Original Article

The Global Trends of Pancreatic Cancer Research: A Scientometric Study

Majid Mobasseri[1], Nooshin Milanchian[2] , Mahnaz Mahmoudi[3], Reza Aletaha[3] , Maryam Shoaran[4] , Amir Ghaffarzad[5] , Zahra Sheikhalipour[6], Hadi Salehpour[3], Mahdi Bahari[3] , Hanieh Salehi-Pourmehr[7*]

[1]Endocrinology Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

[2]Department of Internal Medicine, Faculty of Medicine, Tabriz Medical Sciences, Islamic Azad University, Tabriz, Iran

[3]Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran

[4]Pediatric Health Research Centre, Tabriz University of Medical Sciences, Tabriz, Iran

[5]Emergency and Trauma Care Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

[6]Medical and Surgical Nursing Department, Nursing and Midwifery School, Tabriz University of Medical Sciences, Tabriz, Iran

[7]Research Center for Evidence-Based Medicine, Iranian EBM Centre: A JBI Centre of Excellence, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Abstract

Background: Pancreatic cancer is an aggressive and deadly disease with a rising incidence due to obesity, an aging population, and better diagnostic capabilities. It poses a growing global health burden. This study used scientometric methods to identify research frontiers and development trends in pancreatic cancer research.

Methods: Articles and reviews related to pancreatic cancer were retrieved from the Scopus database in January 2025. Scientometric analysis was conducted using R software and the Bibliometrix package. Over 170.000 articles were initially obtained using predefined specific keywords. Given the large volume of data, data analysis was performed in two phases: first, the top 2000 most-referenced papers in the database were analyzed, and then papers were published within the last five years.

Results: This scientometric analysis of pancreatic cancer research examined both highly cited articles and recent publications. Leading institutions included the University of California and Johns Hopkins University (highly cited category) and Fudan University and Harvard Medical School (recent publications). The United States, United Kingdom, Germany, Japan, and China ranked as the top countries in highly cited works, while China, the United States, Japan, Italy, and Germany led in recent output. Co-word analysis revealed key topics such as "pancreas cancer" and "neoplasms." Thematic mapping identified well-developed "Motor Themes" (e.g., inflammation, metabolism), less impactful "Niche Themes" (e.g., prognosis, clinical articles), declining "Emergency Themes" (e.g., curcumin, breast cancer), and essential but under-addressed "Basic Themes" (e.g., pancreatic cancer, pancreas). Recent trends demonstrated an increase in publications and expanded collaborative research.

Conclusion: This study visually represented the current state of knowledge regarding pancreatic cancer by mapping it using scientometric methods.

Keywords: Pancreatic neoplasms, Bibliometrics, Scientometry, SCOPUS

Introduction

Pancreatic cancer ranks seventh in global cancer-related mortality and is the 12th most prevalent cancer worldwide.[1] In 2017, the global disability-adjusted life years (DALYs) associated with this condition reached approximately 9.1 million, reflecting a significant loss of years of life.[2] Without treatment, the average survival time for patients with metastatic disease is only three months, and the overall "cure rate" for the disease remains as low as 9%.[3] Due to its poor survival rate and highly aggressive nature, pancreatic cancer continues to impose a significant global health burden.[4]

Over recent decades, the incidence of pancreatic cancer has risen and is expected to continue increasing.[5,6] Several factors have been proposed to explain this trend, including higher rates of obesity, diabetes mellitus, physical inactivity, and the consumption of high-calorie/high-fat diets in some countries.[7-10] Additional contributors include advances in the diagnosis and clinical recognition of pancreatic cancer and an overall increase in life expectancy.[11,12] Pancreatic cancer is projected to surpass breast cancer as the third leading cause of cancer-related mortality in the European Union, a trend that has already occurred in the United States.[6,13]

The growing body of research in pancreatic cancer significantly impacts guiding recommendations for diagnosis and treatment and provides insights into evolving factors that shape incidence and mortality trends in this field.[2,14-18] It is undeniable that researchers cannot read this enormous volume of literature; therefore, new methods are required to identify and condense the most pertinent information to capture public attention and current research interests.[19] One such technique for quantitatively analyzing academic publications is known as "bibliometrics," which has the capacity to uncover disciplinary research developments on a macroscopic scale and offer guidance for future research directions.[20] Scientific mapping, productivity, and effect evaluation are two primary analytical methods that comprise bibliometric research.[21] Scientometric studies have examined certain aspects of pancreatic cancer in recent years, including developments in immunotherapy and the role of the intestinal microbiota in disease development.[22-25]

To define the current state of research on pancreatic cancer, we performed the present scientometric analysis. To guide future researchers, we sought to gather data on the most representative nations, organizations, journals, authors, and keywords in publications related to pancreatic cancer.

Materials and Methods
Search Strategy
Using the SCOPUS database, we searched for studies on pancreatic cancer without language or chronological constraints. From the earliest available publication up to the end of January 2025, we included publication types such as narrative reviews, case reports, case series, systematic reviews, and meta-analyses. The following were included in the search terms: ("pancreas" OR "pancreatic") AND ("neoplasms" OR "cancer" OR "malignancy" OR "Carcinoma"). After completing the search, the acquired studies were evaluated by two

authors based on their titles and abstracts. Subsequently, two authors examined the full texts of the screened studies to determine if they met the inclusion criteria. Finally, the text analysis incorporated the full texts of all studies that were eligible and satisfied the inclusion criteria.

