







# Sex disparities among PhD graduates in Oral Pathology and Oral Medicine in Brazil

Stéphanhy Maria Meira<sup>1\*</sup> , Maria Theresa Tavares de Souza<sup>2</sup> , Fabrício Emanuel Soares de Oliveira<sup>1</sup> , Daniella Reis Barbosa Martelli<sup>1,3</sup> , Árlen Almeida Duarte de Sousa<sup>1</sup> , Hercílio Martelli-Júnior<sup>1,3</sup> 

## Abstract:

**Objective:** To evaluate the professional practice and scientific output of PhD graduates in Oral Pathology and Oral Medicine in Brazil, with an emphasis on sex disparities. **Methods:** This cross-sectional study analyzed 564 graduates who completed their PhDs up to 2021. Variables included sex, year of defense, number of articles published within three years, female participation as first and last author, state, institution, postgraduate program, area of concentration, program rating by CAPES, and type and place of professional activity (public and/or private). Statistical analyses were performed using the Mann–Whitney U test, Pearson’s  $\chi^2$  test, and paired Wilcoxon test. **Results:** The sample showed a predominance of females (64.5%). No significant differences were observed between sexes regarding time to PhD completion ( $p=0.176$ ) or professional field ( $p=0.239$ ), with most graduates working in the private sector (61.5%). Training was mainly concentrated in the Southeast region (73.2%). Despite the greater female representation, men had higher mean numbers of scientific publications as first and last authors ( $p<0.001$ ), indicating disparities in academic output according to sex. **Conclusion:** Disparities according to sex remain among PhD graduates in these fields. Although women represent the majority and predominate in professional practice, particularly in the private sector, men more frequently occupy prominent authorship positions in scientific publications.

**Keywords:** Oral pathology; Oral medicine; Scientific output; Sex distribution.

## INTRODUCTION

In the Brazilian context, Oral Pathology (OP) and Oral Medicine (OM) are recognized as dental specialties. OP was officially recognized as a specialty in 1971, while OM received official recognition in 1992<sup>1</sup>. Despite the development of these specialties in Latin America and the growing recognition of the contributions of professionals working in this field<sup>2–4</sup>, their consolidation and strengthening remain relatively recent processes in several countries<sup>5</sup>.

In recent years, there has been significant progress in the training of specialized professionals through postgraduate programs in these areas, directly impacting both professional practice and the continuous development of scientific output<sup>3,6</sup>. However, despite these academic and professional advances, challenges persist<sup>7</sup>, particularly regarding sex-based inequalities that have historically permeated science, higher education, and the labor market<sup>8,9</sup>. Although women currently represent a substantial proportion of students in undergraduate and postgraduate

### Statement of Clinical Significance

Understanding sex disparities among PhD holders in Oral Pathology and Oral Medicine helps elucidate the structural inequities that influence scientific productivity and leadership representation. Addressing these imbalances is essential to fostering equitable academic advancement and promoting inclusive professional practices in dental research and education.

programs in many countries<sup>10</sup>, disparities in career progression and academic recognition remain evident.

Analyzing professional practice and scientific output from the perspective of sex-based differences is therefore essential. Despite the increasing representation of women in postgraduate education in Brazil<sup>7</sup>, they continue to face barriers to occupying leadership positions, achieving greater visibility and scientific productivity, and accessing professional opportunities under equal conditions<sup>8,9</sup>. Similar patterns may also be observed in the fields of OP and OM, where understanding how

<sup>1</sup>State University of Montes Claros, Postgraduate Program in Health Sciences – Montes Claros (MG), Brazil.

<sup>2</sup>State University of Montes Claros, Undergraduate Program in Dentistry – Montes Claros (MG), Brazil.

<sup>3</sup>State University of Montes Claros, Oral Pathology and Oral Medicine, School of Dentistry – Montes Claros (MG), Brazil.

