Closing the gender gap in the authorship of hematology/oncology-related randomized controlled trials requires inclusive effort from male and female senior researchers

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Research Article

Keywords: cancer, research, gender disparity, race, education

Posted Date: November 21st, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3628199/v1

Additional Declarations: No competing interests reported.

Abstract

Importance: Severe gender gap in academic research output is pervasive across all medical specialties, including hematology and oncology.

Objective: This bibliometric study aimed to investigate the representation of females in premier first and last authorship positions of hematology- and oncology-related randomized controlled trials (RCTs) published between 2000–2022. Additionally, we investigated the trend of females in first authorship positions with a male or female senior author.

Design: Bibliometric analysis of clinically oriented hematology and oncology RCTs published between 2000 and 2022 across all PubMed-indexed journals.

Participants: First and last authors of 5,891 hematology- and oncology-related RCTs.

Main Outcomes: Change in the proportion of female first and senior authors and the proportion of RCTs with the same and cross-gender dyads of first and senior authors.

Results: 5,891 RCTs were available with identifiable gender of first and senior authors. A total of 49 countries and 62 journals were represented in our study sample. The proportion of females in our study population was 22.9% (n = 1,349) in the first authorship and 17.5% (n = 1,032) in the senior authorship positions and were predominantly affiliated with institutions in high-income countries (94.1%, n = 1,270 and 95.3%, n = 984). We also noted a significant upward trend in the percentage of female authors in the first authorship position (16.3% in 2000 to 32.4% in 2022, $p = 0.001$) between 2000 and 2022; the trend was stronger with male than female senior authors. However, the odds of the females in the first authorship position with a female senior author were significantly higher only when both authors came from high-income countries [OR = 1.702 (95%CI 1.461–1.984; $p < 0.0001$]. The proportion of female senior authors remained stable during the study period.

Conclusions and Relevance: Despite early trends in closing the gender gap in the authorship of hematology- and oncology-related RCTs, females remain severely underrepresented in premier authorship positions. The increasing proportion of female authors in the first authorship position with a male senior author indicated that a more inclusive effort to train, mentor, and encourage young female physician-scientists with the involvement of senior male and female researchers will likely accelerate the overall increase in female authorship.

Key points

Question: Are we close to achieving gender parity in the authorship of clinically oriented hematology and oncology research?

Findings: We also noted a significant upward trend in the percentage of female authors between 2000 and 2022, but only in the first authorship position. The increase in female first authors was primarily

driven by RCTs with a male senior author.

Meaning: A more inclusive effort involving both senior male and female researchers is required to accelerate the overall increase in female authorship.

Introduction

Gender diversity in the research workforce fosters collaboration, expands research networks, drives scientific discovery and innovation, and can even help reduce gender disparity in recruiting clinical research participants.[1–3] However, several studies have highlighted severe gender disparities in medical research output[4,5] with the under-representation of females in the authorship of research articles[6,7], clinical case reports[8], clinical practice guidelines[9], invited commentaries[10], commissioned articles[11], as editorial boards of medical journals[12,13], an invitation to academic grand rounds as speakers[14], and in the receipt of recognition awards[15,16].

This gender gap is pervasive across all medical specialties[6], including hematology and oncology. Females comprise less than one-third of the authors in every article category (clinical trials, observational studies, systematic reviews, general reviews, or others, which include letters, correspondences, news, replies, comments, and editorials) and across all oncological disciplines (general, surgical, and radiation).[17] Even severe disproportionate representation of females (~ 20–25%) has also been reported in the authorship of hematology- and oncology-related conference speakership[18], U.S. National Comprehensive Cancer Network guideline panel members[19], or as editorial board members of sixty leading oncology journals.[20] Several hypotheses have been proposed to explain the gender gap in medical research output, including the "leaky pipeline" from medical school to senior academic positions, lower rate of promotion to associate professor, lower self-efficacy, gender norms, and discrimination.[21]

Several authors have underscored the need for better mentoring of female physician-scientists to achieve gender parity in the medical research workforce and output.[6,22–24] Some have even called for targeted interventions to increase the number of females in research leadership positions to act as mentors[24] due to strong gender concordance between first and senior authors.[25–30] While targeted interventions will be crucial to achieving gender parity in research leadership positions, the impact on the overall representation of females is likely to be slow due to the time required to mentor female physician-scientists into leadership positions who will, in turn, mentor more females physician-scientists. Additionally, the call for targeted intervention presumes that male researchers in leadership positions may not be optimal mentors for female physician-scientists. On the other hand, non-targeted intervention for senior male and female physician-scientists to mentor younger female researchers will allow for leveraging the predominant population of male physician-scientists, which will likely accelerate the representation of females across authorship roles. However, although there is ample research on gender concordance between the first and last authors, there is a paucity of data on the authorship trends in the gender-disconcordant first and last author dyads.

