

Distribution of dental surgeons specialists in Temporomandibular Dysfunction and Orofacial Pain in Brazil

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Abstract The objective of this study was to analyze the distribution of dental surgeons (DSs) specialists in Temporomandibular Dysfunction and Orofacial Pain (TMD/OP) in Brazil. An ecological study was conducted using data from the Federal Council of Dentistry, the Ministry of Health, the Ministry of Education and the Brazilian Institute of Geography and Statistics. Descriptive analyzes were performed to characterize the distribution of specialists by State (UF), performance in the Unified Health System (SUS) and to identify the other specialties registered by these professionals. We tested the correlation between the number of specialists per UF and the variables resident population, number of dental education institutions, Gross Domestic Product (GDP) and Gini index by means of the Spearman correlation test $\alpha=(0.05)$. 1,613 DSs specialists in TMD/OP were identified, representing 1.4% of Brazilian DSs. The Southeast region concentrated 59.2% of these experts, while the North region counted 2.9%. In SUS, 52 specialists (3.2%) were identified. In addition, 72.8% of the specialists had registration in other specialties, especially orthodontics (27.7%) and dental prosthesis (17.0%). There was a significant positive correlation between the number of specialists and the resident population $p=(0.86 \ 0.01; p<0.88)$, the number of educational institutions ($p=0.01; p<0.93$) and the GDP ($p=0.01; p<$) per UF. It is concluded that there are inequalities and limitations in the distribution of TMD/OP specialists in Brazil, with higher concentration in the Southeast, in addition to a shortage of professionals in SUS. The geographic distribution of these professionals was correlated with the resident population, the number of educational institutions and the GDP.

Descriptors: Health Human Resource Training. Education, Dental, Graduate. Temporomandibular Joint Dysfunction Syndrome. Facial Pain.

Distribución de cirujanos dentistas especialistas en Trastornos de la Articulación Temporomandibular y Dolor Orofacial en Brasil

Resumen El objetivo fue analizar la distribución de los cirujanos dentistas (CD) especialistas en Trastornos de la Articulación Temporomandibular y Dolor Orofacial (ATM/DO) en Brasil. Se llevó a cabo un estudio ecológico que utilizó datos del Consejo Federal de Odontología, del Ministerio de Salud, del Ministerio de Educación y del Instituto Brasileño de Geografía y Estadística. Se realizaron análisis descriptivos para caracterizar la distribución de los especialistas por Unidad Federativa (UF), su actuación en el Sistema Único de Salud (SUS) y para identificar las demás especialidades registradas por estos profesionales. Se evaluó la correlación entre el número de especialistas por UF y las variables población residente, número de instituciones de enseñanza de Odontología, Producto Interno Bruto (PIB) e índice de Gini, mediante la prueba de correlación de Spearman ($\alpha=0,05$). Se identificaron 1.613 CDs especialistas en ATM/DO, lo que representa el 1,4% de los CDs de Brasil. La región Sudeste concentró el 59,2% de estos especialistas, mientras que la región Norte contó con el 2,9%. En el SUS se identificaron 52 especialistas (3,2%). Además, el 72,8% de los especialistas poseían registro en otras especialidades, destacándose Ortodoncia (27,7%) y Prótesis Dental (17,0%). Se observó una correlación positiva significativa entre el número de especialistas y la población residente ($p=0,86; p<0,01$), el número de instituciones de enseñanza ($p=0,88; p<0,01$) y el PIB ($p=0,93; p<0,01$) por UF. Se concluye que existen desigualdades y limitaciones en la distribución de especialistas en ATM/DO en Brasil, con mayor concentración en el Sudeste, además de una escasez de profesionales en el SUS. La distribución

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geográfica de estos profesionales se correlacionó con la población residente, el número de instituciones de enseñanza y el PIB.

Descritores: Capacitação de Recursos Humanos em Saúde. Educação de Pós-graduação em Odontologia. Síndrome de la Disfunción de Articulación Temporomandibular. Dolor Facial.