\*Correspondence to: E-mail: stephannymm@hotmail.com

Received on October 7, 2025. Accepted on March 27, 2026.

https://doi.org/10.5327/2525-5711.428



---

sex disparities influence the professional and academic trajectories of graduates may provide valuable insights for the development of more inclusive and equitable strategies. Identifying where these disparities occur may contribute to advancing equity between sexes<sup>11</sup>.

Given this context, this study analyzed the professional practice and scientific output of male and female PhD graduates in the fields of OP and OM in Brazil, with an emphasis on sex disparities.

## METHODS

### Study design and participants

This was a cross-sectional study involving 564 professionals who graduated from PhD programs in OP/OM in Brazil. The sample included graduates who defended their theses between 2013 and 2021, a period chosen due to the considerable number of defenses, whose curricula were updated and accessible on the Lattes Platform (<http://buscatextual.cnpq.br/>) up to the last year considered. The study period was defined to ensure sufficient time for graduates, after completing their PhD, to consolidate and develop their academic and scientific trajectories. Although the study includes time-dependent variables, such as publications within three years after PhD completion, it was designed as a cross-sectional analysis based on secondary data collected at a single time point.

### DATA COLLECTION

Data were obtained from the digital thesis repository of the Coordination for the Improvement of Higher Education Personnel (CAPES) (<https://catalogodeteses.capes.gov.br/catalogo-teses/#!/>) and from the Lattes Platform (<http://buscatextual.cnpq.br/>). This study relied exclusively on publicly available secondary data and did not require submission to a Research Ethics Committee.

Sex was determined based on the individuals' names and information available in the Lattes Curriculum. However, this approach may be subject to misclassification bias, as it does not account for individual self-identification or possible discrepancies between name and biological sex. Additionally, the presence of transgender individuals or those who do not use their birth names cannot be ruled out, representing a limitation of this study.

### Covariates

Variables related to the participants personal and academic characteristics were collected, including sex,

year of thesis defense, state, training institution, post-graduate program, program rating (CAPES), date of last Lattes update, and type and place of professional activity (public and/or private).

Scientific output was assessed by counting scientific articles published within three years after thesis defense, up to 2021, allowing for the analysis of early career scientific productivity. In addition, the positions occupied by women in publications were examined, specifically their frequency as main authors, first authors, and last authors, in order to assess their representation in leadership roles within scientific production.

### Statistical analysis

Data were organized into spreadsheets, and a database was subsequently constructed using the Statistical Package for the Social Sciences (SPSS®), version 27.0, for statistical analyses. The analysis consisted of descriptive statistics, including absolute and relative frequencies, as well as mean, standard deviation, median, and interquartile range. Pearson's chi-square test, Mann-Whitney U test, and Wilcoxon test were also applied.

The analysis sought to identify potential sex-based disparities in both employability and scientific output among graduates, as well as to relate these findings to institutional and professional characteristics.

## RESULTS

Data were collected from 564 PhD graduates in OP/OM, of whom 364 were women (64.5%). Regarding the time since completion of the doctorate, male PhD graduates completed their programs an average of 8.17 years ago, compared with 7.92 years for female PhD graduates, with no statistically significant difference ( $p=0.176$ ).

Concerning the CAPES rating of the doctoral programs, the mean scores were similar between women ( $5.18\pm 1.16$ ) and men ( $5.04\pm 1.25$ ), with no significant difference ( $p=0.185$ ) (Table 1).

Another relevant finding concerns the region where participants completed their programs: Southeast, South, and Northeast. For both sexes, the majority were concentrated in the Southeast (73.2%), while the South showed the lowest prevalence, with only 10.5% of graduates. When analyzed by university, the highest proportion of graduates was from the Universidade de São Paulo (38.9%), followed by Centro Universitário Sagrado Coração (10.6%) and Universidade Estadual de Campinas (13.1%). No significant differences were observed in the distribution by institution between men and women ( $p=0.215$ ).

With respect to the professional field, approximately 52% of the graduates worked in the private sector, either in teaching or service provision. However, for this variable, it was not possible to assess the entire sample due to missing information in some individuals' Lattes curriculum (Table 1).

