



Is there a gender gap in national Cardiology research? Data review from the Portuguese Journal of Cardiology



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Abstract gA gender gap is apparent in several professional areas, including in Medicine and particularly in the Cardiovascular field. We present a brief review of the subject and we analyse data from the Portuguese Journal of Cardiology regarding women authorship.

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Ainda persiste um gap de género na investigação cardiológica nacional? Uma revisão de dados da Revista Portuguesa de Cardiologia

Resumo O gap de género é evidente em várias áreas profissionais e também na área da Medicina e em particular na área cardiovascular. Fazemos uma breve revisão sobre o tema e analisamos os dados da Revista Portuguesa de Cardiologia relativamente a autorias do género feminino.

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Medicine is still a male-dominated field. However, the proportion of women in medical school is already close to 50%

in the United States of America, with 38% of female medical professionals practicing.^{1,2,3} This growing trend has become evident in virtually every country in the world, particularly in recent decades. There is still huge gender disparity according to medical specialty. More specialized areas, such as Cardiology, are particularly affected and in some countries, the proportion of women does not even amount to 20%. Although data are scarce, the representation of women in academic medicine and clinical practice in Europe seems

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to be higher, including in the cardiovascular area. In Spain, where the situation is usually closer to that of Portugal, 68% of Cardiology interns were women in 2017, a much higher figure compared with other countries.⁴ However, this increase in women in the younger age groups has not been reflected in career progression and management positions. Representativeness is also lower in some subspecialties, with female cardiologists tending to opt for less invasive subspecialties.⁴ In a survey conducted in Spain, 40% of cardiologists were women but only 19% were department directors, 11% were service directors and 7% were full professors. This confirms there is a clear lack of parity, particularly in positions of greater responsibility, clearly conditioned by the lower presence of women in the more advanced age groups.⁴ There is, thus, a horizontal gap in equity among subspecialties and a vertical gap in professional hierarchy.

Statistics available in Portugal show that over a 20 year period between 2000 and 2019, there was an increase of 194% in young women enrolled in medical school and 111% in young men. Since 1991, there has been a consistent predominance of women (Table 1).⁵ With regard to the overall number of physicians, there was a much more significant increase in the number of women than men (104% vs. 34%), with equity only being achieved in terms of distribution in 2010 (Table 1). In Cardiology, there is an overall predominance of men in all age groups; it is more striking in the >50 age groups (Table 2).⁶ However, in the last 20 years, the overall increase was also much more notable in women (122% vs. 21%), with a reduction of 13 to 47% of men in the 41–60 age groups. There are, however, no specific data according to subspecialty or on the degree of differentiation and professional responsibility.

The gender gap is part of the glass ceiling effect, which is defined as the presence of an invisible barrier that prevents women and minorities from ascending to the highest hierarchical positions in a company. This metaphorical designation has become more popular in recent decades as despite the increased presence of women in virtually all areas traditionally primarily occupied by men, their presence remains very scarce in leadership positions, particularly in business. This term was first used by Marilyn Loden in 1977 in a speech to the Women's Action Alliance. This phenomenon is supported by conscious or unconscious stereotypes of incompatibility between personal/family and professional life, lack of organizational policies to support the balance between professional and personal efforts, the lack of mentors or role models for women with an interest in career progression, and a shortage of contacts to facilitate such access for women. Indeed, socio-economic, cultural, religious and environmental factors, among others, may have conditioned women's access to many professional areas and positions of responsibility for decades, but this situation has gradually changed in recent years in developed countries. Many scientific societies have established working groups with the main objective of promoting gender equity, including in the area of Cardiology, such as Women in European Society of Cardiology and Women in Cardiology – American College of Cardiology, and some of them with broader objectives of promoting knowledge of cardiovascular diseases among women (Go Red for Women by World Heart Federation).

The reduced representation of women in professional and academic spheres is reflected directly in the authorship of scientific articles, in particular where women are the first author, as this represents their active involvement in scientific research. Also the last author, or senior author, is significant as it is a position associated with mentoring activity or leadership in the unit where the research was conducted. The low representation of women as authors has a significant impact, and may partly explain the disparity in terms of leadership. One of the metrics of professional or academic progression is research output and this can be analyzed based on publication in peer-reviewed journals and their impact factor. On the other hand, a senior position reflects the person's organization skills and ability to lead projects.

To appraise gender equity in cardiology research in Portugal, we analyzed authorship in the Portuguese Journal of Cardiology (RPC) between 2013 and 2018. All original articles, editorials and review articles published in this period were included. Articles whose origin or authors were not from Portugal were excluded. These results were compared with the data recently published by Asghar et al., which analyzed six high impact factor journals in the clinical cardiovascular field (Journal of American College of Cardiology, Circulation, American Journal of Cardiology, European Heart Journal, BMJ Heart and Clinical Cardiology).¹ This study analyzed data from the last 20 years and found only 16.5% and 9.1% of women as first author and senior author, respectively. In 2016, the last year analyzed, they found 21% as first authors and 12% as senior authors; these figures were substantially lower when compared with high impact factor journals in other areas of Medicine. During period of analysis, the growing trend in female authorship was confirmed, with an increase of 9.5% and 6.6% (first author and senior author, respectively). This pattern was observed for all journals, with the exception of the European Heart Journal, where there was a reduction of women in senior authorship positions. This growth was not significant for multinational articles and for review articles. Another interesting finding was that the median citation was higher for articles written by women, indicating greater article impact. In this analysis, the proportion of women on journal editorial boards and the impact factor of the journals had no influence on the proportion of female authorship, but there was a positive correlation between a senior female author and first female author. Other authors encountered similar data and another curious finding⁷ was that in an analysis of the top 100 of the most prolific authors in these publications, only 5% were women. The number of publications by female authors was also lower in a comparative analysis (4 vs. 2.3 publications per author).⁷

