Authorship trends in urology literature: A bibliometric analysis by gender

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ABSTRACT

Introduction: The increasing entry of women into urology underscores the need to evaluate academic representation and characterize ongoing disparities within the specialty. This study provides a comprehensive global assessment of gender representation in urologic literature over time by study design, journal type, and geographic region.
Methods: All PubMed database abstracts under "Urology"[MeSH] or "Urology" (January 2002 to January 2024) were evaluated. Authorship position, institutional affiliation country, and journal name were extracted. Descriptive statistics and inferential tests were performed to assess gender-based differences in publication characteristics through validated name-to-gender matching tools.
Results: A total of 130 621 publications comprising 885 343 author names were included, of which 21.7% were identified as women. The proportion of women authors increased significantly from 11.4% in 2002 to 26.3% in 2024 ($p<0.001$). Overall, the number of women in senior authorship positions (14.8%) remains lower than in first-authorship roles (21.6%). The lowest representation of overall women authors was from African institutions (15.3%), whereas

KEY MESSAGES

- Previous studies evaluating gender in urology authorship have been limited by small datasets, short timeframes, and a narrow scope. This study offers a comprehensive global analysis.
- Women remain underrepresented across all authorship roles, particularly in senior positions.
- Despite a steady increase in women authorship over time, disparities persist across all continents and study types, with the lowest representation of women reported in Africa and Asia.
- Across all article types, women authors were more likely to be first authors than senior authors, highlighting gaps in academic leadership.

the highest was from European institutions (27.3%). Women published less proportionally than men across all study designs, particularly in interventional research (18.5%) and case reports (17.2%). First and senior women authors had higher odds of publishing in predatory journals compared with non-predatory journals (adjusted odds ratio (AOR) 1.18, 95% confidence interval (CI): 1.12−1.24; AOR 1.21, 95% CI 1.14−1.28, respectively).
Conclusions: Despite progress, substantial gender disparities persist in authorship in urology research, particularly in senior authorship roles. This global bibliometric analysis highlights the need to better understand the barriers that limit female representation in urologic publications.

INTRODUCTION

Urology is a specialty with a significant predominance of men in independent practice.[1] In the United States, the proportion of women in Urology has increased over time. In 2024, women comprised only 1% of practicing urologists aged ≥65 years, yet nearly 22% of those younger than 45 years.[2] This trend also exists in academic Urology, as many studies have demonstrated a low but steadily increasing number of women authors in Urology journals.[3–5] Demonstrably, a study by Prunty et al. examined publications from ten primary Urology journals from 2002-2020 (n = 59,375).[6] They found that the overall percentage of women authors increased from 17.2% to 27.2%, first authorship from 15.2% to 28.5%, and senior authorship from 10.4% to 18.6%.[6]

Despite the steadily increasing representation of women in Urology authorship, women remain particularly underrepresented in senior and corresponding author roles.[7] Zillioux et al. examined five prominent Urology journals between 2012 and 2017, noting that despite the overall increase in women authorship in Urology, there was no increase in women senior authorship after controlling for journal and subspecialty.[5] Other studies, such as one by Demir et al., have even noted a steady decrease in the proportion of women as senior authors, from 7% (2004) to 2.5% (2019).[8] Moreover, there is an apparent gender disparity in authorship in higher-impact journals.[9]

Currently, there is no comprehensive evaluation of gender-based trends across Urology publications that accounts for geographical factors and compares peer-reviewed and predatory journals. Given the increasing number of women entering Urology, and recognizing that progress toward gender parity in academia may lag behind workforce changes, we hypothesize that gender inequities persist in authorship metrics within this field.

The objectives of this study are to examine temporal trends in gender disparities in Urology authorship, with subgroup analyses of first and senior-authorship roles. We also compared regional differences in Urology research output over time and examined gender differences in authorship in predatory journals.