Analysis
The SCOPUS online analysis tool was utilized to document the identified papers and citations, as well as to obtain data on nations, authors, institutions, and publications. A comprehensive scientometric analysis was then conducted using Bibliometrix (v.4.0), an R package within RStudio (version 4.4.2), along with VOSviewer (v.1.6.20). The results were visualized using Bibliometrix-generated images.

Results
Given the substantial volume of data, the analysis was conducted in two distinct phases:
1. The first phase focused on the top 2000 most cited articles in the database.
2. The second phase evaluated articles published within the past five years.

Results of the Analysis of 2000 Highly Cited Articles
Among the 2000 articles extensively referenced, the studies spanned the years 1954 to 2024. On average, each document received 940 citations. Figure 1 illustrates the average number of citations per article per year.

A total of 18536 authors registered during this period, but only 119 studies were single-authored; the remaining documents were produced from collaborative work. The survey revealed an average of 13.1 authors per paper.

The most relevant sources, according to the findings, were the Journal of Clinical Oncology with 76 publications, Cancer Research and the New England Journal of Medicine with 68 publications each, and Nature with 65 publications. Of these four journals, one is published in the
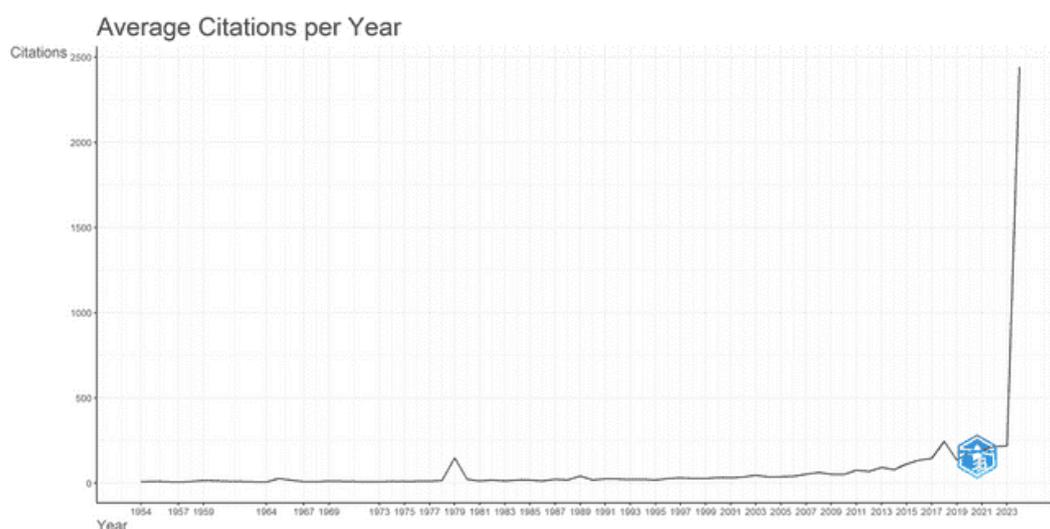

Figure 1. Average Article Citations Per Year

United Kingdom, and the remaining three are published in the United States. Figure 2 and Supplementary file, Figure S1 present the ten most productive journals and their production over time in the field of pancreatic cancer, respectively. Supplementary Figure 2 depicts the citation network map of these sources.

Figure 3 indicates the output of the top ten authors in this particular field. With 66 published works, HRUBAN RH led the field in contributions, followed by MAITRA A with 31 and YEO CJ with 29. Figures 4a, 4b, and Supplementary file, Figure S4 show the author collaboration network, author co-citation network, and author productivity over time, respectively. The number of publications is indicated by the size of the nodes.

Table 1 displays the top 20 most cited documents in this field. Out of the documents examined, the most cited was BRAY F, 2018, published in CA: CANCER J CLIN, with 65741 citations and an annual citation rate of 9391.57. This was followed by FERLAY J, 2015, INT J CANCER, which received 23637 citations and 2363.7 citations annually; SIEGEL RL, 2016, CA CANCER J CLIN, which received 23496 citations and 2610.67 citations annually; and NAT PROTOC, with 20635 citations and 1213.82 citations annually, respectively.

Based on the analysis of the 2000 most-cited papers, the HARVARD MEDICAL SCHOOL ranked first among contributing institutions with 222 publications, followed by the UNIVERSITY OF CALIFORNIA with 157 publications and the JOHNS HOPKINS MEDICAL INSTITUTIONS with 110 publications (Supplementary file, Figure S5). Figure 5a shows the collaboration network analysis of universities and institutions, where the size of each node corresponds to the number of publications. Moreover, the production trends of these affiliations over time are presented in Figure 5b.