Distribuição de cirurgiões-dentistas especialistas em Disfunção Temporomandibular e Dor Orofacial no Brasil

Resumo Objetivou-se analisar a distribuição dos cirurgiões-dentistas (CDs) especialistas em Disfunção Temporomandibular e Dor Orofacial (DTM/DO) no Brasil. Foi conduzido um estudo ecológico que utilizou dados do Conselho Federal de Odontologia, do Ministério da Saúde, do Ministério da Educação e do Instituto Brasileiro de Geografia e Estatística. Realizaram-se análises descritivas para caracterizar a distribuição dos especialistas por Unidade Federativa (UF), atuação no Sistema Único de Saúde (SUS) e para identificar as demais especialidades registradas por esses profissionais. Testou-se a correlação entre o número de especialistas por UF e as variáveis população residente, número de instituições de ensino de Odontologia, Produto Interno Bruto (PIB) e índice de Gini, por meio do teste de correlação de Spearman ($\alpha=0,05$). Identificaram-se 1.613 CDs especialistas em DTM/DO, representando 1,4% dos CDs do Brasil. A região Sudeste concentrou 59,2% desses especialistas, enquanto a região Norte contou com 2,9%. No SUS, foram identificados 52 especialistas (3,2%). Além disso, 72,8% dos especialistas possuíam registro em outras especialidades, destacando-se Ortodontia (27,7%) e Prótese Dentária (17,0%). Observou-se correlação positiva significativa entre o número de especialistas e a população residente ($\rho=0,86$; $p<0,01$), o número de instituições de ensino ($\rho=0,88$; $p<0,01$) e o PIB ($\rho=0,93$; $p<0,01$) por UF. Conclui-se que há desigualdades e limitação na distribuição de especialistas em DTM/DO no Brasil, com maior concentração no Sudeste, além de uma escassez de profissionais no SUS. A distribuição geográfica desses profissionais correlacionou-se com a população residente, o número de instituições de ensino e o PIB.

Descritores: Capacitação de Recursos Humanos em Saúde. Educação de Pós-Graduação em Odontologia. Síndrome da Disfunção da Articulação Temporomandibular. Dor Facial.

INTRODUCTION

The term temporomandibular Dysfunction (TMD) comprises a series of conditions that affect the temporomandibular joints, the mastication muscles and adjacent structures. TMD is characterized by a range of symptoms, including facial pain, limitation of jaw movement and joint sounds, which can vary significantly in intensity¹. The diagnosis encompasses several categories, including those of muscle origin and those related to the temporomandibular joint². The underlying cause of DTMs is multifaceted, involving biological, psychological and social factors. In Brazil, its prevalence ranged from 25.6% to 50.5%³. In addition, it was estimated that about 4% of adults experience a first episode of TMD each year, with frequent recurrence⁴. Therefore, this condition can have a substantial impact on quality of life and the ability to perform activities at work, leisure and social interactions^{5,6}.

In addition to the challenges inherent in the condition of TMD, patients often face obstacles in seeking effective dental care and trying to make health professionals understand their situation^{7,8}. The guidelines for TMD management emphasize the importance of conservative approaches, reserving surgical interventions for cases with specific clinical indications⁹. However, due to the intensity of painful symptoms and the difficulties of keeping the mouth open for long periods, even routine dental care becomes a challenging task¹. In this context, it is crucial to have the assistance of qualified professionals able to meet the needs of patients in an adequate way.

In Brazil, the dental specialty in Temporomandibular Dysfunction and Orofacial Pain (TMD/OP) was recognized by the Federal Council of Dentistry (CFO) in 2002. The TMD/OP specialist has competence to diagnose and predict complex orofacial pain, including chronic temporomandibular disorders, as well as to work in multidisciplinary pain teams, perform epidemiological and pathophysiological studies in this area, and provide specialized dental treatment to alleviate these conditions¹⁰.

Although Brazil has many dental surgeons (DSs) and dental education institutions, there are concerns about the unequal distribution of these professionals in geographical terms^{11,12}. Despite the high prevalence of TMD in the country, only a small portion, equivalent to 0.38% of DSs, specializes in this area¹³.

Therefore, the objective of this study was to analyze the distribution of DSs specialists in TMD/OP in Brazil. Understanding this workforce, that is, quantifying the professionals available to meet specific needs, becomes essential to guide the formulation and implementation of policies related to work management and health education¹⁴.

METHODS

This ecological study, with a descriptive and analytical approach, was based on secondary data from the Federal Council of Dentistry (CFO), the Ministry of Health (MS), the Ministry of Education (MEC) and the Brazilian Institute of Geography and Statistics (IBGE). The units of analysis were the States (UF) of Brazil.

Data on the distribution of DSs specialists in TMD/OP were obtained from the CFO electronic portal, considering only DSs with active registration¹⁵. The number of specialists working in the Unified Health System (SUS) was extracted from the human resources base of the National Register of Health Establishments of MS¹⁶. The number of undergraduate courses in Dentistry was consulted in the National Register of Higher Education Courses and Institutions of MEC, considering only the courses with "situation in activity"¹⁷. The reference period for these data was October 2024.