Although women represent the majority among doctoral graduates, men exhibited a higher average number of scientific publications in the three years following the defense (5.32 for men versus 3.85 for

women), up to 2021. Regarding first authorship, women published on average 1.28 articles (SD=2.32), with a median of 0 (IQR 0–1), whereas men published on average 2.93 articles (SD=5.01), with a median of 1 (IQR 0–4) ( $p<0.001$ ). As for last authorship, a position generally held by the research supervisor, women had a mean of 0.63 publications (SD=1.28), with a median of 0 (IQR 0–1), whereas men had a mean of 3.58 publications (SD=5.92), with a median of 2 (IQR 0–5) ( $p<0.001$ ) (Table 2).

**Table 1.** Description and bivariate analysis of graduates from postgraduate programs in Oral Pathology/Medicine (n=564).

Variables	Female n (%)	Male n (%)	p-value	
Time to completion of PhD				
Mean (standard deviation)	7.92 (2.59)	8.17 (2.44)	0.176*	
Median (interquartile range)	8 (6–10)	8 (6–10)		
CAPES rating of the PhD				
Mean (standard deviation)	5.18 (1.16)	5.04 (1.25)	0.185*	
Median (interquartile range)	5 (4–6)	4 (4–6)		
Brazilian region				
Southeast region	262 (63.4)	151 (36.6)	0.133†	
South region	45 (76.3)	14 (23.7)		
Northeast region	57 (62.0)	35 (38.0)		
Brazilian University				
Universidade de São Paulo	149 (67.4)	72 (32.6)	0.215†	
Universidade Estadual de Campinas	43 (58.1)	31 (41.9)		
Universidade Estadual Paulista Júlio de Mesquita Filho	23 (71.9)	9 (28.1)		
Universidade Federal do Rio Grande do Sul	20 (87.0)	3 (13.0)		
Centro Universitário Sagrado Coração	32 (53.3)	28 (46.7)		
Universidade Federal da Bahia	29 (60.4)	19 (39.6)		
Universidade Federal do Rio Grande do Norte	25 (64.1)	14 (35.9)		
Pontifícia Universidade Católica do Paraná	16 (64.0)	9 (36.0)		
Universidade Federal de Minas Gerais	14 (56.0)	11 (44.0)		
Universidade Federal da Paraíba	3 (60.0)	2 (40.0)		
Universidade Federal de Santa Catarina	8 (88.9)	1 (11.1)		
São Leopoldo Mandic	1 (50.0)	1 (50.0)		
Universidade de Taubaté	1 (100.0)	0 (0.0)		
Professional field (n=451)				
Public and Private	32 (51.6)	30 (48.4)		0.239†
Public	99 (63.9)	56 (36.1)		
Private	144 (61.5)	90 (38.5)		
Total	364 (64.5)	200 (35.5)		

\*Mann-Whitney U test; †Pearson's  $\chi^2$  test.

**Table 2.** Comparative data on the number of publications of graduates from Postgraduate Programs in Oral Pathology/Medicine in the last three years (n=564).

Authorship position	Sex	Mean (SD)	Median (IQR)	p-value*
First author	Female	1.28 (2.32)	0 (0-1)	<0.001
	Male	2.93 (5.01)	1 (0-4)	
Last author	Female	0.63 (1.28)	0 (0-1)	<0.001
	Male	3.58 (5.92)	2 (0-5)	

\*Wilcoxon test.

## DISCUSSION

The results of this study indicate that sex disparities exist in the scientific development of PhD graduates in Brazil. Although female participation in academia and scientific research has increased significantly in recent years<sup>7</sup>, this study observed a predominance of women (64.5%) compared to men (35.5%), corroborating data indicating that women now outnumber men in undergraduate and postgraduate programs in various countries<sup>10</sup>.

