Is There Gender Bias in Radiology Journal Publication?

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INTRODUCTION

It has been known that there is an underrepresentation of women in the radiology workforce, and although this gender gap is slowly closing, it is far from equal. According to the JACR Workforce Survey[1], 26.5% of practicing radiologists in the U.S. were women in 2019, an increase from 13% in 1990. A study by Shroyer et al[2] also showed a significant disparity between female and male faculty authorship in top three peer-reviewed international medical journals (*JAMA, NEJM, and Lancet)*. There are few publications that show recent trends in authorship between genders in radiology specific journals. Our study aimed to identify gender disparities, if any, in first authorship (FA) or senior authorship (SA) in the journal *Radiology*.

OBJECTIVES

1. Compare overall percentage of female FA and SA in *Radiology* to percentage of female amongst all radiologists
2. Examine trends of percentage of female FA or SA in *Radiology* as well as such trends in each subspecialty sections within the journal
3. Compare percentage of same gender FA/SA pairs between female and male FA

METHODS

Radiology was selected for analysis because of its high impact factor (29.15 in 2021), and its division into subspecialties allowing for stratification of subspecialty-specific authorship trends. Only articles in the Original Research category were counted as publications. Publications were subdivided between Clinical (N=1,040) and Non-clinical (N=174). Clinical publications were further subdivided into subspecialties: breast, cardiac, emergency radiology, GI, GU, head and neck imaging, musculoskeletal (MSK), neuroradiology, nuclear medicine, obstetrics, pediatrics, thoracic, ultrasound, and vascular/IR. Genders were assigned using author biographies, pronouns, first names, and photographs from the internet.

Statistical analysis- Binomial tests with Clopper-Pearson confidence intervals were utilized to examine whether the % of female authors among FA or SA was significantly different from 26.5%, which is the % of females among all radiologists in the U.S. based on 2019 data. The linear trend of the % of female authors over time was examined using log-linear Poisson regression models with year as an explanatory variable. A relative risk (RR)>1 indicated a linear increasing pattern over time and a RR<1 indicated a linear decreasing pattern. The equality tests were used to measure whether the binomial proportion of same gender FA/SA pair was the same between female FA and male FA. Statistical analysis was performed using SAS 9.4 (SAS Institute, Inc., Cary, NC) and significance level was set at 0.05.

RESULTS

Figure 1: Trend of Female Authors Among FA/SA From 2018-2022

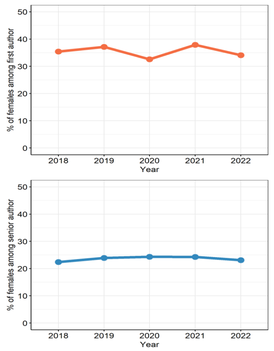

Figure 2: Distribution of Clinical Subspecialty Publication by Gender

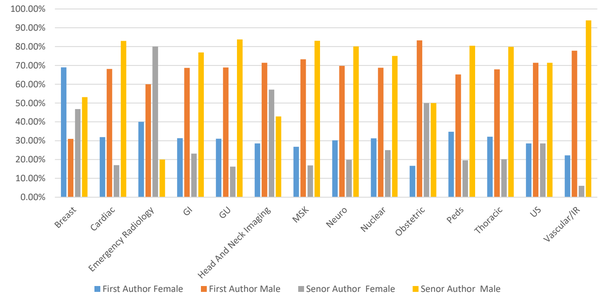

Figure 3: Distribution of Non-Clinical Subspecialty Publication by Gender

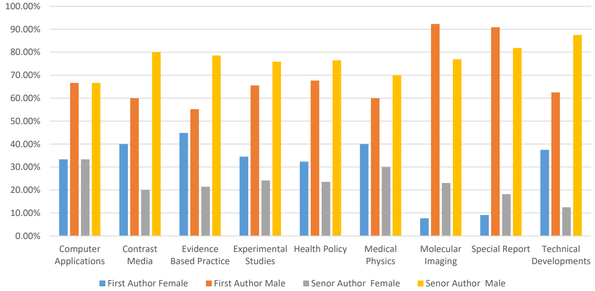

Table 1: Trend of Female Authors Among FA/SA From 2018-2022

		First author		Senior author	
Year	Total (N=1214)	Female (N=431, 35.5%)	Male (N=783, 64.5%)	Female (N=285, 23.5%)	Male (N=927, 76.5%)
2018	336	119 (35.4%)	217 (64.6%)	75 (22.4%)	260 (77.6%)
2019	272	101 (37.1%)	171 (62.9%)	65 (23.9%)	207 (76.1%)
2020	227	74 (32.6%)	153 (67.4%)	55 (24.3%)	171 (75.7%)
2021	206	78 (37.9%)	128 (62.1%)	50 (24.3%)	156 (75.7%)
2022	173	59 (34.1%)	114 (65.9%)	40 (23.1%)	133 (76.9%)
Relative risk (95% CI)		0.9955 (0.9548, 1.0379)		1.0120 (0.9884, 1.0362)	
P-value		0.8318		0.3223	