Data on the resident population were obtained from the 2022 Demographic Census of IBGE¹⁸. The Gross Domestic Product (GDP), with reference in 2021, was extracted from the IBGE¹⁹. The Gini Index, with reference in 2023, was obtained by the National Survey of Continuous Household Sample of IBGE²⁰.

Absolute, relative frequencies and the proportion between the number of specialists and the resident population were calculated. Additionally, the relationship was investigated between the number of specialists per UF and the following indicators: resident population, number of higher education institutions in dentistry, GDP and Gini Index. For this analysis, the Spearman non-parametric correlation test was used, which describes the monotonic relationship between two variables, offering robustness against outliers, non-normal distributions and tied data²¹. The Spearman correlation coefficient (ρ) is an effect size whose absolute value can be classified as weak ($\rho \geq 0.3$), moderate ($\rho \geq 0.5$), high ($\rho \geq 0.7$) and very high ($\rho \geq 0.9$)²². All analysis were performed using software R (version 4.3.2)²³ and adopted a significance level (α) of 5%.

According to Resolution No. 510 of April 7th, 2016, of the National Health Council, the review by a Research Ethics Committee was dismissed due to the nature of the data, which is secondary, public access and does not contain individual identification information²⁴.

RESULTS

In the analysis period, 1,613 TMD/OP specialists were registered in Brazil, which corresponds to 0.38% of the total registered DSs ($n = 423,332$).

Regarding the geographical distribution in the country, the Southeast region stood out with the largest contingent, totaling 955 specialists (59.2%), resulting in a proportion of 0.11 specialists per 10,000 inhabitants. On the other hand, the North region presented the lowest number of specialists (2.9%) and a proportion of 0.03 specialists per 10,000 inhabitants. On a national scale, the proportion was 0.08 specialists per 10,000 inhabitants (Table 1).

In the Unified Health System, 52 specialists (3.2% of the total specialists) were identified, with 1.9% in the North, 9.6% in the Northeast, 57.7% in the South and 7.7% in the Midwest.

Among the TMD/OP specialists, it was found that 72.8% had registration in another dental specialty. The second most recorded specialties were Orthodontics (27.7%), Dental Prosthesis (17.0%) and Oral and Maxillofacial Surgery and Traumatology (7.4%) (Table 2).

The Spearman correlation test revealed a positive, very high and statistically significant correlation between the number of professionals and GDP ($\rho = 0.93$; $p < 0.001$). In addition, a positive, high and statistically significant correlation was observed between the number of professionals and the number of Dentistry courses ($\rho = 0.88$; $p < 0.001$) and resident population ($\rho = 0.86$; $p < 0.001$). However, no statistically significant correlation was found with the Gini index ($\rho = -0.26$; $p = 0.20$) (Figure 1).

Table 1. Geographic distribution of the number of TMD/OP specialists and proportion of specialists per 10,000 inhabitants in Brazil.

Region	UF	n	%	Specialists per 10,000 inhabitants ¹
Central-West	DF	63	3.9	0.22
	GO	24	1.5	0.03
	MS	10	0.6	0.04
	MT	16	1.0	0.04
	Total	113	7.0	0.07
Northeast	AL	11	0.7	0.04
	BA	41	2.5	0.03
	CE	24	1.5	0.03
	MA	12	0.7	0.02
	PB	18	1.1	0.05
	PE	29	1.8	0.03
	PI	11	0.7	0.03
	RN	5	0.3	0.02
	SE	7	0.4	0.03
	Total	158	9.8	0.03
North	AC	4	0.2	0.05
	AM	7	0.4	0.02
	AP	4	0.2	0.05
	PA	20	1.2	0.02
	RR	2	0.1	0.03
	TO	9	0.6	0.06
	RO	0	-	-
	Total	46	2.9	0.03
Southeast	ES	42	2.6	0.11
	MG	250	15.5	0.12
	RJ	155	9.6	0.10
	SP	508	31.5	0.11
	Total	955	59.2	0.11
South	PR	138	8.6	0.12
	RS	102	6.3	0.09
	SC	101	6.3	0.13
	Total	341	21.1	0.11
Brazil		1613		0.08

¹ Population based on the 2022 Brazilian Demographic Census¹⁸; UF: State.**Table 2.** Distribution of the second specialties of TMD/OP specialists.