Therefore, this bibliometric study aimed to investigate the representation of females in premier first and last authorship positions of hematology- and oncology-related randomized controlled trials (RCTs) published over the past two decades. Additionally, we investigated the trend of females in first authorship positions with a male or female senior author. Finally, we conducted a sub-group analysis with same or cross-gender first and senior authors dyads affiliated to institutions in low, lower-middle, upper-middle, and high-income countries to identify potential associations between economic development as a proxy indicator for gender equality[31] and the increase in female-led RCTs. We specifically analyzed the authorship of RCTs as they are crucial in shaping clinical practice and informing the development of new therapies and authorship trends in the first and last positions, which are associated with better peer recognition and promotions.[32,33]

Methods

Study Design and Data Collection

This study comprehensively investigates authorship across all PubMed-indexed journals that published clinically oriented hematology and oncology RCTs between 2000 and 2022. The literature search was conducted using the easyPubMed package for R, version 4.3.0[34], and manual PubMed search using the following search phrase:

The following Medical Subject Headings (MeSH) search terms were used in the PubMed search: "hematology," "oncology," "randomised controlled trials," "authorship," "gender," and "race and health." Search strings were created to capture all relevant articles, combining terms with Boolean operators as follows: ((hematology OR oncology) AND (randomised controlled trials) AND (authorship) AND (gender OR race and health)). Filters for publication dates (01-01-2000 to 12- 31-2022) and language (English) were also applied.

Inclusion and Exclusion Criteria

All RCTs in the hematology and oncology disciplines published in English with identifiable gender of both first and senior authors were included for analysis. Duplicate publications and articles with missing/incomplete author information were excluded.

Data Extraction

Name, gender, race/ethnicity, education, and country of the affiliated institution of the first and last author were extracted using a standardized form. The publication year of the articles and the journal name were also extracted.

The gender and race/ethnicity of authors were determined through public profiles, author biographies, or direct email correspondence with the authors. When information was unavailable, we used an automated gender inference tool (gender API).

Two independent reviewers (S.C. and S.L.) conducted data extraction, and any discrepancies were resolved through discussion or consulting a third reviewer (R.K.).

Analysis

The country of the affiliated institution of the first and last author was categorized into low-income, lower middle-income, upper middle-income, and high-income countries based on the World Bank Income Classification.[35] For sub-group analysis, four groups of first and last author dyads were created based on gender concordance as follows: (i) both males, (ii) both females, (iii) male first author with a female last author, and (iv) female first author with a male last author. The data was further subdivided based on the income classification of the country of the author's affiliated institution. Trends were analyzed using simple linear regression and descriptive data presented as n (%). The odds ratio (OR) with a 95% confidence interval (95%CI) was calculated to determine the association between the gender of the first and last author. All analyses were performed using GraphPad Prism V9.0.0 for Windows (GraphPad Software, San Diego, California, U.S.), with a two-sided *p*-value of < 0.05 considered statistically significant.

Results

Our search yielded 5,954 hematology and oncology-related RCTs. The gender of the first or the senior author of 63 RCTs could not be confirmed. Therefore, the population sample for analysis comprised first and senior authors of 5,891 RCTs.

The majority of the first (85.0%, n = 5,009) and senior authors (85.7%, n = 5,049) in our study population were White; Asian authors comprised about 13% in both authorship positions (Table 1). Over two-thirds of the authors had an M.D. degree without a master's or Ph.D., and 22% had an M.D. with a Ph.D. in both authorship positions.

Table 1
Characteristics of the authors of hematology and oncology RCTs. All values are presented as n (%).

Variables	Overall (n = 5,891)		Female Authors	
	First Author	Senior Author	First Author (n = 1,349)	Senior Author (n = 1,032)
Race or ethnicity				
White	5,009 (85.0)	5,049 (85.7)	1,153 (85.5)	898 (87.0)
Asian	767 (13.0)	722 (12.3)	174 (12.9)	114 (11.0)
Hispanic	86 (1.5)	83 (1.4)	14 (1.0)	14 (1.4)
Black	18 (0.3)	27 (0.5)	6 (0.4)	5 (0.5)
Other	11 (0.2)	10 (0.2)	2 (0.1)	1 (0.1)
Education				
Master	12 (0.2)	19 (0.3)	7 (0.5)	9 (0.9)
Master, Ph.D.,	29 (0.5)	27 (0.5)	11 (0.8)	10 (1.0)
M.D.	3,960 (67.2)	3,975 (67.5)	851 (63.1)	673 (65.2)
M.D., Master	242 (4.1)	188 (3.2)	94 (7.0)	39 (3.8)
M.D., Master, Ph.D.	20 (0.3)	32 (0.5)	7 (0.5)	2 (0.2)
M.D., Ph.D.	1,299 (22.1)	1,333 (22.6)	240 (17.8)	210 (20.3)
Ph.D.	242 (4.1)	274 (4.7)	102 (7.6)	75 (7.3)
Other	31 (0.5)	23 (0.4)	15 (1.1)	10 (1.0)
N/A	56 (1.0)	20 (0.3)	22 (1.6)	4 (0.4)
Country of Affiliated Institution (World Bank Income Classification)*				
Low income	0 (0.0)	1 (0.0)	0 (0.0)	0 (0.0)
Lower middle income	31 (0.5)	27 (0.5)	8 (0.6)	4 (0.4)
Upper middle income	235 (4.0)	235 (4.0)	71 (5.3)	44 (4.3)
High income	5625 (95.5)	5628 (95.5)	1270 (94.1)	984 (95.3)
Top 10 Journals based on Publication Count#				
Ann Oncol	950 (16.1)	950 (16.1)	200 (14.8)	161 (15.6)
Haematologica	134 (2.3)	134 (2.3)	41 (3.0)	25 (2.4)

