

Female authorship in major endocrinology journals: a 25-year progression

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Context: The number of women in academic medicine has increased significantly in recent years. However, female authors are underrepresented in major medical journals.

Objective: The aim was to determine the distribution of female first and senior authors of original articles in four American endocrinology journals over a period of 25 years.

Design: A retrospective analysis of the literature was undertaken.

Setting: Four journals were selected: *Journal of Clinical Endocrinology & Metabolism*; *Thyroid*; *Journal of Bone and Mineral Research* and *Diabetes Care*.

Participants: The first and senior authors of all original articles published in 1991, 1996, 2001, 2006 and 2015 were included.

Intervention: none.

Results: The main outcome measure was the distribution of female first and senior authors of original articles. A total of 4 148 articles were included. Of these, 28.9% (1 199) articles were authored by females of whom 751 (62%) were first authors. Over the study period, there was a shift towards female authorship. A statistically significant trend was observed ($p < 0.001$).

Keywords: authorship and gender, endocrinology

Introduction

Over the past three decades the number of women in medical fields has increased significantly. Almost half of students enrolled in medical schools in the United States are women. This is a remarkable increase from less than 10% in 1965.¹ In endocrinology, the proportion of female physicians is 44%. The gender gap is expected to close even further, as three-quarters of applicants to endocrinology fellowships in 2014 were women.²

However, women continue to be underrepresented in senior academic positions and tenured faculty posts. In 2014, while 38% of faculty positions in US medical schools were filled by female physicians, only 22% of tenured professors were women.¹ Similar findings have been reported in other Western countries. In the United Kingdom, women filled only 18% of full professorships in 2015.³ Female physicians are less satisfied with mentoring, income and career advancement opportunities compared with their male counterparts.^{2,4}

Authorship of scientific papers is an important measure of academic productivity. Promotion to full professorship is highly dependent on publication in medical journals. Previous studies showed that the number of women authors increased significantly over the past four decades. The percentage of female first authors in major medical journals increased from 5.9% in 1970 to 29% in 2004.⁵ Similar findings were reported in studies looking at literature specific to certain fields and specialties in medicine.^{6,7}

To our knowledge there has not yet been systematic evaluation of endocrinology literature. Therefore, in this study, our aim is to determine the distribution of female first and senior authors of original articles in four American endocrinology journals over a period of 25 years.

Methods

This study was a retrospective analysis of the literature. It did not involve human subjects. Therefore it was exempt from the need for institutional review board approval.

Data collection

Four prominent American endocrinology journals were selected: *Journal of Clinical Endocrinology & Metabolism*; *Thyroid*; *Journal of Bone and Mineral Research* and *Diabetes Care*. This was based on the wide readership of these journals as reflected by their high impact factor and expert opinion. All original articles published in 1991, 1996, 2001, 2006 and 2015 were included. Authors without an MD or equivalent degrees were excluded. This was done to limit our study population to researchers in clinical endocrinology.

For each article we identified the first and last author's sex. An author's gender was identified by inspection of their first name. If the name was not clear, it was determined by using internet search engines like Google. Authors whose genders were not clearly identifiable after exhausting all sources were labelled as 'unknown' and excluded from the analysis. For the purposes of this study, we considered last authors to be the senior authors.

Statistical analysis

The data were analysed with the use of STATA® 12.1 (StataCorp, College Station, TX, USA) was used to determine the gender distribution of the first and senior authors of original articles for each journal. Chi-square testing was used to compare categorical variable. The Cochran–Armitage trend test was used to test for the trend over time. Reported p -values with a threshold of

Table 1: Distribution of male and female authorship in major endocrinology journals between 1991 and 2015

Gender	Year					Total
	1991	1996	2001	2006	2015	
Female (%)	145 (23%)	145 (23%)	238 (26%)	326 (30%)	345 (39%)	1 199
Male (%)	476 (77%)	491 (77%)	671 (74%)	777 (70%)	534 (61%)	2 949
Total	621	636	909	1 103	879	4 148

Note: *Pearson's chi-square⁴ = 70.1399, $p = 0.000$.

Table 2: Distribution of male and female endocrinology authorship between 1991 and 2015 according to journal

Gender	Journal DC	JBMR	JCEM	Thyroid	Total
Female	426 (27%)	205 (28%)	485 (33%)	83 (26%)	1 199
Male	1 166 (73%)	562 (72%)	989 (67%)	232 (73%)	2 949
Total	1 592	767	1 474	315	4 148

Note: Pearson's chi-square³ = 17.8079, $p < 0.0001$.

