Authorship by Gender in Anesthesiology Journals: A Retrospective Cross-sectional Study for Japan

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Abstract

Purpose: Although it is important to recognize gender disparities in publishing to achieve gender diversity, women's authorship in Japan remains unclear. Therefore, this study aimed to investigate the percentage and analyze the trends of articles authored and published in anesthesiology journals by Japanese female authors.

Methods: The genders of the first and last authors affiliated with Japanese institutions were surveyed in the *Journal of Anesthesia* (*JA*) (1990, 1995, and 2000–2022) and 11 international anesthesiology journals (2010–2022).

Results: We included 845 and 819 original research articles from *JA* in the analyses of the first and last authors, respectively. The proportion of female first authors significantly increased from 41 (11.7%) out of 351 before 2009 to 119 (24.1%) out of 494 after 2010 ($p < 0.001$). The proportion of female last authors was 11 (3.3%) out of 335 before 2009 and 22 (4.5%) out of 484 after 2010, respectively, with no significant difference ($p = 0.470$). We included 624 and 572 original research articles from international anesthesiology journals in the analyses of first and last authors, respectively. Among these, there were 134 (21.5%) and 23 (4.0%) female first and last authors, respectively. These proportions in international anesthesiology journals did not significantly differ from those in *JA* ($p = 0.334$, $p = 0.789$, respectively).

Conclusion: The percentage of female first authors has increased, commensurate with the percentage of female anesthesiologists. However, the percentage of female last authors has not increased and remains low in Japan.

Introduction

The number of female anesthesiologists is increasing, with women accounting for over 40% of the members of the Japanese Society of Anesthesiologists (JSA) from 2021 onward. The role of women in advancing anesthesiology is becoming increasingly important; however, female doctors tend to face difficulties in securing leadership positions [1, 2]. A previous report showed that women constituted only 2.6% of full-time professors across 80 Japanese medical schools in 2013 [3]. Publication in peer-reviewed journals remains crucial for conventional academic promotion [4]. Accordingly, to develop strategies for advancing the position of women, it is important to elucidate gender disparities in publishing.

There have been numerous reports regarding gender disparities in major international anesthesiology journals, with several of them indicating an increase in the number of female authors in peer-reviewed journals [5–9]. Specifically, the percentage of woman-authored articles (articles written by women as either the first or last author) in the *Anesethesiology*, *British Journal of Anaesthesia*, *Anaesthesia*, *European Journal of Anaesthesiology*, and *Anesthesia and Analgesia (Anesth Analg)* was 45.7% in 2018 [5]. However, since gender disparity in authorship varies by country [10, 11], there may

be even fewer female authors publishing anesthesiology articles in Japan; no study has tested this hypothesis.

Since details regarding women's authorship in Japan remain unclear, we aimed to investigate the percentage and analyze the trends of articles authored by Japanese female authors and published in anesthesiology journals. Moreover, we aimed to investigate the gender disparity in conference presentations, which generally prelude article publications. Compared with a homogeneous workforce, a diverse workforce generally plays a beneficial role in improving performance [12–14]; diversifying the scientific workforce is essential for advancing medical research [15]. This study aims to provide information that would aid in developing strategies for achieving gender diversity in the field of anesthesiology in Japan.

Methods

This was a retrospective, observational, cross-sectional study. Since this study was based on bibliometric analysis, it did not require approval from an Institutional Ethics Board.

This study addressed the following questions regarding the academic activity of women affiliated with Japanese institutions.

1. What was the percentage and trend of female authors in the *Journal of Anesthesia (JA)*, which is the official journal of JSA?
2. What was the percentage of female authors in international anesthesiology journals? Were there differences in the rate of female authorship in these journals compared with that in *JA*?
3. What was the percentage of female presenters in the presentations at JSA annual meetings? Were there differences compared with the gender proportion of JSA members?