METHODS

Data collection

In September 2024, all abstracts indexed in the PubMed database under “Urology” [MeSH] or “Urology” (2002-2024) were extracted. The year 2002 was selected as that was when PubMed began publishing full author names.[10] The metadata collected contained full author names and affiliations, as well as author order. The following study designs were included: original research articles, case reports, and reviews. Those labelled as comments, letters, biographies, autobiographies, retracted publications, and published errata were excluded.

Author information

In this study, author gender identity was inferred from names rather than self-identification. Accordingly, non-binary designations of clinicians and researchers are entirely excluded from these works. The forename of each author was extracted from the full names provided by PubMed. In instances where the forename consisted only of initials, the entries were excluded. Author gender was determined using the Python library gender-guesser.[11] Names classified as "andy" (androgynous) were merged with the "unknown" group. To further reduce the number of unidentified genders, a supplementary name-to-gender matching was performed using a publicly available database of first names and likely associated genders.[12] These two name-to-gender matching tools have been validated and are frequently cited in academic literature.[13–15] We have also manually verified the gender assignments provided by the tools. In cases where the gender remained unknown, they were excluded from the analysis.

As PubMed does not explicitly identify authors who share first or senior authorship, author positions were inferred from the database's sequential order. Authors who were the sole contributors to a publication were classified as first authors. To determine the country of affiliation for each contributing author, country names were extracted from the affiliation fields provided by PubMed. Records without identifiable country information were excluded. If an author had more than one affiliation, the first listed country of affiliation was considered.[7,16] Countries were then classified into five regions: North America, Europe, Asia (including Türkiye), Latin America, and Oceania.

Research study designs were categorized as observational, interventional, case studies, or reviews. When the study design was not explicitly stated, it was inferred from the title and abstract. Titles containing terms such as “review,” “systematic review,” or “meta-analysis” were classified as reviews. Observational studies were identified by the presence of key terms including: “observational,” “cohort,” “prospective,” “retrospective,” “cross-sectional,” “case-control,” “epidemiological,” “epidemiology,” “non-experimental,” “naturalistic,” “naturalistic observation,” “longitudinal,” and “survey”. Interventional studies were identified by terms such as: “interventional,” “experimental,” “randomized controlled trial,” “RCT,” “clinical trial,” “trial,” “controlled trial,” “randomization,” “blinded study,” “double-blind,” “placebo,” “pre-

post," "quasi-experimental," "intervention," and "efficacy". Studies for which the design could not be determined were categorized as "unclassified."

Journal information

To determine each journal's impact factor, the Scimago Journal Ranking (SJR) was used rather than the journal impact factor provided by Web of Science. The Web of Science database is incomplete, and the SJR has been used in previous studies.[17–19] The SJR was grouped into four quartiles. Journals ranked in the top 25%, top 25%-50%, top 50%-75%, and bottom 25% were classified into Q1, Q2, Q3, and Q4, respectively.[17,19] Journal predatory status was determined using a publicly available database, labelling journals in the dataset as "predatory" or "non-predatory."[20] A predatory journal is one that uses exploitative business models, such as charging the authors publication fees without thorough article assessment for legitimacy or providing editorial services.[20]

Statistical analysis

Descriptive statistics were used to describe the total number of publications and study designs, and to stratify by gender. Differences between categorical variables were tested using the chi-square test. A univariate linear regression was also used to examine the temporal trend in the proportions of men and women authors. Two independent multivariate binary logistic regression analyses were conducted to determine the association between each bibliometric measure (year of publication, region of affiliation, research design, SJR quartile, and predatory status) and authorship position. Year of publication was a continuous variable, while region of affiliation, research design, SJR quartile, and predatory status were categorical. The significance threshold was set to 0.05. All data importing and cleaning procedures were performed on Python, whereas analyses were conducted in R version 4.2.1.

