



Title	Women among first authors in Japanese cardiovascular journal: An observational study
Author(s)	Fujii, Tomoko; Matsuyama, Tasuku; Takeuchi, Jiro et al.
Citation	International Heart Journal. 2018, 59(2), p. 372-377
Version Type	VoR
URL	https://hdl.handle.net/11094/78721
rights	
Note	

The University of Osaka Institutional Knowledge Archive : OUKA

<https://ir.library.osaka-u.ac.jp/>

The University of Osaka

Women among First Authors in Japanese Cardiovascular Journal

An Observational Study

Tomoko Fujii,¹ MD, Tasuku Matsuyama,² MD, Jiro Takeuchi,³ MD, Masahiko Hara,⁴ MD,
Tetsuhisa Kitamura,⁵ MD and Keiko Yamauchi-Takahara,^{6,7} MD

Summary

The representation of women in Japanese academic medicine is not evident. We aimed to assess trends related to the proportion of female first authors in Japanese cardiovascular journals.

We reviewed original research articles in 6 journals published in English by Japanese societies between 2006 and 2015 related to cardiovascular fields. We conducted a multivariable logistic regression analysis to assess the factors associated with the gender of first authors and plotted the trend of predicted probability for female first authors over the study period. Of 7,005 original articles, 1,330 (19.0%) had female first authors. Affiliations located in Japan (adjusted odds ratio [aOR], 0.76; 95% confidence interval [CI], 0.71-0.81), concurrent first and corresponding authors (aOR, 0.69; 95% CI, 0.64-0.74), and the total number of listed authors (aOR, 0.97; 95% CI, 0.95-0.99) were negatively associated with female first authors. The adjusted probability of a female first author increased from 13% to 20% on an average between 2006 and 2009, but the increase reached a plateau after 2010.

Female first authors of original research articles published in Japanese cardiovascular journals increased over the examined decade. However, the representation of women is still low and has plateaued in recent years. A gender gap in authorship for Japanese cardiovascular journals remains.

(Int Heart J 2018; 59: 372-377)

Key words: Japan, Gender Gap, Authorship

The representation of women in the workplace has been the focus of discussion worldwide.¹⁻⁴⁾ Japan is known for its devastatingly low female representation in employment by industries among the Organization for Economic Co-operation and Development (OECD) member nations. Further, Japan had the lowest female proportion of seats on the boards of the largest publicly listed companies in 2015 (i.e., only 3%).⁵⁾

Regarding medical professionals, the proportion of women among those who passed the required national examinations has increased since 2001 reaching over 30%.⁶⁾ However, the proportion of female physicians among those under the age of 35 years is still the lowest for the OECD members (i.e., 33% in 2014).⁷⁾

Moreover, female physicians accounts for a much smaller proportion than men in medical society leadership positions and academic positions. In the United States⁸⁾ and Europe⁹⁾ women account for a higher proportion of the active physicians than in Japan. It has been reported in Japan that the proportion of women is less than 5% in the top three academic positions of professor, associate pro-

fessor, and senior lecturer for medical courses in public medical schools.¹⁰⁾

Editorial p.248

As publications have a strong influence on the tenure and promotion in most academic institutions, a woman's representation in publications of medical literature as first authors would carry an important implication for developing policies to reduce the gender disparities in academic medicine. Previously, several studies have revealed an under-representation of women among authors of medicine research papers.^{2,11,12)} However, Japanese authors were rarely included in these studies.^{2,11,12)} The inference for Japanese researchers is unclear. Therefore, we aimed to assess the representation of female researchers by determining the prevalence and trends regarding female first authorship in original research articles published in the English language in Japanese cardiovascular journals.

From the ¹Department of Epidemiology and Preventive Medicine, Kyoto University Graduate School of Medicine, Kyoto, Japan, ²Department of Emergency Medicine, Kyoto Prefectural University of Medicine, Kyoto, Japan, ³Kyoto University Health Service, Kyoto, Japan, ⁴Department of Cardiovascular Medicine, Osaka City University Graduate School of Medicine, Osaka, Japan, ⁵Division of Environmental Medicine and Population Sciences, Department of Social and Environmental Medicine, Graduate School of Medicine, Osaka University, Osaka, Japan, ⁶Department of Cardiovascular Medicine, Osaka University Graduate School of Medicine, Osaka, Japan and ⁷Osaka University Health Care Center, Osaka, Japan.

This work was supported by JSPS KAKENHI Grant Number JP15K01712.