Variables	Overall (n = 5,891)		Female Authors	
	First Author	Senior Author	First Author (n = 1,349)	Senior Author (n = 1,032)
Race or ethnicity				
J Clin Oncol	2,057 (34.9)	2,057 (34.9)	491 (36.4)	371 (35.9)
J Natl Cancer Inst	177 (3.0)	177 (3.0)	47 (3.5)	34 (3.3)
J Thorac Oncol	219 (3.7)	219 (3.7)	47 (3.5)	38 (3.7)
JAMA Oncol	126 (2.1)	126 (2.1)	30 (2.2)	20 (1.9)
Lancet	215 (3.6)	215 (3.6)	38 (2.8)	34 (3.3)
Lancet Oncol	610 (10.4)	610 (10.4)	133 (9.9)	112 (10.9)
Leukemia	148 (2.5)	148 (2.5)	28 (2.1)	23 (2.2)
N Engl J Med	413 (7.0)	413 (7.0)	75 (5.6)	67 (6.5)

*First authors represented 30 high-income, nine upper-middle-income, and seven lower-middle-income countries. Senior authors represented 32 high-income, 11 upper-middle-income, five lower-middle-income, and one low-income country.

[#] RCTs meeting our inclusion criteria were published in 62 journals, 85.7% of which were published in 10 journals. Country and Journal-level datasets are presented in **Supplementary Tables 1 and 2**

A total of 49 countries were represented in our study sample. Authors in both authorship positions were predominantly (95.5%) affiliated with institutions in high-income countries (Table 1). At the country level, the majority of first and senior authors were affiliated with institutions in the U.S. (35.1%, n = 2069 and 36.3%, n = 2140), Germany (8.8%, n = 518 and 9.2%, n = 540), U.K. (8.7%, n = 512 and 8.4%, n = 494), and France (8.5%, n = 503 and 8.2%, n = 485). Complete data for authorship distribution at the country level is presented in **Supplementary Table 1**.

Although our overall sample included RCTs published in 62 journals, 85.7% of the RCTs were published in just ten journals: J Clin Oncol (34.9%, n = 2,057), Ann Oncol (16.1%, n = 950), Lancet Oncol (10.4%, n = 610), N Engl J Med (7%, n = 413), J Thorac Oncol (3.7%, n = 219), Lancet (3.6%, n = 215), J Natl Cancer Inst (3%, n = 177), Leukemia (2.5%, n = 148), Haematologica (2.3%, n = 134), and JAMA Oncol (2.1%, n = 126) (Table 1). Author distribution for all 62 journals is presented in **Supplementary Table 2**.

Representation of females in first and senior authorship positions

The proportion of females in our study population was 22.9% (n = 1,349) in the first authorship and 17.5% (n = 1,032) in the senior authorship positions (Table 1). Like the overall study population, females in first

(85.5%, n = 1,153) and senior (87.0%, n = 898) authorship positions were predominantly White, held an M.D. degree without master's or Ph.D. (63.1%, n = 851 and 65.2%, n = 673), and were affiliated with institutions in high-income countries (94.1%, n = 1,270 and 95.3%, n = 984) (Table 1). Most female first authors in our study population were affiliated with institutions in the U.S. (24%, n = 496), followed by the Netherlands (40.3%, n = 108), France (19.9%, n = 100), Italy (23.4%, n = 98), and U.K. (18.8%, n = 96) (**Supplementary Table 1).** Female senior authors were most commonly affiliated with institutions in the U.S. (19.7%, n = 422), U.K. (17.2%, n = 85), France (15.3%, n = 74), Germany (11.5%, n = 62), and Italy (15%, n = 60) (**Supplementary Table 1)**. The top 10 journals accounted for 83.4% of RCTs with females in the first authorship position and 85.7% with females in the senior authorship position (Table 1).