Specialties	n	%
Orthodontics	446	27.7
Dental Prosthesis	274	17.0
Oral and Maxillofacial Surgery and Traumatology	120	7.4
Implant Dentistry	90	5.6
Functional Orthopedics of the Jaws	70	4.3
Dentistry	57	3.5
Hospital Dentistry	49	3.0
Periodontics	40	2.5
Endodontics	36	2.2
Others	176	10.9

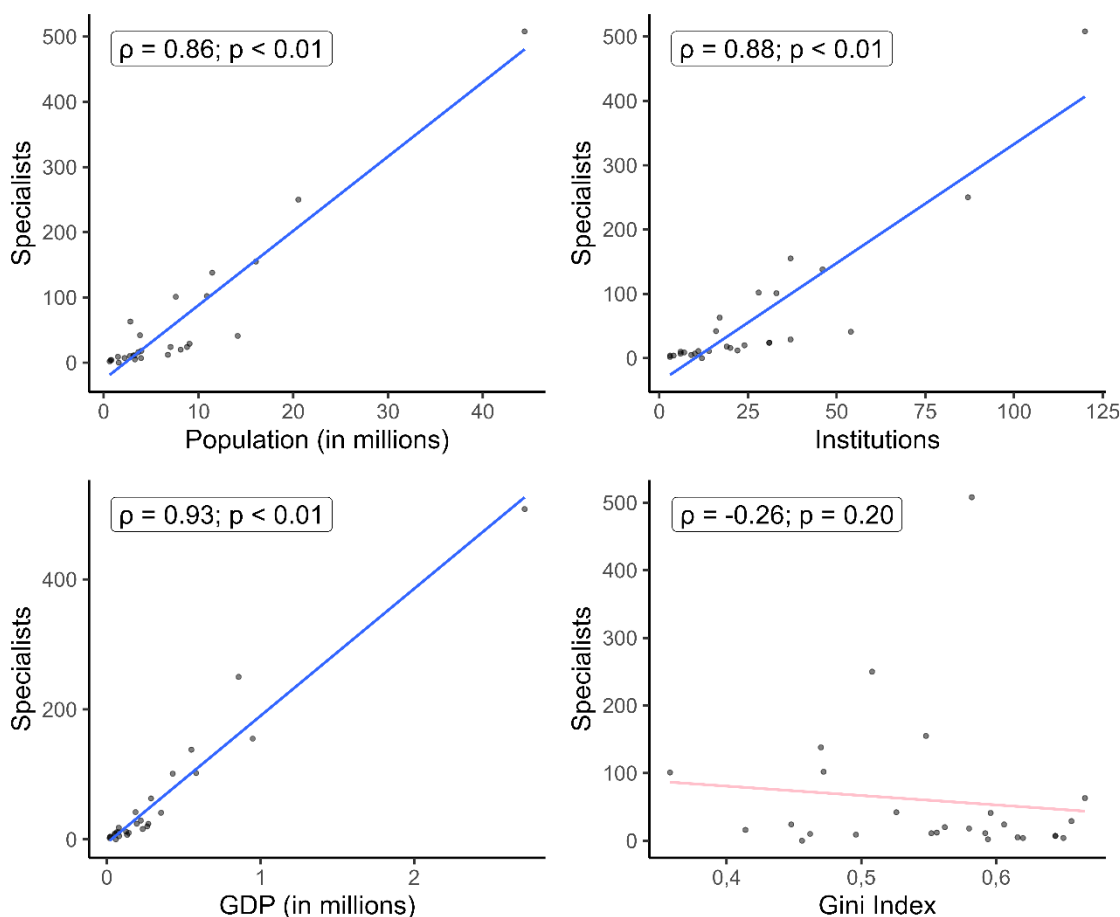


Figure 1. Correlation between the number of TMD/OP professionals with the resident population (in millions), the number of dental institutions, the GDP (in millions) and the Gini index, by State (UF).

DISCUSSION

This study provides an overview of the distribution of DSs specialists in TMD/OP in Brazil. The results showed a limited number of specialists in this area in the country, especially in the North and Northeast regions and active in SUS. There were associations between the geographic distribution of these professionals and population, educational and economic indicators.

The World Health Organization (WHO) does not define an ideal proportion of DSs per population, because this measure depends on several local conditions, such as the epidemiological profile and the labor market¹². However, in 2021, WHO estimated that in Brazil there are 6.68 DSs per 10,000 inhabitants²⁵. On the other hand, this study revealed a proportion of 0.08 TMD/OP specialists per 10,000 inhabitants. Although a lower proportion of specialists is expected compared to general practitioners, due to the more specific nature of their demands, the high prevalence of TMD/OP in the Brazilian population highlights a high shortage of specialists in this area.