Upon analyzing 2000 articles with the highest number of citations, it was found that the leading countries in the field of pancreatic cancer research were the United States, the United Kingdom, Germany, Japan, and China, closely followed by France, Italy, Canada, the Netherlands, Australia,
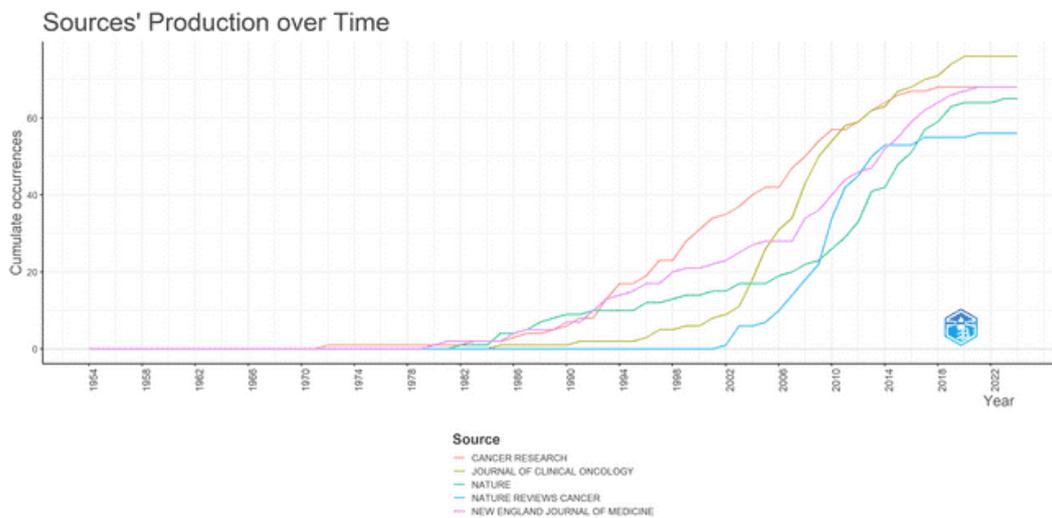

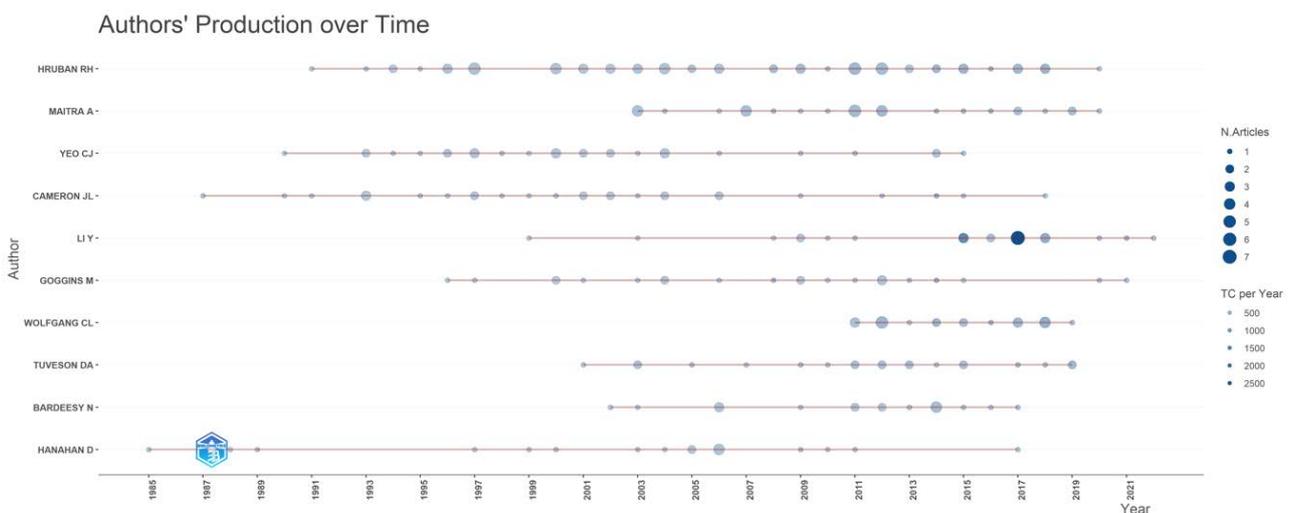**Figure 2.** Sources' Production Over Time
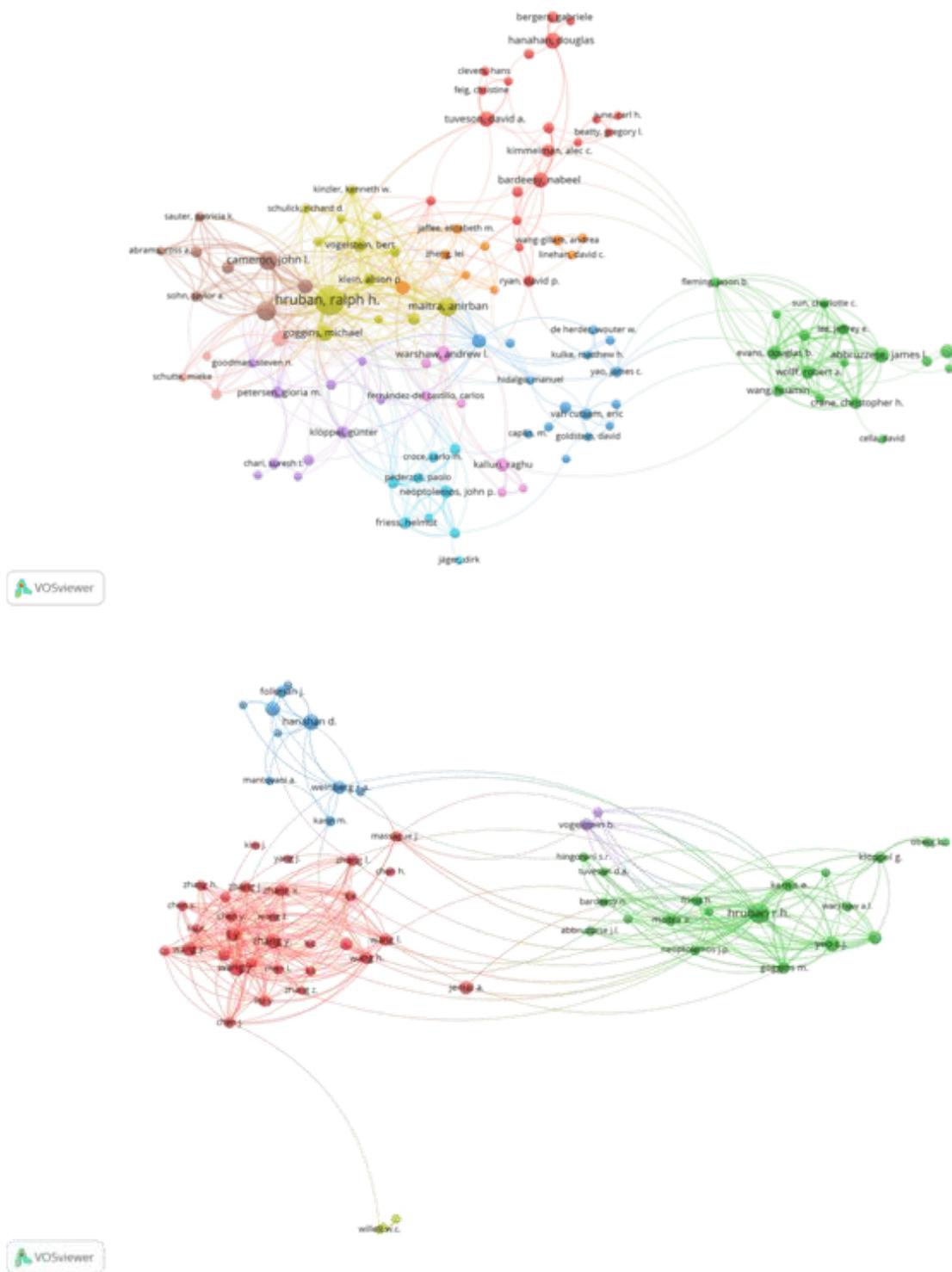