Address for correspondence: Tomoko Fujii, MD, Department of Epidemiology and Preventive Medicine, Kyoto University Graduate School of Medicine, Yoshida-Honmachi, Sakyo-ku, Kyoto, 606-8501, Japan. E-mail: tofujii-ky@umin.net

Received for publication April 3, 2017. Revised and accepted May 30, 2017.

Released in advance online on J-STAGE February 20, 2018.

doi: 10.1536/ihj.17-187

All rights reserved by the International Heart Journal Association.

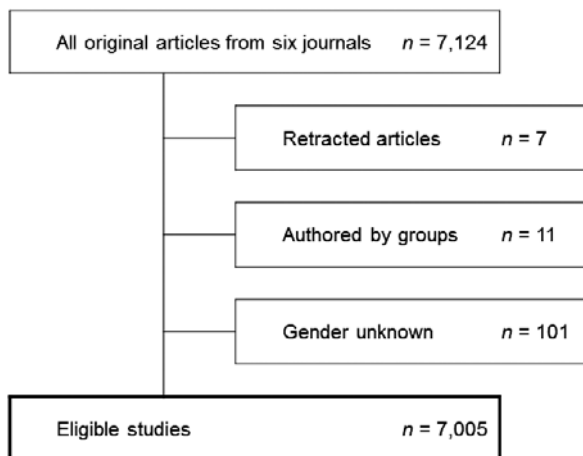


Figure 1. Study flow chart.

Methods

We retrospectively assessed the proportion of female first authors of original research articles published in Japanese cardiovascular journals between 2006 and 2015. We examined relevant changes over time as well as characteristic differences stratified by the journals. Because this study did not involve individual patients, ethical approval was not required.

Data collection—inclusion and exclusion criteria: We selected 6 cardiovascular-related journals published in English by Japanese societies and indexed in PubMed for more than 5 years prior to 2015. We excluded journals published collaboratively by both Japanese and international publishers. The 6 journals were as follows: Circulation Journal (CIRC J), Journal of Cardiology (J CARDIOL), Journal of Atherosclerosis and Thrombosis (J ATHEROSCLER THROMB), Hypertension Research (HYPERTENS RES), Heart and Vessels (HEART VESSELS), and International Heart Journal (INT HEART J). From the full text of the articles, the number of authors and their names, the country of the first author's affiliation, article type, and the study subjects were available. We collected data for original research articles including meta-analyses published in these journals from January 2006 to December 2015 and excluded short papers, case reports, review articles, editorials, and letters.

Variables of interest: From each original article, we retrieved data regarding the year of publication, journal, gender of the first author, location of the first author's affiliation, type of the first author's affiliation, total number of authors, corresponding author, and study subjects. We collected the last three variables to explain the possibility that female researchers could be less likely to lead large clinical research projects.

We determined the gender of the first author by the first name. If it was difficult to adjudicate an author's gender from the name, we examined websites of their institutions, social media accounts (e.g., ResearchGate, Researchmap, LinkedIn, and Facebook), and internet search engines (e.g., Google). If genders were not identifiable af-

ter these searches, we grouped them as "unknown." The total number of authors was defined as the number of listed authors.

Data quality: Four reviewers (TF, TM, JT, and TK) used a standardized data collection sheet. Reviewers retrieved data independently, and the data were double-checked. Discrepancies were resolved through discussions between the reviewers.

Statistical analysis: We summarized characteristics of each article in numbers and percentages for categorical variables and in mean and standard deviations for continuous variables. We used a logistic regression model for investigating the factors associated with the gender of the first author. The model included the following independent variables: year of publication, journal, country of the first author's affiliation, type of the first author's affiliation, total number of authors, corresponding author, and study subjects. The year of publication and total number of authors were treated as continuous variables and modeled with a five-knot cubic spline to avoid assuming a linear association with the female first author.¹³⁾ We calculated adjusted odds ratios (aORs) and their 95% confidence intervals (CIs). We also plotted the association between the time of publication and the predicted probability of women as first authors according to the various journals. All statistical analyses were performed using the JMP® Pro 11.2.0 software (SAS Institute Inc., Cary, NC, 2013).

Results

Among the 6 journals, J CARDIOL had been published for the most recent 8 years, whereas the other 5 journals had a 10-year publication history for the 10-year study period. Among 7,124 original articles that were collected, 7 were retracted, 11 were authored by groups and in 101 articles, the gender of the first author was not distinguishable. Thus, 7,005 items were eligible for the analyses (Figure 1). Overall, 1,330 of the 7,005 articles (19.0%) had female first authors (Table I).