The reduced number of TMD/OP specialists working by SUS (3.2%) aggravates inequalities in access to specialized dental care. In the United States, conditions such as headache, cervicgia and orofacial pain generate an annual cost of \$US 31,692 to the patients²⁶. In addition, patients with chronic pain face four times higher costs compared to those who do not have these conditions²⁷. Although there are no specific studies on the costs of TMD/OP in Brazil, it is known that 71.5% of Brazilians do not have a health insurance plan, which means that they depend exclusively on public health services or have to pay full for private services²⁸. There is also an association between socioeconomic conditions and TMD²⁹, which indicates that low-income patients are particularly vulnerable. In addition to being more susceptible to these conditions, these patients have little accessibility, which aggravates the cycle of pain and discomfort. This scenario reinforces the need to expand public attention specialized in Dentistry, aiming to ensure a more accessible and effective care throughout the country.

The concentration of TMD/OP specialists in the Southeast region, in contrast to the scarcity in the North and Northeast region, reflects a geographical disparity that is common in several health areas in Brazil³¹⁻³². Although Brazil does not have a national survey to compare regional prevalence rates of TMD/OP, a systematic review reported combined rates of 32.8% in the Southeast, 34.1% in the Northeast and 35.5% in the Midwest, with no data available for the North and South regions³³. Despite the high prevalence rates in the Northeast and Midwest, these regions have lower proportions of specialists/inhabitants, indicating a mismatch between need and supply of care.

The results showed that 72.8% of TMD/OP specialists had registration in another dental specialty, with emphasis on Orthodontics, Dental Prosthesis and Oral and Maxillofacial Surgery and Traumatology. Although the relationship between TMD/OP, occlusion and orthodontics is controversial, it is essential to emphasize that orthodontists can contribute to the detection of TMD/OP signs and symptoms³⁴. In addition, patients with signs and/or symptoms of TMD often require prosthetic treatment, aiming to provide comfort to the patient, occlusal stability and complex restoration of teeth³⁵. On the other hand, Oral and Maxillofacial Surgery and Traumatology offers interventions for severe cases of TMD, when other conservative approaches do not demonstrate efficacy³⁶.

The significant correlation between the number of professionals per UF and the resident population, the number of institutions and GDP suggests that the availability of specialists is directly related to socioeconomic and demographic infrastructure. This pattern is in line with the results obtained by Bhandari et al. (2015)³⁷, which identified an inverse relationship between income inequality and the use of dental services, implying that regions with better socioeconomic conditions have greater access to specialized dental services. In addition, the research conducted by Fonseca et al. (2016)³⁸, which revealed a correlation between the number of dental schools and the number of dentists in Brazil, it suggests that dental education and vocational training play a crucial role in the geographical distribution of specialists.

Although Bhandari et al. (2015)³⁷ found an inverse relationship between income inequality and dental use, Moeller and Quiñonez (2016)³⁹ did not identify a direct relationship between the Gini index and reports of dental problems such as toothache, tooth sensitivity or pain in the jaw. In the present study, the lack of significant association between the Gini index and the distribution of specialists in temporomandibular dysfunction suggests that other factors besides income inequality, such as health policies and distribution of resources, are determinant in the allocation of these specialists.

A possible factor for the low prevalence of TMD/OP specialists is the low spread of the specialty, which was only regulated by the CFO in 2002¹⁰. Another relevant point is that there may be gaps in academic education, since about 51% of higher education institutions in Dentistry in the Northeast do not offer this curricular component⁴⁰. Although there is no specific data for the Southeast, a survey conducted with students from the Federal University of Santa Maria (UFSM) indicated that, despite hearing about TMD during graduation, 70% considered to have little or no knowledge base on the subject⁴¹.

The study presents some limitations to be considered. The analysis was based on secondary data from public sources, which may not fully reflect the reality of the professional practice of TMD/OP specialists. The ecological nature of the analysis limits the ability to establish causal relationships between the investigated variables, and other variables not addressed can influence the results. On the other hand, despite the associations explored with socioeconomic and health indicators, there are other contextual factors not considered in this study that may contribute to the unequal distribution of TMD/OP specialists in Brazil. Therefore, the conclusions should be interpreted with consideration of these limitations and as a starting point for furthermore detailed and comprehensive investigations on the subject.

CONCLUSION

There was an unequal distribution of DSs specialized in TMD/OP in Brazil, with higher concentration in the Southeast and lower in the North. In addition, there is a limited presence of these specialists active in SUS. The geographic distribution of these professionals showed significant correlations with the resident population, the number of dental education institutions and the GDP.

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