5% pertain to the significance of comparisons and trends over time in these data.

Results

A total of 4 307 articles were identified, of which 159 articles were excluded due to inability to determine the gender of first authors. Upon examining the included articles, 1 199 (28.9%) articles were authored by females of whom 751 (62%) were first authors. There was a clear predominance of male authorship observed throughout the years of reported publications (Table 1).

Hypothesis testing

Similarly, when stratified by journal (Table 2) and authorship rank (Table 3), males dominated in publications.

Time trend

Upon analysing trends over time with regard to shifts towards female authorship in endocrine journals between 1991 and 2015, a statistically significant trend was observed ($p < 0.001$) (Figures 1 and 2).

Discussion

This study looked at four major endocrinology publications in the United States over a 25-year period. It showed that women remained a minority as first and senior authors in this discipline's literature. Nonetheless, the overall percentage of female authors increased from 23.3% in 1991 to 39.2% in 2015. This might be a reflection of the increasing number of female physicians pursuing endocrinology as a career. In 2013, almost three-quarters of fellows starting endocrinology training in the United States were women.⁸ However, it remains a male

predominant speciality with men composing more than half of practising endocrinologists.⁹

The increase in female authors is encouraging. Nonetheless, facing difficulty getting a paper published may contribute to physician's dissatisfaction with her/his career regardless of their gender. In endocrinology, only half of practising physicians reported overall satisfaction with their career and less than that number would choose their speciality again.^{2,10} These findings were similar in both genders.

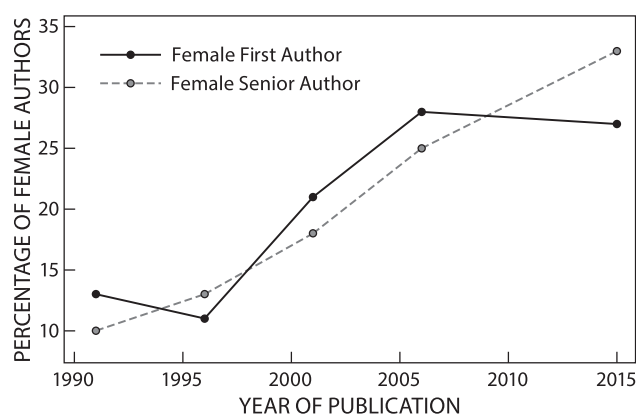
The findings in this study are consistent with other studies looking at gender-based authorship in the medical literature. Some have looked at the medical literature in general.^{5,11} Others have studied publications in certain specialties.^{12,13} These studies demonstrated an increase in female authorship over the past three decades. To our knowledge, our study is the first to look at gender-based authorship in endocrinology.

Another important aspect of this study looked at senior authorship. The increase in the number of female first authors over the study period was matched by a similar increase in the percentage of senior authors (see Figure 1). Our findings are in contrast to previous studies looking at the gender gap in authorship.^{5,14,15}

Table 3: Distribution of male and female authorship in major endocrinology journals between 1991 and 2015 according to authorship rank

Gender	Year		Total
	First author	Senior author	
Female (%)	751 (36%)	448 (22%)	1 199
Male (%)	1 317 (64%)	1 632 (78%)	2 949
Total	2 068	2 080	4 148

Note: *Pearson's chi-square¹ = 110.1845, $p < 0.0001$.

