.7326/0003-4819-155-2-201107190-00005	2589	199.15	63.25
Danaei G, 2011, LANCET	10.1016/S0140-6736(11)60679-X	2572	197.85	62.83
Abbatati C, 2020, LANCET	NA	2553	638.25	153.7
Wong W.L, 2014, LANCET GLOB HEALTH	10.1016/S2214-109X(13)70145-1	2527	252.7	75.78
Pearce M.S, 2012, LANCET	10.1016/S0140-6736(12)60815-0	2447	203.92	77.16
Walling M.T, 2019, LANCET NEUROL	10.1016/S1474-4422(18)30443-5	2216	443.2	137.24
Prince M, 2007, LANCET	10.1016/S0140-6736(07)61238-0	2003	117.82	31.85
Cross M, 2014, ANN RHEUM DIS	10.1136/annrheumdis-2013-204763	1982	198.2	59.44
Rubenstein L.Z, 2006, AGE AGEING	10.1093/ageing/af1084	1946	108.11	36.79
Wang P.S, 2005, ARCH GEN PSYCHIAT-a	10.1001/archpsyc.62.6.629	1920	101.05	26.48
Nicholse E, 2019, LANCET NEUROL	10.1016/S1474-4422(18)30403-4	1841	368.2	114.02
Unutzer J, 2002, JAMA-J AM MED ASSOC	10.1001/jama.288.22.2836	1746	79.36	22.96
Vannderpump MPJ, 1995, CLIN ENDOCRINOL	10.1111/j.1365-2265.1995.tb01894.x	1562	53.86	29.74
NA, 2013, DIABETES CARE	10.2337/dc12-2625	1534	139.45	45.75
Lorig K.R, 1999, MED CARE	10.1097/00005650-199901000-00003	1524	60.96	23.29
Busist A.S, 2007, LANCET	10.1016/S0140-6736(07)61377-4	1470	86.47	23.37
Soriano J.B, 2017, LANCET RESP MED	10.1016/S2213-2600(17)30293-X	1421	203	62.65

TC, Total Citations; NP, Number of publications; PY, Published Year

Table 7. The 20 Most Common Keywords Used in Health Services for the Elderly Research

Terms	Occurrences	Terms	Occurrences
Health services research	1501	Children	514
Epidemiology	1333	Prevalence	514
Health services	1237	Aged	509
Mental health	1034	Mortality	508
COVID-19	841	Health services accessibility	460
Depression	810	Quality of life	449
Primary care	672	Dementia	425
Public health	651	Older adults	400
Elderly	602	Adolescent	388
Primary health care	529	Adolescents	383

Journal of the American Geriatric Society published the most scientific productions on COVID-19 and aging and had the most citations (44). In another study conducted in the field of nutrition for the elderly, it was shown that Clinical Nutrition journal published the most articles in this field, which has a high reputation among journals in the field of nutrition for the elderly (45).

The results of this study showed that the universities of Canada, Australia, and England had the most scientific productions in the field of elderly health services, among which the universities of Toronto and Melbourne were ranked first and second. Cohen A.D. is the most prolific and cited author in this field, who is one of the old researchers of geriatric health services. Most of the

**Figure 5.** Keyword Usage in a Variety of Research Papers

corresponding authors were from the three countries i.e. the United States of America, England, and Australia. The United Kingdom had more international collaboration articles than other countries, although the United States had 1.5 times more publications than the United Kingdom in the field of geriatric health services. The United States, England, Canada, China, Iran, Australia, Brazil, Israel, and Japan have collaborated the most. Similar to the present study, Soytaş conducted a bibliometric analysis of articles in the field of COVID-19 and aging. The results showed that the most articles in this field were published by the United States and it is the most cited country in this regard (44). The study conducted by Tutan and Bürkük also indicated similar results regarding the most prolific countries publishing geriatric nutrition articles (45).

