

Women in leading positions among authors in cardiology papers: Is the gender gap closing?

Małgorzata Koniecznyńska^{1,2}, Elżbieta Paszek^{1,2}, Maciej Polak³, Anetta Undas^{1,2}

¹Department of Thromboembolic Disorders, Institute of Cardiology, Jagiellonian University Medical College, Kraków, Poland

²Saint John Paul II Hospital, Kraków, Poland

³Department of Epidemiology and Population Studies, Jagiellonian University Medical College, Kraków, Poland

Correspondence to:

Małgorzata Koniecznyńska, MD, PhD,
Department of Thromboembolic Disorders,
Institute of Cardiology,
Jagiellonian University Medical College,
Prądnicka 80, 31–202 Kraków, Poland,
phone: +48 12 614 30 04,
e-mail: malgorzata.koniecznynska@uj.edu.pl

Copyright by the Author(s), 2024

DOI: 10.33963/v.phj.100772

Received:

April 23, 2024

Accepted:

May 19, 2024

Early publication date:

May 23, 2024

INTRODUCTION

Cardiovascular disease remains the leading cause of mortality worldwide for both men and women [1]. Sex differences in risk factors, clinical manifestations, and therapy are the subject of extensive research [2, 3]. At the same time, women are underrepresented among cardiology researchers and authors, even though it has been postulated that a diverse representation among authors leads to inclusive perspectives on sex and ethnicity [4].

The current number of professionally active physicians in Poland is 165 858, including 99 090 (59.7%) women. There are now 5332 specialists in cardiology, including 2381 (44.6%) women, and 381 in cardiovascular surgery, including 23 (6%) women [5].

Although the number of female cardiologists has increased, it remains unknown whether the proportion of female authors in the scholarly cardiology literature in Poland is growing at a similar rate. We decided to explore these trends over the last 10 years by looking at the gender of the authors who have published articles in the *Polish Heart Journal (Kardiologia Polska)*, the official monthly of the Polish Cardiac Society.

METHODS

We performed a bibliometric analysis of all issues of the *Polish Heart Journal (Kardiologia Polska)* published from January 2014 to December 2023. We assessed all original full-length articles, clinical vignettes, and short communications (introduced in 2018), with regard to the number and percentage of female first, corresponding, and senior (last) authors. Reviews were excluded from the analysis since they were submitted upon

the editor's invitation. Clinical guidelines (in Polish before 2018), expert opinions, or position papers were also excluded. Given a growing number of foreign authors, their sex was classified using the Namsor application (Namsor, Versailles, France), which indicated gender based on the first name, using data from 249 countries, 22 regions, and 22 alphabets. Moreover, we extracted original articles and categorized them into pediatric and adult cardiology. The latter category was further divided into interventional cardiology (vascular interventions, electrocardiology, structural interventions, and cardiovascular surgery) and non-interventional cardiology to evaluate gender disparities in the topics covered by the articles published.

Statistical analysis

The percentage of female first, corresponding, and senior authors was calculated on a yearly basis. The changes in the percentage of women as first, corresponding, or senior authors in the years 2017–2023 were assessed using Spearman rank correlation (Supplementary material, *Table S1*). The differences in percentages of women as first, corresponding, or senior authors between 2014–2017 and 2018–2023 were assessed by a two-proportion test (Supplementary material, *Table S2*). The level of statistical significance was set at 0.05. Statistical analysis was performed using R 3.4.2 (R Foundation, Vienna, Austria, www.r-project.org).

RESULTS AND DISCUSSION

Between January 2014 and December 2023, 115 issues of the *Polish Heart Journal* were published, featuring 837 original studies, 825 cli-