We also noted a significant upward trend in the percentage of female authors between 2000 and 2022, but only in the first authorship position (16.3% in 2000 to 32.4% in 2022, $p = 0.001$; Fig. 1A).

Trends based on the gender of the first and senior author

Nearly two-thirds (64.9%, n = 3,825) of the RCTs in our study sample had males in both first and senior authorship positions, 17.5% (n = 1,034) had a female first author with a male senior author, 12.1% (n = 717) had a male first author with a female senior author, and 5.3% (n = 315) had females in both first and senior authorship positions.

However, there was a significant decline in the percentage of RCTs with males in both first and senior authorship positions, while the percentage of RCTs with a female in the first authorship position and a male senior author increased significantly between 2000 and 2022 ($p = 0.0025$ and 0.0009; Fig. 1B). There was a small but significant increase in the percentage of RCTs with females in both first and senior authorship positions ($p = 0.0014$). In contrast, the percentage of RCTs with a male in the first authorship position and a female in the senior position remained unchanged (Fig. 1B).

Trends based on the gender of the authors and the income classification of the country of their affiliated institution

In 97.8% of the included RCTs, the first and senior authors were affiliated with institutions in countries with matching World Bank income classification. However, most author dyads were from high-income countries (94.4%), followed by upper-middle (3.1%) and lower-middle (0.3%) income countries. There were no author dyads from low-income countries.

Two-thirds of the RCTs with males in first and senior authorship positions were from lower-middle and high-income countries. In contrast, only half of the RCTs from upper-middle-income countries had males in first and senior authorship positions (Fig. 2A). Although the percentage of RCTs with females in both first and senior authorship positions was highest in high-income countries (5.4%; n = 302), the percentage of RCTs with First Female-Senior Male (29.5%, n = 54) and First Male-Senior Female (15.8%, n = 29) dyads were highest in upper-middle-income countries (Fig. 2A). As a result, the odds of the females in the first authorship position with a female senior author were significantly higher when both authors came from

high-income countries [OR = 1.702 (95%CI 1.461–1.984; $p < 0.0001$]. Although the odds of females in the first authorship position with a male senior author when both authors came from upper-middle-income countries was numerically higher, it did not reach statistical significance [OR = 2.406 (95%CI 1.004–6.278; $p = 0.0512$].

In 68 RCTs (1.2% of the included RCTs), the first author was affiliated with institutions in countries with a lower income classification than the senior author; in all instances, the senior author was from a high-income country. The percentage of the RCTs with the First Female-Senior Male dyad was higher when the first author was affiliated with an institution in a lower-middle income country (26.7%, n = 4) compared to when affiliated to an institution in an upper-middle income country (15.4%, n = 8). At the same time, the First Male-Senior female dyad was more common when the first author was affiliated with an institution in an upper-middle income country (6.7%, n = 1 vs. 15.8%, n = 29) (Fig. 2B). However, the odds of females in the first authorship position with a female senior author when the first author was affiliated to an institution lower income country than the senior author was insignificant [OR = 1.333 (95%CI 0.2478–6.617; $p = 0.66$].

In the remaining 62 RCTs (1.1% of the included RCTs), the first author was affiliated with institutions in countries with a higher income classification (in all instances, a high-income country) than the senior author. In these RCTs, the dyad of male first and male senior authors was most common (69.4%, n = 43), followed by dyads of First Female-Senior Male (12.9%, n = 8), First Male-Senior Female (11.3%, n = 7), and both females (6.5%, n = 4) authors (Fig. 2B). However, the odds of females in the first authorship position with a female senior author when the first author was affiliated to an institution higher income country than the senior author was insignificant [OR = 3.071 (95%CI 0.8325–11.29; $p = 0.19$].

Trends based on the gender of the authors in the top ten journals

While the dyad of male first and male senior authors was predominant in all ten journals, J Natl Cancer Inst (61%, n = 108) and Haematologica (61.2%, n = 82) had the lower percentage of males in both authorship positions followed by J Clin Oncol (63.7%, n = 1311), JAMA Oncol (65.1%, n = 82), J Thorac Oncol (65.3%, n = 143), Ann Oncol (65.6%, n = 623), Lancet Oncol (65.9%, n = 402), Leukemia (68.9%, n = 102), N Engl J Med (69.5%, n = 287), and Lancet (70.7%, n = 152) (Fig. 3).

Interestingly, even though the top 10 journals also accounted for the majority of females in the first and senior authorship positions, the bottom 52 journals had even greater odds of a female in the first authorship position with a female senior author [OR = 2.084 (95%CI 1.427–3.041; $p = 0.0002$] than the top ten journals [OR = 1.553 (95%CI 1.320–1.828; $p < 0.0001$].