RESULTS

Overview

The initial extraction yielded 320,822 publications from 1950 to 2025. After excluding studies published before 2002, 139,801 studies met the inclusion criteria based on article type. Papers with androgynous author names and unidentified gender were removed, resulting in a total of 130,621 publications with 885,343 forenames. Overall, there were 693,117 (78.3%) men authors and 192,226 (21.7%) women authors based on the tools used.

Senior and first authorship

Women were underrepresented in both senior and first authorship roles across all publication types. Of the 123,289 first authors, 26,565 (21.6%) were labelled as women and 96,724 (78.5%) were labelled as men. Similarly, of the 115,556 senior authors, 17,052 (14.8%) were labelled as women and 98,504 (85.2%) as men.

Temporal Trends

The estimated proportion of women authors increased from 11.4% in 2002 to 26.3% in 2024 ($p < 0.001$) (Figure 1). Correspondingly, the proportion of women first authors increased from 10.4% in 2002 to 28.0% in 2024 ($p < 0.001$), and women as senior authors increased from 8.2% in 2002 to 18.8% in 2024 ($p < 0.001$).

Research Study Design

A lower percentage of women authors were listed on interventional studies (18.5% overall; 18.7% first; 12.7% senior), observational studies (18.8% overall; 17.7% first; 11.6% senior), reviews (21.5% overall; 21.8% first; 14.3% senior), and case reports (17.2% overall; 18.2% first; 11.3% senior), compared to men **(Figure 2)**. Overall, there was a statistically significant difference between author gender and their research study design ($p < 0.001$).

Geographic Trends

In all the geographic areas assessed, there was a lower percentage of women authors compared to men authors. Europe had the highest percentages of women authors overall (27.3%) and senior women authors (17.7%), whereas Oceania had the highest percentage of women as first authors (29.6%) (Figure 3). Africa had the lowest representation of women across all types of authorship (15.3% overall; 13.1% first; 11.3% senior) (Figure 3). Overall, there was a statistically significant difference between author gender and their region of affiliation ($p < 0.001$).

Predatory Journal Status and SJR Quartile

Women authors were proportionally better represented in predatory journals (26.3% predatory vs 21.2% non-predatory) than men authors (73.7% predatory versus 78.8% non-predatory) (Figure 4). Among women in the overall and first-author groups, the largest proportion published in journals ranked SJR Q1 (22.3% and 22.2%, respectively) (Figure 5). In contrast, among women senior authors, the largest proportion published in SJR Q4 journals (16.8%) (Figure 5). Overall, there was a statistically significant difference between author gender and predatory journal/SJR status ($p < 0.001$).

Multivariable model analyses between authorship position and each bibliometric measure

The first model (first author as the dependent variable) was statistically significant ($\chi 2$ (df) = 77.66(8), $p < .001$), explaining 6.40% of the variance in first authorship (Nagelkerke pseudo-R2; Table 1). The second model (senior author as the dependent variable) was statistically significant ($\chi 2$(df) = 21.46(8), $p < .001$), explaining 3.37% of the variance in senior authorship (Nagelkerke pseudo R2; Table 1).

A one-unit increase in publication year was associated with a higher likelihood that a woman was the first or senior author. Compared to authors affiliated with institutions in North America, women authors affiliated with institutions in Europe had higher odds of being first or senior authors (adjusted odds ratio (AOR) = 1.14, 95% confidence interval (CI): 1.10 - 1.19; AOR = 1.06, 95% CI: 1.01-1.11, respectively). Women authors affiliated with institutions in

Asia and Africa had lower odds of being first (AOR = 0.52, 95% CI: 0.50 - 0.54; AOR = 0.45, 95% CI: 0.40 - 0.51, respectively) and senior authors (AOR = 0.65, 95% CI: 0.63 - 0.68; AOR = 0.64, 95% CI: 0.56 - 0.73, respectively). Women authors affiliated with institutions in Latin America had lower odds of being first authors (AOR = 0.74, 95% CI: 0.65-0.83).