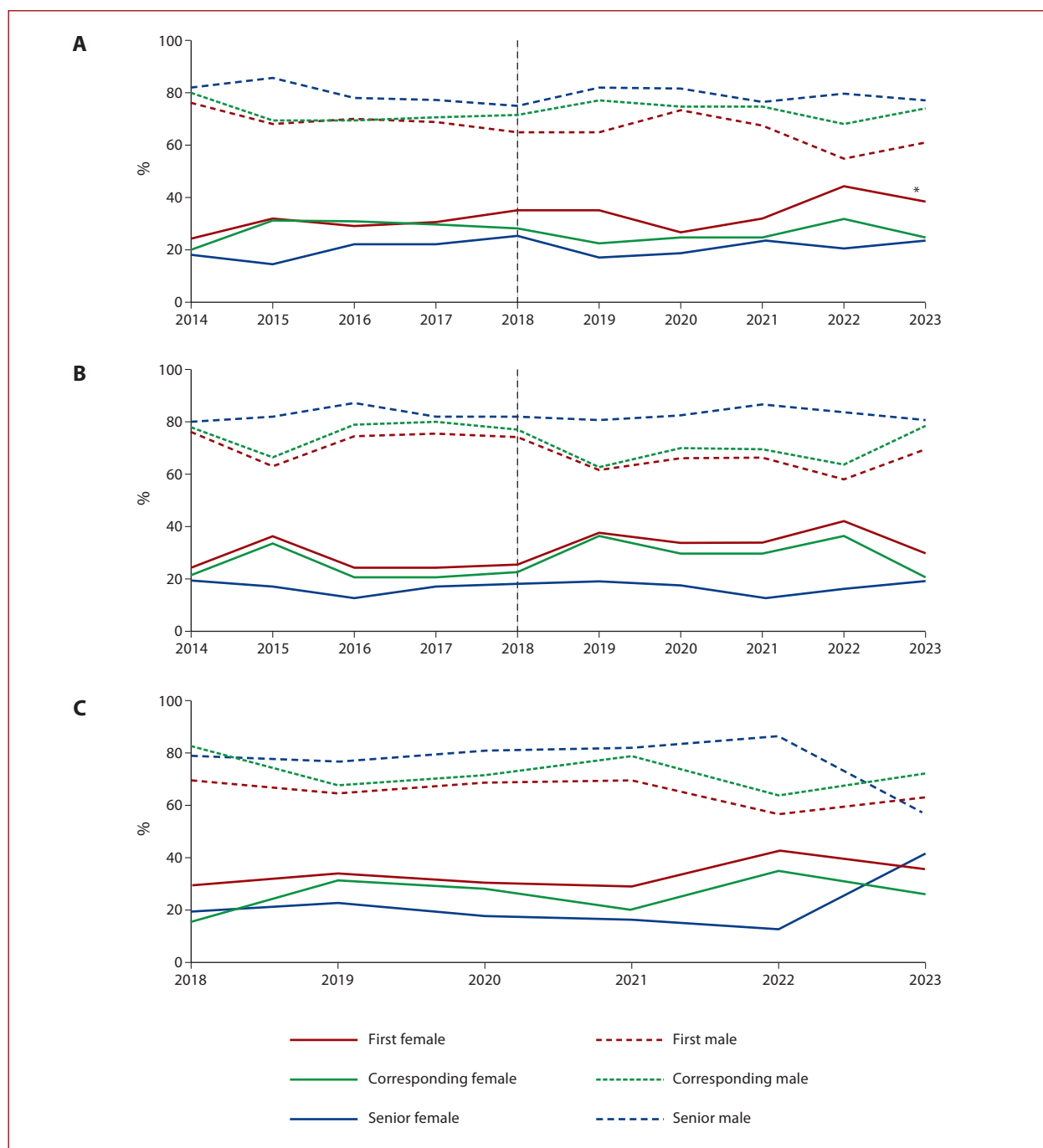


Figure 1. Mean percentages of female versus male first, corresponding, and senior authors in relation to the year of publication. **A.** Original articles. **B.** Clinical vignettes. **C.** Short communications. The temporal trend analysis for original articles showed a significant increase in the percentage of female first authors, but not corresponding or senior authors (* $P=0.019$)

nical vignettes, and 252 short communications (since their initiation in 2018). During the last decade, among original articles, there were 274 first female authors (32.7%), while 172 (20.5%) had female senior authors and 229 (27.4%) had female corresponding authors. Considering clinical vignettes, 261 (31.6%) had women as first authors, 139 (16.8%) as senior authors, and 224 (27.1%) as corresponding authors. Among short communications, 87 (34.5%) were authored by women in the first position; there were 56 (22.2%) senior female authors, and 69 (27.4%) corresponding female

authors in this category. The temporal trend analysis for original articles showed a significant increase in the percentage of female first authors, but not corresponding or senior authors ($P=0.019$) (Figure 1A). There were no similar trends for clinical vignettes or short communications (Figure 1B–C). Comparing data for 2014–2017 and the recent 6 years, we observed a 5.5% increase in the representation of first female authors (from 29.8% to 35.3%).

