Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

A Odontopediatria Brasileira quebrou o teto de vidro na participação das mulheres na ciência acadêmica?

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ABSTRACT

Objective: To investigate gender-based disparities in academic performance among leading researchers in Brazilian Pediatric Dentistry, a field where female representation is high but leadership and recognition may remain unequal. **Methods:** Using a bibliometric approach, we analyzed data from 29 research productivity grant holders listed by Brazil's National Council for Scientific and Technological Development (CNPq). Researcher profiles, scientific output, and student supervision data were extracted from publicly available Lattes CVs between October and November 2024. Metrics were evaluated across the researchers' entire careers and for the recent five-year period (2019–2024). **Results:** Women comprised 62.1% of the sample and authored 61.3% of all publications in the period studied. However, men had significantly higher average citation counts for their most cited publications ($p = 0.021$ in Scopus; $p = 0.029$ in Web of Science), as well as higher h-index and m-index values. Men were also more likely to supervise PhD students, while women were more active in mentoring undergraduate and master's students. **Conclusion:** Despite the numerical majority of women, the data suggest that gender disparities may still exist in academic impact and research visibility. These findings highlight the need for policies that not only promote women's participation in science but also ensure equitable recognition and advancement in academic dentistry.

KEYWORDS

Brazilian research; Gender equity; Pediatric dentistry; Scientific production; Women.

RESUMO

Objetivo: Investigar disparidades baseadas em gênero no desempenho acadêmico entre os principais pesquisadores em Odontopediatria no Brasil, uma área com alta representação feminina, mas onde a liderança e o reconhecimento podem permanecer desiguais. **Métodos:** Utilizando uma abordagem bibliométrica, analisamos dados de 29 bolsistas de produtividade em pesquisa listados pelo Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). Perfis de pesquisadores, produção científica e dados de supervisão de estudantes foram extraídos de Currículos Lattes disponíveis publicamente entre outubro e novembro de 2024. As métricas foram avaliadas ao longo de toda a carreira dos pesquisadores e para o período recente de cinco anos (2019–2024). **Resultados:** As mulheres representaram 62,1% da amostra e foram autoras de 61,3% de todas as publicações no período estudado. No entanto, os homens apresentaram contagens de citações significativamente mais altas para suas publicações mais citadas ($p = 0,021$ no Scopus; $p = 0,029$ no Web of Science), bem como valores mais altos de índice h e índice m.

Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

Os homens também foram mais propensos a supervisionar doutorandos, enquanto as mulheres foram mais ativas na supervisão de alunos de graduação e mestrado. **Conclusão:** Apesar da maioria numérica de mulheres, os dados sugerem que ainda podem existir disparidades de gênero no impacto acadêmico e na visibilidade da pesquisa. Esses achados destacam a necessidade de políticas que não apenas promovam a participação feminina na ciência, mas também garantam reconhecimento e avanço equitativos na odontologia acadêmica.

PALAVRAS-CHAVE

INTRODUCTION

Throughout history, women have been assigned the role of caregivers, often linked to intellectual and professional inferiority [1]. Although progress has been made in recognizing and supporting female participation in research, gender inequality remains a structural challenge influenced by political, economic, and social factors [2]. These inequalities persist globally in scientific production [3], affecting women in academic dentistry as well [4].

Despite women comprising the majority of undergraduate and postgraduate students in many countries, they remain underrepresented in academic leadership roles, such as full professorships. They also face disparities in hiring, salaries, funding, and patent registration [5,6]. A recent ranking of the world's most influential scientists highlighted this issue, showing that Brazilian female scientists make up only 11% of the top 100,000 [7].

Notably, this underrepresentation is not due to low academic productivity. Brazil ranks second globally in the number of scientific publications in dentistry, behind only the United States [8]. Within Brazil, Pediatric Dentistry stands out as the second most productive dental specialty among recipients of Research Productivity Fellowships, surpassed only by Public Health and Epidemiology [9].

