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Pro-Metrics

ORIGINAL ARTICLE

Mapping the research structure on Crohn's disease in PubMed and Web of Science (2014-2023)

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ABSTRACT

This research aims to generate a thematic analysis and scientific mapping of Crohn's disease research in PubMed and Web of Science databases. The current research is descriptive-cross-sectional and uses a scientometric approach. The required data was collected from Web of Science and PubMed databases on December 23, 2022, and the collection method used was census type. The collected data includes all the documents from 2014 to 2023 in PubMed and Web of Science. Vosviewer 1.6 software was used to draw scientific maps. Gastrointestinal hepatology was the most relevant topic. The United States of America ranked first with 13% of all scientific productions, while Iran ranked 41st in the world. Scientific maps showed the importance of studies related to women. The findings showed the importance of age, nutrition, biomarkers, endoscopy, and their relationship with Crohn's disease. The position of Iran's studies in the field of Crohn's disease was not very favorable among the countries of the world, and scientific maps showed the importance of studies related to women and adults as well as young people and revealed the increase of this disease among women in recent years. The importance of the role of nutrition in the immune system and digestive system in Crohn's disease was also shown.

Keywords: Crohn's disease, science mapping, bibliometrics, knowledge discovery, database.

INTRODUCTION

Crohn's disease is a condition that affects the digestive system and is characterized by chronic inflammation and autoimmune responses. It is part of the inflammatory bowel disease family and usually occurs in people between 15 and 30 (Khalili *et al.,* 2015; Ghalehnoei *et al.,* 2018; Hanauer, 2006; Johnston & Logan, 2008; Cho, 2008; Naderi *et al.,* 2007). The disease is chronic and can have periods of remission and recurrence. Crohn's disease is caused by inflammation and wound formation, with infectious and autoimmune factors playing a role. The most commonly affected areas are the small intestine's lower part and

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the large intestine's first part. The disease can have extraintestinal inflammatory manifestations, indicating this disorder's systemic nature (Najafzadeh *et al.,* 2015; Ohlsson *et al.,* 2007; Ebrahimi *et al.,* 2007). Common symptoms of Crohn's disease include fever, weight loss, lack of sleep, and anorexia (Aghazadeh *et al.,* 2010). Although extensive clinical and genetic studies have been conducted, the exact cause and pathogenesis of inflammatory bowel diseases and Crohn's disease remain unknown. It is believed that three factors, including immunological, environmental, and individual genetic characteristics, contribute to the development of Crohn's disease (Naderi *et al.,* 2007; Aghazadeh *et al.,* 2010).

It appears that the primary cause of Crohn's disease is the inflammatory response triggered by intestinal bacteria and antigens (Bonen & Cho, 2003). The disease is clinically classified based on its location, extent, behavior (such as causing fistula, stricture, and inflammation), and history of surgery (Naderi *et al.,* 2007, Gasche *et al.,* 2000). Crohn's disease is a debilitating condition that mainly affects young adults. Although death from this disease is rare, it can have a significant impact on the affected person's health, education, work, and life. Limited studies suggest that the prevalence of Crohn's disease is increasing in Iran (Naderi *et al.,* 2012, Aghazadeh *et al.,* 2005).

Showing a comprehensive picture of the type of scientific activities in a particular field is possible by knowing the state of scientific productions and the progress achieved in different subject areas. This can help researchers and authors identify the strengths and weaknesses of the research done in that field (Abasi *et al.,* 2014). Cartographic maps are used to visually represent the path of knowledge flow and draw a general view of that field (Li *et al.,* 2021). These maps analyze the publications of a scientific field from different angles and distinguish the fields with the most and the least proximity. By doing so, they provide comprehensive information visually, which can play an essential role in choosing a research topic (Noroozi, 2018). The goal of scientific maps is to present a clear picture of the status of previous research, identify how different subject areas are related, and recognize points of knowledge that follow the so-called hot debates of their respective fields (Rahmani, 2018). To evaluate and illustrate the quality and quantity of research activities related to distinct fields of science, scientometric analyses, and new knowledge visualization techniques can be combined (Schüffel *et al.,* 2016).

