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

Short title: Gender gap in Polish cardiology

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INTRODUCTION

Cardiovascular disease remains the leading cause of mortality worldwide for both men and women [1]. Gender differences in risk factors, clinical manifestations, and therapy are the subject of extensive research [2, 3].

Another aspect of gender issues in cardiology is a low representation of women among researchers and authors. It has been postulated that a diverse representation among authors leads to diverse perspectives specific to gender, race, 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 physicians in cardiology has increased, it remains unknown whether the proportion of women in scholarly cardiology literature in Poland is growing at a similar rate. We decided to determine trends over the last 10 years in the gender of the authors who have published articles in the *Kardiologia Polska* (*Polish Heart Journal)*, the official monthly of the Polish Cardiac Society.

METHODS

We performed a bibliometric analysis of all issues of the *Kardiol Pol* (*Polish Heart Journal*) published from January 2014 to December 2023. We assessed all original full-length articles, clinical vignettes, and short communications (implemented 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 editor invitations. Clinical guidelines (published in Polish till 2018), expert opinions, or position papers were also exluded. Given a growing number of foreign authors, their sex was classified using the Namsor application (Namsor, Versailles, France), which estimates the gender associated with a first name, based on 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 were calculated on a yearly basis. The changes in percentage of women as first, corresponding, or senior author in the time between 2017–2023 were assessed using Spearman rank correlation (Supplementary material, *Table S1*). The differences in percentages of women as first, corresponding, or senior author between 2014–2017 and 2018–2023 were assessed by 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 *Kardiol Pol* were published, featuring 837 original studies, 825 clinical 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 on the first position; there were 56 (22.2%) senior female authors, and 69 (27.4%) corresponding female authors in this type of articles. The temporal trend analysis for original articles revealed 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 and short communications (Figure 1B–C). Comparing data for 2014–2017 and the recent six 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 to assess 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 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 percentage of overall women authors (22.5% vs. 21.9%), women as first authors (3.8% versus 3.6%), or women as last authors (2.5% vs. 2.3%) when comparing 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 on 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 female representation among leading authors of scientific articles.

Balasubramanian et al. [11] showed there were no women editors-in-chief for US general cardiology journals between 1998 and 2018 and only one woman editor-in-chief for a general European cardiology journal. Since 2018, when a woman has been the editor-in-chief of the *Kardiol Pol*, we observed an increasing trend in the mean percentage of female authors

in original articles and clinical vignettes, as compared with 2014–2017, which corresponds to an increasing Impact Factor [12].

Analyzing the fields covered by papers, women constituted 18 out of 63 first authors in pediatric cardiology (28.6%) and 242 out 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 out of 561 (36.5%) in non-interventional cardiology and 37 female first authors out 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 by Blumer et al. [7] in 2023, 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 interested in clinical research in invasive cardiology to a large extent 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 indicates that female authors are “overrepresented” among first authors in our journal as compared to the role of female operators in Poland and other countries.

Our study has limitations. We evaluated a single top Polish cardiology journal and other journals may differ in gender disparities. While other studies used Namsor with considerable success, we must acknowledge that the application programming interface 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 of female leading authors involved in cardiology research, there is a significant gender gap, with male researchers still outnumbering their female counterparts despite almost 50% representation of women in 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

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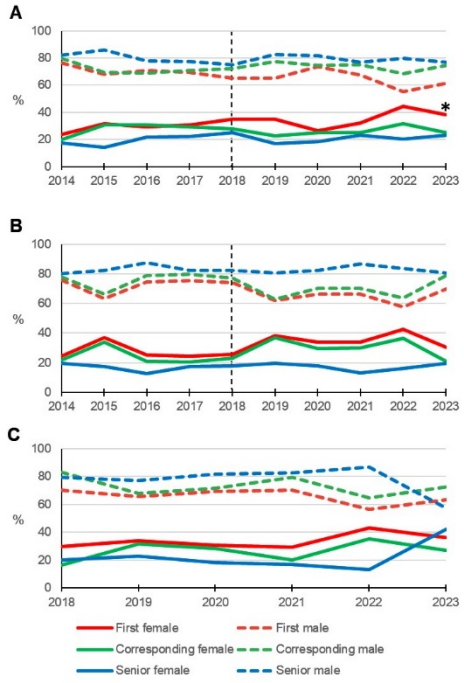

Figure 1. Mean percentages of female versus male first, corresponding, and senior authors with regard to the year of publication. A. Original articles. **B.** Clinical vignettes. **C.** Short communications. The temporal trend analysis for original articles revealed a significant increase in the percentage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