Discussion

This bibliometric study demonstrates that Male, White racial background, M.D. (without a Ph.D.), and affiliation with institutions in high-income countries dominated the first and senior authorship positions

of hematology and oncology RCTs. Similar racial, educational, and affiliation trends were noted in the sub-population of female first and senior authors. Nevertheless, our analysis reveals early trends in diminishing the gender gap with a significant increase in the percentage of female authorship in the past decade but only in the first authorship position.

These findings are broadly consistent with previous studies. Hornstein et al.[36] showed an increase in female first authors from 15.8% in 2015 to 51.3% in 2020 and female senior authors from 25.5–53.8%, albeit inclusive of all article types (original reports, special articles, reviews, commentaries, case reports and editorials) published in a single journal (Journal of Clinical Oncology Global Oncology). Additionally, the study showed a higher proportion of female first authors than males in high-income (47.2% vs. 40.6%) and upper-middle-income (47.6% vs. 41.3%) countries.[36] Similarly, Bernard et al.[37] performed a bibliometric analysis of two journals (European Radiology and Cardiovascular and Interventional Radiology) and showed a significant increase in female representation but only in European Radiology from 22–35% among first authors and 13–18% among last authors between 2002 and 2016. The study also observed a higher proportion of female first authors (41% vs. 21%) with a female last author than a male last author. In another study, Dalal et al.[38] showed an increase in female representation in first (17.7–36.6%) and senior (11.7–28.5%) between 1990 and 2017. However, none of these studies selectively include RCTs.

We identified only two studies that analyzed authorship trends in hematology and oncology-related RCTs. Yalamanchali et al.[17] showed an increase in female authorship (any position) from 27.5–32.1% in general oncology-related clinical trials, from 24.9–33.2% in radiation oncology-related clinical trials and from 23.3–29% in surgical oncology-related clinical trials between 2002–2004 and 2016–2018 with lower odds of a female senior author than first authors in all three disciplines. Ludmir et al.[39] analyzed female representation as corresponding authors of oncologic phase 3 RCTs between 2003 and 2019. Only 17.9 of the 589 trials had a female corresponding author, all in radiotherapy and supportive care trials, with no corresponding authors for surgical trials.[39] Additionally, we identified a meeting abstract that reported a significantly lower proportion of females in first (3.2% vs. 6.3%), senior (3.3% vs. 6.0%), or corresponding (2.5% vs. 5.8%) authorship positions.[40] This meeting abstract also noted higher female authorship (any position) among non-randomized than randomized (30.4% vs. 26.5%) and phase 1/2 trials than phase 3 (29.9% vs. 26.3%) trials.[40]

The low representation of females in authorships persists despite the increase in female trainees and full-time faculty in hematology and oncology. For example, the proportion of hematology-oncology trainees and faculty was about 45% and 40% in 2015 in the U.S.[41] In our sample, female representation in all the RCTs published in 2015 by first authors affiliated with institutions in the U.S. was only 15.4% (8/52); the corresponding number for the senior authorship position was 22.7% (10/44). More recently, Chowdhary et al.[42] reported 35.9% female representation among hematology and oncology faculties in the U.S. in 2018/2019. In our sample, females comprised 27.5% in the first authorship and 21.8% in the senior authorship position among RCTs with U.S.-affiliated authors published in 2019. Surveys of oncologists

indicated that a sizable proportion (64.2%) of female oncologists cite work and family balance as the biggest challenge to progressing into leadership positions.[43]

An interesting and novel finding of the current study is that the increase in female first authors was primarily driven by RCTs with a male senior author. Although the percentages of RCTs with both female authors have also significantly increased during the study period, the growth is relatively minor compared to RCTs with a male senior author. An earlier study also suggested that the cross-gender author dyads of abstracts selected for presentations at the American Society for Radiation Oncology annual meeting were more likely to publish in high-impact journals than male-male or female-female dyads in due course.[44] It should be noted that although we presume the senior author to act as the mentor, it is hard to assess if co-authorship reflects mentorship or collaboration.

Furthermore, RCTs with Female First-Male senior authors were more common when both authors were affiliated with institutions in upper-middle-income countries than any other income classification. In contrast, female in both authorship position was more common when both authors were affiliated with institutions in high-income countries. However, the odds of female first authorship were higher with a female senior author due to the predominance of RCTs where both first and senior authors were males.