Table I shows the characteristics of the included original articles by gender of the first author: J ATHEROSCLER THROMB had the highest proportion (26.4%) of the female first authors, and J CARDIOL had the lowest (13.0%) proportion. Among 4,631 first authors whose affiliations were located in Japan, 703 (15.2%) were females. A total number of listed authors had revealed a minor difference between articles by females as first authors and males as first authors (8.2 versus 8.7, $P < 0.001$), and fewer female first authors were corresponding authors than were male first authors (12.5% versus 87.5%, $P < 0.001$).

From the multivariable logistic regression analysis, J ATHEROSCLER THROMB and HYPERTENS RES were more likely to publish articles by female first authors in reference to HEART VESSELS, whereas CIRC J and J CARDIOL were less likely (Table II). Regarding affiliation located in Japan (aOR, 0.76; 95% CI, 0.71-0.81), the concurrent first and corresponding author (aOR, 0.69; 95% CI, 0.64-0.74) and the total number of listed authors (aOR, 0.97; 95% CI, 0.95-0.99) were negatively associ-

Table I. Characteristics of Articles Published in the 6 Journals

	Total	Female	Male	<i>P</i> value
<i>n</i> (%)	7005	1330 (19.0)	5675 (81.0)	
Journal				< 0.001
Circulation Journal	2640	411 (15.6)	2229 (84.4)	
Heart and Vessels	695	145 (20.9)	550 (79.1)	
Hypertension Research	1428	340 (23.8)	1088 (76.2)	
International Heart Journal	669	121 (18.1)	548 (81.9)	
Journal of Atherosclerosis and Thrombosis	811	214 (26.4)	597 (73.6)	
Journal of Cardiology	762	99 (13.0)	663 (87.0)	
Publication year				0.004
2006	518	70 (13.5)	448 (86.5)	
2007	589	91 (15.4)	498 (84.6)	
2008	702	139 (19.8)	563 (80.2)	
2009	698	151 (21.6)	547 (78.4)	
2010	774	155 (20.0)	619 (80.0)	
2011	742	135 (18.2)	607 (81.8)	
2012	759	166 (21.9)	593 (78.1)	
2013	714	144 (20.2)	570 (79.8)	
2014	750	139 (18.5)	611 (81.5)	
2015	759	140 (18.5)	619 (81.6)	
Location of affiliation				
Japan	4631	703 (15.2)	3928 (84.8)	< 0.001
Overseas	2374	627 (26.4)	1747 (73.6)	
Asia	1372	359 (26.2)	1013 (73.8)	0.777
Non-Asia	1002	268 (26.7)	734 (73.3)	
Affiliation				< 0.001
University/Medical school	5662	1129 (19.9)	4533 (80.1)	
Others	1343	201 (15.0)	1142 (85.0)	
Total no. of listed authors, mean (SD)	8.6 (3.7)	8.2 (3.5)	8.7 (3.7)	< 0.001
Correspondence				< 0.001
First author	3142	393 (12.5)	2749 (87.5)	
Others	3863	937 (24.3)	2926 (75.7)	
Subjects				< 0.001
Human	6046	1099 (18.2)	4947 (81.8)	
Animal	878	215 (24.5)	663 (75.5)	
Others	81	16 (19.8)	65 (80.2)	

SD indicates standard deviation.

Table II. Factors Associated with Female First Authors

	Crude OR	95% CI	Adjusted OR	95% CI
Journals				
Heart and Vessels	ref.		ref.	
Circulation Journal	0.78	0.70-0.87	0.81	0.72-0.91
Hypertension Research	1.32	1.17-1.48	1.25	1.11-1.42
International Heart Journal	0.93	0.78-1.11	0.90	0.75-1.07
Journal of Atherosclerosis and Thrombosis	1.51	1.31-1.74	1.47	1.26-1.70
Journal of Cardiology	0.63	0.52-0.76	0.71	0.58-0.86
Years	1.02	1.00-1.04	1.01	0.99-1.03
Location of affiliation—Japan versus Overseas	0.71	0.66-0.75	0.76	0.71-0.81
Affiliation—University/Medical school versus others	1.19	1.10-1.29	1.06	0.98-1.16
First and corresponding author versus others	0.67	0.63-0.71	0.69	0.64-0.74
Subject				
Animal	ref.		ref.	
Human	1.02	0.62-1.69	1.16	0.70-1.93
Others	0.66	0.24-1.77	0.68	0.25-1.86
Total number of listed authors (per one author)	0.96	0.95-0.98	0.97	0.95-0.99

OR indicates odds ratio; and CI, confidence interval.

ated with female gender of the first author (Table II).