We surveyed the gender of the first and last authors (presenters) affiliated with Japanese institutions in *JA*, international anesthesiology journals, and conference presentations at JSA annual meetings. Since we could not determine the authors'

nationality, we checked the country of affiliation. Authors affiliated with overseas institutions were excluded. Consistent with the methods used in previous related reports, the gender of the authors (presenters) was determined based on their names. In case this was difficult, gender was determined based on photos on the internet and social networking services (SNS), including Facebook [5, 7, 8]. Authors whose gender could still not be determined were excluded from the analysis.

For *JA*, we queried for articles published in 1990, 1995, and 2000–2022 until Issue 5. Original research articles, clinical reports, reviews, short communications, special articles, editorials, and invited reviews were included. Contrastingly, letters, guidelines, announcements, symposium information, erratum, and retracted articles were excluded. Editorials and invited reviews are typically solicited by the editorial board. Both unsolicited and solicited articles were included for comparisons [9]. These data were obtained from the *JA* website.

For international anesthesiology journals, we included 11 journals from the category of Anesthesiology and Pain Medicine in Scimago Journal Rank (SJR) (Table 1); among them, 10 journals were ranked Q1 (top 25%). Although *Acta Anaesthesiologica Scandinavica* was ranked Q2 (top 50%), it was included since it is popular in Japan [16]. We included original research articles, clinical reports, and

reviews published from 2010 onward, with letters and articles without an abstract being excluded. On 11th October 2022, the databases of both PubMed and SCOPUS were searched for articles to minimize search omissions. Since the initial number of papers was exceedingly high, we excluded the papers that did not include Japan in the address of the authors' affiliations. We subsequently surveyed the gender of the authors manually. For articles that only listed the author's initials, full names were obtained using the SCOPUS author search API.

Regarding presentations at the JSA annual meeting, we searched for presentations from 2017 to 2022; however, the year 2021 was excluded since there was a different presentation format due to the presence of preventive measures taken against coronavirus disease 2019 (COVID-19). We included peer-reviewed presentations. Symposiums, international sessions, and retracted presentations were excluded. Further, we investigated whether the presentation was nominated for the best abstract award. These data were obtained from the JSA member's website. Moreover, we contacted the JSA office to determine the gender ratio of JSA members.

Data are presented as numbers (percentage, %). Ratios were compared using the chi-square test or Fisher's exact test in case of five or fewer cells. All p-values were two-sided, and values less than 0.05 were considered statistically significant. Statistical

analyses were performed using EZR (Saitama Medical Center, Jichi Medical University, Saitama, Japan), which is a graphical user interface for R version 4.1.3 (The R Foundation for Statistical Computing, Vienna, Austria) that provides statistical functions frequently used in biostatistics [17].

Results

We identified 3256 articles in *JA* published in 1990, 1995, and 2000–2022. Based on the eligibility and exclusion criteria, 1641 and 1506 articles were included in the analyses of the first and last authors, respectively. (Supplemental Figure 1). Among the 1641 first authors, 299 (18.2%) were women. The proportion of female first authors significantly differed according to article type ($p < 0.001$). Specifically, there were relatively few female first authors for reviews and editorials (2 [4.4%] and 0 [0.0%], respectively). Among the 845 first authors of original research articles, 160 (18.9%) were women. The proportion of female first authors for original research articles increased significantly from 41 (11.7%) out of 351 before 2009 to 119 (24.1%) out of 494 after 2010 ($p < 0.001$). Among the 1506 last authors, 68 (4.5%) were women. The proportion of female first authors differed significantly according to article type ($p < 0.001$). There were no female last authors for reviews, special articles, and editorials. Among 819 last authors of original research articles, 33 (4.0%) were women. The proportion of female last authors for original research articles was 11 (3.3%) out of 335 before 2009 and 22 (4.5%) out of 484 after 2010, with no significant difference ($p = 0.470$). (Table 2, Figure 1)

