Gender Inequalities in the Dental Workforce: Global Perspectives

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Abstract

The aim of this review is to investigate the growth of diversity and inclusion in global academic dental research with a focus on gender equality. A diverse range of research methodologies were used to conduct this review, including an extensive review of the literature, engagement of key informants in dental academic leadership positions around the world, and review of current data from a variety of national and international organizations. Results provide evidence of gender inequalities that currently persist in dental academics and research. Although the gender gap among graduating dental students in North America and the two most populous countries in Europe (the United Kingdom and France) has been narrowed, women make up 30% to 40% of registered dentists in countries throughout Europe, Oceania, Asia, and Africa. In academic dentistry around the globe, greater gender inequality was found to correlate with higher ranking academic and leadership positions in the United States, United Kingdom, several countries in European Union, Japan, and Saudi Arabia. Further disparities are noted in the dental research sector, where women make up 33% of dental researchers in the European Union, 35% in North America, 55% in Brazil, and 25% in Japan. Family and societal pressures, limited access to research funding, and lack of mentoring and leadership training opportunities are reported as also contributing to gender inequalities. To continue advancing gender equality in dental academia and research, efforts should be geared toward the collection and public dissemination of data on gender-specific distributions. Such evidence-driven information will guide the selection of future strategies and best practices for promoting gender equity in the dental workforce, which provides a major pipeline of researchers and scholars for the dental profession.

Keywords: diversity, gender equity, dental research, dental pipeline, academic dentistry, women dentists

Introduction

Diversity and inclusion are hallmarks of progress in any profession (Bersin 2015; Organisation for Economic Cooperation and Development [OECD] 2017). The term *diversity* encompasses gender, gender identity, race, ethnicity, and sexual orientation and is inclusive of all other differences. All members of the dental profession are affected by and benefit from diversity, including academic clinicians, educators, and researchers; corporate/industrial partners; professional associations; and philanthropists. Significantly, inclusion creates a culture in which diversity is understood, valued, and leveraged. Inclusion results in well-being, satisfaction, and commitment among group members and demands recruitment of the best talent (Price et al. 2005; Shore et al. 2011). Inclusion also fosters innovation, ensuring representation of multiple perspectives at the decision-making table (Pless and Maak 2004). This article focuses on the progress and status of one dimension of diversity and inclusion—namely, gender equality within dental education and academic research sectors.

In 1897, the *Los Angeles Herald* published an article stating that "the most startling innovation is the woman dentist" (Edwards 1897). The article summarized the emergence of women in dentistry as a pursuit of the "thorny way," describing a "story of struggles" and suggesting that the admission of women into dental schools was a "dangerous precedent."

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A supplemental appendix to this article is available online.

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Earlier, in 1870, 0.3% of US dental graduates were women, and numbers increased to 2.7% by 1900. While the number of graduated women dentists decreased in the 1950s to 1.7%, representation increased to 3% by 1982 (Shue and Seldin 2017).

By 1909, 45 German women had completed a DDS degree from the United States, as they were not allowed to attend academic dental programs in Germany (Kuhlmann 2001). The first British woman to enter a dental school was in Edinburgh in 1908 (Whelton and Wardman 2015). By the 1970s, women accounted for over half of the dental workforce in Greece and one-third of the dental workforce in countries such as Denmark, Sweden, Norway, and France (Barac Furtinger et al. 2013).

The first Brazilian woman to matriculate into the University of Sao Paulo Dental School did so in 1911, and by 1920, women represented 16% of total Brazilian dental graduates (Lucia et al. 2008). Women were able to enroll in the first dental school opened in Mexico City in 1904, and by the end of the 1930s, they composed about one-third of students of all dental schools in Mexico (Prasanna et al. 2015).

In developing countries, the growth of women in the dental workforce has been slower. In India, women became a part of the dental workforce in the early 1940s (Tandon 2004; Jaiswal et al. 2014). Although data on gender distribution in dentistry are scarce for African nations, literature indicates that women started to enroll in dental schools as soon as the first school opened in Nigeria in 1965 (Ogunbodede 2004; Chukwumah and Umweni 2017). In highly conservative societies such as Saudi Arabia, women did not begin to enter dental education until 1978 (Shaker and Babgi 2009).

While profiles of differential growth in the numbers of female dental students in the international community are evident, the dental profession at large has progressed in its efforts to reduce gender inequalities and enhance career advancement opportunities for women. Despite these improvements, universal concerns prevail, and much work remains to promote women in all domains of dentistry and dental research.

The overarching aim of this article is to review emerging trends for women within the academic dentistry workforce. Specifically, the objectives of this article are to review the following: the growth of women dental school graduates; the gender gap in the research workforce and data on productivity, generally; the distribution of women in academic dentistry and dental research; and the participation of women engaged in the public dissemination of dental research findings. While academic dental research represents a relatively small proportion of the profession, studying the success of academic women serves as a valuable indicator of equality among those training the next generation of researchers and clinicians.