Several programs such as Duke Engaging Mentorship for the Promotion of Women in Oncology Research[38], the Women in Hematology Working Group of the American Society of Hematology[45], and Pan African Women's Association of Surgeons (PAWAS) mentorship program[46] have emerged to support the career development of female physician-scientists. However, there is a dearth of programs to counsel, educate, and encourage senior male physician-scientists to mentor and promote the career advancement of female physician-scientists. Our data warrants the development of such programs to accelerate the representation of females in premier authorship positions in hematology-oncology RCTs. The implication of increasing female representation extends well beyond achieving gender parity in the hematology-oncology workforce. It may also help achieve gender parity while recruiting cancer clinical trial participants[3], which is another gender-related problem persistent in hematology-oncology clinical trials.[47]

Limitations

This study has some limitations. First, there is an inherent risk for gender misclassification due to global variation in naming practices and gender-neutral names, even though we tried to mitigate this risk by using a gender detection tool (Gender API) with the lowest risk of misclassification (< 2%).[48] We also excluded authors with indeterminate genders from the analysis. Moreover, the use of male or female binary excludes non-binary, trans, and non-conformity genders. Second, we could not assess if a small proportion of authors had a disproportionately high publication rate due to methodological challenges and need to be explored in future bibliometric studies with a well-validated methodology. Finally, we did not assess the citation counts of male versus female authors in premier authorship positions as this study focused on gender representation and not impact. However, as a proxy for clinical relevance and

impact of the research, citation count may be a significant determinant of promotions, funding success, and greater research opportunities.

Conclusion

Despite early trends in closing the gender gap in the authorship of hematology- and oncology-related RCTs, females remain severely underrepresented in premier authorship positions. The increasing proportion of female authors in the first authorship position with a male senior author is promising. A more inclusive effort to train, mentor, and encourage young female physician-scientists with the involvement of senior male and female researchers will likely accelerate the overall increase in female authorship.

Declarations

Ethics statement: Ethical approval was not sought for this study as it involved a bibliometric analysis using publicly available data.

Conflicts of interest: The authors declare no conflicts of interest.

Source of Funding: This study did not receive any research funding.

Ethics approval and consent to participate: Not applicable.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Authors' contributions: **Roopa Kumari:** Formulated the initial research question, conceptualized the study, and drafted the primary manuscript.

Sindhu Luhana: Literature search, managed data extraction, performed data analysis, contributed to data acquisition, and drafting the initial manuscript.

FNU Sadarat: Literature search and data extraction, formation of tables and figures in primary manuscript.

Om Parkash: Analysis of the data and data interpretation.

Zubair Rahaman, Hong Yu Wong: Reviewed the draft for correction of grammatical errors and refining the overall clarity of the content.

FNU Kiran: Concentrated on the organization and presentation aspects of the manuscript.

Subhash Chander: Conceptualizing the study, providing overarching supervision and mentorship throughout the research process.

Acknowledgements: Not applicable.

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Supplementary Tables 1-2

Supplementary Tables 1-2 are not available with this version.

