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A ten-year comparison of women authorship in U.S. dermatology literature, 1999 vs. 2009

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ABSTRACT

Women are entering medicine at increasing rates, particularly in dermatology. In this study, we compared women's influence and status in academic dermatology with that of men by examining authorship roles in peer-reviewed dermatology literature. We examined the literature in 2009 and compared that to 10 years prior (1999). A total of 1399 articles were reviewed, 594 of which met study criteria and were included in statistical analysis. There was a marked increase in senior female authorship over a decade (22% vs. 38%, $p < 0.001$). Female first authorship increased as well (41% vs. 51%, $p < 0.001$). In contrast, changes in male senior and first authorship were not statistically significant. Federal funding for female senior authors increased over a decade (19% vs. 37%, $p = 0.05$), and female senior authors in the 2009 cohort were more likely to hold a dual MD/PhD degree (0% vs. 11%, $p = 0.04$) or pure PhD degree (11% vs. 27%, $p = 0.04$). Women are approaching parity with men in terms of authorship in the dermatology literature, and additional research training and attainment of federal funding have helped women publish as senior authors.

Introduction

Over the past five decades, women have drastically increased enrollment at U.S. medical schools. In 1965, women comprised only 9.3% of the matriculants, but nearly half (47.2%) of incoming medical students in 2013 were female (American Association of Medical Colleges [AAMC], 2014; Boulis and Jacobs, 2008). In some medical specialties such as dermatology, female residents already outnumber their male colleagues, at 62.4% (AAMC, 2014). Such trends suggest that women are approaching parity with men in medicine, particularly in dermatology. However, despite this increased influx of women to medicine, the question remains whether their presence is also seen in the academic sphere of medicine. Can women compete with men to hold greater leadership positions and status in academia?

The core missions of academic medicine, in addition to patient care, include educating the next generation of physicians and biomedical scientists by fostering research and innovative thought. Academic physicians exert tremendous influence on the future of medicine and their respective specialties by disseminating their research findings through publications, which in turn brings professional recognition. As the editor of *Academic Medicine* wrote, a considerable portion of academic medicine pertains to publishing "original articles and research reports, critical review, perspectives, and commentaries that address topics across the full spectrum of broad-based concerns" (Kanter, 2008). Thus, one approach to evaluate women's standing in academic medicine is to measure their publishing activity, which has traditionally been viewed as an indicator of academic impact and success.

A 2004 study published in the *New England Journal of Medicine* explored the "gender gap" in authorship of academic literature in fields of internal medicine, surgery, pediatrics, and obstetrics and gynecology (Jagsi et al., 2006). However, studies of such kind are few in dermatology.

In this study, we set out to compare women's influence in academic dermatology with that of men by examining authorship roles in peer-reviewed dermatology literature from 2009 to 2010 compared to 10 years prior (1999-2000). Specifically, we looked at the quantity of peer-reviewed articles published and the role of authorship (first and last) with the aim of shedding light on the overall status of women in academic dermatology. A study examining data from 2006 also looked at the gender gap in manuscript authorship in dermatology (Feramisco et al., 2009); however, unique to our study, we also examined the level of education and research training and the source of research funding, which may help explain any underlying trends.

Materials & methods

Data were extracted from 12 issues each of the "1999 cohort" (August 1999 through July 2000) and the "2009 cohort" (August 2009 through July 2010) from the *Journal of Investigative Dermatology* (JID)

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and *JAMA Dermatology*, formerly called *Archives of Dermatology* (Archives), two of the most highly cited peer-reviewed scientific journals in dermatology based on impact factor in recent years.

Non-peer reviewed pieces such as "Archives a Century Ago," "Book Reviews," and "News and Notes" were excluded. "In-reply" pieces were also excluded, as these are typically responses to commentaries from the author of the original article.

Since the focus of the present study is the status of women in academic medicine in the United States, we focused solely on U.S.-authored articles and excluded non–U.S.-authored articles. We defined articles as U.S. authored if the first, senior (last), and corresponding authors were affiliated with a U.S. institution. If an article failed to meet this criterion, it was identified as a non–U.S.-authored article. For the U.S.-authored articles, data collected included number of authors, gender, postgraduate degree of first and last authors, and sources of funding. Types of funding were categorized as federal, private, or industry. Articles funded solely by a department or division of a university were considered unfunded. Data from articles with two or more authors were analyzed first. The same analysis was then performed for single-author papers.

We compared female authorship roles of the 2009 cohort with that of the 1999 cohort using Fisher and binomial tests. The Fisher test was used to compare the proportion of women between the two time cohorts, whereas the binomial test accounted for absolute numbers. Additionally, we compared male authorship roles of the 2009 cohort with that of the 1999 cohort, as well as female authorship roles with that of males for each cohort. A p value of < 0.05 was considered statistically significant. We used SAS, version 9.2 (SAS Institute Inc., Cary, NC, USA), for all statistical analyses.

Table 1
Female Senior and First Author Characteristics of U.S. Articles with at least Two Authors.