Methods

Data collection involved 4 principal methodologies:

1) An extensive review was conducted of reports from the past 20 years on gender inequities in dentistry. The search was extended to all literature published in English in electronic databases, including MEDLINE via PubMed, Ovid Med, and Google Scholar (search terms reported in the Appendix).

2) After collection of names and email addresses of individuals who currently hold leadership positions, email requests were sent to key informants asking for information on the gender distribution of academic dentists within their dental schools (Houston and Sudman 1975). To reduce discrepancy in data reported, a template questionnaire was sent to all key informants (see Appendix; note that names of the key informants who are not listed as coauthors are mentioned in the Acknowledgements). Information provided by key informants was taken from country-specific websites (see Figs. 1–3).

3) To gain a better sense of the worldwide community of dental researchers, 2 specific data sets were requested from the International Association for Dental Research (IADR) Global Headquarters: 3a) gender distribution of members and presenters (2017 and 2018 meetings) and 3b) Distinguished Lecture Series presenters (2007 to 2018).

4) Current dentist gender distribution data were also accessed from national and international organizations, including the OECD, the United Nations Education, Scientific and Cultural Organization (UNESCO), the World Dental Federation, the Council of European Dentists, the American Dental Education Association, and the Dental School Council of the United Kingdom.

Results

Women Dental School Graduates

To understand the current state of the pipeline of women into academic dentistry and to provide context for the results presented subsequently, the gender distribution of graduating dental students was reviewed. Findings reveal that for a majority of countries where such data were available, women graduates outnumber their male counterparts in dental schools (Fig. 1a). The numbers of men and women graduating from dental schools in North America are almost equal (American Dental Association 2018). In 2016, percentages of women dental school graduates varied more across Europe, with 10 countries exhibiting graduating dental school classes consisting of at least 70% women (Kravitz et al. 2016). In France and the United Kingdom, 55% and 56% of graduating dental students entering the pipeline were women, respectively (Kravitz et al. 2016). Japan graduated 846 women dental students out of 2,041 total students (41%) in 2014 (Japan Dental Association 2014).

For countries where data about graduating students were not available, the gender distribution of registered women dentists was reviewed (Fig. 1b). Data from some Latin American countries, such as Brazil in 2018 (Counsel of Federal Odontologia 2018) and Chile in 2016, demonstrated that $>$50% of registered dentists were women (Guíñez et al. 2018). In 2012, women made up 33.2% and 36.8% of registered dentists in Australia and New Zealand, respectively (Australian Institute of Health and Welfare 2014). While the current literature on women in dentistry remains most scarce for African and Asian countries, data were found for a few nations. In Cameroon, 53% of registered dentists were women (Agbor et al. 2018). In 2014, women in Rwanda and the Democratic