Figures

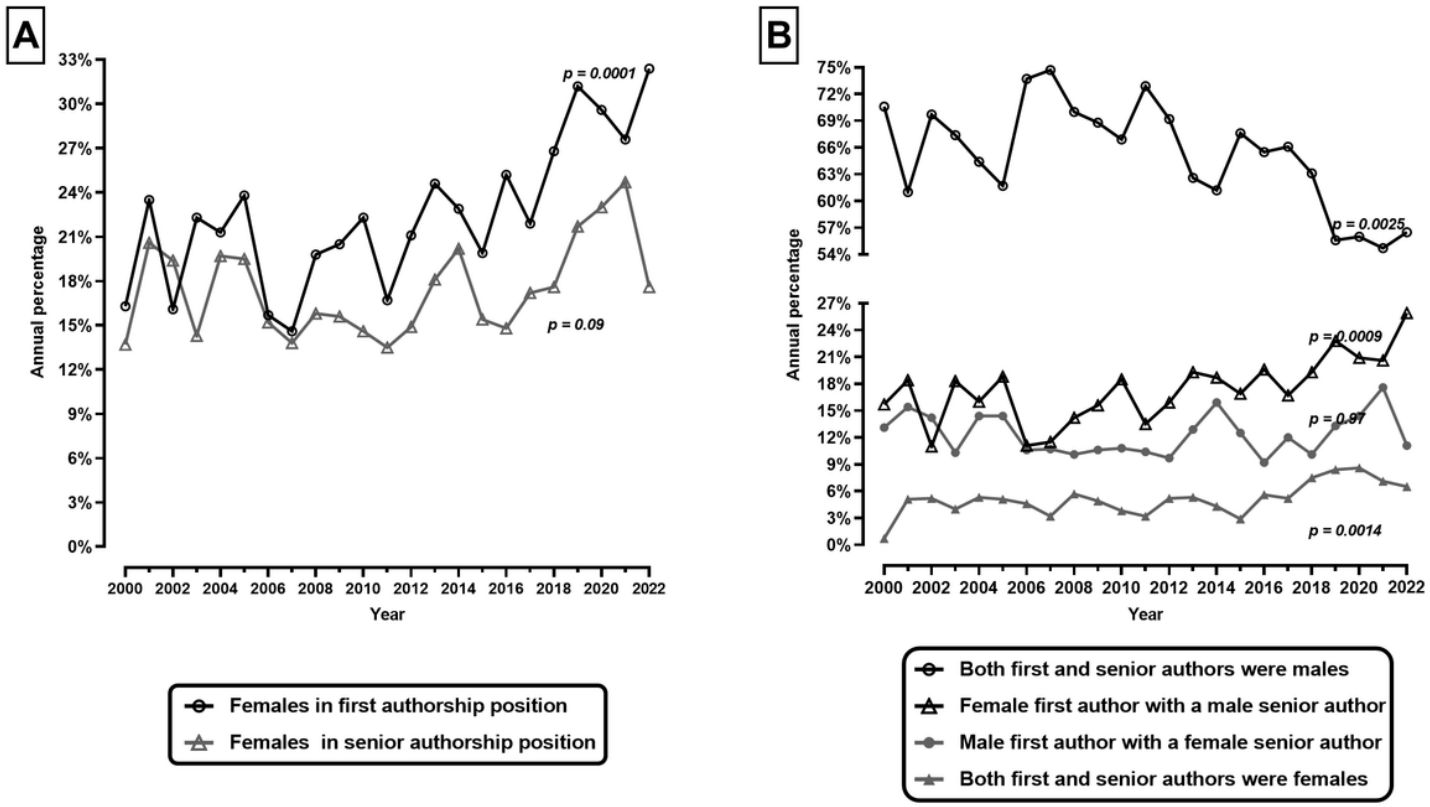

Figure 1

(A) Change in the proportion of females in the first and senior authorship positions of hematology and oncology RCTs published between 2000 and 2022. ***(B)*** Change in the proportion of first authors relative to the gender of the senior authors in hematology and oncology RCTs published between 2000 and 2022.