To our knowledge, this study is the first analysis of gender differences in the authorship of articles in Polish

cardiology journals. In a bibliometric analysis including all authors of original research articles between 1980 and 2017 from three high-impact cardiology journals (*Journal of the American College of Cardiology*, *Circulation*, and *European Heart Journal*), female authors accounted for 33.1% of all authors; however, they represented only 26.7% of total first authors [6], which is lower compared to our findings. Analysis of 396 549 articles from cardiology journals published in the past two decades did not show a significant difference in the overall percentage of women authors (22.5% vs. 21.9%), women as first authors (3.8% vs. 3.6%), or women as last authors (2.5% vs. 2.3%) when compared to United States (US) journals versus non-US journals [7]. Analysis of the top 20 most cited cardiology journals between January 1, 2018 and October 31, 2021 demonstrated that 27% of articles had women as first authors and 20% as senior authors [8]. Our data indicate a slightly higher percentage of female authors in leading positions, which corresponds with a relatively high proportion of practicing female cardiologists in Poland (44.6%). In the US, women represent <15% of cardiologists, while in most European countries, women account for about one-third of cardiologists [9]. In 2023, female researchers in Polish scientific institutions constituted 46%, with the highest percentage (58%) in medical and health sciences [10]. It might be speculated, based on Polish data, that the more female cardiologists, the larger the female representation among leading authors of scientific articles.

Balasubramanian et al. [11] showed there were no women serving as editors-in-chief for US general cardiology journals between 1998 and 2018 and only one female editor-in-chief for a general European cardiology journal. Since 2018, when a woman has been the editor-in-chief of the *Polish Heart Journal*, we observed an increasing trend in the mean percentage of female authors in original articles and clinical vignettes, as compared with the years 2014–2017, which also corresponds to an increased Impact Factor [12].

Analyzing the fields covered by articles, women constituted 18 of 63 first authors in pediatric cardiology (28.6%) and 242 of 774 (31.3%) in adult cardiology in the study period. Gender disparity was observed when gender distribution in medical specialties was addressed. Among original articles in our journal devoted to adult patients, there were 205 female first authors of 561 (36.5%) in non-interventional cardiology and 37 female first authors of 213 in the interventional field (17.4%). Available data indicate a markedly lower proportion of female authors in the field of interventional cardiology, as shown in 2023 by Blumer et al. [7], who reported that interventional cardiology manuscripts tended to have the lowest proportion of overall (18.4%), first (2.7%), and last women authors (1.7%). This indicates that Polish female cardiologists are, to a large extent, interested in clinical research in invasive cardiology even though interventional cardiology is traditionally a male-dominated field, and this pattern is consistent around the world. According to the data from the Polish

National Registry of Percutaneous Coronary Intervention (PCI), women constitute around 4% of all PCI operators in Poland [13]. Interestingly, this demonstrates that female authors are “overrepresented” among the first authors in our journal as compared to the number of female operators in Poland and other countries.

Our study has limitations. We evaluated a single leading Polish cardiology journal and other journals may differ in gender distribution. While other studies used Namsor with considerable success, we must acknowledge that the programming interface of this application is not 100% accurate. The number of citations of the articles in relation to the authors’ gender was not analyzed.

In conclusion, this study documents that although there is a rising trend in leading female authors involved in cardiology research, there is a significant gender gap, with male researchers still outnumbering their female counterparts despite women constituting almost 50% of the community of Polish cardiologists. Further efforts are needed to support scientific activity among female cardiologists in Poland and other countries.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/polish_heart_journal.

Article information

Conflict of interest: None declared.

Funding: None.

Open access: This article is available in open access under Creative Commons Attribution-Non-Commercial-No Derivatives 4.0 International (CC BY-NC-ND 4.0) license, which allows downloading and sharing articles with others as long as they credit the authors and the publisher, but without permission to change them in any way or use them commercially. For commercial use, please contact the journal office at polishheartjournal@ptkardio.pl