Table 2: Distribution of Publications by Gender Within Each Subspecialty

	First author		Senior author	
Subspecialty	Female	Male	Female	Male
Clinical				
Breast	109 (69.0%)	49 (31.0%)	74 (46.8%)	84 (53.2%)
Cardiac	30 (31.9%)	64 (68.1%)	16 (17.0%)	78 (83.0%)
Emergency Radiology	2 (40.0%)	3 (60.0%)	4 (80.0%)	1 (20.0%)
GI	42 (31.3%)	92 (68.7%)	31 (23.1%)	103 (76.9%)
GU	23 (31.1%)	51 (68.9%)	12 (16.2%)	62 (83.8%)
Head And Neck Imaging	4 (28.6%)	10 (71.4%)	8 (57.1%)	6 (42.9%)
MSK	19 (26.8%)	52 (73.2%)	12 (16.9%)	59 (83.1%)
Neuro	55 (30.2%)	127 (69.8%)	36 (19.9%)	145 (80.1%)
Nuclear	5 (31.3%)	11 (68.8%)	4 (25.0%)	12 (75.0%)
Obstetric	1 (16.7%)	5 (83.3%)	3 (50.0%)	3 (50.0%)
Peds	16 (34.8%)	30 (65.2%)	9 (19.6%)	37 (80.4%)
Thoracic	43 (32.1%)	91 (67.9%)	27 (20.2%)	107 (79.9%)
US	2 (28.6%)	5 (71.4%)	2 (28.6%)	5 (71.4%)
Vascular/IR	22 (22.2%)	77 (77.8%)	6 (6.1%)	93 (93.9%)
Non-Clinical				
Computer Applications	5 (33.3%)	10 (66.7%)	5 (33.3%)	10 (66.7%)
Contrast Media	6 (40.0%)	9 (60.0%)	3 (20.0%)	12 (80.0%)
Evidence Based Practice	13 (44.8%)	16 (55.2%)	6 (21.4%)	22 (78.6%)
Experimental Studies	10 (34.5%)	19 (65.5%)	7 (24.1%)	22 (75.9%)
Health Policy	11 (32.4%)	23 (67.7%)	8 (23.5%)	26 (76.5%)
Medical Physics	8 (40.0%)	12 (60.0%)	6 (30.0%)	14 (70.0%)
Molecular Imaging	1 (7.7%)	12 (92.3%)	3 (23.1%)	10 (76.9%)
Special Report	1 (9.1%)	10 (90.9%)	2 (18.2%)	9 (81.8%)
Technical Developments	3 (37.5%)	5 (62.5%)	1 (12.5%)	7 (87.5%)

Table 3: Same gender FA/SA Pairs Between Female and Male FA

Subspecialty	First author	Different gender SA	Same gender SA	Difference of gender concordance (95% CI)	P-value
Overall	Female	294 (68.2%)	137 (31.8%)	-49.3% (-54.5%, -44.1%)	<.0001
	Male	148 (18.9%)	635 (81.1%)		
Clinical	Female	253 (67.8%)	120 (32.2%)	-49.2% (-54.7%, -43.4%)	<.0001
	Male	124 (18.6%)	543 (81.4%)		
Non-Clinical	Female	41 (70.7%)	17 (29.3%)	-50.0% (-62.9%, -34.7%)	<.0001
	Male	24 (20.7%)	92 (79.3%)		

RESULTS

Between January 2018 and September 2022, there were 1,214 publications in Radiology: 431 (35.5%) of the FAs were female and 783 (64.5%) of the FAs were male; 285 (23.5%) of the SAs were female and 927 (76.5%) of SAs were male. The percentage of publications with female FAs (35.5%, 95% CI: 32.8-38.3%) was significantly higher (p-value<.0001) than the percentage of female radiologists (26.5%). The percentage of publications with female SAs (23.5%, 95% CI: 21.2-26.0%) was significantly lower (p-value=0.019) than 26.5%. Clinical subspecialties with the highest percentage of publications from female FA include breast (69.0%), pediatric (34.8%), and thoracic (32.1%). The lowest percentage of publications from female FA include obstetric (16.7%), vascular/IR (22.2%), and MSK (26.8%).

DISCUSSION AND CONCLUSION

In conclusion, women are more likely to publish as first author than their men counterpart (35.5%) when taking account into underrepresentation of women in the field of radiology (26.5%)[1]. There was no significant change in the percent of females among FAs or SAs from 2018 to 2022. Female FAs were significantly less likely to publish with same gender SAs compared with male FAs (31.8% vs 81.1%, p-value<.0001), demonstrating the need for more female-to-female mentors.

While this study is limited by comparing authors worldwide publishing in *Radiology* to percentage of female radiologists in the U.S., there continues to be increasing awareness for females to be involved in research worldwide. Further studies in other large impact factor journals and demographics data from other countries can help increase the power of our study.

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