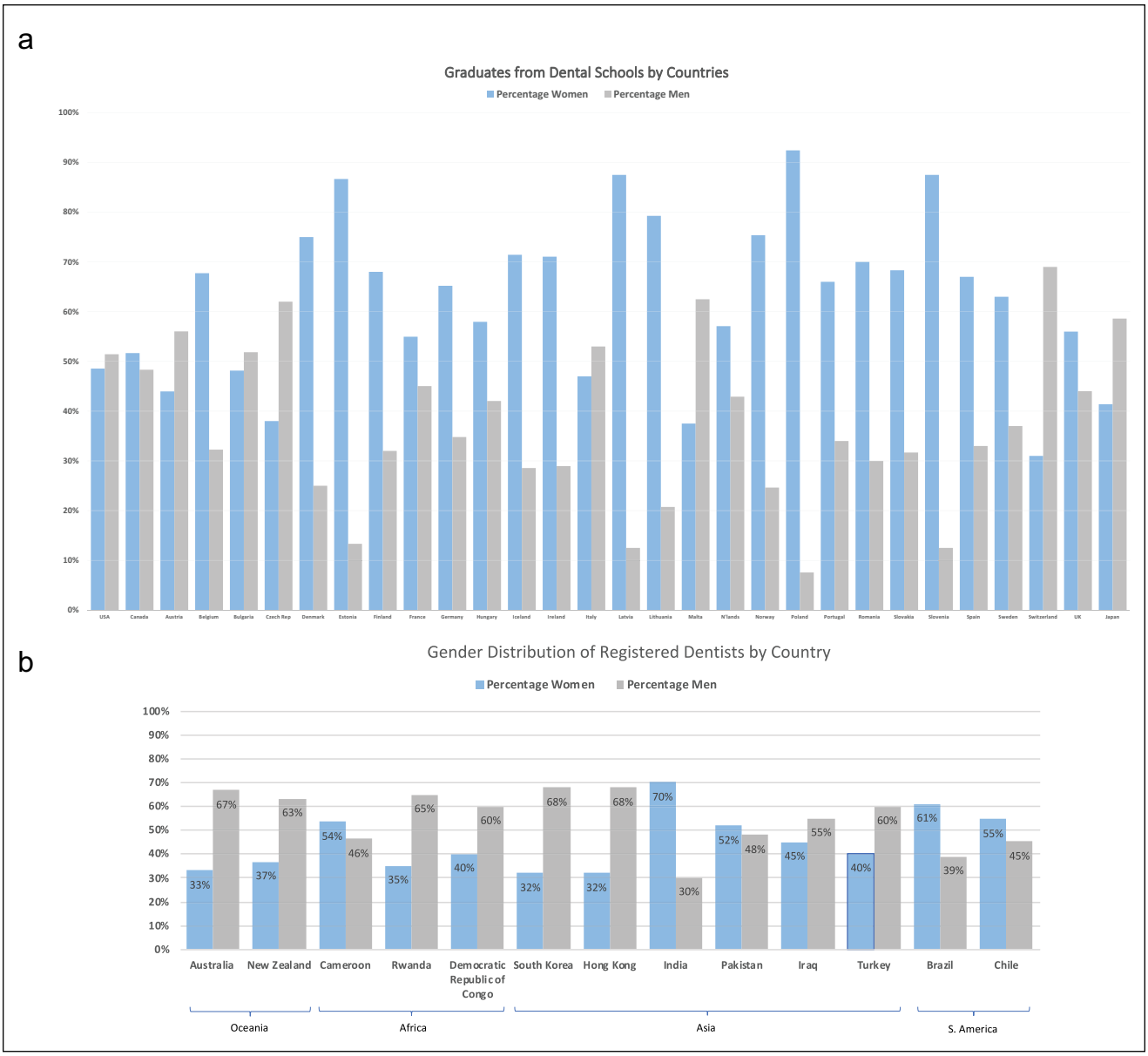

Figure 1. Gender distribution of (**a**) dental school graduates and (**b**) registered dentists by country. Sources: (a) American Dental Association (2018). Kravitz et al. (2016). Ministry of Education, Culture, Sports, Science and Technology in Japan. Ministry of Health, Labor, and Welfare, https://www.jda.or.jp/dental_data/pdf/chapter_04.pdf, translation from Japanese to English done by Dr. Kentaro Ikeda, University of Colorado. (b) Agbor et al. 2018. Australian Institute of Health and Welfare (2014). Counsel of Federal Odontologia (2018). Data provided by Magda Feres, dean for dental research and graduate education, Guarulhos University. Dental Council of India (2018). Guíñez et al. (2018). World Dental Federation (2015).

Republic of the Congo made up 35% and 40% of registered dentists, respectively (World Dental Federation 2015). Women made up 32% of the registered dentists in Hong Kong SAR and South Korea (World Dental Federation 2015). According to the Pakistan Medical and Dental Council (2018), 52% of the dental surgeons registered in 2018 in Pakistan were women. The Dental Council of India's current data (2018) show that women make up 70% of all registered dentists in India.

Gender Gap in Research and Productivity

The *UNESCO Science Report: Towards 2030* provides a comprehensive review of gender distribution for medical researchers (UNESCO 2015). Although Canada, Australia, New Zealand, and the United States were excluded from this report due to the international incompatibility of their data, the report provides gender data from 137 countries. The report found that women

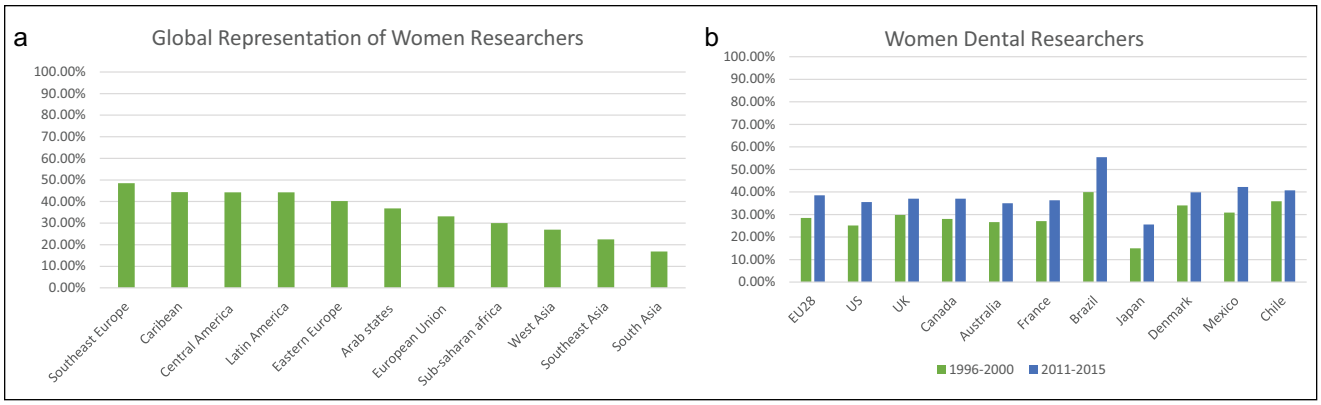

Figure 2. Global representation of women in research: (**a**) women researchers and (**b**) women dental researchers. (a) United Nations Educational, Scientific and Cultural Organization (2015). (b) Allagnat et al. (2017).