Pediatric Dentistry, identified as the third dental specialty in terms of productivity grant distribution [10], also shows a relatively higher percentage of women in academic positions compared to other dental fields [11]. However, gender discrepancies remain evident, particularly regarding the recognition and prestige of female researchers. This reinforces ongoing gender bias within the academic dental community [12].

Although public policies in academia have aimed to support women's educational advancement, gender inequalities seem to persist, especially in the allocation of research productivity grants [13]. While these grants are intended to recognize excellence in scientific output [14], they have not equally benefited women, despite their growing academic qualifications. In Pediatric Dentistry, this disparity remains underexplored, and evidence of equitable opportunities for leadership and scientific recognition is still limited [15]. Given this context, the present study aims to profile prominent Brazilian researchers in Pediatric Dentistry and assess gender-related aspects of academic productivity and scientific impact.

MATERIAL AND METHODS

Design and participants

This is a bibliometric study. Submission to the Research Ethics Committee was not required, as the data used in this study are public and secondary. Furthermore, although the data are publicly available, no individual data were presented, as the information collected and reported in the results was grouped by gender. It should be noted that, in the present study, gender was assessed as a binary variable (male/female). The platform of the National Council for Scientific and Technological Development (CNPq, in Portuguese) (https://www.cnpq.br/) was used to obtain the list of current research productivity grant holders in the field of Dentistry. Data collection occurred during October and November 2024. A total of 229 researchers were identified, with twenty-nine in the sub-area of Pediatric Dentistry included in the study. Researchers holding a PhD and/or with a research focus in the area were selected, which constituted the inclusion criterion.

In Brazil, a significant number of researchers are linked to the CNPq. These researchers are classified into different categories, such as 1, 2, and Senior Researcher, with Category 1 being further subdivided into levels A, B, C, or D—level A

Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

representing the highest rank. To reach the Senior category, the top of the hierarchy, the researcher must have held a productivity grant in Category 1, levels A or B, for at least fifteen years [13].

Data collection

The curriculum vitae of each productivity grant holder was accessed through the Lattes Platform (https://lattes.cnpq.br/), and those who met the inclusion criteria were selected. After sample selection, each researcher's curriculum vitae was reviewed, from which the data for evaluation were extracted. The information collected included: gender, state and region of affiliation, academic institution, institutional category (public/private), country and institution where the PhD was completed, time since PhD completion, country where postdoctoral training was conducted, CNPq grant category, total number of articles published since the first recorded scientific publication in the curriculum (until October 2024), number of articles published between 2019–2024, total number of citations and most cited article in the Scopus and Web of Science (WoS) databases, and human resource training measured by completed supervision of undergraduate research, master's, and PhD students throughout the career and between 2019–2024. The WoS database was used to obtain the H-index (which is defined as the number, h, of published articles by an author that have each been cited at least h times) [16], and to calculate the m-index (a metric that reduces the inherent bias of the H-index against more experienced researchers) [17].

Statistical analysis

The SPSS software (Statistical Package for the Social Sciences for Windows, Inc., USA), version 27.0, was used to build the database and conduct the statistical analysis. Relative and absolute frequencies were used for categorical variables. For numerical variables, means, standard deviations (SD), and their respective 95% confidence intervals were calculated, stratified by gender. The Shapiro-Wilk test was used to determine the distribution of numerical variables. Student's t-test was applied for variables with a normal distribution, and the Mann-Whitney test for those without a normal distribution, to assess whether differences existed between the means of the analyzed parameters

according to researcher gender. Values of $p \leq 0.05$ were considered statistically significant.

RESULTS

The sample consisted of eighteen women (62.1%) and eleven men (37.9%). The researchers were distributed across four of the five regions of Brazil, with the majority located in the Southeast region (23; 79.3%), followed by the South (3; 10.3%), Northeast (2; 6.9%), and Midwest (1; 3.4%). No representatives were identified from the North region.

