ORIGINAL RESEARCH

Who is Focusing on Women's Health: A Bibliometric Analysis of Global Research Trends on Overweight in Female Patients with Gynecologic or Breast Cancer

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Objective: Obesity has become a significant public health concern, strongly linked to various diseases, particularly gynecologic and breast cancers. This bibliometric review aims to analyze global research trends on overweight women, particularly those with gynecologic and breast cancers, to identify research hotspots, key contributors, and emerging areas of study.
Methods: A comprehensive bibliometric analysis was conducted using the Web of Science Core Collection (WoSCC) database, covering the period from January 2013 to September 2024. Articles were screened and analyzed using tools such as VOSviewer and Biblioshiny platform, with metrics including publication volume, citation analysis, and co-authorship networks. Key areas of focus were global research trends, leading countries, institutions, authors, journals, and keyword analysis.
Results: A total of 1452 publications were analyzed. Research activity on the association between obesity and gynecologic/breast cancer has steadily increased, with the United States leading in publications and citations, followed by China and Italy. Core journals included Breast Cancer Research and Treatment and Gynecologic Oncology. Key research areas identified through keyword analysis include the relationship between body mass index (BMI) and cancer risk, survival rates in cancer patients, physical activity, and the role of adipose tissue inflammation in tumor progression. Emerging topics include extracellular vesicles and cancer-associated fibroblasts.
Conclusion: Global research on the relationship between obesity and female-specific cancers has shown significant growth. The findings highlight BMI, survival, and physical activity as central themes. Future research should explore the molecular mechanisms linking obesity to cancer and evaluate weight loss interventions for cancer prevention and treatment.
Keywords: obesity, gynecologic cancer, breast cancer, bibliometrics, women health

Introduction

Obesity is widely recognized as a global public health crisis, with its prevalence rising significantly over recent decades.[1] According to the World Health Organization (WHO), the prevalence of overweight and obesity is increasing globally, particularly in high- and some middle-income countries.[2] Obesity is strongly associated with metabolic syndrome, cardiovascular disease, and diabetes. Studies also show it is a high-risk factor for several cancers, including gynecological and breast cancers, common in women.[3] Due to lifestyle changes, the prevalence of obesity continues to rise, with the number of obese women increasing from 69.3 million to 390 million between 1975 and 2016. Obesity also contributes to gynecological cancers, emphasizing its significant impact on the burden of these cancers.[4] Given the

prominent role of obesity in cancer, more studies are focusing on overweight women, particularly those with gynecologic or breast cancers.[5,6]

Breast cancer is the most common cancer in women, causing millions of new cases and numerous cancer-related deaths annually.[7] Similarly, gynecologic cancers, including endometrial, ovarian, and cervical cancers, are serious global threats to women's health. A recent study showed that gynecologic and breast cancers account for over 40% of new cancer cases and over 30% of cancer deaths in women.[7] The incidence of gynecologic and breast cancers is expected to double by 2070.[8] Increasing evidence suggests that obesity is a high-risk factor for breast cancer and is strongly linked to various gynecologic cancers.[9] Therefore, studying the impact of obesity on patients with gynecologic and breast cancers has critical clinical and public health implications.

Despite widespread attention and research on the relationship between obesity and female cancers, the global scientific research trends and developments in this field have not been systematically analyzed. Traditional literature reviews often rely on researchers' subjective judgment, making it difficult to fully capture the field's development and future direction. The introduction of econometric analysis, through quantitative analysis of extensive academic literature, reveals key information such as research hotspots, trends, core scholars, institutions, and international collaborations, providing researchers with a more objective and systematic reference.[10] Bibliometrics is a widely used quantitative tool for assessing the impact of academic publications, research trends, and knowledge structures. It uncovers the dynamics and development direction of academic fields by analyzing indicators such as publication volume, citations, authors, journals, and keywords.[11,12]

This study aims to systematically analyze global research trends and the current status of overweight women, particularly those with gynecological and breast cancers, using bibliometric methods. It focuses on key questions: i) What are the global research trends regarding obese women with gynecological or breast cancer? ii) Which countries and regions lead in this field? i) Which institutions and researchers have made significant contributions? iv) What are the research hotspots and emerging areas in this field? By offering a comprehensive overview, this study highlights the clinical significance of obesity in gynecological and breast cancer, focusing on its potential impact on diagnosis, treatment, and management. Furthermore, the findings aim to identify research gaps, advance scientific knowledge, and guide future studies to address unmet needs in managing and preventing cancer in overweight women. These insights will support researchers, clinicians, and public health experts in designing targeted interventions and policies to improve health outcomes for this vulnerable group.

Materials and Methods
Source of Data
We retrieved all relevant articles on obesity, overweight, and gynecologic cancer-related research from the Web of Science Core Collection (WoSCC) database. The search criteria were: i) publication date from 1 January 2013 to 1 September 2024; ii) language restricted to English; and iii) literature type limited to reviews and original articles. Supplementary Table 1 outlines the detailed search strategy, and Figure 1 illustrates the document search and analysis process.

Data Statistics and Visualization
Articles retrieved from the WoSCC database were screened and exported, ensuring that all records and references were complete. For data statistics and visual analysis, this study employed Microsoft Office Excel 2021, VOSviewer,[13,14] the Biblioshiny package from R,[15] and the Bibliometric online analysis platform (https://bibliometric.com/). The H-index was also included to comprehensively evaluate the scholarly impact. The H-index is a critical measure for evaluating the volume and quality of academic output at the journal, institutional, or national level.[16]