Among the 11 international anesthesiology journals, 40269 and 42497 articles published from 2010 onward were initially retrieved from SCOPUS and PubMed, respectively. Based on the eligibility and exclusion criteria, 670 and 609 articles were included in the analyses of the first and last authors, respectively (Supplemental Figure 2). Among the 670 first authors, 143 (21.3%) were women. There was no significant difference in the proportion of women by article type (p = 0.779). Among 624 first authors of original research articles, 134 (21.5%) were women, with no significant difference compared with the proportion in *JA* during the same period (vs. 24.1%, p = 0.334). Among 609 last authors, 26 (4.3%) were women. The proportion of female authors did not significantly differ according to article type (p = 0.091). Among 572 original research articles, 23 (4.0%) had a female last author, with no significant difference compared with the proportion in *JA* during the same period (vs. 4.5%, p = 0.789). (Table 3, Figure 1) Moreover, there were no significant differences in the percentage of female authors among international journals (p = 0.470 for first authors, p = 0.418 for last authors, Supplemental Table 1).

We identified 2581 presentations at the JSA meeting in the 2017–2022 period. Based on the eligibility and exclusion criteria, 2496 and 2420 presentations were included in the analyses of first and last authors, respectively (Supplemental Figure 3).

Among the 2496 first presenters, 935 (37.5%) were women. There was no significant difference in the gender distribution of JSA members across the years (Supplemental Table 2). Further, there was no significant difference in the proportion of female first authors with respect to the nominations for the best abstract award (35.1% with nominations vs. 37.8% without nominations, $p = 0.340$). Among the 2420 last presenters, 170 (11.1%) were women. Female last presenters were significantly less likely to be nominated for the best abstract awards (5.2% with nominations vs. 12.1% without nominations, $p < 0.001$) (Table 4).

Discussion

This study investigated the percentage and trends of Japanese woman-authored articles published in anesthesiology journals. The percentage of female first authors for original research articles showed an increase, plateauing after 2010 at approximately 25%, which is consistent with the findings of previous foreign reports [6–9]. Additionally, the percentage of female first authors in *JA* is comparable with that in previous reports (31.6% in *Anesthesiology* [8], 29.7% in *Anesth Analg* [8], and 27% in *Canadian Journal of Anesthesia (Can J Anaesth)* [9]) in 2017. Contrastingly, there was no increasing trend in the percentage of female last authors in Japan, which remained at approximately 5%; this finding is inconsistent with the global trend of an increase in the percentage of both first and last female authors [6–9]. Moreover, the percentage of female last authors in Japan appears to be much lower than that in previous foreign reports (21.9% in *Anesthesiology* [8], 22.5% in *Anesth Analg* [8], and 18% in *Can J Anaesth* [9]) in 2017.

There were no female authors for editorials, which are typically solicited by the editorial board of *JA*. Similarly, *Can J Anaesth* reported that there were fewer female first authors for solicited editorial articles (19%) than those for original articles (27%) in 2017. Nevertheless, the lack of female authors of *JA* editorials is drastic. It may be

attributed to the lack of women on the editorial board of *JA*. McMullen et al. reported that women occupied 18% of all editorial board positions in 19 anesthesiology journals, including *JA* with 0% of female editors, on average in 2020 [18]. Editorial boards strongly influence the articles that are published, which in turn considerably affect the entire specialty field. Therefore, editorial boards should regularly monitor, evaluate, and report on compliance with diversity goals [4, 19]. There has been increasing interest in gender diversity on editorial boards [18, 20–25].

We investigated the gender distribution of authors in 11 international anesthesiology journals; among these, 10 journals had higher impact factors than *JA* in 2021. The gender distribution in authorship did not significantly differ among the journals. While there are some criticisms regarding the citation metrics, the impact factors of the journals are considered to play an important role in securing academic promotion [26, 27]. Previous reports observed that women were less productive in high-impact journals [11, 28]. However, our finding suggests that Japanese women achieved publications regardless of the journal's impact factor in the field of anesthesiology.