A higher concentration of researchers was found in the state of São Paulo (17; 58.6%), followed by Minas Gerais (5; 17.2%), Rio Grande do Sul (3; 10.3%), Goiás (1; 3.4%), Pernambuco (1; 3.4%), Paraíba (1; 3.4%), and Rio de Janeiro (1; 3.4%) (Figure 1). The majority were affiliated with public higher education institutions (96.1%), with the University of São Paulo (USP) being the most represented, accounting for 44.8% of the researchers.

The distribution of researchers across CNPq research productivity grant categories was as follows: Category 1A (2; 6.9%), 1B (4; 13.8%), 1C (2; 6.9%), 1D (6; 20.7%), and Category 2 (15; 51.7%). Women held 50% of the 1A grants, 25% of the 1B grants, and 50% of the 1C grants. In Category 1D, they held five grants, representing 83.33% of the total in that category, and in Category 2, they held ten grants, accounting for 66.67% of the total awarded.

Regarding academic training, most researchers earned their PhDs in Brazil (28; 96.6%), with one completing the degree in the United Kingdom (University of London) (1; 3.4%). The Brazilian institutions responsible for the PhD training included: University of São Paulo (USP) (19; 67.9%), São Paulo State University (UNESP) (2; 7.1%), Federal University of Minas Gerais (UFMG) (2; 7.1%), University of Pernambuco (UPE) (2; 7.1%), Federal University of Pelotas (UFPel) (1; 3.6%), and Fluminense Federal University (UFF) (1; 3.6%).

The average time of professional experience since PhD completion was 22.1 years (SD = 6.59), ranging from nine to thirty-three years. Among women, the average was 23.17 years (SD = 6.60), while among men it was 20.45 years (SD = 6.52). Most researchers had completed postdoctoral training (72.4%) in the following countries: Brazil (9; 31%), the United States (4; 13.8%), Canada
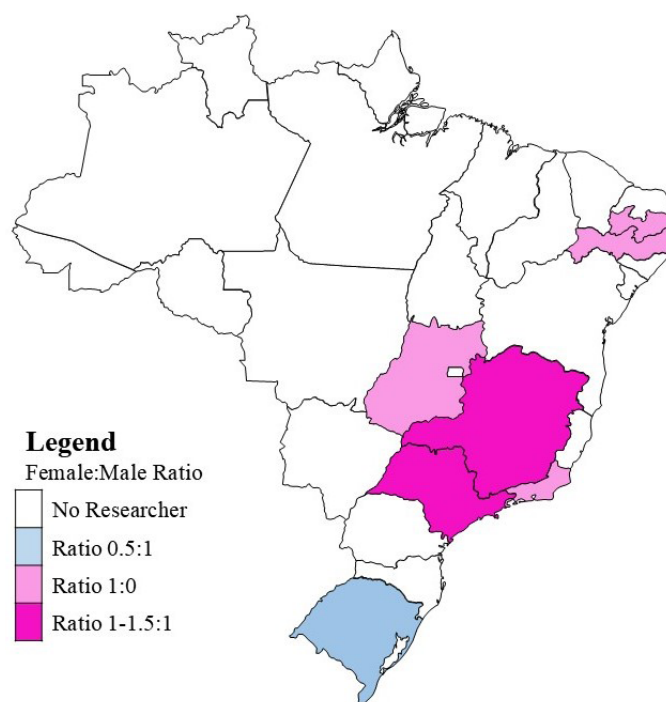
Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

Figure 1 - Ratio of the female-to-male distribution across the federal states.

(4; 13.8%), the United Kingdom (1; 3.4%), South Africa (1; 3.4%), Italy (1; 3.4%), and the Netherlands (1; 3.4%).

Regarding academic productivity, the 29 researchers produced a total of 7,153 scientific articles, with 4,386 (61.3%) published by women and 2,767 (38.7%) by men. The average number of articles per researcher was similar between genders (Table I).