Analyzing and reviewing scientific research, particularly in medical sciences, is crucial. A recent study by Klang, Eyal, and their colleagues reviewed studies conducted in PubMed over the last two decades on treating inflammatory bowel diseases using text analysis and text mining. The analysis revealed that among all the treatment methods, biological medical treatment methods had the largest share of studies conducted from 2000 to 2020 (Klang *et al.,* 2021). In another research, Karmi Rabati and his colleagues used the scientometric method to analyze the scientific productions of Iran's gastroenterology and liver in the science reference database. The study found that despite the higher annual growth of Iran's production compared to that of the world's gastroenterology and liver production, Iran's position in this area was not very satisfactory. Additionally, Iranian researchers had the most participation with the researchers of Tehran University of Medical Sciences and the United States at the national and global levels (Karami *et al.,* 2019).

According to a study by Vorri *et al.,* (2018), the output of publications in gastroenterology and liver decreased significantly in Greece after the financial crisis, compared with other specialties and other European countries. Chang *et al.,* (2017) analyzed the scientific publications on gastroenterology and hepatology in Taiwan. He found that the production of publications increased while the number of cited articles and the impact factor of journals decreased. Schoffel Norman conducted a scientometric study on studies undertaken in Ulcerative Colitis, which indicated the need to strengthen research cooperation at individual, institutional, national, and international levels. Weintraub *et al.,* (2014) evaluated articles registered in PubMed between 1993 and 2011. They found that clinical trials, meta-analyses, and controlled clinical trials were published more than lower-quality articles such as editorials or letters to the editor in the subject area of inflammatory bowel diseases.

This study aims to evaluate the research on inflammatory bowel diseases, specifically Crohn's. The analysis was carried out by reviewing the scientific productions in the PubMed and Web of Science citation databases. Understanding the current state of science in various scientific fields is crucial for advancing research in those areas.

MATERIALS AND METHODS

Based on the research methodology, the current study is descriptive-cross-sectional and has utilized a scientometric approach. The data was collected using a census method from the Web of Science (WoS) and the PubMed database on December 23, 2022. The collected data encompasses all documents produced from 2014 to 2023 related to Crohn's disease and is available in PubMed and WOS. Notably, this particular period has been selected due to the significant change in the trend of scientific productions in the field of Crohn's disease during the mentioned period. To gather data from the mentioned databases, the following strategies were used:

Search strategy in PubMed:

> "crohn*"[All Fields] AND ("disease"[MeSH Terms] OR "disease"[All Fields] OR "diseases"[All Fields] OR "diseases"[All Fields] OR "diseased"[All Fields]) Also, the search strategy in the WOS was as follows:

Search strategy in WoS:

> TI=(crohn* NEAR/3 disease OR Ileocolitis OR Regional Enteritis OR Granulomatous Enteritis OR Terminal Ileitis) and 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 or 2022 or 2023 (Publication Years) and Gastroenterology Hepatology or Surgery or Medicine General Internal or Pharmacology Pharmacy or Pediatrics or Radiology Nuclear Medicine Medical Imaging or Medicine Research Experimental or Immunology or Nutrition Dietetics or Pathology or Multidisciplinary Sciences or Dermatology or Health Care Sciences Services or Cell Biology or Biochemistry Molecular Biology or Microbiology or Health Policy Services or Oncology or Economics or Genetics Heredity or Clinical Neurology or Neurosciences or Public Environmental Occupational Health or Rheumatology or Biotechnology Applied Microbiology (Exclude – Web of Science Categories).

The data analyzed in this study were stored in WoS in the form of 1000 number packets and in plain text format, and the PubMed database in the form of ten thousand packets and in the "text" format named PubMed. The analysis section of the WOS was used to extract raw statistical data, which was then visualized using Excel version 2019 software to draw tables and graphs. Additionally, Vosviewer 1.6 software was utilized to draw scientific and co-occurrence maps, which helped to determine scientific and newly formed co-occurrence clusters. Weighted software was also employed to visualize the co-occurrence of subjects with Size Variation of Circle type, with Max. Length 30 and Min. strength and Association Strength method used to normalize Network Visualization. Before the data review process, irrelevant data was removed by monitoring it. It is important to note that the samples examined in this research were scientific documents such as research articles, reviews, and books, and therefore, ethical considerations were not a factor in this study.

RESULTS

This study analyzed 9666 records from the PubMed database and 16771 from the Web of Science. These records were published between 2014 and 2023 and focused on Crohn's disease. After analyzing the data, we found that 2020 had the highest number of records with 2049 publications. On the other hand, 2023 had the lowest number of records, with only one publication. The detailed results can be seen in Table 1.