Results
Trends in Publications and Annual Citations
A total of 1452 publications were reviewed, comprising 1219 original studies and 233 reviews. Figure 2 illustrates global trends in publications and total citations related to gynecologic cancer and obesity research from 2013 to 2024. The
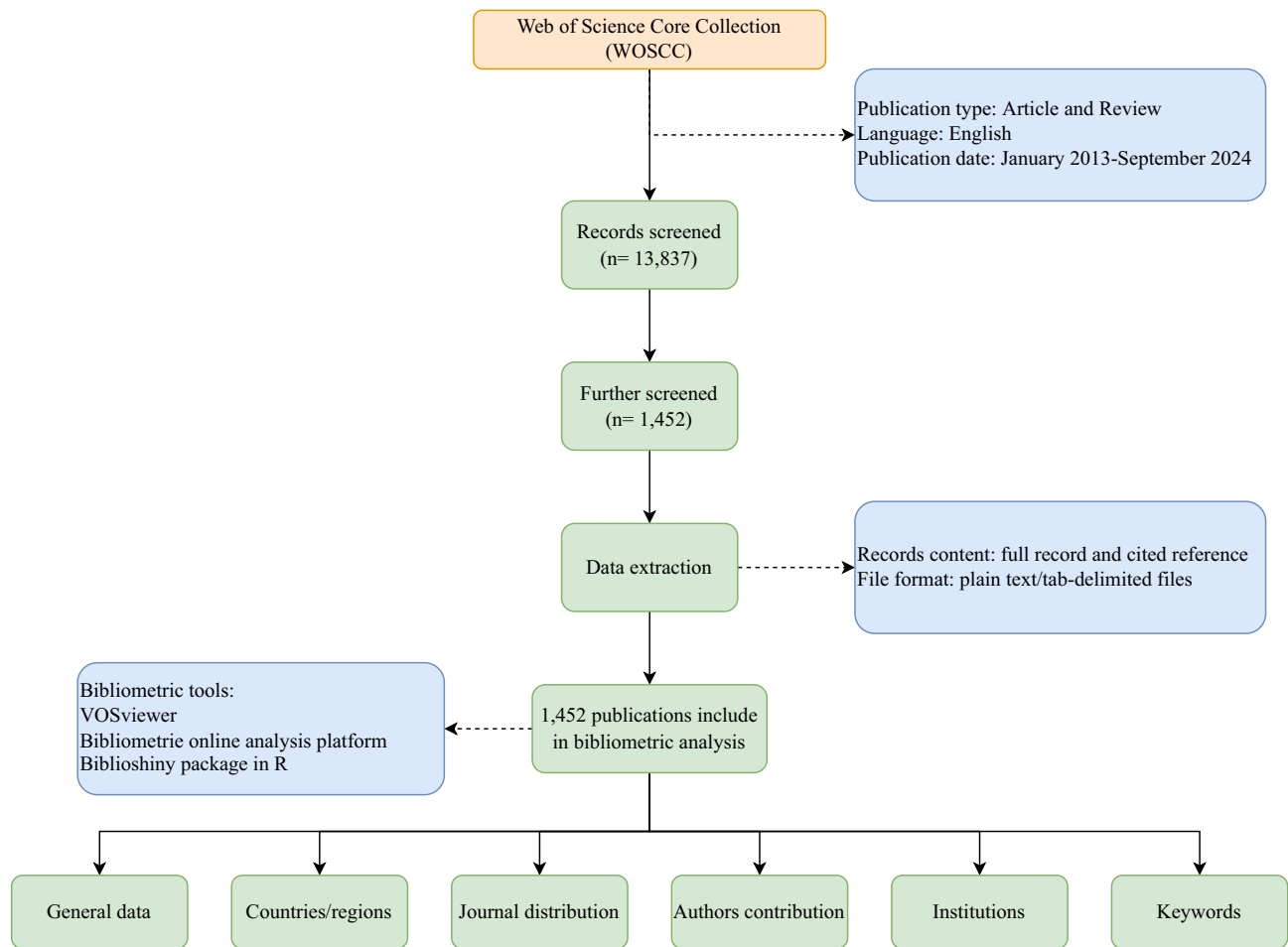
Figure 1 Flowchart of study identification and selection.

annual number of publications shows a general increase, despite some fluctuations (Figure 2A). The number of annual citations has increased steadily, with peaks in 2013 and 2015 (Figure 2B).

Country/Region Distribution

Research on this topic has been published in 77 countries globally. Table 1 lists the top 10 most cited countries. As shown in Figure 3A, most research on obesity and gynecologic/breast cancer originates from North America, Asia, Europe and Australia. The United States contributed the most publications (46.56%), followed by China (13.15%) and Italy (8.26%).
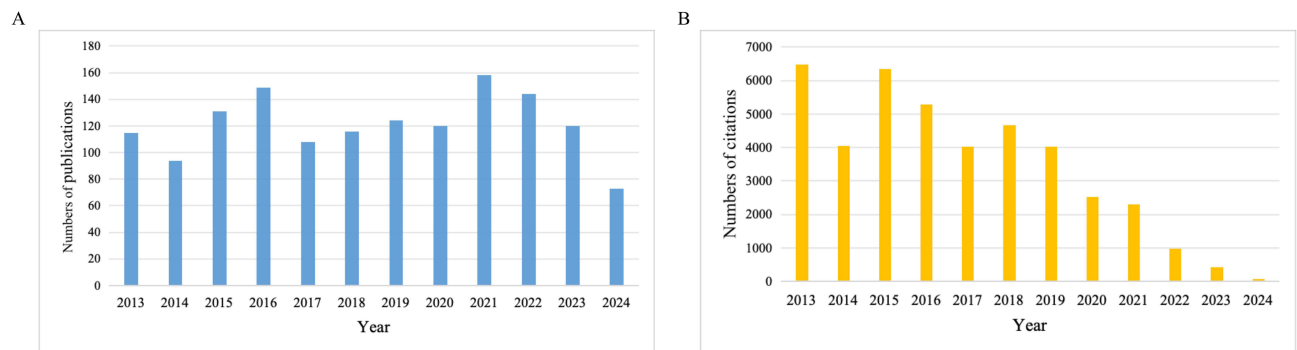

Figure 2 The number of (**A**) publications and (**B**) citations in the field of overweight and gynecologic/breast cancer.