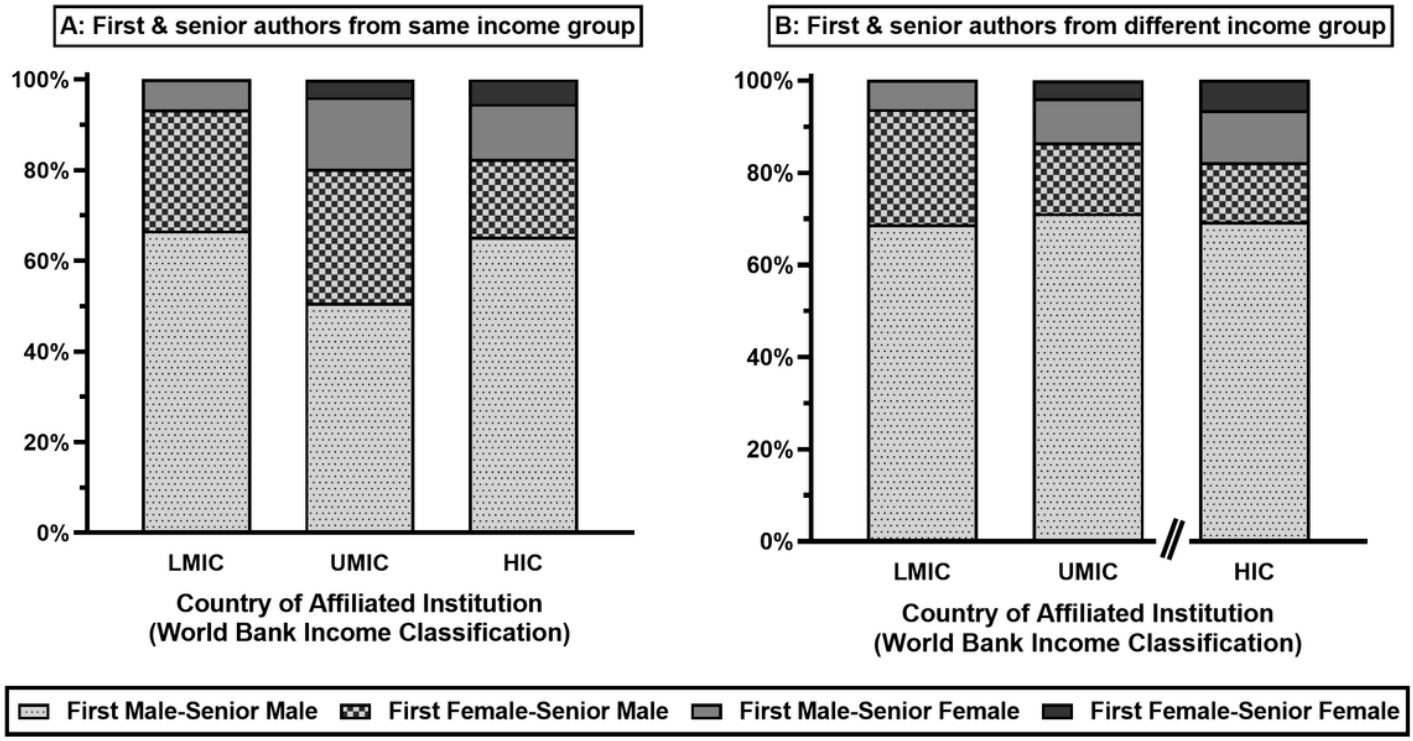

Figure 2

(***A***) Sub-group analysis with same and cross-gender first and senior authors dyads affiliated to institutions in lower-middle (LMIC), upper-middle (UMIC), and high-income countries (HIC). There were no dyads from low-income countries (LIC). (***B***) In 1.2% of the RCTs, the first author was affiliated with institutions in LMIC or UMIC, while the senior author was affiliated with institutions in HIC. In another 1.1% of RCTs, the first author was affiliated with institutions in HIC, while the senior author was affiliated with institutions in LIC, LMIC, or UMIC.

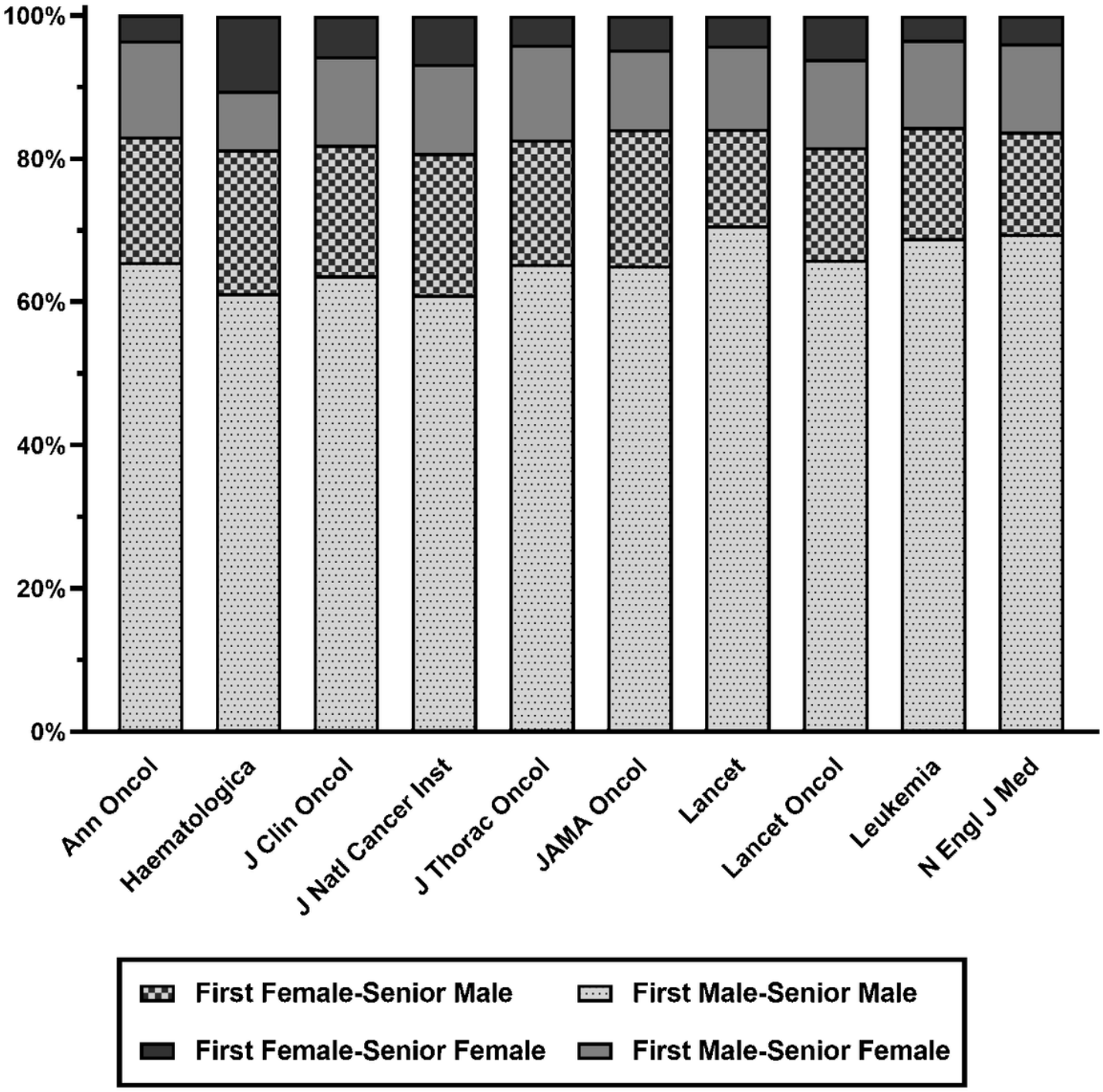

Figure 3

Distribution of same and cross-gender first and senior authors dyads among the top ten journals in terms of the number of hematology and oncology RCTs published between 2000 and 2022.