Looking at chart 1, it is clear that researchers in the field of Crohn's disease are most interested in gastroenterology, which accounts for a whopping 79.37% of all scientific productions in this area. On the other hand, other technological sciences appear to be the least researched subject, with only 1.33% of total scientific productions.

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Number of records from 16771	Year of publication
(The least produced record) 1	2023
1800	2022
2042	2021
(Most Record Produced) 2049	2020
1988	2019
1864	2018
1864	2017
1778	2016
1707	2015
1681	2014

Table 1. The number of records published from 2014 to 2023.

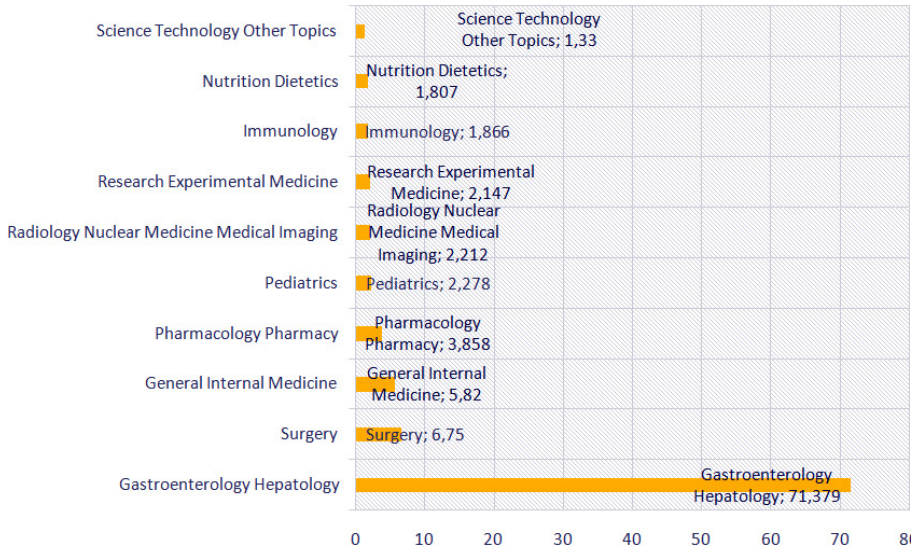

Chart 1. Percentage of research areas desired by researchers in 2014-2023.

According to the data presented in Table 2, Elsevier Publications has been the leading publisher of scientific records related to Crohn's disease between 2014 and 2023. It's interesting to see how one publisher can have such a significant impact in a particular field. The information provided in this table can be useful for researchers and professionals looking to stay up-to-date on the latest developments in Crohn's disease research.

Percentage of total records generated	Number of records	Publisher
24.238	4065	Elsevier
21.823	3660	Oxford
11.907	1997	Springer
9.355	1569	Williams and Wilkins
8.64	1449	Wiley

Table 2. Publishers with the most scientific records from 2014 to 2023.

According to Figure 2, the United States of America leads in the production of research in Crohn's disease, accounting for 13% of all scientific output. Iran, on the other hand, is ranked 41st in the world as per Chart 2.

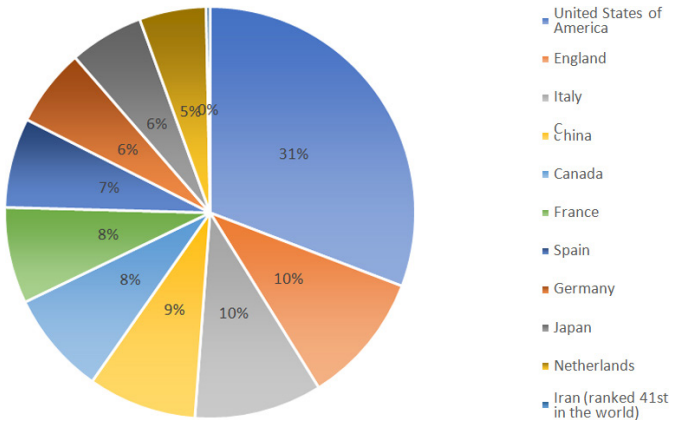

Chart 2. Top 10 science-producing countries in the studied field in 2014-2023.

Table 3 contains the top ten authors of scientific productions in Crohn's disease, with Colombel JF at the top with 348 records. In addition to Table 3 in Figure 1, inserted after this table, which draws a general scheme of co-authorship and the relationship between authors in Crohn's disease (Table 3 and Figure 1).