Table 1 Top 10 Countries in Terms of Cumulative Citations

Rank	Country	Publications (%)	Citations	
			Total	**Average**
1	USA	676 (46.56)	23,298	34.46
2	China	191 (13.15)	4326	22.65
3	England	91 (6.27)	3307	36.34
4	Italy	120 (8.26)	2904	24.20
5	Australia	73 (5.03)	2727	37.36
6	Canada	70 (4.82)	2484	35.49
7	France	82 (5.65)	2027	24.72
8	Norway	35 (2.41)	1670	47.71
9	Germany	53 (3.65)	1449	27.34
10	Spain	50 (3.44)	1318	26.36

Additionally, analysis of country collaborations (Figure 3B) showed strong partnerships between the United States, China, and Australia. The United States and Australia were pioneers in this field, while China and Italy joined later (Figure 3C). In terms of citations (Table 1), the United States had the highest citation count (n = 23,298), followed by China (n = 4326), England (n = 3307), and Italy (n = 2904).
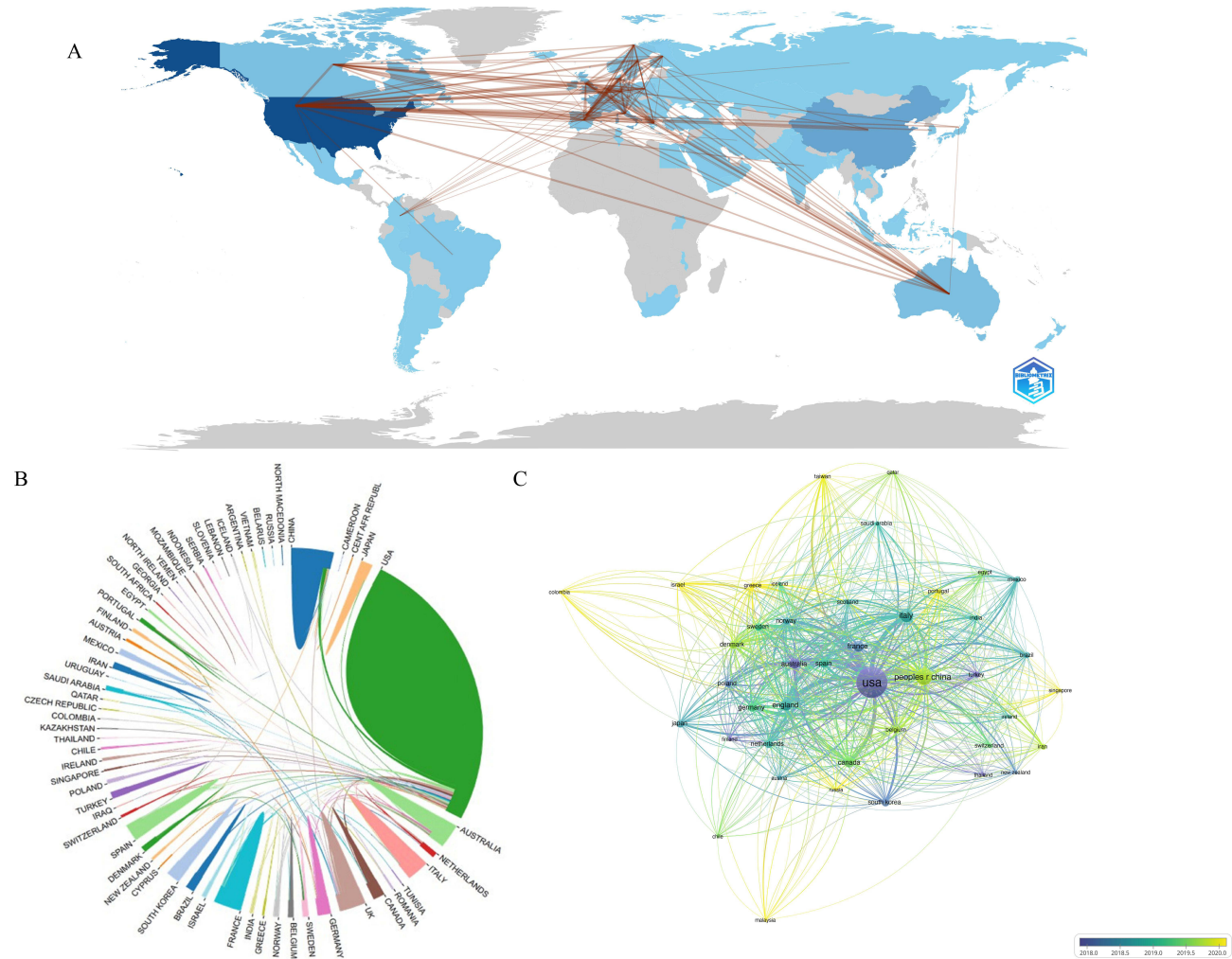
Figure 3 Countries associated with the gynecological/breast cancer field between 2013 and 2024. (**A**) World map of countries' collaboration; (**B**) International collaboration between countries; (**C**) Country cooperation networks with time series.

Analysis of Source Journals

Between 2013 and 2024, 404 journals published studies on obesity and gynecologic/breast cancer. The top 10 journals published 350 articles. Breast Cancer Research and Treatment published the most articles (n = 74), followed by Gynecologic Oncology (n = 57) and Cancers (n = 37) (Table 2). In terms of citations, Gynecologic Oncology, a leading journal in oncology, ranked first with 57 publications receiving 1762 citations. Breast Cancer Research and Treatment (1675 citations) and Journal of Clinical Oncology (1396 citations) followed closely (Supplementary Table 2). Additionally, Bradford's Law was applied to identify 19 core journals in the study of gynecologic/breast cancer, including Breast Cancer Research and Treatment, Gynecologic Oncology, Cancers, and Frontiers in Oncology (Figure 4).

Analysis of Authors and Institutions

A total of 8772 unique authors contributed to the 1452 publications in this study. Table 3 lists the authors ranked by the number of publications, with Hursting SD being the most prolific, having published 21 papers over the last 10 years with an H-index of 12. Demark-Wahnefried W and Bandera EV ranked second and third, and both attained the highest H-index scores. Figure 5 illustrates the collaborative network among the authors and their teams. Cluster analysis reveals four main collaboration clusters. Three teams are from the United States, and one is from Italy. Additionally, Table 4 shows the top 10 most productive institutions, with the University of North Carolina, the University of Texas MD Anderson Cancer Center, and Memorial Sloan Kettering Cancer Center as the top three in publication output.