REFERENCES

1. Tsao CW, Aday AW, Almarazooq ZI, et al. Heart Disease and Stroke Statistics — 2022 Update: A report from the American Heart Association. *Circulation*. 2022; 145(8): e153–e639, doi: [10.1161/CIR.0000000000001052](https://doi.org/10.1161/CIR.0000000000001052), indexed in Pubmed: [35078371](https://pubmed.ncbi.nlm.nih.gov/35078371/).
2. Awesat J, Abitbol M, Vons S, et al. Current challenges in the diagnosis and management of acute coronary syndromes in women. *Kardiol Pol*. 2022; 80(11): 1084–1093, doi: [10.33963/KP.a2022.0254](https://doi.org/10.33963/KP.a2022.0254), indexed in Pubmed: [36484461](https://pubmed.ncbi.nlm.nih.gov/36484461/).
3. Zdzierak B, Zasada W, Krawczyk-Ożóg A, et al. Influence of sex on the functional assessment of myocardial ischemia. *Kardiol Pol*. 2023; 81(9): 895–902, doi: [10.33963/KP.a2023.0154](https://doi.org/10.33963/KP.a2023.0154), indexed in Pubmed: [37448217](https://pubmed.ncbi.nlm.nih.gov/37448217/).
4. Rai D, Kumar A, Waheed SH, et al. Gender differences in international cardiology guideline authorship: A comparison of the US, Canadian, and European cardiology guidelines from 2006 to 2020. *J Am Heart Assoc*. 2022; 11(5): e024249, doi: [10.1161/JAHA.121.024249](https://doi.org/10.1161/JAHA.121.024249), indexed in Pubmed: [35189693](https://pubmed.ncbi.nlm.nih.gov/35189693/).
5. Central Physician Registry [in Polish]. <https://old.nil.org.pl/rejestr/centralny-rejestr-lekarzy> (accessed: November 2023).
6. Ouyang D, Sing D, Shah S, et al. Sex disparities in authorship order of cardiology scientific publications. *Circ Cardiovasc Qual Outcomes*. 2018; 11(12): e005040, doi: [10.1161/CIRCOUTCOMES.118.005040](https://doi.org/10.1161/CIRCOUTCOMES.118.005040), indexed in Pubmed: [30562072](https://pubmed.ncbi.nlm.nih.gov/30562072/).
7. Blumer V, Zhbannikov IY, Douglas PS. Contributions of women to cardiovascular science over two decades: authorship, leader-

- ship, and mentorship. *J Am Heart Assoc.* 2023; 12(5): e026828, doi: [10.1161/JAHA.122.026828](https://doi.org/10.1161/JAHA.122.026828), indexed in Pubmed: [36847072](https://pubmed.ncbi.nlm.nih.gov/36847072/).
8. Petrechko O, Faturos AS, Pal S, et al. Gender parity in high impact cardiology journals. *Curr Probl Cardiol.* 2023; 48(3): 101549, doi: [10.1016/j.cpcardiol.2022.101549](https://doi.org/10.1016/j.cpcardiol.2022.101549), indexed in Pubmed: [36538996](https://pubmed.ncbi.nlm.nih.gov/36538996/).
 9. Borrelli N, Brida M, Cader A, et al. Women leaders in Cardiology. Contemporary profile of the WHO European region. *Eur Heart J Open.* 2021; 1(1): oead008, doi: [10.1093/ehjopen/oeab008](https://doi.org/10.1093/ehjopen/oeab008), indexed in Pubmed: [35919091](https://pubmed.ncbi.nlm.nih.gov/35919091/).
 10. Nauka w Polsce 2023. <https://radon.nauka.gov.pl/analizy/nauka-w-Polsce-2023> (accessed: April 22, 2024).
 11. Balasubramanian S, Saberi S, Yu S, et al. Women representation among cardiology journal editorial boards. *Circulation.* 2020; 141(7): 603–605, doi: [10.1161/CIRCULATIONAHA.119.042909](https://doi.org/10.1161/CIRCULATIONAHA.119.042909), indexed in Pubmed: [32065777](https://pubmed.ncbi.nlm.nih.gov/32065777/).
 12. Undas A. The 2022 Impact Factor of 3.3: We are the best Polish cardiology journal. *Kardiol Pol.* 2023; 81(7-8): 669–670, doi: [10.33963/KP.a2023.0179](https://doi.org/10.33963/KP.a2023.0179), indexed in Pubmed: [37660367](https://pubmed.ncbi.nlm.nih.gov/37660367/).
 13. Dziewierz A, Vogel B, Zdzierak B, et al. Operator-patient sex discordance and periprocedural outcomes of percutaneous coronary intervention (from the ORPKI Polish National Registry). *Postepy Kardiol Interwencyjnej.* 2023; 19(2): 113–118, doi: [10.5114/aic.2023.129208](https://doi.org/10.5114/aic.2023.129208), indexed in Pubmed: [37465632](https://pubmed.ncbi.nlm.nih.gov/37465632/).