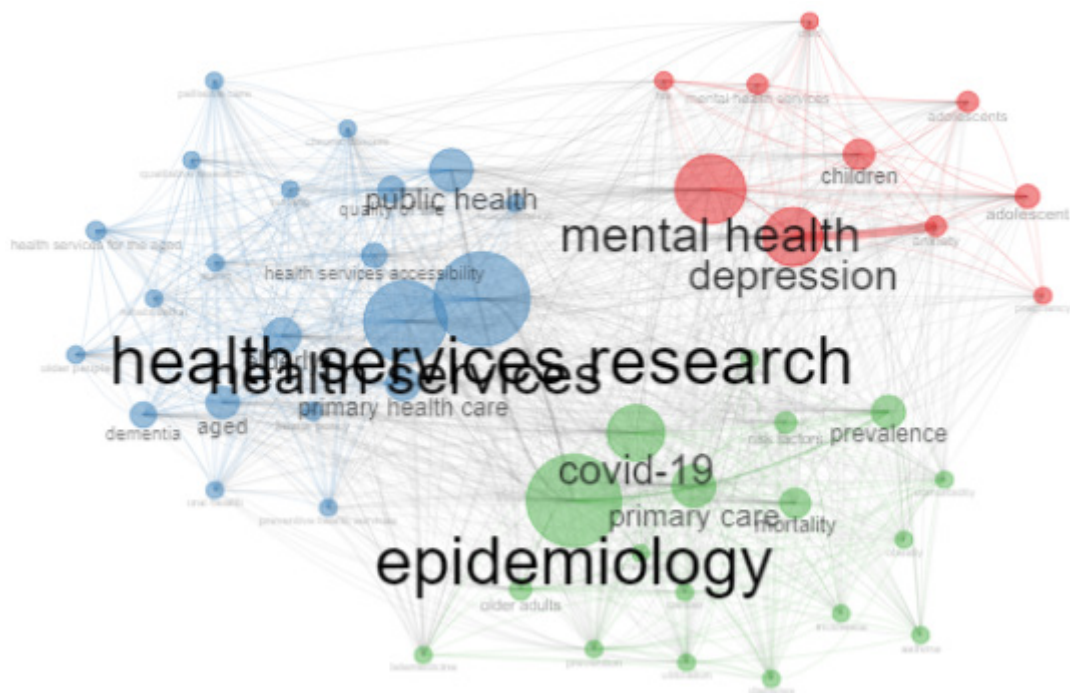


Figure 6. The Network of Keywords Co-occurrence

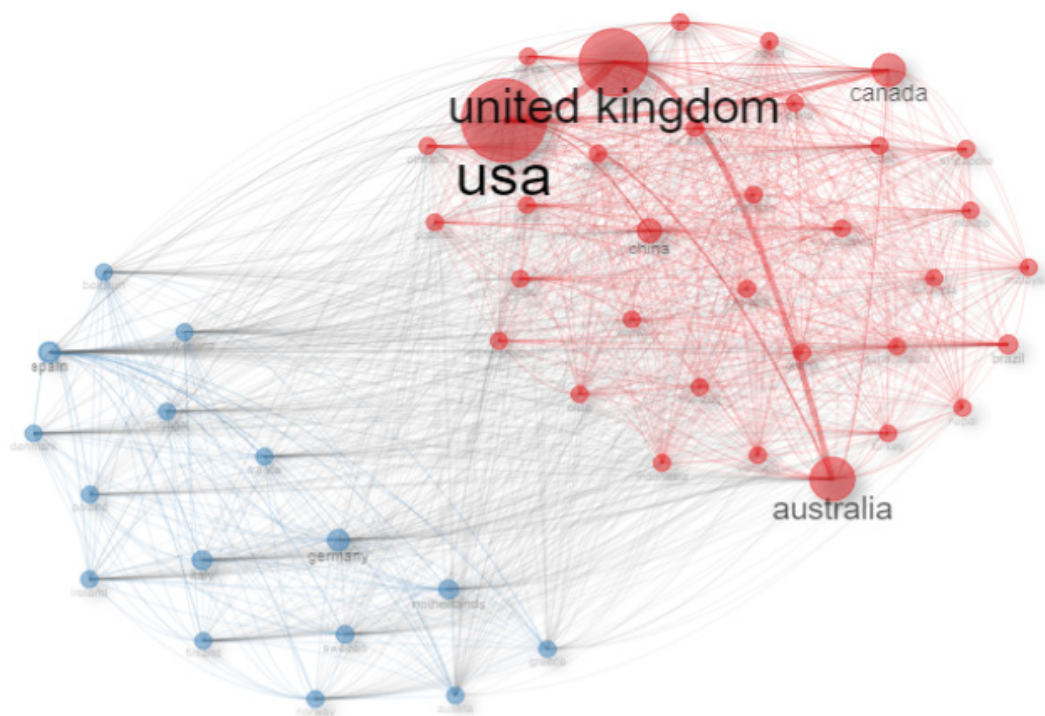


Figure 7. Collaboration Network of Countries

Reviewing the most cited article in the field of geriatric health services shows that this article was published in JAMA and describes the clinical characteristics and outcomes of hospitalized patients with COVID-19 in the United States. This study received a total of 4092 citations, with an average of 1023 citations per year (33). The high citation of this article, despite the fact that a short period of time has passed since its publication, can be due to the fact that COVID-19 has been a hot topic as well as its high

prevalence and death rate in the elderly which highlights the importance of providing elderly services for this group of people in the health care system.

Based on the analysis of the most frequent words, the most important research areas of geriatric health services can be divided into three categories: mental health, providing primary health services, and epidemiology of diseases. A study conducted on COVID-19 and old age in 2021 showed that geriatrics-gerontology was the most

productive and cited field. The results of their study showed that psychological and social support, nutrition, vaccination, and telemedicine can be hot research topics in the future of geriatric studies (44). The study conducted by Wang et al showed that the hot research areas related to the use of artificial intelligence in providing health services to the elderly were Alzheimer disease, aged care, acceptance, and the surveillance and treatment of diseases (42). The study conducted by Cao et al, conducted by a bibliometric method, showed that studies in the field of care for the elderly at home have also enjoyed significant growth and can be the subject of future research; such studies call for collaboration between researchers, scientific institutions, and countries (46).

Conclusion

The results of this study showed that the scientific production of providing health services to the elderly has increased significantly, especially in recent years. Despite the ups and downs in the number of citations to these articles, since 2015, citations to scientific productions in this field have decreased. Most of the scientific productions in this field have been published in a single country, and most of the corresponding authors were from the three countries i.e. the United States of America, England, and Australia. England has had more international collaboration articles than other countries, and international collaboration between other countries in this field is increasing. The articles of this field have been published in prestigious journals in the world in terms of the indexes of the validity of the journals. Also, it is expected that future research on the provision of health services to the elderly will focus more on mental health, epidemiology of diseases, and the providing primary health services. However, the studies that have investigated the research in this field using bibliometric and scientometric methods were limited and more studies are needed to confirm or reject the results of this study.

Authors' Contribution

Conceptualization: Nadia Saniee, Majid Barati.

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Formal Analysis: Ali Ouchi.

Funding acquisition: Majid Barati.

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Methodology: Ali Ouchi.

Project administration: Nadia Saniee.

Resources: Majid Barati.

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Competing Interests

The authors declare that they have no conflict of interest in this research.

Ethical Approval

Not applicable.

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