Analysis of Highly Cited Articles

Highly cited papers greatly influence their fields and provide essential insights into the subject area's knowledge base. We calculated the Global Citation Score (GCS) and Local Citation Score (LCS) to identify the most influential studies and authors (Table 5).[17–26] The article "Body mass index and survival in women with breast cancer - systematic literature review and meta-analysis of 82 follow-up studies", published in *Annals of Oncology*, received the highest number of citations worldwide (n=798) and a high LCS (n=220). The study analyzed pre- and post-diagnosis body mass index (BMI) and mortality data from 213,075 breast cancer survivors, showing a significant link between obesity and reduced survival in breast cancer patients.[17] The second-ranked article, by Lee (2013), investigated the link between obesity and cervical cancer risk in women through an HPV cohort study. The study found that obesity may increase cervical cancer risk, with 555 citations.[18] Picon-Ruiz et al reviewed the effects of obesity on breast cancer, the molecular mechanisms, physical activity, and weight loss interventions.[19] Several studies have confirmed the connection between obesity and gynecologic/breast cancers. Thus, maintaining a healthy weight benefits cancer prevention, reduces tumor risk, and improves cancer survival outcomes.[20–22,25,26] Various molecular mechanisms play a role in the development of breast and endometrial cancers related to obesity.[23,24] These areas remain active research topics and warrant further investigation.

Table 2 Top 10 Leading Journals in Terms of Number of Publications

| Rank	Journal	Publications	Citations		IF (2024)
			Total	Average	
1	Breast Cancer Research and Treatment	74	1675	22.64	3.0
2	Gynecologic Oncology	57	1762	30.91	4.5
3	Cancers	37	787	21.27	4.5
4	Frontiers In Oncology	31	579	18.68	3.5
5	BMC Cancer	30	516	17.2	3.4
6	International Journal of Gynecological Cancer	28	257	9.18	4.1
7	PLoS One	25	1066	42.64	2.9
8	Cancer Epidemiology Biomarkers & Prevention	24	685	28.54	3.7
9	International Journal of Molecular Sciences	24	385	16.04	4.9
10	Breast Cancer Research	20	1101	55.05	6.1

Core Sources by Bradford's Law
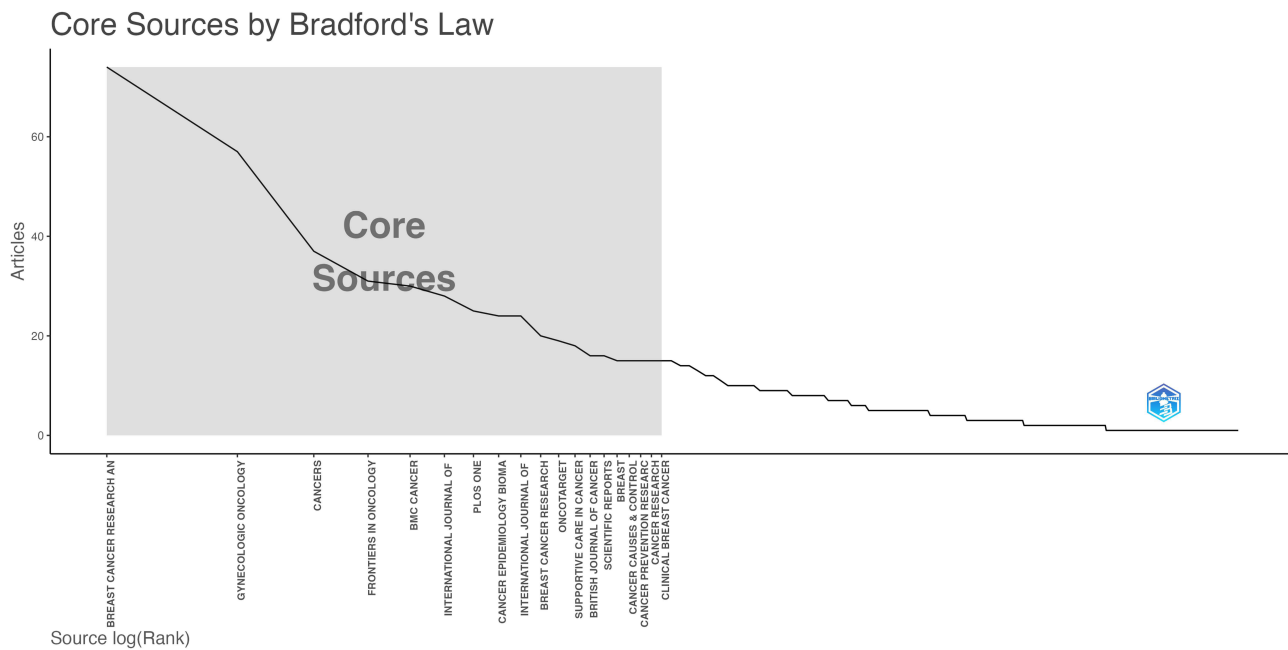
Figure 4 The distribution map of core journals was illustrated.

Keywords Co-Occurrence Network

A total of 1452 articles met the requirements, and the data were analyzed and visualized using the "All keywords" section in VOSviewer, extracting 3897 keywords. Figure 6 presents the analysis of 66 keywords that appear more than 35 times. Certain keywords were modified for consistency, such as changing "exercise" to "physical activity" and "human adipose-tissue" to "adipose-tissue". Descriptive keywords like "obesity", "overweight", and "cancer" were excluded. The important keywords form four broad clusters: i) Cluster 1 consists of 21 nodes with keywords such as 'physical activity,' 'nutrition,' 'diet,' 'quality of survival,' and 'prognosis.' This cluster explores the effects of physical activity and healthy eating on the survival and prognosis of gynecologic/breast cancer patients. ii) Cluster 2 includes 15 nodes with keywords like 'breast cancer,' 'adipose tissue,' 'leptin,' 'mechanisms,' and 'inflammation.' This cluster focuses on common themes in the field, mainly exploring leptin and adipose tissue's role in the inflammatory environment of breast cancer development, progression, and metastasis. iii) Cluster 3 consists of 16 nodes with keywords like 'body mass index,' 'risk factors,' 'weight change,' and 'epidemiology.' This cluster focuses on primary cancer prevention strategies, aiming to identify epidemiological character-istics and risk factors for gynecologic/breast cancer. iv) Cluster 4 includes 14 nodes with keywords such as 'survival,'