account for 28.4% of researchers globally and are highly represented in research in Southeast Europe (49%) and in the Caribbean, Central Asia, and Latin America (44%). In sub-Saharan Africa, much progress has been made, and the number of women researchers has been increasing (Fig. 2a; Huyer 2015). While women make up 33% of researchers overall in the European Union (EU), the number of women researchers has been increasing at a faster rate than the number of men in the last decade. By region, women make up the smallest proportion of researchers in South Asia, while Arab states have shown a significant growth rate of 37% in numbers of women researchers.

Regarding dental researchers, a recent *Gender in the Global Research Landscape* report concluded that within the last 20 years, the increasing rates of women's involvement in dental research vary among countries (Allagnat et al. 2017). However, in this report, all 11 countries reported an increase in women researchers from 1996 to 2015, with the greatest of these increases seen in Brazil (Fig. 2b). Notably, 48% of all researchers were women, congruent with the proportion of women making up the total number of dental researchers (55%). These numbers are consistent with the overall numbers of researchers (in all disciplines) reported for these countries in the UNESCO report. Latin America has the world's highest proportion of women researchers in all fields. Japan was reported to have the lowest percentage of women researchers across disciplines (15%) of all OECD countries, which was also true specifically for dental researchers. The percentage of women in the field of dental research in the EU (38%) was comparable to that of total women researchers (33%) in the EU, consistent with the UNESCO report.

The US-specific data on gender distributions in dental research were obtained from the National Institutes of Health. Between 1995 and 2012, the percentage of women dental researchers rose from 20% to 35%. Women dental researchers were awarded one-third of research awards between 2008 and 2012. While women held 30% of the research project grants awarded (higher when compared with MD/PhD researchers), dentist-scientists and PhDs represent only 2% of the overall National Institutes of Health–funded workforce (D'Souza et al. 2017).

In addition to these gender differences, the publication rate of women researchers in medicine and health care is lower than that for men (OECD 2006). According to a 2010 report, women's first authorship in dental journals, generally, increased from 6% to 21%, and last authorship increased from 7% to 14% from 1985 to 2008 (Yuan et al. 2010). However, trends in women authorship are not so promising for some dental specialties, in particular prosthodontics. Women's participation in scholarly activity in the prosthodontic specialty has remained low, showing no increase in rates of first authorship from 1995 to 2008 (Kongkiatkamon et al. 2010). Although women authors are still considered to be underrepresented in medicine and dentistry, some growth has been observed globally across all disciplines in medicine over the last decade (Dewan et al. 2007; Li et al. 2007; Sidhu et al. 2009).

A pattern of underrepresentation of women on editorial and advisory boards and as peer reviewers in medicine and dentistry has been reported globally (OECD 2006; Faber 2017; Callier 2018). A US study highlighted this underrepresentation on editorial and advisory boards of major dental journals, reporting that women compose 14.8% of editorial board members. Only 16% of the boards had women serving as associate editors in chief, and 2 of the 69 journals included in the study had a woman editor in chief (Ioannidou and Rosania 2015). A study from Pakistan reviewed 79 medical and dental journals and reported that board membership consisted of 17.5% women (Bakht et al. 2017).

Distribution of Women in Academic Dentistry and Dental Research

Most researchers, editors, and dentist-scientists belong to academic universities. Thus, it is imperative to review data on the gender distribution in academic dentistry and related inequalities present in academic leadership. These results are based on the data acquired from key informants (except for US and UK data, which are from published sources), yielding a snapshot of the current state of women in dental academia in a few countries (Fig. 3a). These most recent data highlight the disparate percentages of women employed as dental academics in both