Nonetheless, sex inequality among academics and researchers remains evident<sup>7</sup>. Women's presence in the scientific community as a whole continues to be limited to approximately one-third (33.3%)<sup>12</sup>, particularly at higher academic levels, in scientific productivity, remuneration, and leadership positions<sup>8,9</sup>.

Analysis of professional practice showed that more than half of both men and women work in the private sector, with a similar distribution between sexes. This finding confirms that Brazilian PhD graduates in these fields are predominantly integrated into the market through private institutions<sup>13</sup>. This profile aligns with the majority of graduates, who are qualified to perform clinical activities, engage in higher education teaching, and conduct research in OP/OM<sup>14</sup>.

Geographically, researchers were concentrated in the Southeast, South, and Northeast regions, with the majority of both sexes in the Southeast. This pattern may be related to the location of postgraduate programs with the highest ratings (scores six and seven, assigned by CAPES), most of which are based in the Southeast of Brazil<sup>12</sup>.

Studies conducted in other fields have shown that structural sex inequality may also affect the frequency of scientific publications<sup>10,15,16</sup>. Regarding authorship order, women often occupy positions of lesser prestige; typically, first and last authors are men, regardless of their contributions<sup>17,18</sup>. Similarly, our study demonstrated that, although women constitute the majority among

graduates, men have higher scientific output and more frequently occupy first and last authorship positions.

In a previous study conducted by our team, an increase in female participation in scientific output in OP/OM was observed, evidenced both by the growth in the number of publications and by the higher number of women as first authors during the pandemic. However, sex disparities remain, particularly in leadership positions, such as last authorship, indicating that quantitative advances do not necessarily translate into equity in prominent roles<sup>19</sup>.

According to Wheatley and Ogunlana<sup>20</sup>, the first and last authors of a scientific article play crucial roles in the research process, with the last author traditionally being the most senior scientist or principal investigator, serving as supervisor and group leader<sup>20</sup>. Applying this principle, the data indicate that sex differences persist in other academic dimensions, such as hiring, remuneration, and representation in permanent positions, even in countries where women predominate in undergraduate and postgraduate programs<sup>9</sup>. Female participation in editorial boards of dental journals also shows significant variation across specialties<sup>21</sup>, and institutional initiatives to promote sex equity are often limited to interpersonal interactions, without addressing structural inequalities broadly<sup>22</sup>.

Women spend more time on maternal care and twice as much time on other household tasks compared to men<sup>23</sup>. In addition to the aforementioned disadvantages, women face substantial challenges, particularly after childbirth, when they assume a disproportionate share of parental responsibilities relative to men<sup>8,15</sup>. Since 2021, the National Council for Scientific and Technological Development (CNPq) in Brazil, which manages the Lattes Platform, has implemented a policy allowing users to include periods related to pregnancy and maternity leave in their curricula<sup>24</sup>. Although institutional policies help reduce disparities in research, complete elimination of these inequalities remains distant. The adoption of effective measures to promote equity between sexes, incorporating this perspective in an integrated manner, remains a significant and essential challenge<sup>25</sup>.

A limitation of this study is that the analysis was restricted to graduates of OP/OM postgraduate programs, based on information obtained from curricula available on the Lattes platform, which may present inconsistencies in records of scientific publications and professional activities. Furthermore, as this study focused on a specific population, the findings cannot be generalized to other fields. Sex was inferred based on names and Lattes information, which may result

in misclassification bias. Additionally, the absence of multivariable analysis limits the control of potential confounding factors that may influence scientific productivity. Future studies using self-reported data are recommended to provide a more accurate assessment of these disparities.

## CONCLUSION

Despite the predominance of women among graduates of PhD programs in OP/OM in Brazil, sex disparities persist, particularly in scientific output and in authorship order, with the most prominent positions (first and last authorship) generally held by men. Women, however, constituted the majority in professional practice, especially in the private sector. These findings indicate differences according to sex in both academic productivity and professional trajectories in these areas.