We observed the prevalence of women among first

authors for journal articles over time. The adjusted probability of an article having a female first author increased

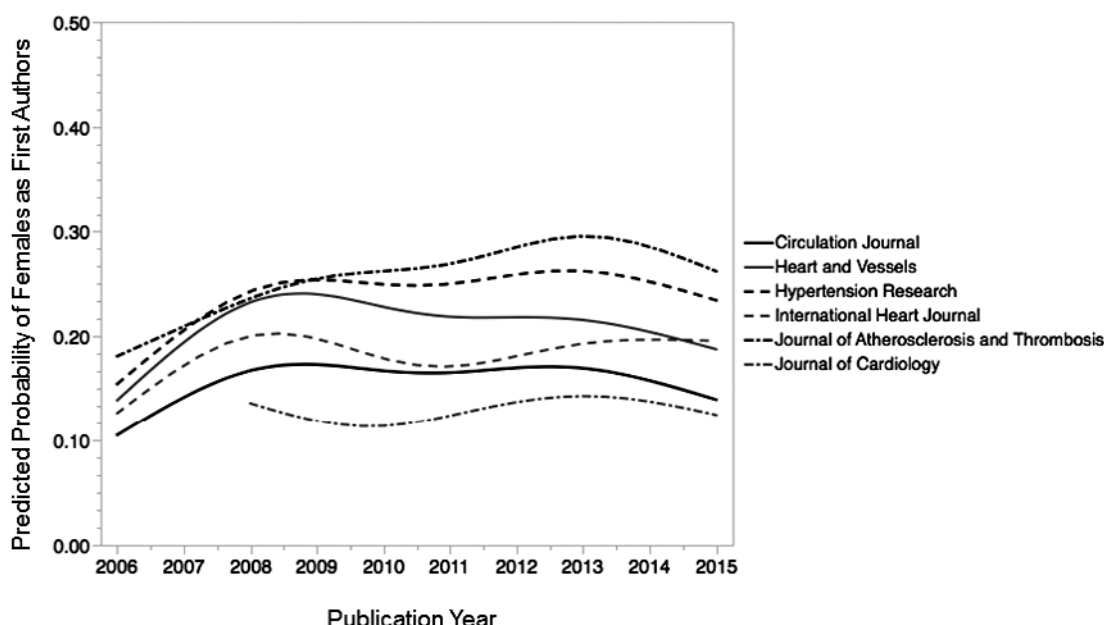


Figure 2. Trend of predicted probability of female first author stratified by journals.

approximately 7% points from 13% to 20% on an average between 2006 and 2009, but the increase reached a plateau after 2010 (Figure 2). Further, J ATHEROSCLER THROMB had the highest proportion (29.5%) in 2013 and J CARDIOL had the lowest (11.3%) in 2010.

Discussion

In the present study, we examined the prevalence of female first authorship in original research articles published over 10 years in Japanese cardiovascular journals. Among the 6 journals we reviewed, 19.0% of the first authors were females. However, the proportion decreased to 15.2% when we limited the location of the first authors to Japan. The trend in the predicted probability of female first authors increased from 2006 to 2009, but it has plateaued at 20% on an average since 2010. Moreover, it has shown a mild decrease in 5 journals since 2013.

Relation to previous studies and possible explanations for the results: Several studies have explored female representation in academic medicine and medical research studies.^{2,11,12,14-16} Filardo and colleagues observed that females accounted for 34% of first authors of original research worldwide for high-impact general medical journals.¹² The proportion of women among first authors increased during the past 2 decades, but plateaued in later years.¹² In their study, 26%-31% of the articles on the topic of cardiovascular medicine or surgery were first authored by women. We observed a lower prevalence of female first authorship in Japanese cardiovascular journals (19.0%) than in the articles of cardiovascular medicine or surgery, which were published in prominent general medicine journals globally; similar trends indicate that there were no gains from 2010 to 2015. Furthermore, we observed a mild decrease in the predicted probability of female first authors over the last 3 years. A declining trend

was also noted in the study by Filardo.¹² Our study implies that concerns about a failure to advance women to leadership roles in medical research are more serious within the Japanese cardiology field than in the general medical field globally, and the trend is parallel in general medicine worldwide.