First and senior women authors had higher odds of publishing in predatory journals than in non-predatory journals (AOR = 1.19, 95% CI: 1.13 - 1.25; AOR = 1.21, 95% CI: 1.15 - 1.29, respectively). Compared with reviews, women authors had higher odds of publishing case reports as first authors (AOR = 1.20, 95% CI: 1.06–1.34). As for SJR quartiles, women first authors had higher lower odds of publishing in Q3 journals compared to Q1 (AOR = 0.90, 95% CI: 0.86 - 0.95), though they had higher odds of publishing in Q2 (AOR = 1.09, 95% CI: 1.04 – 1.13) and Q4 (AOR = 1.29, 95% CI: 1.16 – 1.44) journals as senior authors.

DISCUSSION

The present global bibliometric analysis suggests that women are underrepresented in urology authorship, specifically in senior authorship roles. Though there was variation, there was a predominance of men in authorship across regions and study designs. Notably, women were better represented as authors in predatory journals than in non-predatory journals. Though women representation in clinical Urology and academia is improving over time, this study suggests that persistent inequities exist. This is a complex, systemic issue that needs to be quantified in order to identify and address barriers to the involvement of women in urological academic medicine.

The underrepresentation of women in senior and first-author roles is well documented in the literature, with women consistently holding fewer leadership positions in Urology. Prunty et al. examined variation in gender representation on the editorial boards of Urology journals and found a statistically significant relationship between the proportion of women editors and the overall proportion of women authors.[21] Despite considerable growth in mid-level editor positions, there was no increase in women's representation among consulting editors, and no women served as Editor-in-Chief for the included journals.[21] Burg et al. conducted a similar study, noting that women's leadership in Urology journals was approximately six times less prevalent than that of their men counterparts.[19] Thus far, the persisting trend has been fewer women urologists holding senior academic positions.[22] Notably, the first author is more likely to be a woman when the senior author is a woman in Urology papers, demonstrating possible support among women in the field.[23]

One potential contributor to the low proportion of women authorship is the predominance of men in the academic urology workforce, which begins at the resident level. Halpern et al. used data from the American Urological Association from 1996 to 2015, finding that the mean number of men versus women residency Urology applicants was 285.0 ± 27.1 versus 76.5 ± 21.8 ($p < .001$), respectively.[24] A similar study conducted in Saudi Arabian medical schools found a statistically significant correlation between gender and consideration of pursuing Urology as a future specialty (p=0.0001), with only 27.7% of those considering this path being women.[25] The

reasons are multifactorial, with some studies suggesting it is due to the misconception that Urology only has male patients. In contrast, others suggest that potential gender biases in letters of recommendation for fellowships, academic careers, and residency applications may contribute to the lower number of women urologists.[26,27] As is supported by the present study, this trend is improving according to American data. The proportion of women residents increased across all specialties from 1978 (15.4%) (1978) to 2013 (46.1%) (2013), but the proportion of women Urology residents rose from 0.9% to 23.8%, representing the greatest growth among all specialties ($p < 0.001$).[24] Given the recent increase in the number of women urologists, the majority may still be in the early stages of their careers and will later transition into senior roles.

The gender wage gap in Urology is another important factor to consider when discussing equity in academic medicine. Pace et al. noted that urologists who identify as men received more total funding, median general payments per capita, research funding, speaker fees, education fees, median consulting fees, and total industry payments.[28] There is also a positive correlation between industry payments and the total number of publications.[28] Vollstedt et al. noted that this wage gap persists after controlling for years of experience, practice setting, and hours worked.[29] Some authors suggest that women are less likely to work in academic institutions due to the aforementioned barriers, which in turn leads to less research production. North et al. noted that women are more likely to work in less-profitable settings and to perform fewer inpatient procedures.[30] Furthermore, both peer-review models and journal subspecialties affect women authorship, with more women authors pursuing lower-funded areas of research (e.g., pediatric Urology).[31] For instance, Whitley et al. noted that most papers who had women as first- and senior-authors were published in subspecialty journals.[23] This may partly explain why women authors are more likely to publish in predatory/lower-impact journals.