Figure 3. Most Relevant Authors

Figure 4. a) Writers' Collaboration Networks, b) Authors' Co-citation Networks. Node size represents the number of publications

Table 1. Most Cited Documents

Paper	DOI	Total Citations	T.Cs per year	Normalized T.Cs
BRAY F, 2018, CA CANCER J CLIN[1]	10.3322/caac.21492	65741	9,391.57	38.18
FERLAY J, 2015, INT J CANCER[13]	10.1002/ijc.29210	23637	2,363.70	20.90
SIEGEL RL, 2016, CA CANCER J CLIN[6]	10.3322/caac.21332	23496	2,610.67	19.36
CONROY T, 2011, NEW ENGL J MED[16]	10.1056/NEJMoa1011923	6209	443.50	5.88

Note. T. Cs: Total citations; DOI: Digital object identifier; CA CANCER J CLIN = CA: A cancer journal for clinicians; INT J CANCER: International journal of cancer; NEW ENGL J MED: New England journal of medicine.
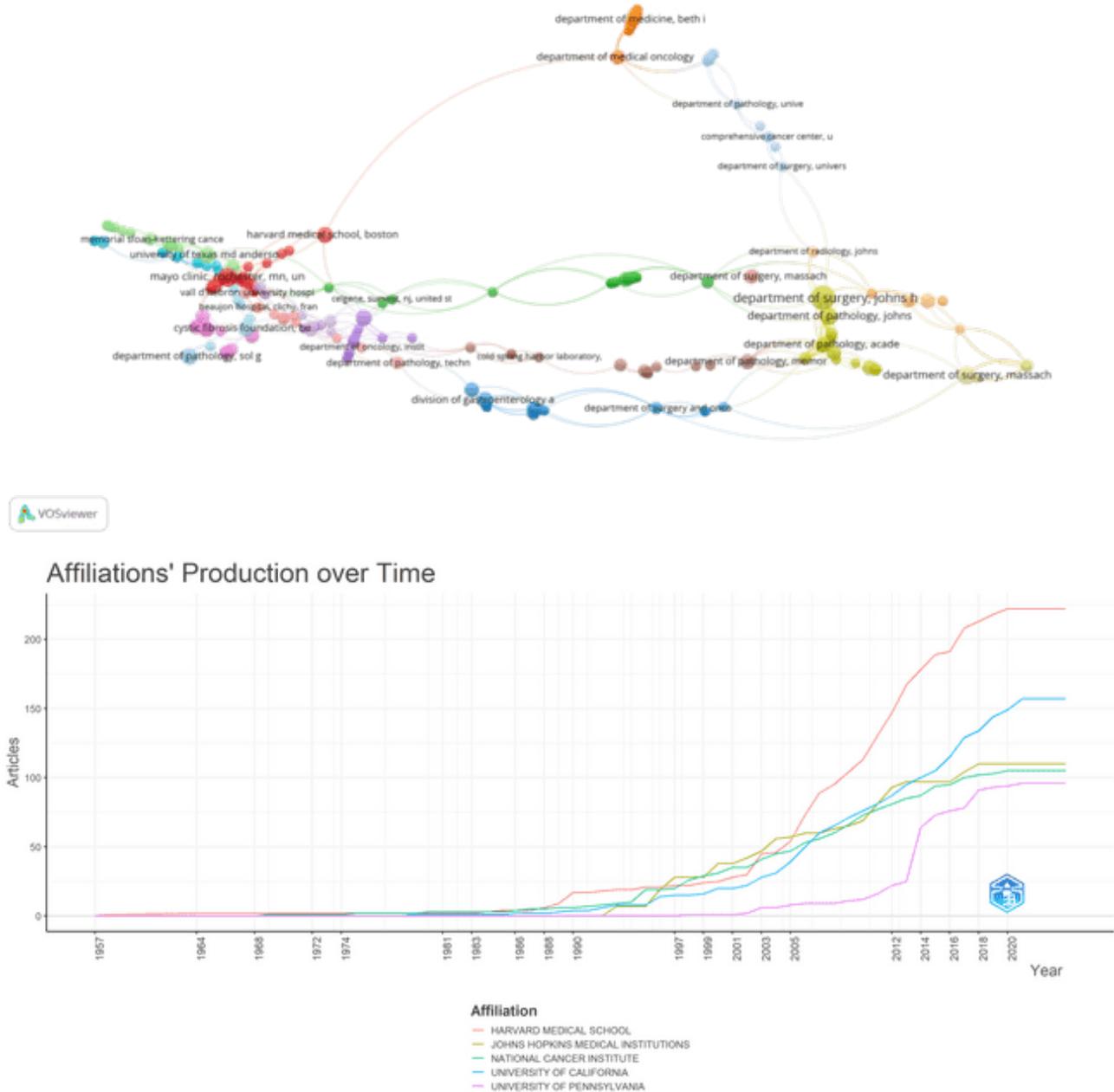
Figure 5. a) Institutions and Universities Collaboration Networks, **b)** Affiliations' Production Over Time