In terms of citations, women's articles received an average of 2,646.17 citations (95% CI: 2,101.30–3,295.13) in Scopus, compared to 4,871.27 citations (95% CI: 2,661.91–8,238.15) for men (p = 0.116). The most cited article by women had an average of 169.06 citations (95% CI: 135.95–209.93), significantly lower than the average of 1,132.36 citations (95% CI: 209.46–2,796.31) for men (p = 0.021). A similar trend was observed in WoS citations, with averages of 2,090.50 (95% CI: 1,626.38–2,603.14) for women and 3,885.82 (95% CI: 2,169.90–6,353.05) for men (p = 0.116). The most cited article in WoS had means of 151.44 (95% CI: 125.56–183.26) and 864.00 (95% CI: 189.31–2,089.65) for women and men, respectively, with a significant difference (p = 0.029).

The H and m indices were also compared. The average H-index was 24.2 (95% CI: 21.5–26.9) for women and 27.1 (95% CI: 22.4–31.8) for men (p = 0.274), while the m-index showed the same trend for men, 1.46 (95% CI: 1.02–1.89), compared to 1.09 (95% CI: 0.91–1.24) for women (p = 0.080).

With regard to human resource training, female researchers supervised a higher average number of undergraduate students throughout their careers, with an average of 37.7 (95% CI: 26.3–49.2), compared to men, who had an average of 31.8 (95% CI: 17.7–45.9; p = 0.458). However, when analyzing only the last five years, men stood out, with an average of 9.91 supervisions (95% CI: 4.38–15.4), while women recorded an average of 7.67 (95% CI: 4.43–10.9; p = 0.589).

For master's degree supervisions, a similar trend was observed. Throughout their careers, women supervised more master's students, with an average of 24.9 (95% CI: 19.5–30.4), compared to men, who had an average of 23.5 (95% CI: 15.0–32.1; p = 0.636). Nonetheless, in the last five years, men surpassed women in this regard, with an average of 7.18 supervisions (95% CI: 3.58–10.8), while women had an average of 5.78 (95% CI: 4.26–7.29; p = 0.982).

For PhD supervisions, men supervised a slightly higher number of students both throughout their careers, with an average of 18.7 (95% CI:

Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

Table I - Scientific publication, citation, mentoring, H and *m* index by Pediatric Dentistry Brazilian researchers (n = 29)

Variables	Female Mean (95%CI)	Male Mean (95%CI)	Female Total (N)	Male Total (N)	*p*-Value
Published articles in career	243.67 (199.01-298.15)	251.55 (186.28-330.98)	4,386	2,767	0.753[†]
Published articles (2019-2024)	73 (53.6-92.4)	98.9 (58.2-140)	1,314	1,088	0.126[†]
Articles citations in Scopus	2,646.17 (2,101.30-3,295.13)	4,871.27 (2,661.91-8,238.15)	47,631	53,584	0.116[†]
Most cited article in Scopus	169.06 (135.95-209.93)	1,132.36 (209.46-2,796.31)	3,043	12,456	0.021[†*]
Articles citations in WoS	2,090.50 (1,626.38-2,603.14)	3,885.82 (2,169.90-6,353.05)	37,629	42,744	0.116[†]
Most cited article in WoS	151.44 (125.56-183.26)	864.00 (189.31-2,089.65)	2,726	9,504	0.029[†*]
H-index	24.2 (21.5-26.9)	27.1 (22.4-31.8)	438	298	0.274[‡]
m-index	1.09 (0.91-1.24)	1.46 (1.02-1.89)	19.75	16.02	0.080[†]
Scientific initiation mentorship (career)	37.7 (26.3-49.2)	31.8 (17.7-45.9)	679	350	0.458[†]
Scientific initiation mentorship (2019-2024)	7.67 (4.43-10.9)	9.91 (4.38-15.4)	138	109	0.589[†]
Master mentorship (career)	24.9 (19.5-30.4)	23.5 (15.0-32.1)	449	259	0.636[†]
Master mentorship (2019-2024)	5.78 (4.26-7.29)	7.18 (3.58-10.8)	104	79	0.982[†]
PhD mentorship (career)	17.9 (13.7-22.1)	18.7 (10.6-26.9)	322	206	0.719[†]
PhD mentorship (2019-2024)	4.89 (3.97-5.81)	6.73 (4.44-9.02)	88	74	0.165[†]

[‡]T-test was used due to a normal distribution. [†]Mann-Whitney U test was applied due to the lack of a normal distribution. *The p-values indicate a significant difference.