The topic of gender equity is a critical consideration in the peer review process. A Urology-specific study found that journals with a double-anonymous review process were more likely to have women as first, second, or corresponding authors.[32] Another study found that, when evaluating Urology subspecialty journals, those with double-blind peer review had a higher proportion of women as first and senior authors than those with single-blind peer review.[9] Overall, a blinded review process substantially diminishes the potential for inherent bias in the publication process.

Despite the lower proportion of women in academic Urology, previous literature suggests that this is not related to gender differences in research productivity.[3,23,33,34] For instance, Yamamura et al. examined high-impact Urology journals, noting that the shares of women first authors were significantly higher than the proportion of women physicians.[35] Similarly, Mayer et al. found that, despite holding lower seniority than men, women had the same research productivity as men at each rank after controlling for career duration.[33] These data suggest that disparities in authorship are not due to lower productivity of women academic urologists. Rather, women produce research at a rate that exceeds their number in the field. Future avenues of research should build on the work of Yamamura et al. and Mayer et al., examining longitudinal

research productivity among women in Urology, with a potential focus on childbearing years and financial status/resource access.

Observed geographic differences in authorship should be interpreted in the context of global disparities in research funding, academic infrastructure, mentorship networks, access to publications, and editorial bias. Future analyses should avoid continent-level generalizations and instead incorporate country-level variables such as research investment, institutional capacity, and policy-driven gender equity initiatives.

One limitation of this work is the method used to determine author gender. The tools used cannot capture the authors' self-identification; instead, they make assumptions about their gender identity based on their names, limiting the work. Given the tools used, non-binary representation could not be assessed and warrants further research. Despite using a large global dataset to estimate gender from names, it is possible that names from less-represented countries were more likely to be "unknown" and excluded from our dataset. Another limitation is the lack of accurate research study design classification in PubMed, so that specific articles were labelled as "Journal Article." This limitation has been noted in several studies, prompting the use of text mining to extract key terms related to study design from titles or abstracts, thereby identifying the appropriate study design for articles that did not include this information.[36,37] This methodology was unable to determine the presence of co-first authorship and therefore used the listed order as the actual authorship order. Figures 2-5 did not control for multiple comparisons, as we were interested in the overall trends and instead compared author gender to overall category (i.e., research design, geographical region, SJR quartile, and predatory journal status). Due to the overwhelming significance in each category, this is likely a minor limitation. Finally, this methodology could not confirm whether the authors were urologists or worked in an adjacent or overlapping field (e.g., medical oncologists or gynecologists). As such, the findings cannot be used to conclusively extrapolate women's contributions solely in the field of Urology.

CONCLUSION

This bibliometric analysis spans over two decades of Urology academic literature and reveals an improving yet persistent gender disparity in research authorship. This disparity appears to be especially evident in senior positions and in Asia and Africa. Despite the steady increase in the number of women authors, there is a significant underrepresentation in high-impact research and an overrepresentation in predatory journals. Future efforts should better characterize the barriers preventing women from publishing in Urology, guide targeted funding, inform policies, support mentorship, and enact institutional reforms to advance women in this field.

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FIGURES AND TABLES

Figure 1. Gender proportion of authors contributing to urologic research stratified by author position (2002−2024).