and Switzerland. Half of the top 10 countries belonged to Europe. Three belonged to Asia-Pacific (Japan, China, and Australia), while the remaining two were the United States and Canada. Supplementary file, Figure S6 displays the map illustrating international research collaborations, and Figure 6 illustrates the production trends of the top six countries over time.

Co-word analysis demonstrates the relationships between the searched keywords and their co-occurrence within the study topics. The co-occurrence network, keyword tree map, and word cloud are displayed in Supplementary file, Figures S7, S8, and S9. The most frequently appearing terms were pancreas cancer (n = 902), neoplasms (n = 750), breast cancer (n = 547), pancreatic neoplasms (n = 544), signal transduction (n = 520), unclassified drug (n = 482), and neoplasm

(n = 476) (see Supplementary file, Figure S10).

Trends in pancreatic cancer-related titles, including therapy, endocrine system, and pancreas, from 1982 to 2020 are illustrated in Supplementary file, Figure S11. Additionally, Figure 7a presents the thematic evolution of keywords over time in the 2000 highly cited articles, while Figure 7b shows the frequency of keywords over time.

Figure 8 displays the thematic map derived from the titles of the analyzed articles. The four equal sections of this figure are referred to as Motor Themes, Niche Themes, Emergency or Declining Themes, and Basic Themes. Motor Themes represent topics that are sufficiently handled and central to the field. Key subjects in this discipline that are covered in this section include inflammation, obesity, and diabetes. Niche themes, on the other hand, reflect topics that have been addressed but
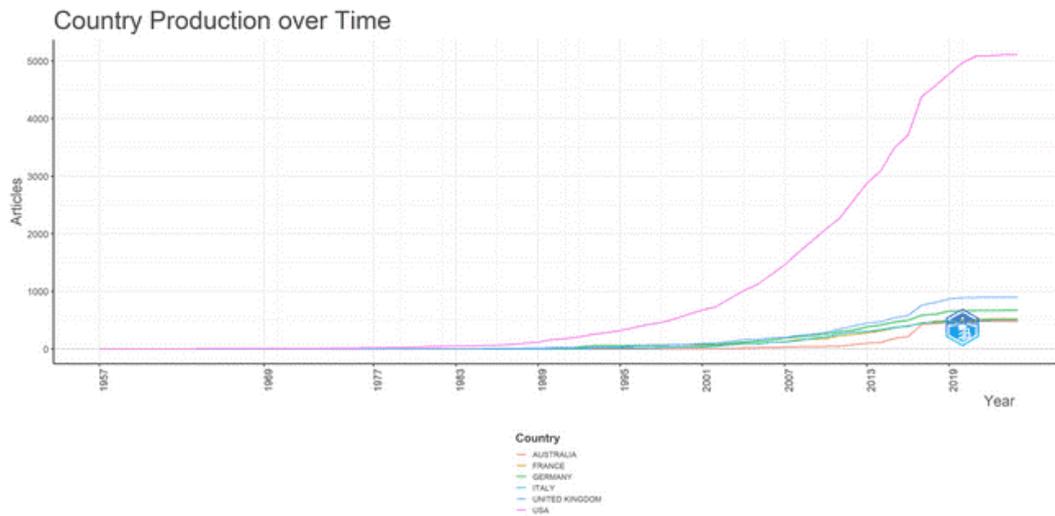
Country Production over Time