10.6–26.9), and in the last five years, with an average of 6.73 (95% CI: 4.44–9.02). Women recorded averages of 17.9 (95% CI: 13.7–22.1) and 4.89 (95% CI: 3.97–5.81), respectively. No statistically significant differences were observed in PhD supervisions, as in the other types of academic supervision, either throughout their careers (p = 0.719) or in the last five years (p = 0.165).

DISCUSSION

In this study, the profile of leading Brazilian researchers in Pediatric Dentistry was outlined, and the gender issue in relation to academic productivity and scientific impact was assessed. In the sample, 62.1% of researchers are women, with a predominant concentration in the Southeast and working in public higher education institutions, especially at USP. These results are similar to those observed in other studies on the profile of CNPq researchers [18,19].

Despite the large number of women in Pediatric Dentistry research, gender disparities in academia still warrant further discussion. Studies show that the reality in the academic community makes this sample one of the exceptions, since, in general, women are underrepresented in areas of professional leadership [5,20,21]. This is also true of

their participation in research productivity groups, lectures at professional meetings, and presidencies of prominent organizations and associations [22]. A 2023 study on productivity grant holders in health sciences also revealed a predominance of male recipients in Dentistry and Medicine [10].

A different context regarding the participation of women in this sample may be due to the area investigated, but this fact is not exempt from the gender issue. A study that analyzed the choice of specialty in Dentistry and associated it with gender found a statistically significant association for Pediatric Dentistry, with a predominance of women in the field. According to the authors, this could suggest a cultural trend in this choice, connected to "maternal aspects" in the form of care [23].

When evaluating academic productivity, it was observed that, overall, women published more articles. This aligns with study suggesting that greater female representation is associated with up to twice the scientific output compared to contexts with lower female presence, highlighting their substantial impact on research productivity [24]. However, contrasting evidence from broader health sciences shows persistent disparities in authorship and funding, with male researchers publishing, on average, nearly 50 more articles than their female counterparts [25]. Still, consistent with

Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

our findings, other study note a steady increase in female-authored publications in Dentistry since 2000, with projections indicating a majority female authorship by 2024 [4].

Given that citation count constitutes one of the metrics for assessing a researcher's quality [26], in our sample, men authored the most cited articles in both Scopus and Web of Science. This aligns with findings that among the 100 most cited articles in Dentistry, there are 4.8 male authors for every female [27]. Despite a significant share of publications by women, their work is less frequently published in high-impact journals, which can hinder career progression [28]. This may be partially attributed to the underrepresentation of women in editorial roles and as reviewers, limiting their influence on what research is published [4,29]. Furthermore, it is recognized that lower-impact articles receive fewer citations [30], and that gender gaps in recognition are not a result of differences in research quality, but in the acknowledgment of women's contributions [31].

Regarding bibliometric indices, male researchers in this sample had higher average H-index and m-index values, although these differences were not statistically significant. These findings complement those of Simon et al. [32], who found that male faculty in Dentistry had more citations and higher H-index values. The slight advantage in m-index scores among men may be explained by a longer duration in the field, as women in this specialty tend to have completed their academic training more recently [15]. Nonetheless, in this study, both the average time since PhD and m-index values were relatively similar between genders, with a slight upward tendency among women.

In human resource training, women supervised more undergraduate and master's students throughout their careers, although this trend reversed slightly in the past five years. In contrast, men supervised more PhD students across both timeframes. This pattern mirrors previous findings indicating a predominance of female supervision at early academic levels, while men lead more PhD supervision [18]. This may be due to the underrepresentation of women in senior academic positions, even in fields where they are numerically dominant [15].