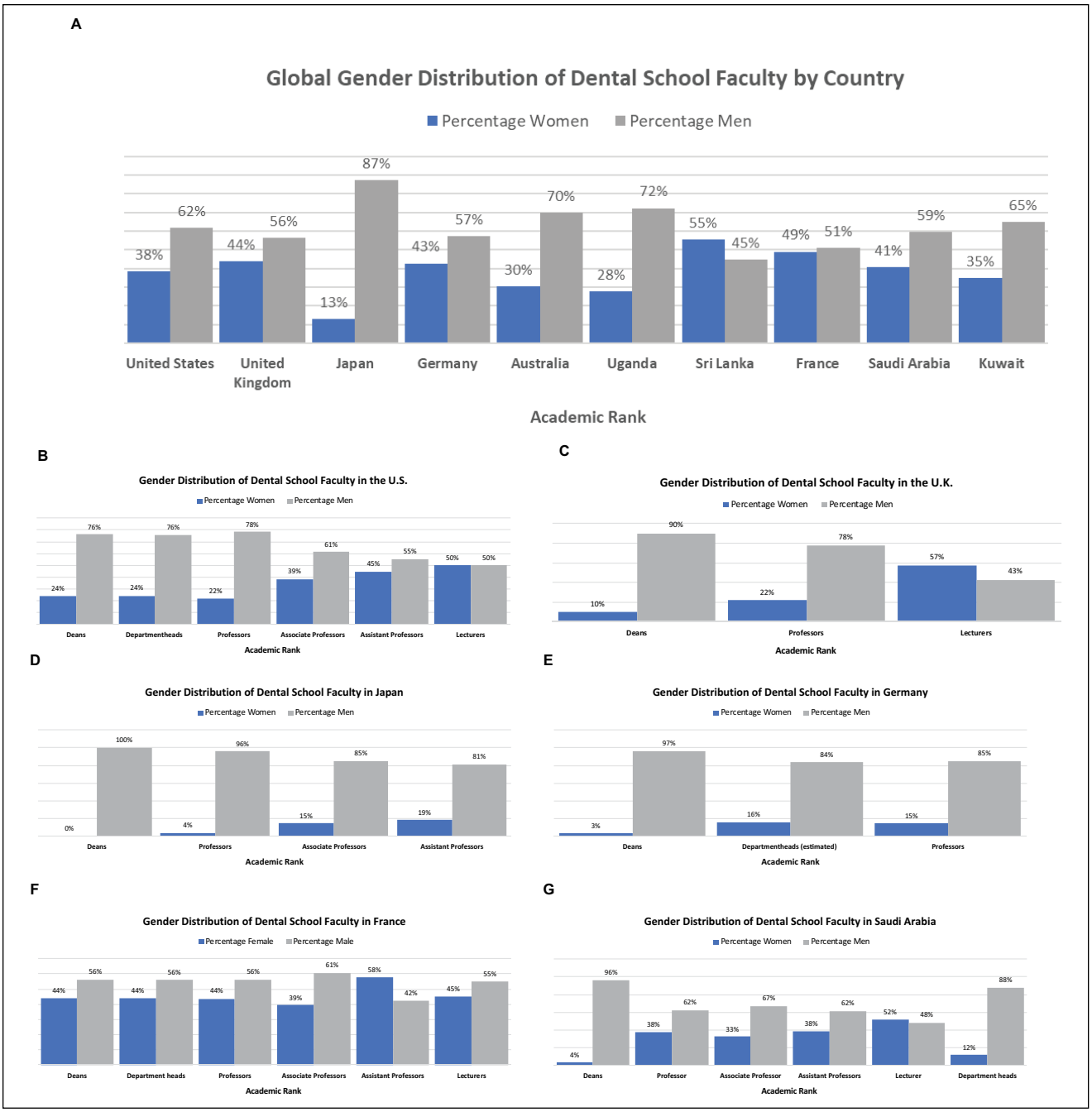

Figure 3. Global gender distribution of dental academic faculty in 2018: (**a**) by country and (**b–g**) by academic rank per country—United States, United Kingdom, Japan, Germany, France, and Saudi Arabia, respectively. Sources: American Dental Education Association (2017). Australian Institute of Health and Welfare (2014). Data from France translated and provided by Prof. Stéphanie Tubert, former dean of the University of Clermont Auvergne, president of the Association for Dental Education in Europe. Data from Saudi Arabia and Kuwait provided by Dr. Huda Abdellatif, Princess Nourah bint AbdulRahman University, and Dr. Ebtissam Al-Madi, College of Dentistry, King Saud University. Data from Sri Lanka provided by Mihiri Madhuka, University of Colombo, http://dental.pdn.ac.lk/stats.php. Data from Uganda provided by Margaret Namusisi, Uganda Dental Association. Federal Ministry of Education and Research, http://landkarte-hochschulmedizin.de, translation of data from German to English by Dr. Petra Hahn, University of Freiburg. Ministry of Education, Culture, Sports, Science and Technology in Japan, http://www.mext.go.jp/b_menu/shingi/chousa/koutou/035/gijiroku/08092415/001.pdf. Ministry of Health, Labor, and Welfare, https://www.jda.or.jp/dental_data/pdf/chapter_04.pdf, translation from Japanese to English done by Dr. Kentaro Ikeda, University of Colorado. Ministry of Health, Labor, and Welfare, https://www.mhlw.go.jp/toukei/list/33-20c.html. Treasurer of the Association for Dental Education in Europe. Watson et al. 2017.

conservative and liberalized societies. Most countries from which data were obtained (number of schools: United States, 62; United Kingdom, 20; Japan, 29; Germany, 30; Australia, 10; France, 16; Saudi Arabia, 28; Uganda, 1 and Kuwait, 1) exhibited a higher percentage of men than women in academic faculty.

