

Gender Disparities in Academic Pain Medicine: A Retrospective, Cross-Sectional Bibliometric Analysis

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Purpose: This study was conducted to characterize the gender disparities within academic pain management departments in the United States, specifically focusing on its relation to research and academic leadership. This will allow for targeted improvements in efforts made to reduce gender gaps within academic pain medicine.

Methods: This is a retrospective, cross-sectional analysis study evaluating pain management faculty of various positions at academic institutions across the United States. We utilized publicly available data on faculty positions and sex to analyze research impact, H-index, number of publications and citations through bibliometric and linear regression analysis.

Results: Our analysis found that female faculty had significantly less research output to male faculty. The three research measurement indices used in this study including H-index, number of publications, and number of citations were significantly lower in females than in males among associate and full professor faculty ranking. Multivariable analysis did not display any significant disparities of research output at the division director and department chair level.

Discussion: As in many areas of medicine, there continues to be a significant gender disparity in academic pain management departments, particularly with regard to leadership positions and research impact within the field. Our study found that female pain physicians had a significantly less research output based on the three variables of H indices, number of publications, and number of citations compared to their male counterparts. This has been shown to have the impact on discrepancies in female faculty ranking. Interestingly, these variables were not significantly different between male and female faculty members of the same level of leadership except for program director. There are various contributory reasons for these disparities, including implicit biases, lack of mentorship, and familial obligations. Addressing some of these factors can help narrow the schism and promote greater gender equality within academic pain management.

Keywords: gender equity, bibliometric analysis, academic rank, pain medicine

Introduction

While the number of women entering medicine is increasing,¹ stark gender disparities exist in leadership roles because of unconscious biases, unsupportive work environments, and personal preferences.² The Association of American Medical Colleges (AAMC) data from 2019 report that 81.0% of all practicing pain practitioners are male.³ Unsurprisingly, female pain physicians hold fewer senior faculty appointments and leadership roles within anesthesiology departments and on the governing boards of national organizations including the American Board of Anesthesiology, the American Society of Regional Anesthesia and Pain Medicine (ASRA), and the American Academy of Pain Medicine.⁴ As pain medicine continues to rapidly grow as a subspecialty,⁵ it is imperative to characterize these differences in order to achieve greater parity towards employment and advancement within academic pain management. In addition to several other factors, research productivity has been found to help contribute towards career advancement opportunities, especially with

promotion, hiring, award selection, and grant funding allocation within an institution.^{6–8} As such, we utilized bibliometrics to characterize sex differences in academic pain faculty in regard to academic rank, leadership roles, and research productivity.

Methods

This retrospective, cross-sectional analysis utilized publicly available data; therefore, institutional research ethics approval was not required. The Fellowship and Residency Electronic Interactive Database was used to identify all active pain medicine fellowships in the United States. Institutional websites were reviewed to identify faculty, including both Medical Doctors and Doctor of Osteopathic Medicine. Sex was assigned by consensus as either male or female based on normative name use, faculty photographs, and pronoun usage in biographies. Professor rank (full, associate, assistant, and instructor) and leadership positions (department chair, division director, and program director) were recorded. Institution-specific leadership positions were excluded. Sex-specific percentages in faculty rank were compared relatively to the national percentages of 81.1% male and 18.3% female pain physicians² using standard parametric testing. Research impact was determined using SCOPUS[®]. The number of publications and citations as well as H-index were collected for each faculty. The H-index is a quantitative measure of productivity and impact of authors' publications based on the number of citations said publications receive. Linear regression analyses were used in comparing sex and H-index, publication, and citation ratios of different professor ranks and leadership positions. All data were gathered between May 2019 and December 2020.

Results

Across 104 identified academic pain medicine fellowship programs, females (N = 255) comprised 28.52% of total faculty while males (N = 639) comprised 71.48%. When considering research impact, we found that female faculty had significantly less research output relative to male faculty (p-value <0.0001). The three research measurement indices used in this study including H-index, number of publications, and number of citations were significantly lower in females than in males (Tables 1–3). Univariate analysis of the data showed that faculty with associate professor or full professor titles had a significantly higher H-index than those without an academic rank or those at the instructor level (Table 1). Faculty who held the position of associate or full professor had a significantly higher number of publications and number of

Table 1 Comparing the H-Index per Person Between Genders and the H-Index per Person Among Different United States Faculty Rank

	Univariate Analysis H Index Ratio	P-value	Multivariable Analysis H Index Ratio	P-value
Female	0.71	<0.0001	0.78	0.0006
Faculty Rank				
None	0.94	0.6859	0.90	0.4882
Instructor	1.23	0.2586	1.22	0.2638
Assistant Prof	1		1	
Associate Prof	1.57	<0.0001	1.54	<0.0001
Full Professor	3.25	<0.0001	3.01	<0.0001
Leadership Level				
Program Director	0.79	0.0258	0.78	0.0078
Division Director	1.77	<0.0001	1.21	0.0689
Dept Chair	1.70	0.0238	1.11	0.613