Overall, under-representation of female professionals in Japan could explain the lower numbers of female first authors compared to other countries in Asia. Japan had ranked one-hundred and one among 145 countries in the World Economic Forum's gender equality rankings of 2015.¹⁷ In 2016, Japan has plunged to the one-hundred and eleventh place out of 144 countries.¹⁸ This downfallen record could be explained by the widening of the gender gap for professional and technical workers, which was at the one-hundred and first place in 2016. This is no doubt the lowest ranking among the Groups of Seven nations; moreover, it is lower than other East Asian countries. Philippines, Thailand, Vietnam, and China were ranked in the first place, and South Korea was in the seventy-eighth position; Singapore was in the eighty-first place.¹⁸

Yamauchi-Takahara surveyed the prevalence of women among presenting authors and chairs at the Annual Scientific Meeting of the Japanese Circulation Society in 2006 and 2015.¹⁹ Females as presenting authors accounted for 11.0% in 2006 and increased to 15.4% in 2015, and female chairs accounted for 2.4% in 2006 and increased to 12.0% in 2015.¹⁹ The proportion of female first authors from Japanese institutions in our cohort was similar to that of female presenting authors at scientific meetings.

There are, perhaps, multiple reasons for the under-representation of females as first authors in cardiology studies. Bakken and colleagues reported that women physician-scientists perceived their abilities to perform or apply knowledge and skills in clinical research as lower than that of men.²⁰ Low self-perceived competency to per-

form clinical research may have restrained female researchers from leading clinical research studies as first authors.

Leadership positions and mentoring could also be important factors in successful careers in academic medicine. In Japanese medical schools, women occupy less than 5% of the top 3 academic positions.¹⁰⁾ There are few female role models or mentors among cardiac physicians, and this situation could have an influence on the low activity in conducting research. Jackson and colleagues conducted a qualitative research of mentoring in academic medicine to explore its complexity.²¹⁾ From their summary of interviews, they noted certain gender challenges and indicated that institutions should make female mentors available to faculty members, even though all mentees may not prefer a mentor of the same gender.²¹⁾ Grant funding is another critical resource for researchers. In 2014, the National Institutes of Health (NIH) reported that women make up only about 30% of the principal investigators for research projects funded by NIH.²²⁾ Limited access to grant funding could discourage women from leading large research studies. In our study, female first authors were less frequently assigned as corresponding authors, and women were more likely to work in studies that used animal models rather than human subjects compared to men. A total number of listed authors could have been small in articles first authored by women, although the difference is rather small. The findings imply that women are less likely to be represented in large clinical studies.

In contrast, the proportion of Japanese women as first authors could have reached a saturation point. According to data obtained from the Japanese Circulation Society (<http://www.j-circ.or.jp>), 12.7% of members were women, and females accounted for 10.5% of all board-certified cardiologists in 2016.¹⁹⁾ Although it is difficult to know how many of them have actively been engaged in academic medicine, the results of our study may overall reflect a limited number of female cardiologists.

Strengths and limitations: This is the first study examining the status of female cardiology researchers through a comprehensive and rigorous review of all original articles published over the past decade.

However, several limitations should be noted. First, we only evaluated 6 English-language journals published by Japanese societies with cardiovascular disease as the focus. We did not evaluate data of journals published in Japanese or prominent international journals. The proportions and trends in this study could not be generalized for all Japanese female researchers involved in cardiovascular medicine. Second, some misclassification might have occurred in terms of the designation of gender of first authors. Third, authors' academic degrees or professional positions were not available from articles; hence, we could not explore whether the low representation of female researchers was related to the proportion of female medical doctors or a lower rank of tenured professional positions occupied by female researchers. Such demographics could reveal the population with an influence on changes in trends.

Conclusions

The study showed that females as first authors of original research published in Japanese cardiovascular journals increased over the examined decade. However, the representation of women has plateaued in recent years, and it is still much lower than the representation observed in general medicine worldwide. A gender gap remains in Japanese cardiovascular journals.

Acknowledgments

We thank Ms. Ling Zha, Ms. Rong Liu, and Ms. Son Hyesoon at Osaka University for discerning genders of authors in China, Taiwan, and South Korea.

Disclosures

Conflicts of interest: TF is supported by the Japan Society for the Promotion of Science (JSPS). This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. All authors declare that they have no competing interests.