Furthermore, one explanation for the shift in supervision profiles in the last five years may be clarified by the impact of the COVID-19 pandemic.

A study showed that the conflict between work and life balance was significantly greater for female professors/researchers compared to men [33]. Nevertheless, the desire for leadership, understood as the pursuit of career progression, among female faculty did not diminish during this period, despite the challenges faced [34].

As evidenced by this sample, a previous study identified a growing trend of women attaining high-level academic positions over the last decade, attributed in part to institutional support programs [35]. However, gender bias often manifests early in a researcher's career and may persist throughout their trajectory [25]. Even in senior positions, female researchers may continue to face structural challenges and gender-related obstacles, including maintaining a balance between professional and personal responsibilities [35].

One of the factors that challenges the balance between women's responsibilities in research and in everyday life is motherhood [36]. Beyond the physical demands of pregnancy, societal expectations place the burden of childcare predominantly on women, often disrupting their academic productivity and limiting access to strategic roles [22,36]. Furthermore, the impact of motherhood varies depending on a woman's academic rank, with early-career researchers more vulnerable to these constraints [36].

Although women have gained visibility and presence in Pediatric Dentistry research, overcoming the glass ceiling, an "invisible" barrier that can impede women's advancement in their professional careers [37], necessitates the implementation of active measures aimed at dismantling systemic obstacles and fostering more inclusive academic environments [4]. More significant than the mere numerical representation of women is the consistency and quality of their scholarly contributions [2]. It is imperative that the dental academy continues to recruit and support female faculty members, promoting their academic productivity and career progression [32]. Additionally, enhancing scholarship opportunities and equitable remuneration for female professors is crucial to advancing gender equity within the dental academic community [15,34].

This study has limitations. It included only Brazilian researchers in Pediatric Dentistry who hold CNPq productivity scholarships, excluding other qualified professionals in the field. Additionally, gender was assessed as a binary variable. However,

Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

gender is a socially constructed, multifaceted concept that intersects with social, economic, and geographic dimensions [38]. Future studies should consider intersectional approaches to better understand the complexities of gender in academic research. Despite these limitations, the findings provide relevant insights into female participation in scientific research within Pediatric Dentistry and contribute to the broader understanding of gender dynamics in Brazilian academia.

CONCLUSION

Women are the majority in a prominent Pediatric Dentistry research group in Brazil, primarily concentrated in the Southeast and affiliated with public universities. They have made significant contributions to scientific publications and student supervision, particularly at the undergraduate and master's levels. However, men receive more citations, have slightly higher H- and m-index scores, and supervise more PhD students. Although this sample reflects strong female representation, it does not indicate that gender disparities in academic dentistry have been fully addressed. Breaking the glass ceiling requires ongoing efforts to promote equity, increase female representation in leadership positions—such as presidencies, institutional directorships, and senior academic roles, and a global effort to investigate and promote women's participation in Pediatric Dentistry research.

Acknowledgements

Author's Contributions

MVSZ, JMD, LMF, RAR: Conceptualization. MVSZ, JMD: Data Curation. LMF: Formal Analysis. MVSZ, JMD: Investigation. MVSZ, JMD, LMF, RAR: Methodology. LMF: Software. MJSC, KLD, RAR: Supervision. MVSZ, JMD: Writing – Original Draft Preparation. MVSZ, LMF, HMJ, MJSC, KLD, RAR: Writing – Review & Editing.

Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

Funding

Regulatory Statement

This study used publicly available secondary data; therefore, approval by a Research Ethics Committee was not required. Furthermore, all data were presented in aggregate form by gender, with no individual information disclosed.

Ethics statement

This study used publicly available data. Therefore, it did not require approval from the research ethics committee.

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Zeferino MVS et al.

Has Brazilian Pediatric Dentistry broken the glass ceiling in women's participation in academic science?

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