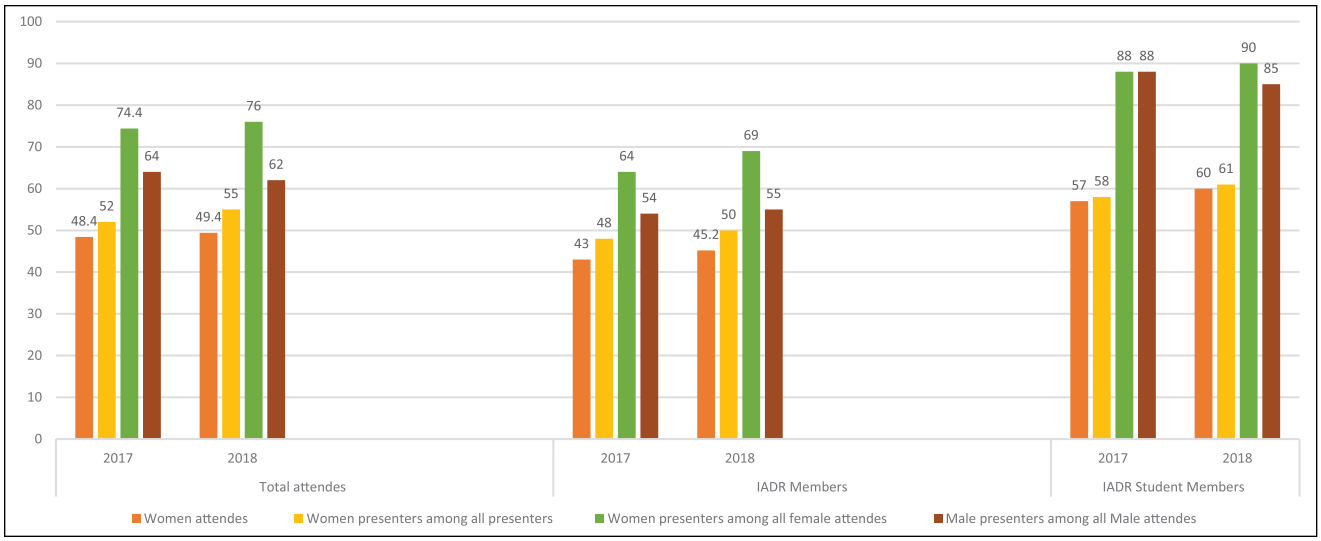

Figure 4. IADR meeting presenter versus nonpresenter distribution. Source: Data provided by IADR Global Headquarters, Alexandria, VA. IADR, International Association for Dental Research.

As shown in Figure 3, the lack of women in high-ranking academic and leadership roles, such as deanship and full professorship, is even more disparate than the distinct gender differences in total faculty. In the United States, United Kingdom, Japan, Germany, France, and Saudi Arabia, greater gender inequality is observed across higher-ranking academic and leadership positions. However, the proportion of women deans was particularly high in France.

In Brazil, the dental education system is divided into undergraduate and postgraduate dental programs. There are 100 postgraduate programs in Brazil, of which 49% have appointed women deans (Ministry of Education 2018). Data were also collected from 3 undergraduate dental schools at the University of Sao Paulo. Among them, 48% of the total academic faculty, 33% of the deans, and 37% of the department heads were women.

Additional data were provided by key informants from Kenya and Denmark. Of the 2 schools in Kenya, current data were collected only from the University of Nairobi, at which 41% of the total academic faculty and 36% of the lecturers were women. There was no representation of women in department head or full professor ranks. Current data collected from the University of Copenhagen in Denmark indicate that women make up 62% of the total faculty but only 22% of full professors (59% of associate professors, 67% of assistant professors).

Participation of Women in the Dissemination of Dental Research through the IADR

Although this article has established global gender inequalities in the dental research workforce, generally, and highlighted a tremendous range of disparities, there are also some positive trends in the growth of women in dental academics and research. At the forefront of the global landscape of dental research, the IADR represents a membership of nearly 11,000 professionals worldwide. The IADR has taken proactive steps directed at accelerating the growth of women in dental research. For instance, the IADR provides avenues for mentoring, seeks to increase women's visibility in academia and leadership, and promotes the participation of women in dental research. Specifically, the current structure and culture of the IADR support gender neutrality by promoting gender balance on committees, councils, and boards.