References

1. Washington Wire. Hillary Clinton's Concession Speech: Video and Full Text. The Wall Street Journal. Nov 9, 2016. Accessed Nov. 26, 2016. Available at: <http://blogs.wsj.com/washwire/2016/11/09/clintons-concession-speech-video-and-full-text> Accessed
2. Jaggi R, Guancial EA, Worobey CC, *et al.* The "gender gap" in authorship of academic medical literature—a 35-year perspective. *N Engl J Med* 2006; 355: 281-7.
3. Wright AL, Schwindt LA, Bassford TL, *et al.* Gender differences in academic advancement: patterns, causes, and potential solutions in one US College of Medicine. *Acad Med* 2003; 78: 500-8.
4. Okoshi K, Nomura K, Fukami K, *et al.* Gender inequality in career advancement for females in Japanese academic surgery. *Tohoku J Exp Med* 2014; 234: 221-7.
5. OECD. Stat; Employment: Female share of seats on boards of the largest publicly listed companies. Organisation for economic co-operation and development. Accessed Nov. 26, 2016. Available at: <http://stats.oecd.org/index.aspx?queryid=54753>
6. Ministry of Health, Labour and Welfare. Report on national exam for medical practitioners. Accessed Nov. 26, 2016. Available at: <http://www.mhlw.go.jp/stf/shingi/2r9852000000zqxg-att/2r9852000000zrf8.pdf>
7. OECD. Stat; Health Care Resources: Physicians. Organisation for economic co-operation and development. Accessed Nov. 26, 2016. Available at: <http://stats.oecd.org/>
8. Association of American Medical Colleges. The state of women in academic medicine: the pipeline and pathways to leadership, 2013-2014. Accessed Nov. 26, 2016. Available at: <https://www.aamc.org/members/gwims/statistics/>
9. European Commission. SHE FIGURES 2015: gender in research and innovation. European Union, 2015. Accessed Nov. 26, 2016. Available at: https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/she_figures_2015-final.pdf
10. Implications to Japan; Promoting women's participation to medicine. Gender Equality Bureau Cabinet Office, 2011. Accessed Nov. 26, 2016. Available at: http://www.gender.go.jp/research/kenkyu/sekkyoku/pdf/senmonsyoku/26_ch6-2-1.pdf
11. Sidhu R, Rajashekhar P, Lavin VL, *et al.* The gender imbalance in academic medicine: a study of female authorship in the

- United Kingdom. *J R Soc Med* 2009; 102: 337-42.
12. Filardo G, da Graca B, Sass DM, Pollock BD, Smith EB, Martinez MA. Trends and comparison of female first authorship in high impact medical journals: observational study (1994-2014). *BMJ* 2016; 352: i847.
13. Greenland S. Dose-response and trend analysis in epidemiology: alternatives to categorical analysis. *Epidemiology* 1995; 6: 356-65.
14. Nonnemaker L. Women physicians in academic medicine: new insights from cohort studies. *N Engl J Med* 2000; 342: 399-405.
15. Feramisco JD, Leitenberger JJ, Redfern SI, Bian A, Xie XJ, Resneck JS Jr. A gender gap in the dermatology literature? Cross-sectional analysis of manuscript authorship trends in dermatology journals during 3 decades. *J Am Acad Dermatol* 2009; 60: 63-9.
16. McCarren M, Goldman S. Research leadership and investigators: gender distribution in the federal government. *Am J Med* 2012; 125: 811-6.
17. The Global Gender Gap Index 2015. the World Economic Forum, 2015. Accessed May 17, 2016. Available at: <http://www3.weforum.org/docs/GGGR2015/The%20Global%20Gender%20ap%20Index%202015.pdf>
18. The Global Gender Gap Index 2016. the World Economic Forum, 2016. Accessed May 17, 2016. Available at: http://www3.weforum.org/docs/GGGR16/WEF_Global_Gender_Gap_Report_2016.pdf
19. Yamauchi-Takahara K. Policy of the Japanese Society of ultrasonics in medicine for the women's carrier support. *Jap J Med Ultrasonics* 2016; 43: S208.
20. Bakken LL, Sheridan J, Carnes M. Gender differences among physician-scientists in self-assessed abilities to perform clinical research. *Acad Med* 2003; 78: 1281-6.
21. Jackson VA, Palepu A, Szalacha L, Caswell C, Carr PL, Inui T. Having the right chemistry: a qualitative study of mentoring in academic medicine. *Acad Med* 2003; 78: 328-34.
22. Rockey S. Women in biomedical research. 2014. Accessed Nov. 26, 2016. Available at: <https://nexus.od.nih.gov/all/2014/08/08/women-in-biomedical-research/>