Figure 6. Countries' Production Over Time
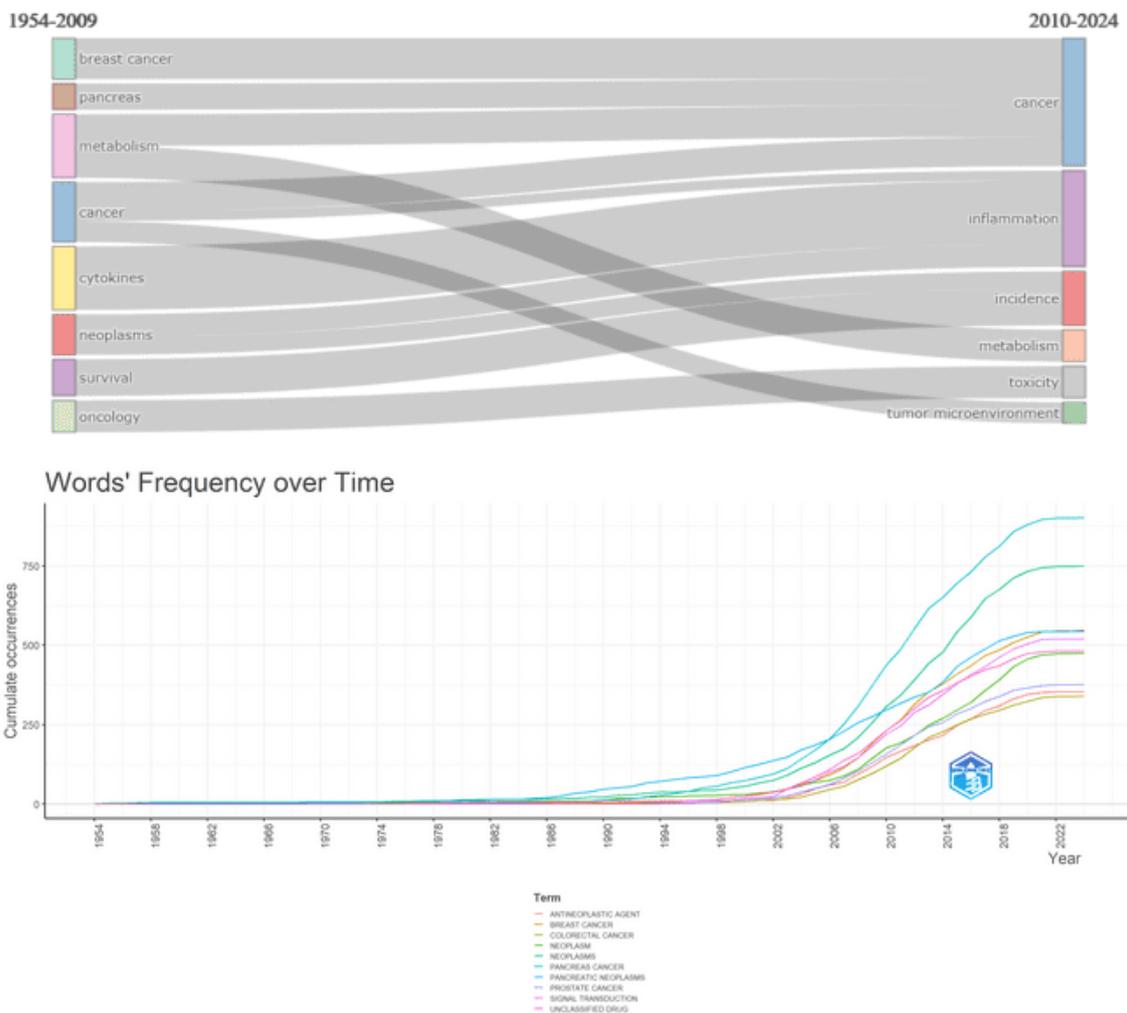

Words' Frequency over Time

Figure 7. a) Thematic Evolution of Keywords, b) Keywords' Frequency Over Time

are not considered highly significant. Put simply, it is not advisable to include this topic among the recommended subjects for future researchers. Examples include breast cancer, colorectal cancer, prognosis, and diagnosis. Emerging or declining themes, such as curcumin, represent topics that have received limited attention and are regarded as insufficiently significant. Finally, Basic Themes highlight critical issues that have not received the necessary attention despite their significance. More attention must be paid to these areas by researchers.
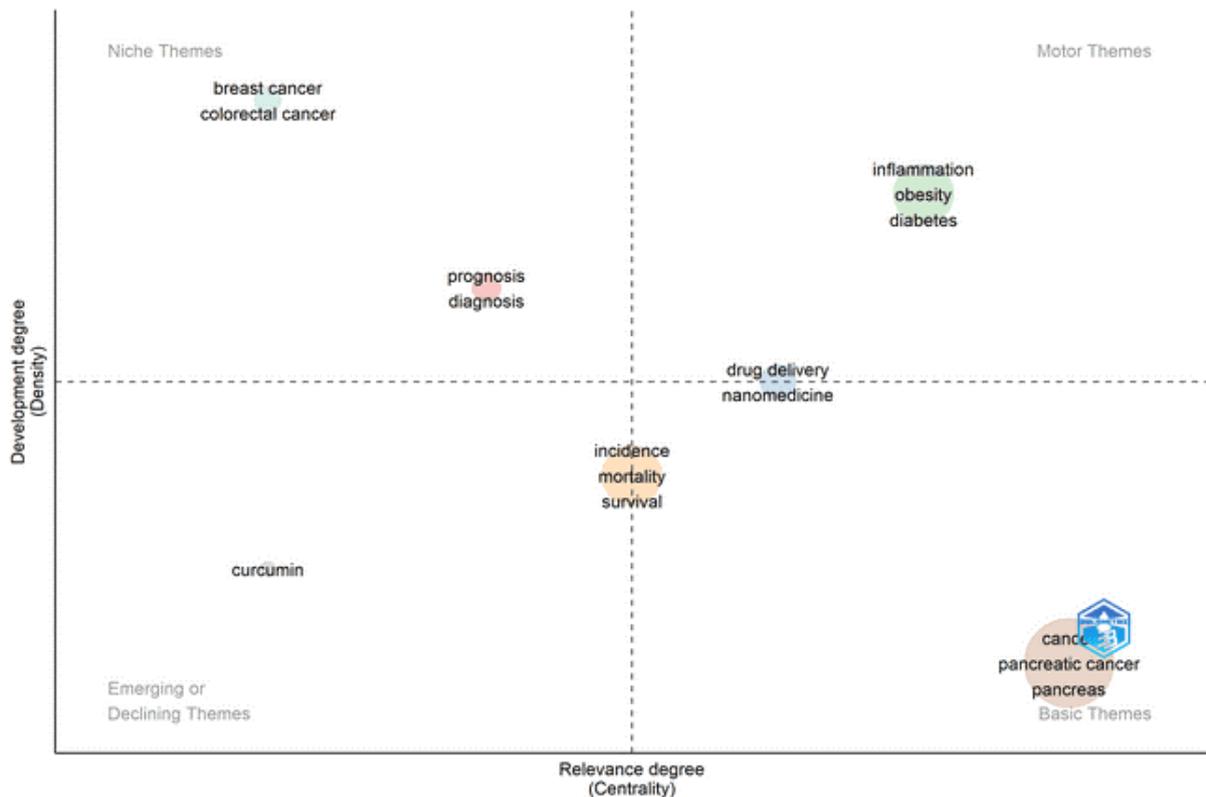
Figure 8. Thematic Map of Keywords Used in 2000 Highly Cited Articles