Percentage of records out of total records	Number of records	Author
2.075	348	Colombel JF
1.997	335	Vermeire S
1.837	308	Sandborn WJ
1.61	270	Peyrin-biroulet L
1.562	262	Danese S
1.312	220	Panaccione R
1.306	219	D'haens G
1.288	216	Feagan BG
1.258	211	Ferrante M
1.187	199	Panes J

Table 3. Authors with the most published records from 2014 to 2023.

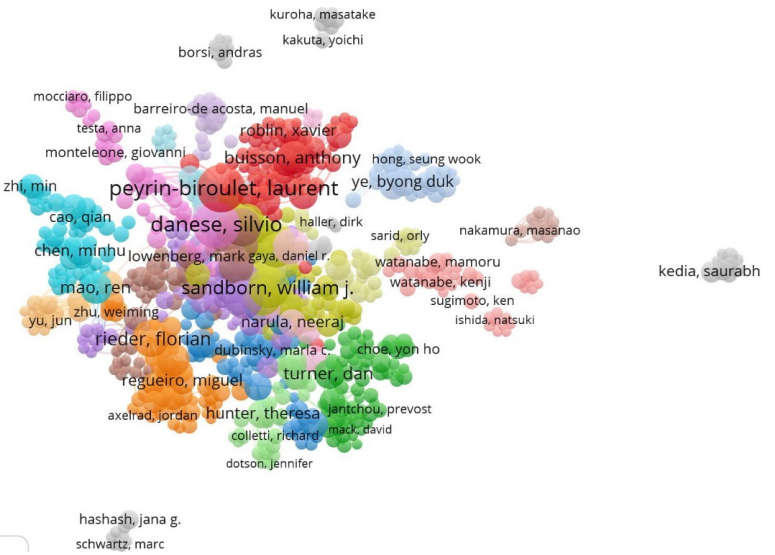

Figure 1. Co-authorship of studies in the field of Crohn's disease.

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After examining Figure 2 and mapping out the scientific landscape of Crohn's disease research, it becomes apparent that studies in this field have focused on various demographics, including women, adults, and young people. The left side of the first map illustrates the significance of different topics over the years, with purple indicating the oldest topics and yellow representing more recent ones. Notably, recent studies from 2014 to 2023 have emphasized the relationship between Crohn's disease and women, as evidenced by the special view of researchers in this field.

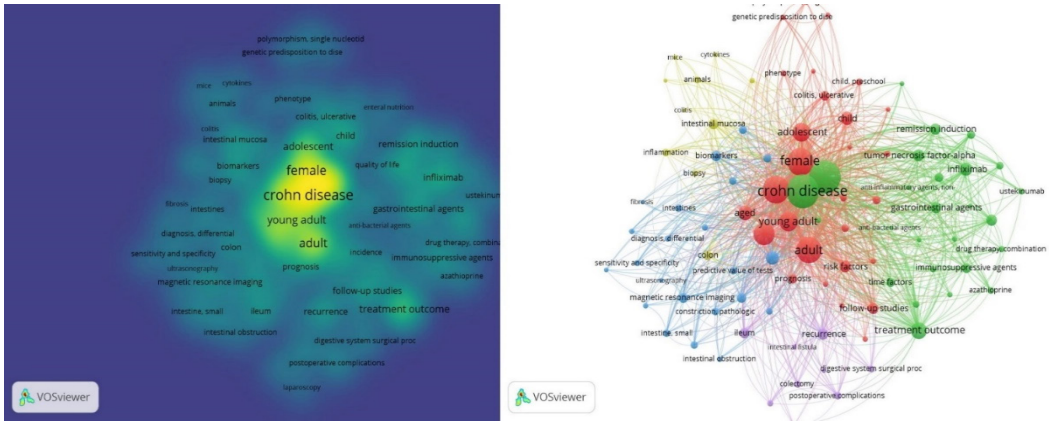

Figure 2. General cluster of studies in Crohn's disease.

According to Figure 3, it seems that the first cluster in the field of Crohn's disease is mainly focused on issues related to adulthood and age. It highlights the importance of age in contracting Crohn's disease, especially for individuals over 80. Additionally, this cluster also covers women's issues, disease prevention (including in children), and follow-up treatment for those with Crohn's disease. Of the 95 co-occurring items in the scientific map of Crohn's disease, 28 items belong to this cluster. On the other hand, the second cluster, which has 28 items, mainly deals with adrenal cortex hormones, antibacterial agents, anti-inflammatory agents, antibodies, pharmaceutical treatments, and the role of nutrition, the immune system, and the digestive system in treating Crohn's disease.