An example of the IADR's success in promoting gender equality in dental research is the recent establishment of the American Association for Dental Research (AADR) Committee on Diversity and Inclusion (CDI), which aims to increase awareness of and commitment to diversity-related issues. In addition to further promoting gender equality, the CDI initiatives include 1) continued assessments that seek to understand the experience of underrepresented racial/ethnic minority (URM) researchers, 2) outreach to URM-serving institutions, 3) the creation of a URM-targeted junior faculty fellowship in collaboration with Procter and Gamble, Inc., and the 4) creation of a URM-targeted student academia and research group. In its next phase of growth, the CDI will spearhead programs and support networks that will promote a culture of inclusion within the AADR as well as in the US dental research workforce.

The number of women presenting their research at IADR meetings has also increased over recent years. Figure 4 provides an overview of women attendees and presenters at the 2017 and 2018 meetings. Overall, the proportion of women attendees has increased, whether measured for total attendees, only IADR members, or only student members. In 2017, women made up 52% of the presenters, and that proportion increased to 55% in 2018. A large majority of women who attended the 2017 and 2018 IADR meetings presented their research (74.4% and 76%, respectively), with the highest numbers reflected for female research trainees: 88% in 2017 and 90% in 2018.

Despite all the positive trends seen for women in the IADR's conference presenter participation, gender inequalities are evidenced by the gender distribution of speakers selected to present as part of the Distinguished Lecture Series at recent IADR and AADR meetings. In selecting speakers for each meeting's Distinguished Lecture Series, a systematic review process is used to select up to 3 speakers. Over the span of 18 meetings since 2007, 17 of the 51 total Distinguished Lecture Series speakers have been women (33%). In the Distinguished Lecture Series, the speaker gender disparities become more prominent after speaker stratification based on meeting site and geographic location. Specifically, when the gender distribution of speakers is aggregated by the country in which the meetings were held, the gender distribution among Distinguished Lecture Series presenters was much more disparate when sessions were held outside the United States. When held within the United States, women speakers made up 39% of the Distinguished Lecture Series presenters at IADR and AADR meetings since 2007, as compared with 20% for meetings outside the United States.

Discussion

The results provide evidence of some reduction in—but a general persistence of—gender inequalities in dental academics and research. The objectives of this article were to review the growth of women dental graduates, the gender gap in the research workforce, gender distribution in dental academics, and the participation of women in dental research dissemination. The results suggest that a considerable majority of women are currently in and coming into the South American dental workforce (Morita et al. 2010; Kfouri et al. 2013). This trend is also suggested by data for several countries in Europe and the United States. Gender inequalities in the Australian, African, and Asian pipelines are more apparent. In Asian countries such as Japan and South Korea, the gender distribution of dental graduates demonstrates significant inequalities. Although Japan has one of the most sophisticated education systems in Asia, gender inequality in STEM (science, technology, engineering, mathematics), academics, and research is significant (Murakami and Borgonovi 2018). At the other extreme, India may seem like an outlier in Asia, with 70% of registered dentists being women in 2018; however, when we look at academic positions in dental research, we see that the "glass ceiling effect" is significant, meaning scarcity of women at the leadership levels (Tandon et al. 2007). The glass ceiling effect is also observed in academic dentistry around the globe, where greater gender inequality was correlated with higher-ranking academic and leadership positions in the United States, United Kingdom, several EU countries, Japan, and Saudi Arabia.

There is a plethora of underlying challenges faced by women around the world that lead to inequalities in pay, leadership, and research productivity (OECD 2006). Family and societal pressures, child care, and the pursuit of a work-life balance all affect women's decisions to pursue full-time academic work, their research productivity, and their partaking in leadership roles (Nordblad 2004; Nagda 2015; Sembawa et al. 2018). Edmunds and colleagues (2016) reviewed the factors associated with underrepresentation of women in academic research, which included a lack of role models and gender discrimination and bias. Women's limited access to research funding and their underrepresentation among senior faculty and editorial boards add to their challenges (Ceci and Williams 2011; Chambers et al. 2017). The *Lancet*'s special issue discusses a cyclic process of inequalities facing women researchers (Clark and Horton 2019). Low research productivity and underrepresentation on editorial boards reflect poorly on the resumes of women researchers, which may lead to additional barriers in seeking successful funding and promotions (Clark and Horton 2019). In turn, the lack of funding results in fewer publications, perpetuating the cycle (Gidlöf Regnier 2006).