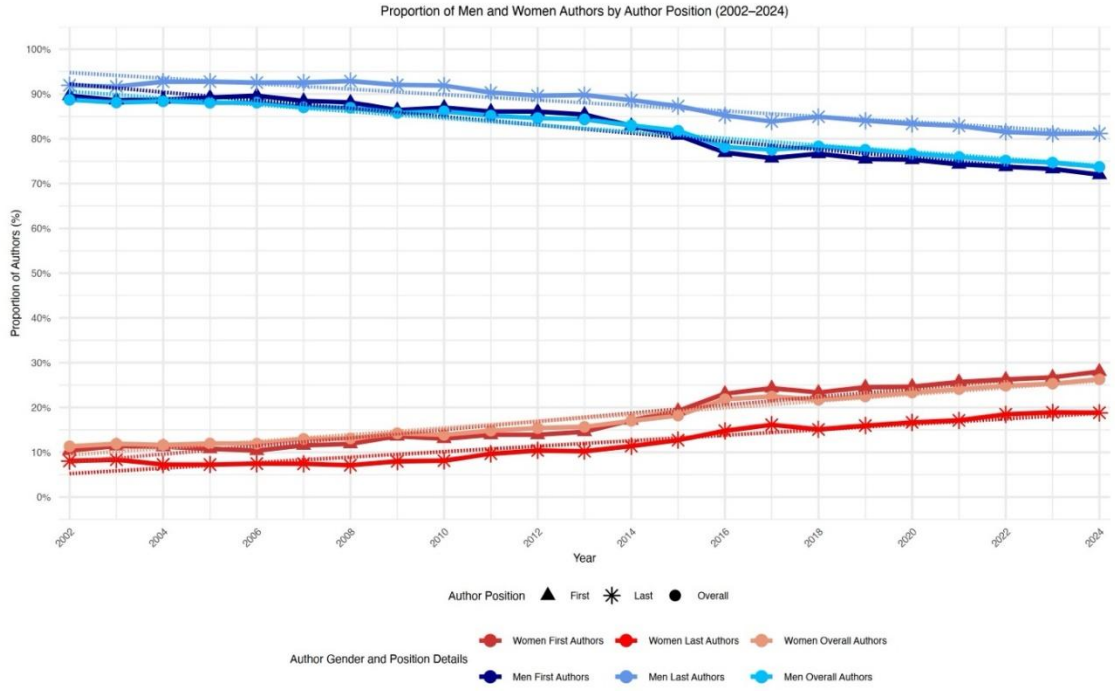

Figure 2. Distribution of research designs by gender and author type

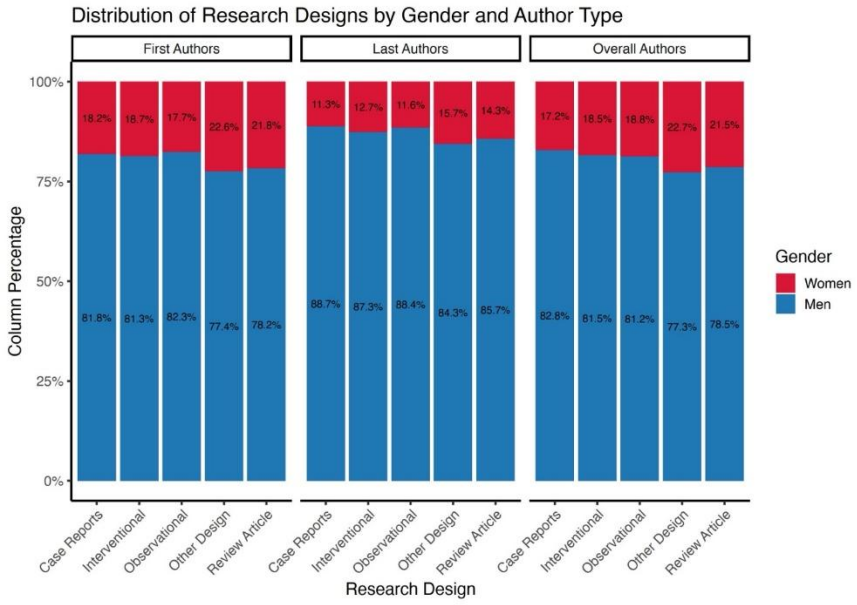

Figure 3. Distribution of regions by gender and author type.