Table 3 Top 10 Authors in Terms of Number of Publications

Rank	Journal	Publications	Citations		H-index
			Total	Average	
1	Hursting SD	21	466	22.19	12
2	Demark-Wahnefried W	17	768	45.18	14
3	Bandera EV	15	486	32.4	13
4	Dannenberg AJ	14	783	55.93	12
5	Bernstein L	13	588	45.23	11
6	Iyengar NM	13	282	21.69	10
7	Andò S	12	523	43.58	10
8	Borgquist S	12	108	9	7
9	Brown KA	12	619	51.58	10
10	John EM	12	399	33.25	11
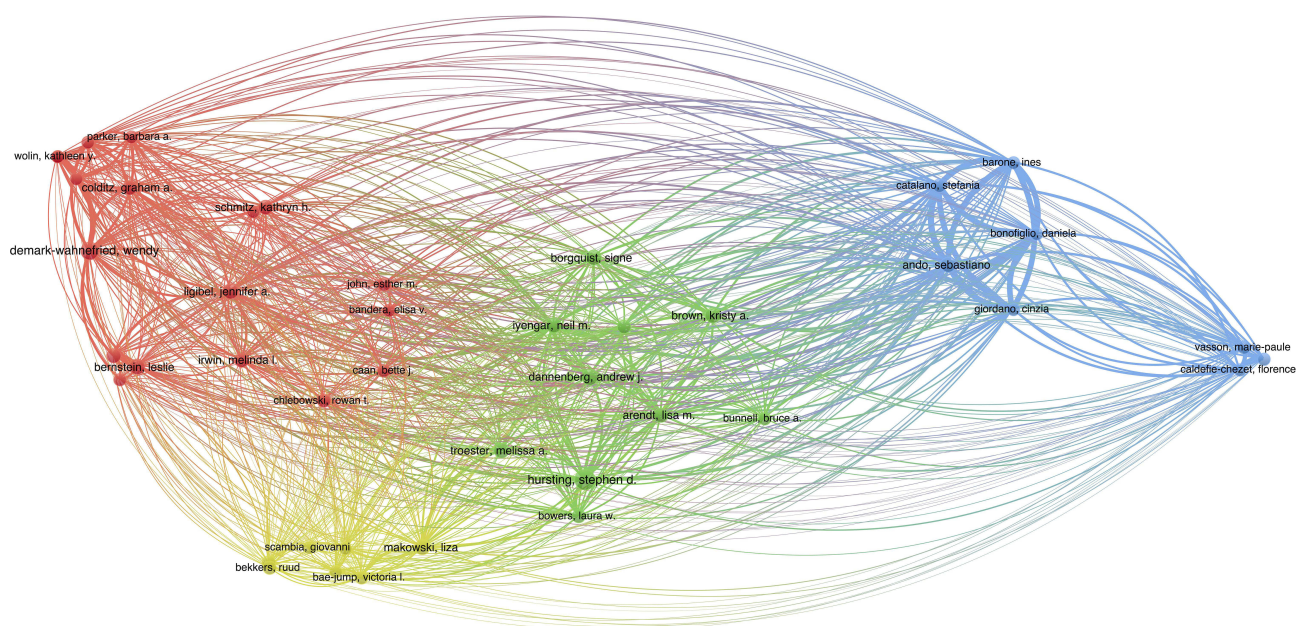
Figure 5 Networks of collaborative relationships between authors and teams.

'mortality,' 'ovarian cancer,' 'endometrial cancer,' and 'management.' This cluster focuses on managing the survival of gynecologic/breast cancer patients after treatment. Additionally, we analyzed the keyword time series and identified emerging topics such as 'extracellular vesicles' and 'cancer-associated fibroblasts' (Figure 7).

Discussion
Global Trends in Research

Using bibliometric analysis, we constructed a knowledge framework on overweight female patients with gynecologic or breast cancer, analyzing data from 2013 to 2024. Based on the analysis, China and the United States were the leading contributors, with the latter demonstrating exceptional proficiency in this field. Notably, Breast Cancer Research and Treatment ranked first in publication count and total citations, while Gynecologic Oncology had the highest number of publications, reflecting its high academic standards. The University of North Carolina was the most prolific institution globally, with all top 10 institutions located in the United States. This success can be attributed to the strong research foundation, substantial funding,

Table 4 Top 10 Organizations in Terms of Number of Publications

Rank	Institutions	Publications	Citations	
			Total	**Average**
1	University of North Carolina	53	1533	28.92
2	University of Texas M. D. Anderson Cancer Center	42	2037	48.5
3	Memorial Sloan Kettering Cancer Center	30	1551	51.7
4	Harvard Medical School	29	1058	36.48
5	National Cancer Institute	29	1146	39.52
6	Dana Farber Cancer Institute	26	1169	44.96
7	The University of Alabama at Birmingham	26	1631	62.73
8	University of California, San Diego	26	791	30.42
9[a]	University of California, Los Angeles	25	1112	44.48
10[a]	The Ohio State University	25	443	17.72
11	Fred Hutchinson Cancer Center	23	2137	92.91

Notes: [a]These institutions share the same ranking due to an identical number of publications.

Table 5 The Top 10 Most Global Cited Publications

Rank	Author, Year	Title	Journal	Global Citation	Local Citation	DOI
1	Chan, 2014[17]	Body mass index and survival in women with breast cancer—systematic literature review and meta-analysis of 82 follow-up studies	Annals of Oncology	798	220	10.1093/annonc/mdu042
2	Lee, 2013[18]	Mild Obesity, Physical Activity, Calorie Intake, and the Risks of Cervical Intraepithelial Neoplasia and Cervical Cancer	PLoS ONE	555	30	10.1371/journal.pone.0066555
3	Picon-Ruiz, 2017[19]	Obesity and adverse breast cancer risk and outcome: Mechanistic insights and strategies for intervention	CA: A Cancer Journal for Clinicians	530	105	10.3322/caac.21405
4	Neuhouser, 2015[20]	Overweight, Obesity, and Postmenopausal Invasive Breast Cancer Risk A Secondary Analysis of the Women's Health Initiative Randomized Clinical Trials	JAMA Oncology	409	117	10.1001/jamaoncol.2015.1546
5	Onstad, 2016[21]	Addressing the Role of Obesity in Endometrial Cancer Risk, Prevention, and Treatment	Journal of Clinical Oncology	343	40	10.1200/JCO.2016.69.4638
6	Caan, 2018[22]	Association of Muscle and Adiposity Measured by Computed Tomography With Survival in Patients With Nonmetastatic Breast Cancer	JAMA Oncology	334	15	10.1001/jamaoncol.2018.0137
7	Balaban, 2017[23]	Adipocyte lipolysis links obesity to breast cancer growth: adipocyte-derived fatty acids drive breast cancer cell proliferation and migration	Cancer & Metabolism	273	30	10.1186/s40170-016-0163-7
8	Wu, 2019[24]	Cancer-associated adipocytes: key players in breast cancer progression	Journal of Hematology & Oncology	262	30	10.1186/s13045-019-0778-6
9	Jiralerspong, 2016[25]	Obesity and Breast Cancer Prognosis: Evidence, Challenges, and Opportunities	Journal of Clinical Oncology	259	71	10.1200/JCO.2016.68.4480
10	Pierobon, 2013[26]	Obesity as a risk factor for triple-negative breast cancers: a systematic review and meta-analysis	Breast Cancer Research and Treatment	255	83	10.1007/s10549-012-2339-3