We investigated the gender distribution among the presenters at the JSA annual meeting. While authors in anesthesiology journals are not limited to anesthesiologists, most presenters at the JSA annual meeting are JSA members. Therefore, it might be

more appropriate for the gender distribution of JSA members to be compared with that of presenters at the JSA annual meeting rather than journal authors. We found no significant difference between the gender distribution of the first presenters and that of JSA members. We further analyzed the gender distribution in the nominations for the best abstract award. This sub-analysis addresses the following concern: presentations at JSA meetings are a requirement for board-certified anesthesiologists, which may affect the proportion of female first presenters. Nevertheless, we confirmed no significant gender differences between first authors with and without the nomination. Contrastingly, the overall percentage of female last presenters was 11.1%; however, the percentage of woman-authored abstracts nominated for a best abstract award was significantly lower (approximately 5%). This may correspond to the percentage of female last authors for original articles.

Taken together, the percentage of female first authors has increased in Japan, commensurate with the percentage of female anesthesiologists. However, the percentage of female last authors has not increased and remains low in Japan, which is in contrast with the global trend. While the order of authorship may vary by institution, region, and academic field, the last authors of original articles are generally considered to be in leadership positions [11, 29, 30]. Although this study design does not allow us

to determine the mechanisms, there are two possible reasons for the lack of the increasing trend in the proportion of female last authors. First, there may be a large age gap between the first and last authors. Since it takes years to take up a leadership position, the number of female last authors may increase later than the number of first authors. Second, there may be some barriers ("glass ceiling") against reaching leadership positions [31, 32]. Numerous reports have indicated that women are more likely to face difficulties when climbing the career ladder [33–37]. Additionally, women are relatively less willing to become leaders [38]. Being a woman is related to the "motherhood penalty" [39], a lack of role models [40], difficulties finding mentors [41], low self-evaluation [42–44], and insufficient self-expression [45, 46]. Furthermore, most of the gender disparities are attributable to gender-specific dropout rates and subsequent gender disparities in publication career duration and total productivity, which indicates the need to support career sustainability among women [47].

This study has several limitations. First, we could not identify the gender of the author/presenter in 12 (0.4%) and 8 (0.6%) cases in the *JA* and international journals, respectively, as well as in 30 (0.6%) cases at the JSA meetings. Second, gender was determined based on the name or photos on the internet or SNS, which may not always accurately indicate gender. Further, some cases may include non-binary cases that can

not be determined based on biological sex. Third, the selection method for the first or last author (presenter) may differ across the institutions and groups. We could not determine the role of the author (presenter) in their work. Fourth, we could not determine the authors' academic degrees since *JA* and some journal authors did not provide the relevant information. A previous report indicated that female authors were more likely to have a Ph.D. or non-medical degree compared with male authors; moreover, most female last authors were non-medical degree holders [5]. Since the authors may comprise several non-medical degree holders, the results may not reflect the actual situation regarding anesthesiologists. To mitigate this limitation, we also examined the gender distribution among the presenters at the JSA meeting.

In conclusion, the percentage of female first authors has increased, commensurate with the percentage of female anesthesiologists. However, the percentage of female last authors has not increased and remains low in Japan, which is in contrast with the global trend. We need to further address the issues underlying this phenomenon to achieve gender diversity.

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Declaration of interests

All the authors declare that they have no conflict of interest

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Figure legends

Figure 1: The percentage of female authors for original research articles over time

JA, *Journal of Anesthesia*; IAJ, international anesthesiology journals

The proportion of female first authors was 41 (11.7%) of 351 in total before 2009 and 119 (24.1%) out of 494 in total after 2010 ($p < 0.001$). The number of female last authors was 11 (3.3%) out of 335 in total before 2009 and 22 (4.5%) out of 484 in total after 2010 ($p = 0.470$).