## ACKNOWLEDGEMENTS

To The Minas Gerais State Research Foundation-FAPEMIG, Brazil, National Council for Scientific and Technological Development – CNPq, Brazil, and the Coordination for the Improvement of Higher Education Personnel, CAPES, Brazil.

## AUTHORS' CONTRIBUTIONS

SMM: Investigation, Writing – original draft, Writing – review & editing. MTTs: Investigation, Writing – review & editing. FESO: Data curation, Formal analysis, Writing – review & editing. DRBM: Data curation, Supervision, Writing – review & editing. AADS: Data curation, Writing – review & editing. HMJ: Conceptualization, Methodology, Project administration, Supervision, Writing – review & editing.

## CONFLICT OF INTEREST STATEMENT

**Funding:** The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

**Competing interests:** The authors declare no conflicts of interest.

**Ethics approval:** Ethical approval was not required for this study since it involved the analysis of secondary data obtained from open-access databases, without the use of identifiable human data.

**Data availability statement:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## REFERENCES

1. Conselho Federal de Odontologia. Histórico. [Internet] Brasília: CFO; 2013 [cited 2025 Aug 13]. Available from: <https://website.cfo.org.br/historico/>
2. Hunter K, Speight P, Wright J, van Heerden W, Rich A, Franklin C. An international survey of speciality training in oral and maxillofacial pathology. *J Oral Pathol Med.* 2014;43(3):232-6. <https://doi.org/10.1111/jop.12118>
3. Santos-Silva AR, Lopes MA, Pedroso CM, Ribeiro ACP, Fonseca FP, Brandão TB, et al. Oral medicine (stomatology) in Brazil: the first 50 years and counting. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2022;134(1):57–64. <https://doi.org/10.1016/j.oooo.2022.01.018>
4. Scully C, Miller CS, Urizar JMA, Alajbeg I, Almeida OPD, Bagan JV, et al. Oral medicine (stomatology) across the globe: birth, growth, and future. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2016;121(2):149–157.e5. <https://doi.org/10.1016/j.oooo.2015.10.009>
5. Stoopler ET, Shirlaw P, Arvind M, Lo Russo L, Bez C, De Rossi S, et al. An international survey of oral medicine practice: proceedings from the 5th World Workshop in Oral Medicine. *Oral Dis.* 2011;17 Suppl 1:99-104. <https://doi.org/10.1111/j.1601-0825.2011.01795.x>
6. Andrade RS, Martelli DRB, Almeida OP, Lopes MA, Swerts MSO, Pires FR, et al. Brazilian scientific production in Oral Medicine and Oral Pathology. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2018;125(2):179–81. <https://doi.org/10.1016/j.oooo.2017.08.009>
7. Shannon G, Jansen M, Williams K, Cáceres C, Motta A, Odhiambo A, et al. Gender equality in science, medicine, and global health: where are we at and why does it matter? *Lancet.* 2019;393(10171):560–9. [https://doi.org/10.1016/S0140-6736\(18\)33135-0](https://doi.org/10.1016/S0140-6736(18)33135-0)
8. Moschkovich M, Almeida AMF. Desigualdades de gênero na carreira acadêmica do Brasil. *Dados.* 2015;58(3):749–89. <https://doi.org/10.1590/00115258201558>
9. Li B, Jacob-Brassard J, Dossa F, Salata K, Kishibe T, Greco E, et al. Gender differences in faculty rank among academic physicians: a systematic review and meta-analysis. *BMJ Open.* 2021;11(11):e050322. <https://doi.org/10.1136/bmjopen-2021-050322>
10. Larivière V, Ni C, Gingras Y, Cronin B, Sugimoto CR. Bibliometrics: Global gender disparities in science. *Nature.* 2013;504(7479):211–3. <https://doi.org/10.1038/504211a>
11. Roper RL. Does gender bias still affect women in science? *Microbiol Mol Biol Rev.* 83:10.1128/mubr.00018-19. <https://doi.org/10.1128/mubr.00018-19>
12. Ferreira LM, Sousa AA, Nascimento JP, Oliveira FE, Martelli DR, Oliveira EA, et al. Analysis of the citation impact of Brazilian researchers in oral pathology and oral medicine over two decades. *Med Oral Patol Oral Cir Bucal.* 2024;29(5):e698–e703. <https://doi.org/10.4317/medoral.26681>
13. Bezerra HKF, Perez DEC, Bonan PRF, Moret MA, Santos-Silva AR, Martelli-Júnior H. Postgraduate employment outcomes of