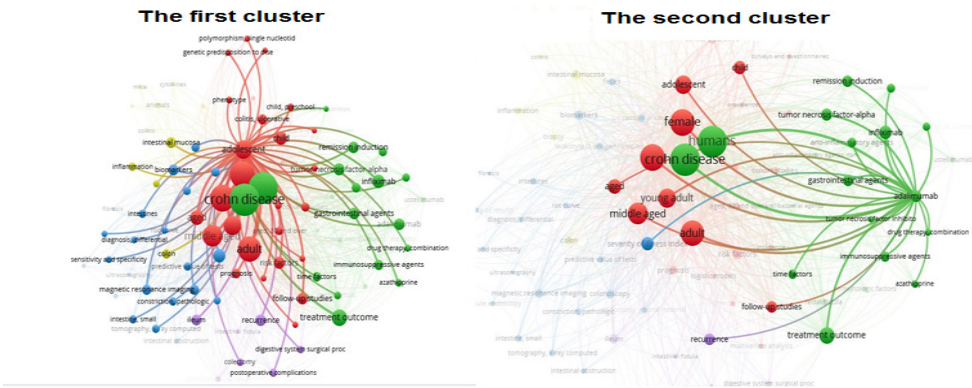

Figure 3. The first and second clusters of studies in the field of Crohn's disease.

According to Figure 4, the present study includes two clusters. The third cluster covers 22 out of 95 items and focuses on the role of biomarkers in Crohn's disease. It also explores different diagnostic methods, such as endoscopy, colonoscopy, and ultrasound, as well as the importance of pathological diagnosis and intestinal obstruction in the disease. The fourth cluster, on the other hand, contains ten items out of 95 and mainly discusses the relationship between animals, biopsy, colitis, colon, inflammation, and Crohn's disease.

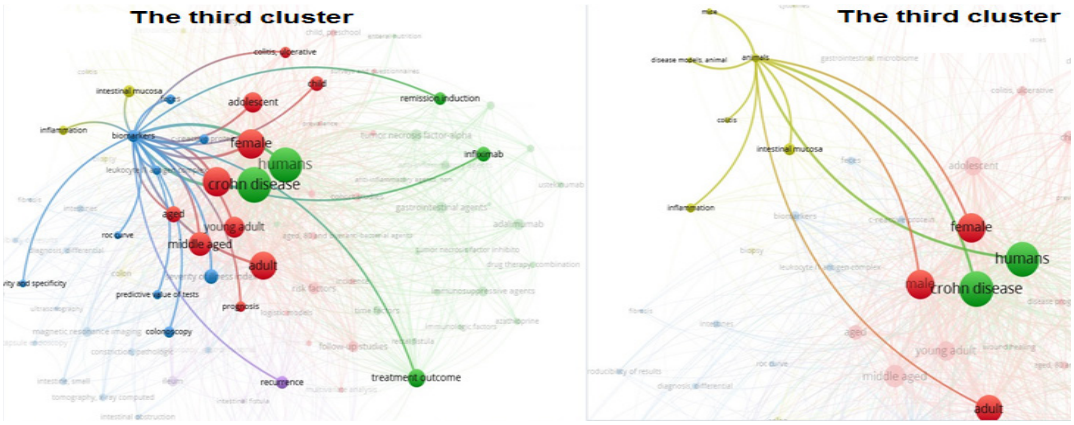

Figure 4. The third and fourth clusters of studies in Crohn's disease.

After analyzing this figure, Figure 5 shows the last cluster. It seems to be focused on topics related to anastomosis, colectomy, gastrointestinal surgery, and laparoscopic surgery and how they relate to Crohn's disease. Interestingly, this cluster only includes 9 out of the 95 total items on the map.