advanced lab management, and greater openness in the United States. Additionally, more researchers are entering this field, with prominent groups led by Hursting SD, Demark-Wahnefried W, Bandera EV, Dannenberg AJ, and Bernstein L. Noteworthy emerging keywords include "extracellular vesicles" and "cancer-associated fibroblasts" as study hotspots. Moreover, "breast cancer", "body mass index", "survival", and "physical activity" are key research hotspots in this field.

Hotspots and Emerging Frontiers of Research

Using the VOSviewer and Biblioshiny, we summarize hot spots and trends in research related to gynecological/breast cancers and overweight.

BMI and Gynecologic Cancer Risk

Obesity throughout life is influenced by several confounding factors. Recent research suggests a potential causal link between increased BMI and endometrial cancer risk, revealing how obesity influences its molecular mechanisms.[27] Soong et al found a positive correlation between BMI and peripheral inflammatory cells in breast cancer patients and
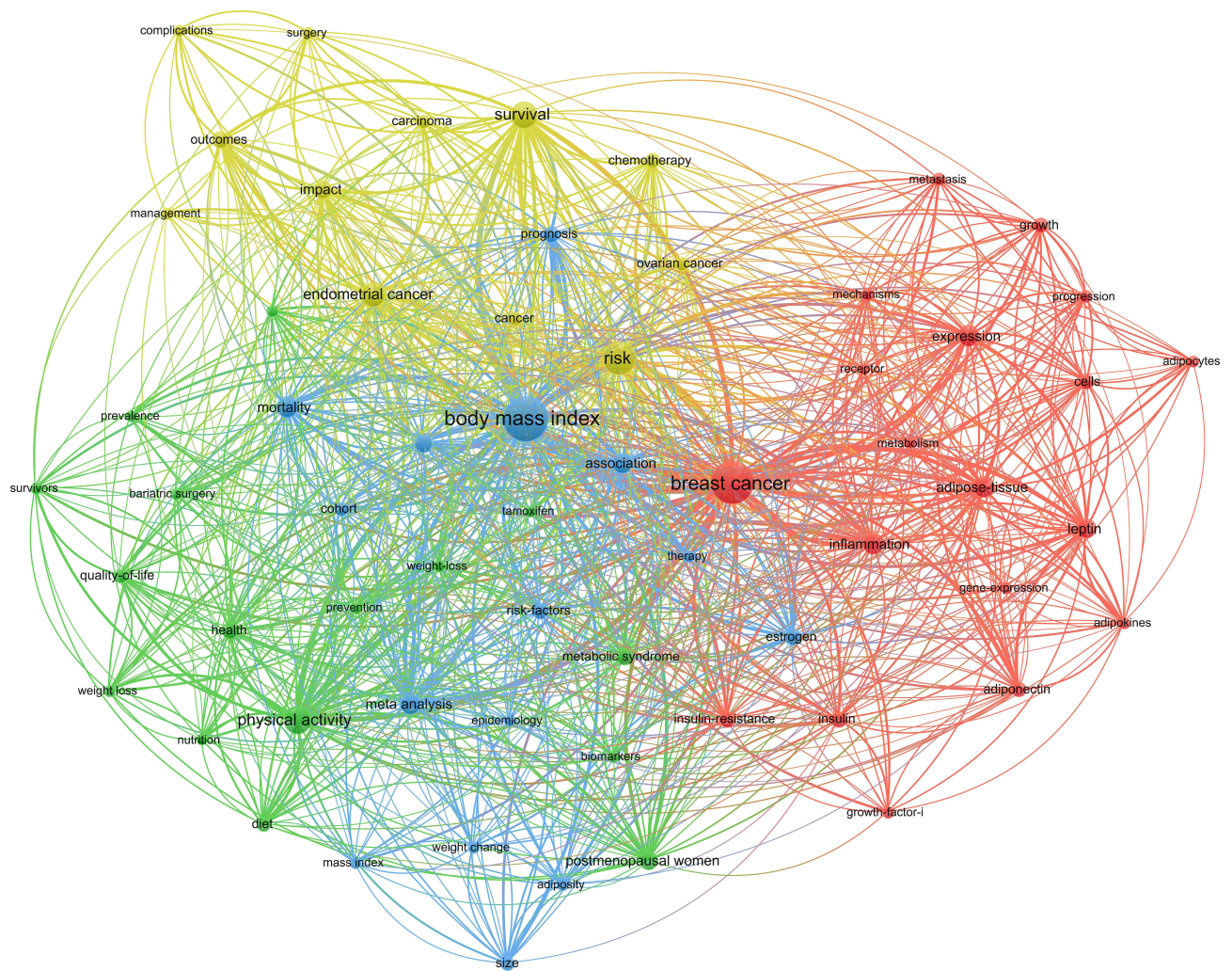
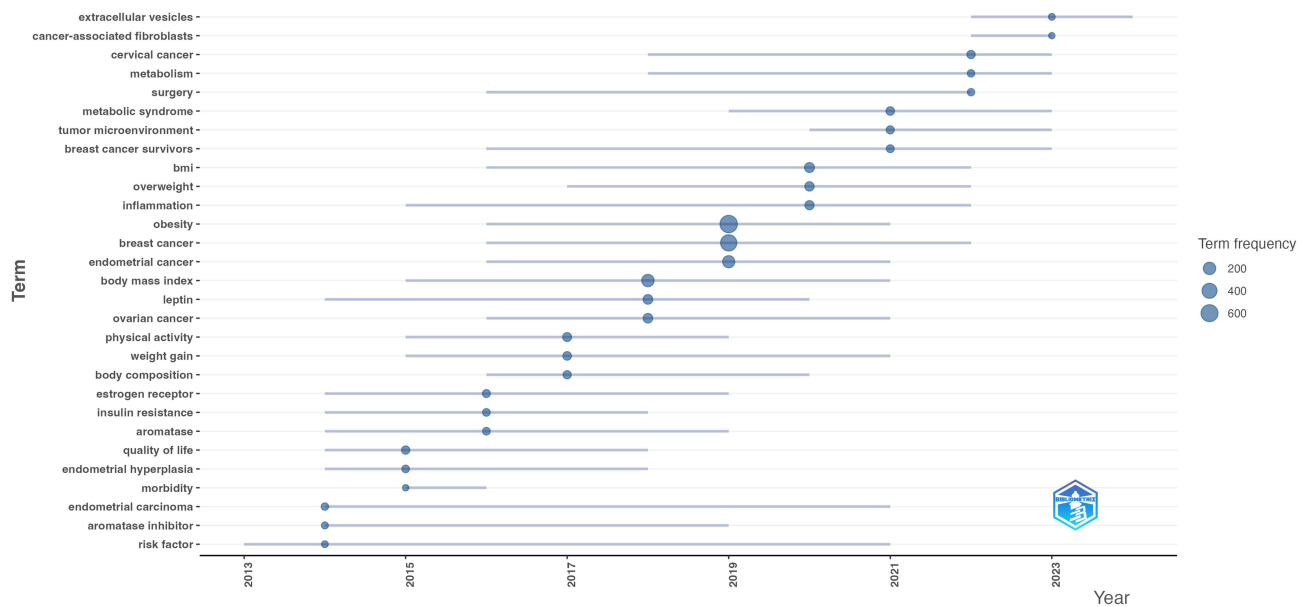**Figure 6** Keyword co-occurrence network clustering diagram.