- 
- Brazilian oral medicine and oral pathology programs. *Oral Dis.* 2024;30(4):2758-9. <https://doi.org/10.1111/odi.14564>
14. Santos-Leite EG, Sobral L, Gilligan G, Flores-Ramos JL, González-Arriagada WA, Vega CP, et al. Oral pathology and oral medicine in Latin American countries: current stage. *Med Oral Patol Oral Cir Bucal.* 2024;29(4):e527-32. <https://doi.org/10.4317/medoral.26500>
15. Shen H. Inequality quantified: mind the gender gap. *Nature.* 2013;495(7439):22-4. <https://doi.org/10.1038/495022a>
16. Keffer GM, Sousa AAD, Oliveira FE, Magalhães MJS, Oliveira EA, Martelli Júnior H. Evaluation of Brazilian women's participation in the CNPq in the field of medical research. *Rev Bras Educ Med.* 2024;48(2):e028. <https://doi.org/10.1590/1981-5271v48.2-2023-0271.ING>
17. Krstacic JE, Carr BM, Yaligar AR, Kuruvilla AS, Helali JS, Saragossi J, et al. Academic medicine's glass ceiling: author's gender in top three medical research journals impacts probability of future publication success. *PLoS One.* 2022;17(4):e0261209. <https://doi.org/10.1371/journal.pone.0261209>
18. Broderick NA, Casadevall A. Gender inequalities among authors who contributed equally. *elife.* 2019;8:e36399. <https://doi.org/10.7554/eLife.36399>
19. Meira SM, Souza MTT, Oliveira FES, Martelli DRB, Coletta RD, Sousa AAD, et al. Gender equity in oral pathology/medicine: analysis of scientific output before and during COVID-19. *Oral Dis.* 2025;31(11):3218-9. <https://doi.org/10.1111/odi.15345>
20. Wheatley RM, Ogunlana L. Gender shapes the formation of review paper collaborations in microbiology. *Proc Biol Sci.* 2023;290(2002):20230965. <https://doi.org/10.1098/rspb.2023.0965>
21. Ioannidou E, Rosania A. Under-representation of women on dental journal editorial boards. *PLoS One.* 2015;10(1):e0116630. <https://doi.org/10.1371/journal.pone.0116630>
22. Carr P, Gunn C, Raj A, Kapllan S, Freund KM. Recruitment, promotion, and retention of women in academic medicine: how institutions are addressing gender disparities. *Womens Health Issues.* 2017;27(3):374-81. <https://doi.org/10.1016/j.whi.2016.11.003>
23. Elsevier. Gender in the global research landscape [Internet]. 2017 [cited 2025 Aug 25]. Available from: [https://www.elsevier.com/\\_\\_data/assets/pdf\\_file/0008/265661/ElsevierGenderReport\\_final\\_for-web](https://www.elsevier.com/__data/assets/pdf_file/0008/265661/ElsevierGenderReport_final_for-web)
24. Brasil. Ministério da Ciência, Tecnologia e Inovação. Conselho Nacional de Desenvolvimento Científico e Tecnológico. CNPq anuncia inclusão do campo licença-maternidade no Currículo Lattes [Internet]. 2021 [cited 2025 Aug 25]. Available from: <https://www.gov.br/cnpq/pt-br/assuntos/noticias/cnpq-em-acao/cnpq-anuncia-inclusao-do-campo-licenca-maternidade-no-curriculo-lattes>
25. Murray S, Swaine A, Doody A. Gender equality policy. Review Report. Irish Aid. Government of Ireland; 2010.