	1999-2000	2009-2010	p value Fisher	p value Binomial
Female Senior Author	$N = 47$ (22.1%)	$N = 115$ (38.0%)		<0.001
Degree				
MD	40 (85.1%)	66 (57.4%)	0.001	
MD/PhD	0 (0%)	13 (11.3%)	0.04	
PhD	5 (10.6%)	31 (27.0%)	0.04	
None	2 (4.3%)	5 (4.3%)	N/S	
Funding[a]				
Federal	9 (19.1%)	42 (36.5%)	0.05	
Private	7 (14.9%)	19 (16.5%)	N/S	
Industry	0 (0%)	7 (6.1%)	N/S	
None	36 (76.6%)	64 (55.7%)	0.02	
Female First Author	$N = 87$ (40.8%)	$N = 154$ (51.2%)		<0.001
Degree				
MD	59 (67.8%)	79 (51.3%)	0.02	
MD/PhD	7 (8.0%)	16 (10.4%)	N/S	
PhD	18 (20.7%)	25 (16.2%)	N/S	
None	3 (3.4%)	34 (22.1%)	<0.001	
Funding[a]				
Federal	37 (42.5%)	59 (38.3%)	N/S	
Private	24 (27.6%)	27 (17.5%)	N/S	
Industry	1 (1.1%)	6 (3.9%)	N/S	
None	44 (50.6%)	82 (53.2%)	N/S	

[a] Percentages do not add up to 100% because some authors received no funding, while others received funding from one or more sources.

Results

A total of 1399 articles were reviewed, 761 of which were from JID and 638 from Archives. Comparing journals from the 1999 cohort, 347 articles were from JID, of which 259 articles were excluded because of their non-U.S. authorship, and 322 articles were from Archives, of which 153 articles were excluded due to their non-U.S. authorship. From the 2009 cohort, 414 articles were from JID, of which 267 were excluded, and 316 articles were from Archives, of which 126 were excluded. Therefore, a total of 594 articles were included, 235 of which were from JID and 359 from Archives.

Female authors

Combining eligible articles from both journals in the 1999 cohort, there were 213 U.S.-based articles with two or more authors, of which 47 (22%) of the senior authors were female (Table 1). In the 2009 cohort, there were 303 U.S.-based articles with two or more authors, of which 115 (38%) of the senior authors were female. There was a marked increase in senior female authorship over a decade (22% vs. 38%, $p < 0.001$).

In characterizing the senior authors, there was a notable change in the distribution of postgraduate degrees amongst female senior authors from the 1999 to the 2009 cohort. Over a decade, there was a considerable decrease in MDs (85% vs. 57%, $p = 0.001$), but an increase in MD/PhDs (0% vs. 11%, $p = 0.04$) and PhDs (11% vs. 27%, $p = 0.04$). With respect to funding sources, there was a significant increase in funding for female senior authors ($p < 0.001$) in the more recent cohort. Female senior authors in the 2009 cohort were more likely to receive federal funds compared to those in the 1999 cohort (37% vs. 19%, $p = 0.05$). Although the proportion of female senior authors receiving funding from other sources (private and industry) also increased, those changes were not statistically significant.

Comparing the 1999 cohort with the 2009 cohort, there was an increase in female first authors in the latter (41% vs. 51%, $p < 0.001$). There was a decrease in the proportion of female first authors holding MDs (68% vs. 51%, $p = 0.02$), although the absolute number of MDs had increased. Furthermore, there was an increase in both the absolute number and proportion of female first authors without a postgraduate degree (3% vs. 22%, $p < 0.001$). Changes in funding for female first authors were not statistically significant.

U.S.-based articles with only one author were examined separately. Of a total of 44 articles in the 1999 cohort with a single author, 9 (20%) were written by female authors. Of a total of 34 articles in the 2009 cohort, 8 (24%) were written by female authors. This difference was not statistically significant. Due to the small sample size, comparisons of the distribution of degrees and funding in this subset were not feasible.

Male authors

Of the 213 U.S.-based articles with two or more authors in the 1999 cohort, 166 (78%) of senior authors were male (Table 2). Of the 303 U.S.-based articles with two or more authors in the 2009 cohort, 188 (62%) of senior authors were male. The observed change in male senior authorship was not statistically significant. However, with reference to the types of postgraduate degrees held by senior male authors in the 1999 compared to the 2009 cohort, there were statistically significant changes. There was a decrease in MDs (72% vs. 59%, $p = 0.01$), but a significant increase in MD/PhDs (10% vs. 25%, $p < 0.001$). No statistical trends were observed regarding funding sources for male senior authors.

As was the trend for male senior authors, there was a decrease in the proportion of male first authors from 1999 to 2009 (59% vs. 49%), although again this difference was not statistically significant. With respect to the distribution of postgraduate degrees, there was a decrease in male first authors with MDs (68% vs. 52%, $p = 0.01$). For other postgraduate degrees, the absolute numbers of MD/PhD, PhD, and non-postgraduate degree holders increased, but these changes