Subjects in this area include cancer, pancreatic cancer, and the pancreas.

The Results of the Analysis of Documents Published in the Last 5 Years

For the scientometric analysis, data from the previous five years were also evaluated in addition to the examination of the 2000 highly cited papers obtained from the Scopus database. Due to journal limitations, all figures related to the 5-year analysis are provided in the supplementary file, available upon request from the corresponding author.

On average, each paper published in the last five years received 12.02 citations. During this period, 192,107 authors were recorded; however, only 2665 studies were single-authored. The remaining publications were produced through co-authorship. On average, 8.07 authors collaborated on each manuscript, according to the survey. The document types obtained from Scopus over the past five years are presented in Supplementary file, Figure S12.

Over the previous five years, the average annual output was 6798.2 publications. The highest yearly production of pancreatic cancer research occurred in 2022, with a total of 14200 publications. Supplementary file, Figure S13 displays the annual publication trends in pancreatic cancer research from 2020 to 2024. Furthermore, Supplementary file, Figure S14 shows the average number of citations per publication per year.

Table 2 lists the ten journals with the greatest number of articles published in this field over the last five years.

Table 2. Sources With the Most Articles Published in the Field of Pancreatic Cancer in the Last Five Years

Sources	Articles
Cancers	2010
Frontiers in Oncology	1443
International Journal of Molecular Sciences	897
Annals of Surgical Oncology	832
Frontiers in Immunology	715
Pancreas	572
Pancreatology	559
Scientific Reports	555
Journal of Clinical Medicine	401
Cells	392

Cancers ranked first with 2010 publications, followed by Frontiers in Oncology with 1443 publications and the International JOURNAL of Molecular Sciences with 897 publications. Supplementary file, Figures S15 and S16 display the top ten most productive journals and their production trends over the past 5 years in the field of pancreatic cancer, respectively.

Supplementary file, Figure S17 illustrates the output of the 10 leading authors in this specific field. WANG Y dominated the field with 1461 published works, followed by ZHANG Y with 1254 and LI Y with 1097. Supplementary file, Figures S18 and S19 illustrate the analysis of the author collaboration network and the productivity of authors over time, respectively. The size of the nodes signifies

the quantity of publications. According to an analysis of the previous five years' papers, FUDAN UNIVERSITY ranked first among the contributing institutions, with 1576 publications, followed by HARVARD MEDICAL SCHOOL with 1367 publications and THE UNIVERSITY OF TEXAS MD ANDERSON CANCER CENTER with 1299 publications (Supplementary file, Figure S20). Supplementary file, Figure S21 displays the findings of the analysis of the collaboration networks among universities and other institutions (the size of the nodes is correlated with the number of publications). Moreover, Supplementary file, Figure S22 illustrates each affiliation's productivity during this time period.

China, the United States, Japan, Italy, and Germany were the top five nations in the field of pancreatic cancer research, according to the analysis of the last five years' publications. Following them were India, Korea, the United Kingdom, France, and Spain. Europe is home to half of the top ten countries. Four of the remaining countries are from Asia: China, Japan, India, and South Korea. The sole remaining nation was the United States. Supplementary file, Figures S23 and S24 show the top 10 countries in terms of productivity in this sector and the collaboration between countries, respectively.

Similar to the top 2000 cited documents, co-word analysis was performed to determine the relationships between the searched keywords and their co-occurrence in the study topics. The co-occurring words network and keyword tree map are displayed in Supplementary file, Figure S25.

Supplementary file, Figure S26 displays the thematic map of the articles derived from each article's title. As mentioned earlier, the four equal sections of this figure are referred to as Motor Themes, Niche Themes, Emergency or Declining Themes, and Basic Themes. Among the most significant subjects in this discipline, which are presented in the motor themes, are metabolism, unclassified drugs, and genetics. Niche themes that represent the problems that have been addressed, rather than their significance, include retrospective studies, clinical articles, and follow-up. Moreover, breast cancer, neoplasm, and neoplasms appear in the emerging or declining themes. Finally, the Basic Themes that more attention must be paid to are pancreatic cancer, pancreatic tumor, and pancreatic neoplasms.