In journals dedicated to basic or pre-clinical cardiovascular research, there were 41% first authors and 21% female senior authors, however the increase is less notable over the years.⁸ The effect of preferential same-gender follow-up/mentoring and the lower proportion of female mentors contributed to the persistence of low female representation. However, the involvement of women in basic research is positively associated with the recognition of gender as a biological variable, thus enabling advances in knowledge and promotion in women's health. There was no demonstrated

Table 1 National data on gender disparity in medical school and among those practicing medicine.

	Students enrolled in medicine			Doctors in Portugal		
	Total	Men	Women	Total	Men	Women
1991	3 362	1 464	1 898 (56%)	28 326	16 941	11 385 (40%)
2000	4 774	1 876	2 898 (61%)	32 498	17 914	14 584 (45%)
2010	10 531	3 707	6 824 (65%)	41 431	20 652	20 779 (50%)
2019 or 2018	12 498	3 965	8 533 (68%)	53 657	23 975	29 682 (55%)

Source: PORDATA

Table 2 Number of cardiologists in Portugal.

	<40 years	41-50 years	51-60 years	>61 years	Total
	M/W	M/W	M/W	M/W	M/W
1996	101/52 (34%)	154/34 (18%)	146/16 (10%)	134/5 (4%)	535/107 (17%)
2000	81/61 (43%)	165/46 (22%)	148/21 (12%)	166/10 (6%)	560/138 (20%)
2010	58/47 (45%)	117/77 (40%)	169/48 (22%)	276/30 (10%)	620/202 (24%)
2019	92/88 (49%)	87/66 (43%)	128/84 (40%)	373/69 (16%)	680/307 (31%)

Source: Portuguese Medical Association
M: men; W: women.

Table 3 Percentage of first authorship and senior authorship in the Portuguese Journal of Cardiology in 2013 (n = 62 publications) and 2018 (n = 114 publications = compared with the Asghar¹ study in international journals with a high impact factor in cardiology).

(1st author/senior) (%)	2013	2018	2016 (international journals)
Total	45.2/19.3	38.6/7.9	20.8/12.3
Original articles	51.2/21.9	50.0/12.0	23.1/14.9
Editorials	18.2/0	20.4/0	18.7/9.7
Review articles	50.0/30.0	80.0/30.0	16.6/11.6

association between gender and experimental rigor or with the impact of the research.

In the analysis of data from the Portuguese Journal of Cardiology RPC, there was an overall reduction in first and senior female authorship from 2013 to 2018, in particular those in a senior position (Table 3). However, the remaining reduction is explained by the higher number of editorials in the 2018 issues, where female weighting is low. This then has significant consequences on the overall percentage. By concentrating on the type of article (original articles), we observe that women account for around 50% of authorship, with no appreciable variation over the two years, but with a substantial increase in review articles. On the other hand, senior authorship has decreased greatly, both globally and in original articles, which may reflect a reduction of women in leadership positions in Portugal. These data corroborate the reported proportions of women in Cardiology in Portugal in the younger age groups, corresponding mostly to specialty interns or young cardiologists, who represent the majority of the first authors of original articles published in the journal, and also the proportions in the more advanced age groups for senior authorship. When compared with the international journals analyzed by Asghar et al., the presence of women, especially as first authors, in the RPC is more pronounced in original and review articles.¹ These results clearly show a higher female representation in Portuguese

cardiology. Even compared to European-based journals, the greater representativeness in Portugal is well-known. Thus, for the European Heart Journal, in 2016 percentages of 20.3% and 6.6% were reported for main and senior authors and for BMJ Heart, 27.8% and 19.6%, respectively. These data also lead us to speculate that there may be a greater difficulty in accepting work of female authorship in journals with a high impact factor.

In general, women are also under-represented as publishers and reviewers. Women are less favorably rated as principal investigators, although there is no difference in the quality of their research proposals.^{9,10} There is also the homophily phenomenon in peer-review processes, where there is greater affinity between people of the same gender.¹¹ In fact, both editors and reviewers show a greater preference for work produced by people of the same gender. The low proportion of women in these roles therefore makes the position of women even more complicated. The use of blind review and an automatic editorial approach are therefore recommended as a global measure to overcome this gender gap. In the RPC, this effect is not so clear, as the Principal Editors or Associates are all male; this was the case in 2013 and in 2018. For reviewers, the proportions were 36% in 2013 and 35% in 2018.

In conclusion, at an international level, gender difference is also present in Medicine, including cardiology.

However, this effect is less pronounced in Portugal, as 50% of first authors of original articles published in the RPC were women. However, in the case of women in senior positions, the data are much more unfavorable compared to other journals, reflecting the well-known glass ceiling effect, with a lower number of women in top positions in cardiovascular medicine in Portugal. The solution to this problem involves not only a change in organizational policy, but also a change in the perception of the role of women in Medicine.

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