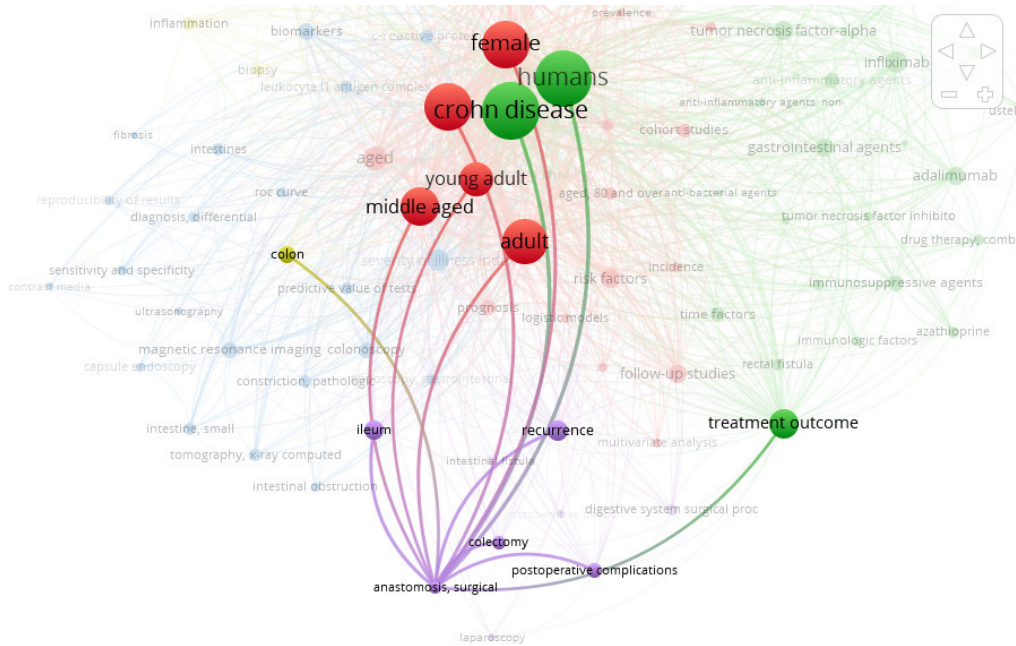

Figure 5. The fifth cluster of studies in the field of Crohn's disease.

DISCUSSION

It is interesting to note that gastrointestinal hepatology emerged as the field with the most scientific productions related to Crohn's disease in a recent study. Elsevier Publications had the highest number of scientific records in this field among the publishers. The United States of America had the highest contribution, with 13% of all scientific productions in the field of Crohn's disease. At the same time, Iran ranked 41st in the world, consistent with Karami Rabati *et al.,* (2018) findings. Additionally, Colombel was identified as the most prolific writer in this field of research.

Science maps have recently highlighted the importance of studying the effects of Crohn's disease on different demographics, such as women, the elderly, and young people. These studies have shown that there is more evidence of women and young people who have Crohn's disease. However, Hashemi's (2015)

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research findings and colleagues have reached different conclusions regarding women. This difference in findings seems to be due to the use of various methods in the two studies. It is also important to note that Hashemi *et al.,* (2015) 's study was limited to Iran, while the present study analyzed Science data mapping of all countries.

The study results show that researchers have focused primarily on the relationship between Crohn's disease and women in recent years. Moreover, the study has confirmed the role of age in the disease. The findings suggest that the increase in the incidence of Crohn's disease among women could be due to better diagnosis in this group of patients, who tend to visit doctors more frequently. These results align with the study conducted by Ghorbinejad *et al.,* (2020). The second cluster of the study focuses on topics related to Crohn's disease treatment, including adrenal cortex hormone, antibacterial agents, anti-inflammatory agents, and pharmaceutical treatments. It also explores the role of nutrition, the immune system, and the digestive system, which aligns with previous studies by Babaei *et al.,* (2013), Karimi *et al.,* (2019), and Farhadi and Mokhtarifar (2017).

The study found that the third cluster highlights the importance of biomarkers in Crohn's disease and various diagnostic tools such as endoscopy, colonoscopy, ultrasonography, and pathological diagnosis in identifying and managing the disease. Additionally, the study revealed the impact of Crohn's disease on gastrointestinal surgeries, including anastomosis, colectomy, and laparoscopic surgery, as well as the role of these surgical procedures in managing the disease.

FINAL CONSIDERATION

Based on the available data, it can be inferred that Iran's research on Crohn's disease is not as significant as that of other countries and that there is a need for more studies, particularly regarding women, elderly individuals, and younger populations. These findings suggest a rise in the disease incidence among these groups, especially women, in recent years. Furthermore, the role of nutrition, the immune system, and the digestive system in developing Crohn's disease has been highlighted in scientific research.

Conflict of Interests

The authors declare no conflict of interest related to this work. ●

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