Discussion

In this work, a scientometric analysis was performed to evaluate the publication output related to pancreatic cancer. The primary objective of the present analysis was to illustrate and evaluate the positions of nations, institutions, and writers who made significant contributions to the field of pancreatic cancer research. By examining these papers, one can gain insight into the field's research trajectory concerning various countries, institutions, journals, authors, and word evaluations. The United States of America was the most productive country. This finding aligns with previous scientometric

analyses conducted in this particular field.[22,24,26] Only the top three of the ten most productive nations were in the Asia-Pacific region. As is evident, the results of pancreatic cancer research vary across the developed and developing countries. According to other scientometric analyses conducted in several sectors, the United States consistently ranked first with the greatest number of publications.[27-31] China, however, is the leading contributor to the field of autoimmune thyroiditis research.[32] This disparity suggests that author collaboration on a global scale needs to be improved.

The top three associations that contributed to this discipline were the University of Queensland, Johns Hopkins Medical Institutions, and the University of Texas MD Anderson Cancer Center. Among the top ten institutions working in this sector, only two were located in the Asia-Pacific region (Australia), while the other eight were based in the United States. In another scientometric analysis, Niu et al reported that the leading institutions for pancreatic cancer immunotherapy research were Johns Hopkins University, University of Texas, and the University of California.[24] In a different scientometric study by Xu et al focusing on pancreatic cancer immunotherapy, Johns Hopkins University made the largest contribution, followed by the University of Texas MD Anderson Cancer Center and the University of Pennsylvania.

The top 10 journals in this discipline collectively published 58 publications, all originating from the United States and the United Kingdom (n = 2), both representing developed countries. It is evident that High-impact journals make a greater contribution to the field of pancreatic cancer because all ten journals were ranked in the quartile 1 (Q1). The Lancet had the highest impact factor (IF = 202.731), with five published papers in the field. According to our findings, *Nature* was the leading contributor, with 11 published papers on the topic. According to Xu et al., the two most active journals in the field of pancreatic cancer immunotherapy research were *Cancers* and *Clinical Cancer Research*.[22] Furthermore, according to a scientometric analysis conducted by Biglu et al, the *Journal of Cancer Research* demonstrated the highest productivity in breast cancer research between 2006 and 2015, followed by the Journal of Clinical Oncology.[33] These journals were also ranked among the top 10 in the present study on pancreatic cancer. In contrast, Nassereldin et al reported that only one Q1 journal was listed among the top ten contributing journals from the MENA region in this subject.[23] This illuminates the disparity between developed and developing nations regarding the quality of pancreatic cancer research.

Strengths and Limitations

Compared to traditional reviews, a scientometric analysis offers a highly comprehensive and objective visual representation of the field's evolving research landscape. In this study, we conducted the required evaluations

to identify the nations, organizations, and pioneering scientists in the field of pancreatic cancer research. The findings can serve as foundational knowledge for researchers, university administrators, and policymakers in the research and technology sectors. This information can help clarify the current state of articles in the field of medicine, particularly cancer and pancreatic cancer. It can also aid in strategic planning for increased investments in these areas of research, as well as fostering both domestic and international collaborations, particularly in low- and middle-income countries. The implementation of the current study was not without limitations. The main limitation was that SCOPUS served as the sole database for data retrieval. Nevertheless, this database accurately represents the field, as it indexes a significant number of high-impact factor journals. Additionally, non-English documents were not included, leading to the exclusion of potentially relevant papers published in other languages.

Conclusion
The accessibility of necessary data has become increasingly challenging for researchers, particularly in the field of pancreatic cancer, owing to the abundance of scientific evidence in this domain. It is possible to gain valuable insight into original papers, frequently cited themes, study types, and global leaders in the research field by analyzing the top 2000 cited publications and recent studies from the past five years. This presents a potential avenue for future researchers to leverage the existing knowledge in order to produce higher-quality evidence on pancreatic cancer.

Authors' Contribution
Conceptualization: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Data curation: Mahnaz Mahmoudi, Nooshin Milanchian, Amir Ghaffarzad, Reza Aletaha, Parmida Jamshidi.
Formal analysis: Majid Mobasseri, Hadi Salehpour, Hanieh Salehi-Pourmehr.
Investigation: Zahra Sheikhalipour, Hadi Salehpour.
Methodology: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Project administration: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Resources: Mahnaz Mahmoudi, Nooshin Milanchian, Amir Ghaffarzad, Reza Aletaha, Parmida Jamshidi.
Software: Zahra Sheikhalipour, Hadi Salehpour.
Supervision: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Validation: Zahra Sheikhalipour, Hadi Salehpour.
Visualization: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Writing–original draft: Majid Mobasseri, Hanieh Salehi-Pourmehr.
Writing–review & editing: Majid Mobasseri, Hanieh Salehi-Pourmehr.

Competing Interests
The authors have no conflict of interests relevant to the content of this article.

Consent to Participate
Not applicable.

Consent for Publication
Not applicable.

Clinical Trial
Not applicable.

Data Availability Statement
The supplementary figures and data supporting the findings of this study are available from the corresponding author upon reasonable request.

Availability of Data and Materials
Not applicable.

Supplementary File
Supplementary file contains Figures S1-S26.

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