**Figure 1:** Female authorship in endocrinology journals by year and authorship rank

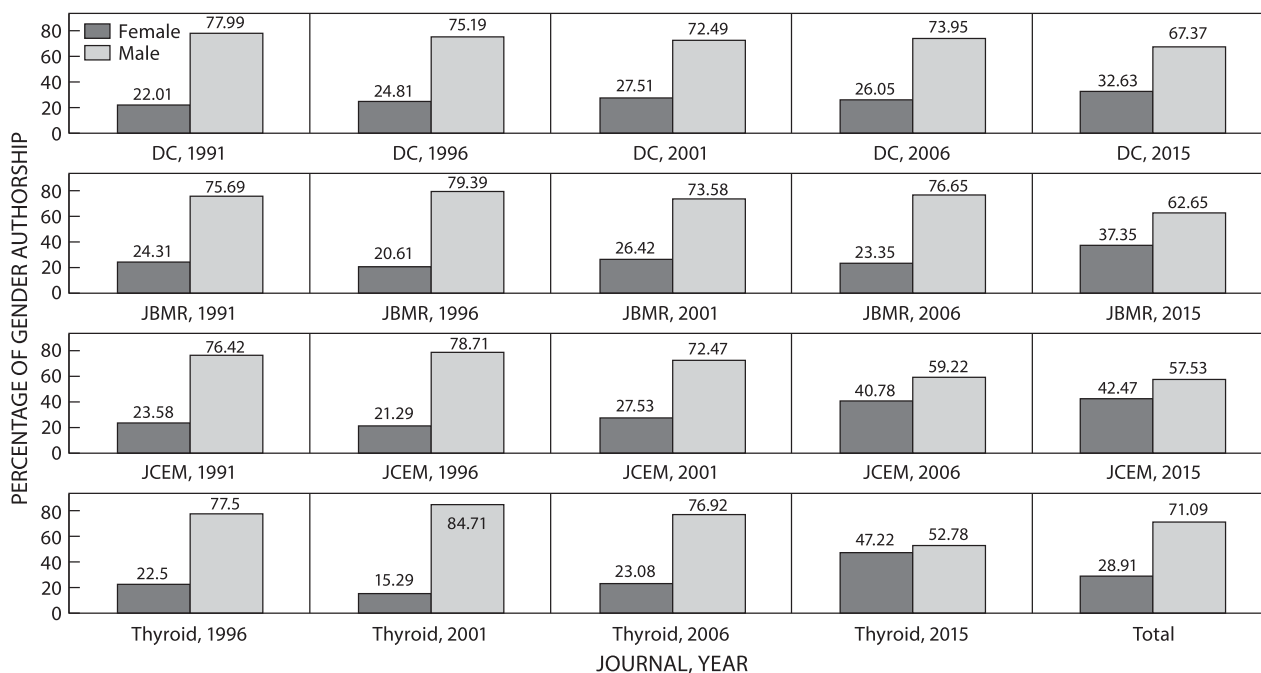


Figure 2: Gender authorship in major endocrinology journals according to journal and year

Women are underrepresented in the traditional tenure track and overrepresented in clinical educator tracks. Promotion of faculty members in the latter track lags behind the traditional tenure track.^{2,16} The gender difference in academic medicine has been well described. Reed *et al.* compared the publication records and academic promotions of men and women at the Mayo clinic over a more than 20-year period. This showed that female authors published overall fewer papers than men. However, after 27 years women produced a mean of 1.57 more publications annually than men.¹⁷

When it comes to publishing in high-impact medical journals, geographical variations exist between North America and Europe on the one hand and Asia, Australia and Africa on the other. In a study looking at the trends of female first authorship, the authors found that in the period from 2009 to 2014 half of first authors from North America were women compared with less than 1% of first authors from Africa publishing in these prestigious journals.¹⁸

In trying to explain the gender gap, some authors of similar studies suggested two potential reasons. First, that female physicians in academic practices may be choosing medical education, quality improvement or administration tasks and therefore end up publishing less than their male counterparts.⁶ Second, women in academic medicine tend to spend more time on parenting and domestic tasks than men in the same field.¹⁹ This may account for their delay in publishing.⁶ In our opinion, the first point has no scientific evidence to support it. The second reason feeds into the negative stereotypes of women in medicine. More time spent attending to child care or domestic tasks does not indicate less productivity including scientific publication.

Appointing more women on editorial boards or in the position of editor in chief may help reduce gender inequalities in publication. Over the period 2009–2014, prestigious journals with female editors in chief had the highest unadjusted rates of female first authorship during these years, whereas the remaining two journals included in that study had considerably lower rates.¹⁸

The strength of this study is that it examined publications over a 25-year period. More than 4 100 original contributions were included in the final analysis. Four US-based endocrinology journals were reviewed.

Our study has limitations. First, we could not establish the gender of authors in 159 cases and these were excluded from the final analysis. Second, although we included four endocrinology journals, papers published in journals based outside the United States or in general medical journals were not included. This may have overlooked important publications by female authors in the field of endocrinology and metabolism. Third, we assigned the sex of the author based on inspection and tradition of first-name gender assignments. This raises the potential of misclassification.

We conclude that there has been an encouraging increase in the number of female first and senior authors in the endocrinology literature. Nevertheless, more needs to be done for the percentage of female authors to match the number of female practitioners in the field.

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