

INSTRUMENTS FOR MEASURING ANXIETY IN DENTAL STUDENTS: A BIBLIOMETRIC ANALYSIS

Instrumentos que miden ansiedad en estudiantes de odontología: análisis bibliométrico

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ABSTRACT

Introduction: Mental health, and anxiety in particular, is a critical area of research among dental students. The dimensions and sources of anxiety within this population are diverse. Bibliometric tools offer a quantitative approach to evaluating the current status and development of research on these topics. **Objective:** To conduct a bibliometric analysis of scientific articles available in *PubMed* that reference the instruments used to measure anxiety in dental students between 2003 and 2023.

Material and Methods: A unique search strategy was used in *PubMed* ("Anxiety" [Mesh] AND "Students" [Mesh])) AND ("School of Dentistry" [Mesh] OR "Dentistry" [Mesh]), with MeSH terms and Boolean operators defined in advance. Inclusion criteria applied were articles published in English between 2003 and 2023. Data collection was carried out in November 2023.

Results: Fifty-one articles were identified that met the search criteria. The most commonly used instrument for measuring anxiety was self-developed, accounting for 37.7%. A total of 56.9% of the articles were published in Q2 journals, with the Journal of Dental Education being the one with the largest number of publications. Brazil led in the number of individual studies, representing 15.7% of the sample; however, Europe, as a continent, accounted for 37.8% of the research output.

Conclusions: Anxiety is increasingly becoming an important issue in dental practice. A considerable proportion of studies uses self-developed instruments, with approximately one-third of them lacking validation. Furthermore, there is a significant number of publications in Q2 journals.

Keywords: Anxiety; Mental health; Bibliometrics; Dental students; Dental education; Surveys and questionnaires.

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RESUMEN

Introducción: La salud mental y en particular, la ansiedad son temas críticos que requieren investigación en estudiantes de odontología. Las dimensiones y fuentes de ansiedad en estos estudiantes son variadas. Herramientas como la bibliometría proporcionan un enfoque cuantitativo para evaluar el estado actual y el desarrollo de estos temas. **Objetivo:** Realizar un análisis bibliométrico de artículos científicos disponibles en PUBMED que refieran los instrumentos utilizados para medición de ansiedad en estudiantes de odontología entre el año 2003 y 2023.

Material y métodos: Se utilizó la llave de búsqueda única en PubMed (((*"Anxiety"*[Mesh] AND *"Students"*[Mesh])) AND (*"School of Dentistry"*[Mesh] OR *"Dentistry"*[Mesh])), definiendo previamente los términos MeSH y los operadores booleanos. Se aplicaron los criterios de inclusión: artículos desde 2003 a 2023, en idioma inglés. La recolección de datos fue realizada en Noviembre 2023

Resultados: Se identificaron 51 artículos que cumplían con los criterios de búsqueda. El instrumento más utilizado para medir la ansiedad fue de elaboración propia, con 37.7%. El 56.9% de los estudios se publicaron en revistas Q2, siendo "Journal of Dental Education" la revista con mayor número de publicaciones. Brasil lidera en cantidad de estudios realizados, con un 15.7% de la muestra; no obstante, Europa como continente concentra el 37.8% de la producción de estudios.

Conclusiones: La ansiedad se está consolidando como un tema importante en el quehacer odontológico, con una frecuencia considerable de instrumentos de elaboración propia, alrededor de un tercio de los instrumentos no cuenta con validación y un número significativo de publicaciones en revistas del cuartil Q2.

Palabras clave: *Ansiedad; Salud mental; Bibliometría; Estudiantes de odontología; Educación en odontología; Encuestas y cuestionarios.*

INTRODUCTION

Worldwide evidence indicates a significant increase in the prevalence of anxiety and depressive disorders in the population during the health crisis caused by COVID-19.¹ The World Health Organization (WHO) reports that approximately 298 million people had anxiety disorders before the pandemic, a figure that rose to 374 million afterwards, an increase of 26%. This rise was more pronounced among women and in younger age groups.²

One of the areas most affected by the COVID-19 pandemic was the academic field. The uncertainty caused by this new context led to increased anxiety levels among students and faculty members, mainly due to the transition from in-person to online education.³

The New Agenda for Mental Health in the Region of the Americas was launched in June 2023, following the work of the High-Level Commission on Mental Health and COVID-19 of the Pan American Health Organization (PAHO). All countries were given ten recommendations to improve the mental health situation of the population. These include: elevating mental health to the supranational level, integrating mental health into all policies, promoting and protecting mental health throughout the life course, and improving data collection and research on mental health.⁴

Anxiety is a relevant public health concern. Although it is defined as a common and normal biological mechanism that helps individuals respond to threatening situations, when it becomes a pathological reaction, it can cause

suffering and disability.⁵ In addition, anxiety can place a substantial burden on social and economic systems and may have a negative impact on the academic performance and general well-being of students.