Table 2 Comparing the Publication Ratio Between Genders and the Publication Ratio per Person Among Different United States Faculty Rank

	Univariate Analysis Publication Ratio	P-value	Multivariable Analysis Publication Ratio	P-value
Female	0.63	<0.0001	0.70	0.0001
Faculty Rank				
None	0.75	0.1303	0.72	0.0796
Instructor	1.07	0.7816	1.06	0.7926
Assistant Prof				
Associate Prof	1.73	<0.0001	1.67	<0.0001
Full Professor	4.56	<0.0001	4.10	<0.0001
Leadership Level				
Program Director	0.78	0.0711	0.76	0.0231
Division Director	2.14	<0.0001	1.30	0.0491
Dept Chair	2.18	0.0121	1.24	0.4285

Table 3 Comparing the Citation Ratio between Genders and the Citation Ratio per Person among Different United States Faculty Rank

	Univariate Analysis Citation Ratio	P-value	Multivariable Analysis Citation Ratio	P-value
Female	0.46	0.0002	0.56	0.0013
Faculty Rank				
None	1.08	0.8442	0.97	0.9288
Instructor	1.85	0.1679	1.75	0.204
Assistant Prof				
Associate Prof	3.61	<0.0001	3.46	<0.0001
Full Professor	17.02	<0.0001	14.20	<0.0001
Leadership Level				
Program Director	0.47	0.0039	0.46	0.0006
Division Director	3.67	<0.0001	1.51	0.1123
Dept Chair	3.70	0.0245	1.28	0.6328

citations as well (Tables 2 and 3). These findings were found after multivariate analysis as well (Tables 1–3). Linear regression models were applied to analyze the differences of research output between males and females at different levels of leadership roles within an academic medicine department, including program director, division director, and department chair. Univariate analysis showed that the H-index was significantly lower for program directors but significantly higher for division director or department chair (Table 1). These H-index findings for division director and department chair were no longer statistically significant after multivariate analysis. There were similar findings after

multivariate linear regression analysis of the number of publications and number of citations. There was a significant difference in the number of citations and number of publications after multivariate analysis at the program director level.

Conclusion

The female presence in and attrition to procedural subspecialties in the United States, specifically in ophthalmology, otolaryngology, orthopedics, neurosurgery, gastroenterology and cardiology, remains low.¹ There is a lack of equal representation of female faculty members in higher faculty ranks and leadership positions. Though the cause is multifaceted, this study investigated this discrepancy in academic pain medicine through the influence of research output. Female faculty were found to have less research output across the three measures we studied, including H-index, number of publications, and number of citations. Interestingly, our analysis did not demonstrate significant differences in research output when comparing these variables between faculty of different leadership levels except for program director. Research productivity showed a similar and statistically significant trend with males having higher average publications, citations, and H-index, which is a trend consistent with patterns observed in science and medicine^{2,7,8} as well as in similar research by Orhurhu et al.⁵ It is important to take into consideration the possible impact of gaps in research years on the H-index and number of publications from women leaving work temporarily for familial reasons, especially during the timeframe in which physicians are likely to be more productive researchers and promoted to associate professor ranking.⁹ Having less research output can contribute to and further perpetuate implicit biases when evaluating these female faculty members for promotion in faculty rank and higher departmental leadership opportunities, including division director or departmental chair. Future studies should investigate various contributors to these differences beyond research output within pain medicine specifically.

Barriers limiting female upward mobility in medicine are well established including implicit biases, ineffective mentoring, and a preference for working part-time.⁸ A large determinant of professional advancement within health care is determined by evaluations and research output. It is imperative that implicit biases in these evaluations be minimized in order to equalize the advancement process. Even after achieving academic seniority, female physicians tend to retain these positions at a lower rate, suggesting ongoing factors limiting sex balance.⁷ Potential next steps in decreasing the disparities in pain medicine highlight the need to create supportive resources for female physicians. Early mentoring in both research and leadership development would be particularly useful in helping female physicians forge early paths towards higher ranking leadership positions within their departments. Aiding in building professional networks for effective mentorship would be important in leadership and research success.⁸

The study's primary limitation is data collection involved surveying publicly available program websites, which may be limited by incorrect and incomplete information. The categorization of sex as male or female based on consensus from normative name use and faculty photograph presents opportunity for bias, as it does not confirm personal gender identification. Publications could have been inappropriately allocated due to name changes. In the analysis of H-index, the academic age and types of journals published in were not stratified, thus presenting possible unmeasured confounding variables. Furthermore, the data analyzed were limited to the United States. To mitigate such risks, an extensive review using multiple combinations of faculty name search terms and academic institutions was pursued. Institution-specific leadership positions were excluded to facilitate comparisons between institutions, limiting our assessment of faculty members' true responsibilities.

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