Figure 7 Timeline of research trends in the field of gynecologic/breast cancer.

healthy women, but the opposite was observed for breast cancer prognosis.[28] Importantly, while there is an association between BMI and gynecological cancer risk, the results are inconsistent. A meta-analysis found that every 5-kg/m² increase in BMI during early life was associated with a 16% reduction in breast cancer risk, a 40% increase in endometrial cancer risk, and a 15% increase in ovarian cancer risk.[29] Moreover, while obesity is a risk factor for gynecological cancers, numerous studies show that assessing it solely based on BMI is not entirely accurate.[30–32] BMI does not account for body composition, but evaluating body composition through fat mass and lean mass provides a more comprehensive disease risk assessment.[33] Analysis of body composition has shown a link between high lean mass and cancer prevention, underscoring its importance as a treatment goal for cancer patients. Interestingly, individuals classified as "metabolically overfat" despite a lean phenotype may be more susceptible to disease than "metabolically healthy" individuals with an obese phenotype.[34,35] Kliemann et al proposed using metabolically defined body types for a better risk assessment, supporting our identification of body composition analysis as a promising research direction.[36]

Survival of Patients with Gynecological Cancer

Survival rates of women diagnosed with gynecological cancers, including breast, ovarian, and cervical cancer, have improved minimally over the past four decades.[37] While obesity is a risk factor for gynecological cancers, its impact on survival has not been firmly established. Various studies have shown that the timing and extent of changes in obesity-related measurements are linked to decreased survival in endometrial cancer survivors.[38] Myosteatosis has also been associated with decreased overall survival in gynecologic cancer patients.[39] Obesity is associated with reduced survival rates in various gynecological cancers, but this relationship may vary across different stages of the disease. For example, patients with localized disease may have lower survival rates, while those with advanced disease may experience higher survival rates.[40] Additionally, obesity increases the risk of postoperative complications after gynecologic cancer surgery.[41] Our review also aligns with prior findings indicating that obesity complicates postoperative outcomes and affects drug dosing and efficacy in cancer treatment.[42] Interestingly, one study suggested that obesity may have a protective effect on endometrial cancer, improving survival rates.[43] Additionally, certain drug interventions may affect the survival rates of gynecological cancers. Notably, obesity can affect the dosage of these interventions, though the relationship between weight-based dosing and patient survival remains unclear.[44] Aspirin use has been linked to endometrial cancer-specific survival, with low-dose aspirin showing a positive effect on survival rates, especially in individuals with obesity.[45] Additionally, body size progression from childhood to adulthood has a lasting impact on breast cancer survival, requiring further investigation to fully understand this relationship.[46] Currently, many effective treatment approaches for gynecological cancer significantly reduce patient mortality risk. For obese gynecological cancer patients, surgery and weight loss can improve survival rates.[47] Beyond survival, quality of life is becoming an increasingly important consideration for gynecological cancer patients. Numerous studies show that obesity severity is closely linked to the quality of life in endometrial cancer survivors, with higher obesity levels associated with poorer quality of life.[48,49] Interventions focused on exercise, diet, and mental well-being have emerged as key strategies to improve quality of life.[50]

Physical Activity in Gynecological Cancer Survivors

Women experience a decline in metabolic health after menopause, and the rising prevalence of obesity further elevates the risk of breast cancer.[51] Many postmenopausal women actively seek alternative strategies to reduce their breast cancer risk. A study confirmed the protective link between physical activity and breast cancer risk in both pre- and post-menopausal women.[52] A randomized clinical trial from the Women's Health Initiative involving 68,132 postmenopausal women showed a reduced risk of benign proliferative epithelial breast disease in those who engaged in physical activity for four years, compared to inactive women.[53] Recent research suggests that a synergistic effect between leisure-time physical activity and BMI could further reduce the risk of ovarian and endometrial cancer.[54] A study on breast cancer revealed that physical activity positively influences the prognosis of postmenopausal breast cancer survivors.[55] Additionally, engaging in at least 300 minutes of moderate-intensity physical activity per week is estimated to reduce the incidence of breast and endometrial cancers by about 2% in women.[56] The American Cancer Society's Nutrition and Physical Activity Guidelines for Cancer Survivors recommend 150–300 minutes of moderate activity or 75–150 minutes

of high activity per week, following the "more active, less sedentary" approach.[57] This highlights the potential for exploring various physical activities as cancer prevention strategies in future research. Women who followed international physical activity guidelines had a significantly reduced risk of all types of breast cancer compared to inactive women, confirming the protective effect of physical activity in reducing breast cancer risk.[58] The precise mechanisms by which physical activity influences gynecologic cancer progression have not been fully explored, but they appear to involve factors like oxidative stress, inflammation, insulin, or glucose metabolism.[59,60] Given the numerous health benefits of physical activity, it is crucial to encourage postmenopausal women to follow regular physical activity guidelines. However, assessing individual needs and physical conditions is essential for designing personalized exercise programs that include a variety of exercises. In cancer rehabilitation, aerobic exercise, resistance training, and strength training have proven to be effective.[61] Additionally, gynecological cancer patients can benefit from high-intensity interval training and endurance training.[62,63]