University students experience approximately twice the levels of stress and a greater risk of psychological disorders compared to populations with similar sociodemographic characteristics. These factors can become a limitation to the adequate development of their professional and social skills.⁶

Health-related degrees, such as medicine and dentistry, show a higher prevalence of mental health problems compared to other fields of study⁷⁻⁹ with dentistry being particularly notable for exhibiting the highest rates of anxiety, depression, exhaustion, and depersonalization.¹⁰ However, students often do not seek help due to fear of stigmatization or lack of acceptance by professors.⁹

Consequently, measuring anxiety and, above all, the instruments used for that purpose, is essential for assessing the situation and improving existing data to support research on anxiety, particularly among dental students.

Based on the search for evidence regarding instruments that allow the measurement of anxiety in the population, scientometrics offers a tool to perform a quantitative analysis of databases to determine the current state of research in this area.^{11,12}

The use of scientometrics not only enables evaluation of scientific production but also provides significant data on the trends and methodological approaches used in research. Scientometrics has experienced a significant growth in recent years, expanding its influence across various fields of medicine and dentistry.

Following PAHO's recommendations, its use in this study was specifically focused on describing the instruments used to measure *"work-related anxiety among dental students."* This study aims to conduct a bibliometric analysis of scientific articles available in *PubMed* that reference the instruments used to measure anxiety in dental students between 2003 and 2023.

MATERIALS AND METHODS

A bibliometric study was conducted in the *PubMed* database for the 2003-2023 period. Between November 1 and 30, 2023, all articles in this database that reported the use of anxiety measurement instruments in dental students and that met the eligibility criteria were reviewed.

For article eligibility, the inclusion criteria were full-text articles published in English that specified the country where the instrument was applied. Exclusion criteria included letters to the editor and narrative reviews. The *PubMed* search strategy was as follows: (("Anxiety" [Mesh]) AND "Students" [Mesh])) AND ("School of Dentistry" [Mesh] OR "Dentistry" [Mesh]), with MeSH terms and Boolean operators defined in advance.

The study variables were: anxiety measurement instrument classification, defined as the type of instrument used to measure anxiety in students; validated or non-validated instruments, determined by the existence of validity and reliability studies in a defined population supporting the reliability of results; and non-validated instruments, defined as those that, being self-developed, lack this type of validation study; *Scimago Journal Rank* quartile, defined as the measure of a journal's position relative to all journals in its field (Q1,

Q2, Q3, or Q4); and the country and continent where the instrument was applied, categorized into one of seven geographic regions of the world (North America, South America, Asia, Europe, Africa, Antarctica, and Oceania). Antarctica was excluded from this study. An Excel database was created, and each variable was coded for transfer to STATA 16.1 software. A descriptive analysis of the study variables was performed, calculating absolute and relative frequencies.

To determine the Scimago Journal Rank quartile, the data were cross-referenced on the online platform (<https://www.scimagojr.com/journalrank.php>), using the ISSN number of each selected journal. Regarding ethical considerations, this study was based on an analysis of secondary data from public and open platforms. Since the unit of analysis was scientific articles, approval from a Scientific Ethics Committee was not required.

RESULTS

The *PubMed* search engine yielded a total of 59 articles, which was reduced to 51 after applying the inclusion and exclusion criteria (four articles were not in English, three articles were letters to the editor, and one used dental technicians as the reference population).

The 51 selected articles reported the use of 62 anxiety measurement instruments. Among the most commonly used, 37.7% were self-developed, 11.5% were the Corah Dental Anxiety Scale, and 9.8% used Visual Analog Scales (VAS). These results are in Table 1.

When examining the presence or absence of validation for the instruments applied to students, it was found that one-third of the articles used non-validated anxiety measurement instruments, Table 2.

Table 1.

Number and frequency of anxiety measurement instruments used in dental students available in *PubMed* between 2003 and 2023

Instrument	Abbreviation	N°	%
Self-developed		23	37.7
Dental Anxiety Scale	CORAH	8	13.1
Visual Analog Scale	VAS	7	11.5
Dental Fear Survey	DFS	5	8.2
Spielberger State-Trait Anxiety Inventory	STAI	4	6.6
Depression Anxiety Stress Scale	DASS-21	2	3.3
Numerical scale (NRS) for anxiety	NRS	2	3.3
Treatment Evaluation Inventory	TEI	1	1.6
Multidimensional Health Locus of Control	MHLC	1	1.6
Moss and McManus questionnaire		1	1.6
Modified Dental Anxiety Scale	MDAS	1	1.6
Hospital Anxiety and Depression Scale		1	1.6
Hopkins Symptom Checklist.		1	1.6
Fletcher & Lockett questionnaires		1	1.6
Dental Hygienist Belief Survey	DHBS	1	1.6
Dental Belief Survey	DBS-R	1	1.6
Child Stress Scale	CSS	1	1.6
Total		62	100

Table 2.

Number and frequency of anxiety measurement instruments used in dental students per year (2003 to 2023), Non-validated and Validated

Instrument	N°	%
Non-validated	23	37.7
Validated	39	62.3
Total	62	100

Table 3.