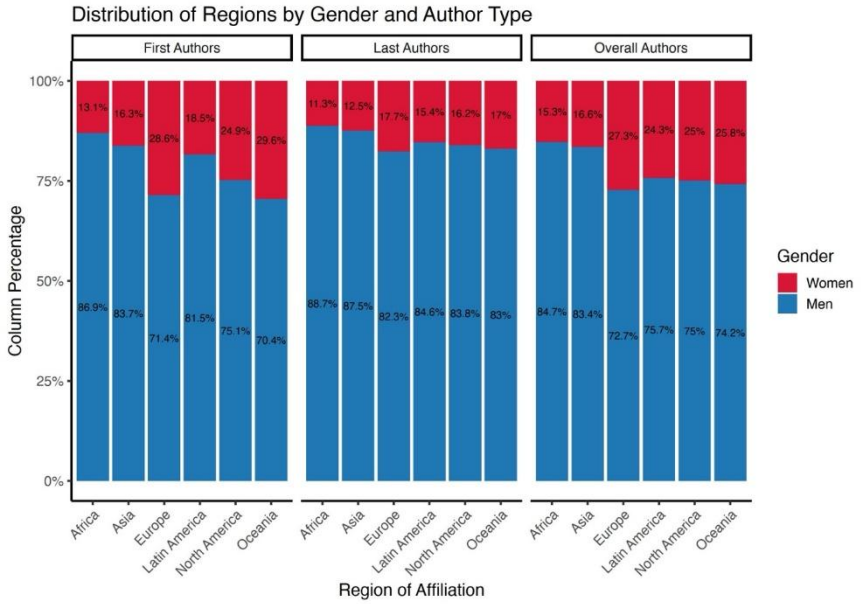

Figure 4. Distribution of predatory journals by gender and author type.

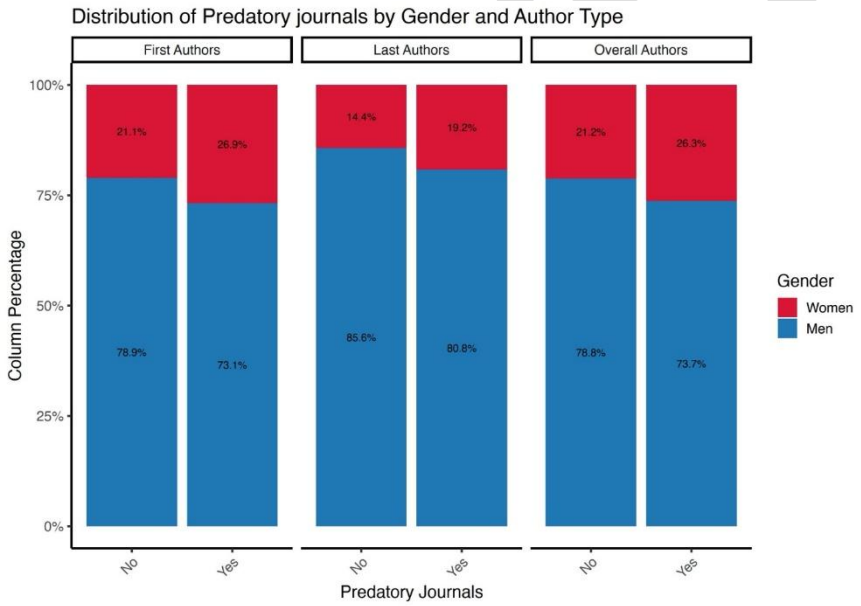

Figure 5. Distribution of Scimago Journal Ranking quartiles by gender and author type.