Adipose-Tissue Inflammation

Inflammation in adipose tissue has become a prominent research focus in recent years. Obesity promotes gynecologic tumor development by inducing adipose tissue inflammation. Weight gain and obesity alter anti-inflammatory cytokines, promote crown-like structure formation by adipose macrophages, suppress T cell activation, and lead to persistent adipose tissue leukocytosis, fostering chronic inflammation. These changes in the adipose tissue microenvironment significantly impact tumor evolution and disease progression. Inflammatory changes in adipose tissue increase autotaxin (ATX) levels in obese individuals, and breast tumors induce ATX transcription in nearby adipose tissue, explaining the link between obesity and breast cancer.[64] The link between obesity, inflammation, and gynecologic tumor progression is well-established, but the precise mechanism remains unclear. A keyword co-occurrence network analysis shows that leptin and adiponectin expression is closely linked to adipose tissue inflammation. Leptin, an inflammatory mediator involved in obesity-related immune metabolic disorders, influences cancer risk, prognosis, and progression. The mechanism likely involves LEPR activation of PI3K, ERK1/2, and Jak2/Stat3 signaling pathways.[65] In contrast, adiponectin exhibits anti-inflammatory and antiproliferative effects, but its levels are significantly reduced in obese individuals. Low adiponectin levels are linked to an increased risk of endometrial cancer, potentially contributing to a poor prognosis.[66] A nested case-control study showed that modulating leptin and adiponectin levels could reduce breast cancer risk in premenopausal women, while the effect of inflammation on breast cancer risk in postmenopausal women was influenced by obesity.[67] These findings suggest that the adiponectin-leptin ratio is a valuable biomarker of adipose tissue inflammation, and increasing this ratio may help prevent gynecological tumors and reduce cancer risk.[68] Additionally, obesity-induced chronic inflammation increases the likelihood of breast cancer metastasis and recurrence. Targeting the SphK1/S1P/S1PR1 axis may help combat obesity-induced tumor progression and inflammation.[69] Obesity-related inflammation is associated with a poor prognosis in breast cancer. However, interventions targeting adipose tissue inflammation in obese postmenopausal breast cancer survivors may reduce cancer recurrence.[70]

Remote Weight Loss Intervention for Cancer Survivors

Weight loss interventions for gynecological cancers have gained significant attention recently. A study revealed that 91.4% of obese and overweight breast cancer survivors were willing to accept a weight loss program after recognizing the dangers of obesity.[71] Importantly, weight loss showed a positive correlation with the quality of life in cancer survivors. Remote weight loss interventions in obese or overweight breast cancer survivors significantly improved metabolic syndrome risk and quality of life.[72] Effective weight management is crucial for overweight or obese breast cancer survivors, and weight loss methods can yield varying outcomes. Interventions involving diet, exercise, and psychosocial support are important, and further research is needed to determine the most effective weight loss intervention.[73] Most long-term endometrial cancer survivors are dissatisfied with their weight, and over half use multiple weight loss methods annually.[74] Recently, remote weight loss interventions have gained popularity due to factors such as the COVID-19 pandemic and economic considerations.[75] Internet-based weight-loss programs are believed to influence weight control to some extent.[76] However, a text-message-based weight loss trial showed that remote weight loss interventions failed to achieve weight loss in obese endometrial cancer survivors.[77] Ongoing studies are investigating

the relationship between bariatric surgery and obesity-related cancers in adults. Although bariatric surgery involves inherent risks, it is linked to reduced risks and mortality rates in breast, ovarian, and uterine cancer. Therefore, obese or overweight patients should be empowered to make informed decisions about their suitability for surgery.[78,79]

Extracellular Vesicles and Cancer-Associated Fibroblasts

Extracellular vesicles (EVs) and cancer-associated fibroblasts (CAFs) have drawn growing attention in gynecological and breast cancer research due to their critical roles in the tumor microenvironment, influencing cancer progression, treatment response, and metastasis.[80,81] EVs act as primary communication mediators between cancer cells and their surrounding environment, transporting proteins, RNA, DNA, and other molecules that regulate tumor biology. In gynecological and breast cancers, EVs promote cancer cell proliferation, invasion, and metastasis while inducing epithelial-mesenchymal transition, a critical step for cells to gain invasive and metastatic traits.[82] Additionally, EVs aid tumor cells in evading immune recognition by influencing immune escape mechanisms, complicating treatment.[83] EVs are increasingly recognized as biomarkers for early detection and predicting therapeutic response, offering a tool for personalized treatment. CAFs are crucial components of the tumor microenvironment. They support tumor growth, angiogenesis, and drug resistance by secreting pro-inflammatory cytokines, stromal remodeling factors, and growth factors. Studies show that CAFs accelerate cancer cell metastasis by remodeling the tumor stroma and promoting immunosuppression.[84] Furthermore, the interaction between CAFs and cancer cells enhances tumor resistance to chemotherapy and immunotherapy.[85] Targeted therapies against CAFs are emerging as a research focus, aiming to disrupt the tumor microenvironment's support for cancer growth and drug resistance.

This study has several limitations, including the restriction to studies published since 2013, which may have resulted in omissions. The search was limited to the WOSCC database due to software constraints, and only English-language studies were included in the analysis. Consequently, the data may not fully represent findings from other databases.

Conclusions

This study analyzed the research field of overweight and gynecologic/breast cancer in women, focusing on identifying the most prominent authors, journals, institutions, and countries. The study revealed that BMI, survival rates, and physical activity are key areas of interest in this field. Future studies should explore the specific mechanisms linking gynecologic/breast cancer and overweight, including interactions between different mechanisms. Additionally, weight loss interventions should remain a central focus of research in this area.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article and its supplementary information files.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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