A lack of mentoring and leadership training represent systemic barriers faced by women that contribute to the type of gender inequalities reported here (Zarkowski 2006). Women face different challenges than do men and so would benefit from greater access to and more tailored mentoring. Mentoring women faculty in navigating the labyrinth of academic research careers, with skills in salary negotiation, conflict resolution, and communication, is one of the practices that can help women succeed in their pursuit of top-ranking positions in dental research (Zarkowski 2006; Tandon et al. 2007; Reed et al. 2012; Tahir et al. 2014; Gadbury-Amyot et al. 2016). Several organizations from Western countries provide leadership and mentoring for academic women, such as the IADR's Women in Science Network, the International Women's Leadership Conferences spearheaded by the American Dental Education Association, Executive Leadership in Academic Medicine, and the Athena Swan program in the United Kingdom. The Athena Swan initiative brought about systemic changes in reducing gender imbalance in universities in the United Kingdom, and now it is a requirement for a unit to have a Silver award to be considered for certain research grant competitions (Ovseiko et al. 2017).

There are no central dental workforce records in most countries, and there is a lack of data repositories globally. Even if workforce data exist, gender identification is often missing from records. Further complicating the situation of unavailable and noncomprehensive workforce data is that existing reporting of gender in most data sets is crude. This is likely attributable to frequent inadvertent confabulation with sex and/or classification of gender as binary even though the current accepted understanding of gender as nonbinary has grown out of the context of increasing recognition of LGBTQ communities globally. Therefore, the main limitation of this review stems from the scarcity of critical data on diversity in academic dentistry and dental research, in both developed and developing countries. The UNESCO, OECD, and *Gender in the Global Research Landscape* reports have all similarly reported major gaps in gender data for several countries globally.

We established personal communications with key informants and international organizations to explore the possibilities of acquiring data stratified by gender. We were, however,

not able to procure any data from China or several African, Asian, Latin American, and European countries. Key informants from some African countries (e.g., South Africa and Zimbabwe) and from the United Arab Emirates, Jordan, and Egypt reported the lack of a central registry and thus difficulty in obtaining gender-stratified data. When procuring data from India, which is home to the largest number of dental schools and has an organized central registry for dentists, leaders in dental education failed to respond to several attempts by the corresponding author to collect data on gender distribution. We speculate that in several parts of the developing world, there is little or no diversity at the top positions of dental academia and research and that the male-dominated leadership may not be keen on divulging information that acknowledges inequality in their countries.

Future Directions

It is imperative that international organizations and country-specific dental associations collect and publish data that are stratified by gender, as gaps in data impede the development of strategies to promote diversity and foster inclusion. To produce such data, it may be necessary to educate the global dental leadership about the importance of gender equality and to push for transparency by encouraging stakeholders to share data from their countries. Guided by those data, adoption of multiple strategies may promote gender equality in the dental academic and research workforce. Such strategies could be informed by those that have been published in the gender inequality literature or at large and could be based on best practices from other disciplines. Continuing assessment of progress that occurs following adoption of those practices should be the topic of future research. Additionally, future studies should systematically identify the drivers of gender equality in countries and organizations where women dental researchers and academic leaders are represented in proportions similar to men. Other strategies may include identifying effective and feasible pipeline programs as well as harnessing newer technologies for improved networking to allow women to share experiences and to be mentored by both women and men allies.

Last, to continue advancing gender equality in the dental academic and research workforce while realizing the goals of optimal inclusion, it will be essential to appreciate diversity as encompassing more than gender and race/ethnicity. That is, movement toward inclusion would be benefited by an embrace of a wider definition of diversity that includes characteristics such as nationality, age, sexual orientation, gender expression, disability status, and religion, among others—and their intersectionality. A more nuanced appreciation of diversity by the dental research profession could advance inclusion efforts in a few ways. For example, an expanded definition of diversity might prompt collection of workforce demographic data for variables in addition to gender and race/ethnicity, which could reveal areas of success and targets for inclusion interventions. An expanded definition might also encourage more comprehensive inclusion programming and initiatives to benefit the dental research workforce, which could have a positive impact not only on those working in research and the quality of their work but also on students/trainees, other researchers, and health care professionals.

Author Contributions

T. Tiwari, contributed to conception, design, data acquisition, analysis, and interpretation, drafted and critically revised the manuscript; C.L. Randall, J. Holtzmann, contributed to data interpretation, drafted and critically revised the manuscript; L. Cohen, contributed to data analysis and interpretation, drafted and critically revised the manuscript; J. Webster-Cyriaque, contributed to data analysis and interpretation, critically revised the manuscript; S. Ajiboye, L. Schou, M. Fidela de Lima Navarro, M. Feres, H. Abdellatif, E. Al-Madi, C.H. Fox, contributed to data acquisition and interpretation, critically revised the manuscript; M. Wandera, contributed to data acquisition and interpretation, drafted and critically revised the manuscript; K. Ikeda, contributed to data acquisition, analysis, and interpretation, critically revised the manuscript; S. Tubert-Jeannin, contributed to data acquisition, critically revised the manuscript; E. Ioannidou, R.N. D'Souza, contributed to data acquisition, analysis, and interpretation, drafted and critically revised the manuscript. All authors gave final approval and agree to be accountable for all aspects of the work.

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