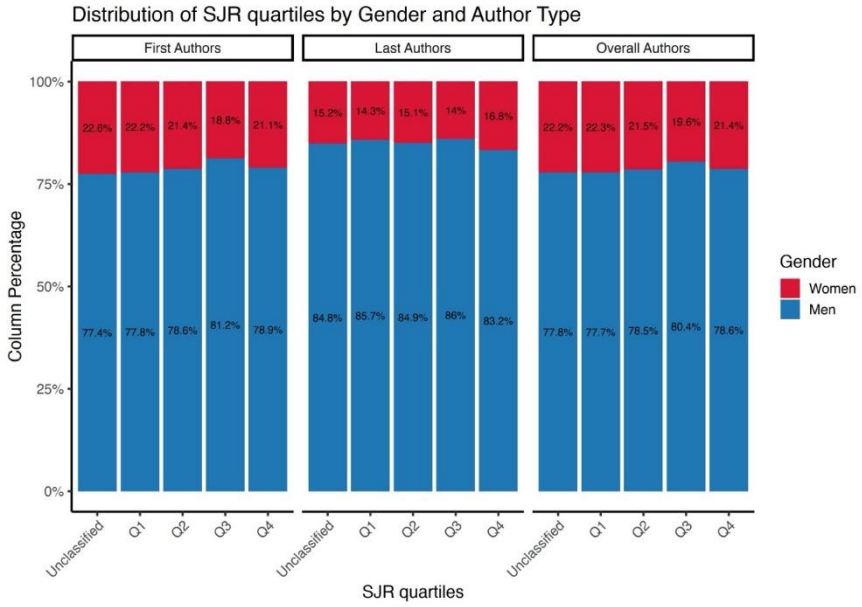

Table 1. Binary logistic regression examining predictors of first and senior authorship across years, study design, author region, predatory journal status, and Scimago Journal Ranking quartiles				
	Women first author[a]		**Women senior author[a]**	
	AOR (95% CI)	**p**	**AOR (95% CI)**	**p**
Year	**1.07 (1.07, 1.07)**	**<0.001**	**1.06 (1.06, 1.06)**	**<0.001**
Research study design				
Reviews	Reference		Reference	
Interventional	1.03 (0.92, 1.16)	0.59	1.07 (0.93, 1.23)	0.38
Observational	1.05 (0.94, 1.18)	0.41	1.03 (0.89, 1.18)	0.75
Case reports	**1.20 (1.06, 1.34)**	**0.003**	1.04 (0.91, 1.19)	0.56
Unclassified	**1.21 (1.09, 1.35)**	**< .001**	**1.23 (1.09, 1.39)**	**<0.001**
Region of affiliation				
North America	Reference		Reference	
Europe	**1.14 (1.10, 1.19)**	**< .001**	**1.06 (1.01, 1.11)**	**0.01**
Latin America	**0.74 (0.65, 0.83)**	**< .001**	1.01 (0.87, 1.15)	0.97
Asia	**0.52 (0.50, 0.54)**	**< .001**	**0.65 (0.63, 0.68)**	**<0.001**
Africa	**0.45 (0.40, 0.51)**	**< .001**	**0.64 (0.56, 0.73)**	**<0.001**
Oceania	1.13 (1.00, 1.27)	0.05	0.97 (0.84, 1.12)	0.67
Predatory journals				
No	Reference		Reference	

Yes	**1.19 (1.13, 1.25)**	**<0.001**	**1.21 (1.15, 1.29)**	**<0.001**
SJR quartiles				
Q1	Reference		Reference	
Q2	1.00 (0.96, 1.03)	0.79	**1.09 (1.04, 1.13)**	**<0.001**
Q3	**0.90 (0.86, 0.95)**	**<0.001**	1.04 (0.98, 1.10)	0.17
Q4	1.03 (0.93, 1.13)	0.61	**1.29 (1.16, 1.44)**	**<0.001**
Unclassified	**1.08 (1.04, 1.13)**	**<0.001**	**1.11 (1.06, 1.17)**	**<0.001**

*p<0.05. [a]Reference category men authors. AOR: adjusted odds ratio; CI: confidence interval; SJR: Scimago Journal Ranking.