Number and frequency of anxiety measurement instruments used in dental students classified according to the Scimago Journal Rank Quartile of the scientific journal, per year (2003 to 2023)

Index Q	N°	%
Q1	13	25.5
Q2	29	56.9
Q3	6	11.8
Q4	3	5.9
Total	51	100

Table 4.

Production relevance indices: H Index, Q Index, and SCImago Journal Rank (SJR) by 2022

Journals	N° Publications	H index	Q index	SJR
Journal of dental education	9	76	Q2	0.56
European journal of dental education	5	49	Q2	0.52
Oral health & preventive dentistry	3	40	Q2	0.36
International journal of dental hygiene	3	44	Q1	0.64
Acta odontologica Scandinavica	2	73	Q2	0.51
Journal of applied oral science	2	53	Q1	0.75
The Journal of clinical pediatric dentistry	2	6	Q3	0.22
International journal of paediatric dentistry	2	71	Q1	0.95
Anesthesia progress	1	38	Q3	0.16
Behaviour research and therapy	1	204	Q1	1.79
BMC oral health	1	63	Q1	0.74
Brain and behavior	1	53	Q2	0.83
Brazilian oral research	1	55	Q2	0.57
Community dental health	1	53	Q2	0.45
Cranio	1	50	Q3	0.37
European archives of paediatric dentistry	1	45	Q2	0.59
European journal of oral sciences	1	100	Q2	0.55
European journal of paediatric dentistry	1	73	Q1	0.73
International endodontic journal	1	139	Q1	1.51
International journal of circumpolar health	1	48	Q2	0.48
International journal of environmental research and public health.	1	167	Q2	0.83
Journal of international medical research	1	67	Q3	0.39
Journal of medical and dental sciences.	1	31	Q4	0.11
Journal of oral rehabilitation	1	104	Q1	0.88
Journal of public health dentistry	1	70	Q2	0.42
Noise & health	1	56	Q3	0.29
PloS one	1	404	Q1	0.89
The Bulletin of Tokyo Dental College	1	26	Q4	0.19
The Scientific World Journal	1	116	Q2	0.45
Vojnosanitetski pregled	1	22	Q4	0.13
Work	1	58	Q2	0.51

Table 5.
Anxiety measurement instruments used in dental students according to the country and continent where the instrument was applied

Country where the instrument was applied	Continent	N°	%
Brazil	South America	8	15.7
United States	North America	4	7.8
England	Europe	4	7.8
Japan	Asia	4	7.8
India	Asia	3	5.9
Israel	Asia	3	5.9
Netherlands	Europe	2	3.9
Sweden	Europe	2	3.9
Norway	Europe	2	3.9
Poland	Europe	2	3.9
Romania	Europe	2	3.9
Malaysia	Asia	2	3.9
Australia	Oceania	2	3.9
Canada	North America	1	2
Finland	Europe	1	2
France	Europe	1	2
Brazil	South America	8	15.7
United States	North America	4	7.8
England	Europe	4	7.8
Japan	Asia	4	7.8
India	Asia	3	5.9
Israel	Asia	3	5.9
Netherlands	Europe	2	3.9
Sweden	Europe	2	3.9

The distribution of journals by quartiles, according to the Q index, shows that most articles were published in Q2 journals (56.9%), followed by Q1 journals (25.5%) (Table 3).

When disaggregating the journals in the Q2 quartile by name and number of publications related to the use of anxiety measurement instruments in dental students, three journals stand out: Journal of dental education with 9 publications, European journal of dental education with 5, and Oral health & preventive dentistry with 3 publications, Table 4.

When analyzing journals by continent, Europe leads the list, with 37.2%, followed by Asia, with 31.3%. However, when examining the countries where these anxiety measurement

instruments have been applied involving dental students, Brazil has the highest frequency (15.7%), followed by the United States (7.8%) and England (7.8%) (Table 5).

DISCUSSION

Anxiety is the most common mental health issue worldwide and remains a topic of great relevance to society. Its assessment is diverse and complex, with different instruments available to measure anxiety in vulnerable populations such as university students. The objective of this study was to conduct a quantitative analysis of scientific articles available in *PubMed* that reference instruments used to measure anxiety in dental

students between 2003 and 2023. The main findings indicate that approximately 37% of the articles report the use of self-developed instruments, one-third indicate that the instruments have been validated, more than half were published in Q2 journals, and one-third are from the European continent.

Anxiety, as previously documented, has various definitions and is understood as a subjective experience. Its expression varies in intensity, severity, and form from one individual to the other. Objective quantification is not a simple task, and this difficulty may help account for the wide variety of instruments available to measure it. Furthermore, the diverse characteristics and manifestations of anxiety further complicate its assessment.¹³

As shown by the scientometric analysis of the last 20 years, various instruments and scales for measuring anxiety have been developed and applied, each with strengths and weaknesses as noted by the authors.¹⁴ The practical importance of quantifying anxiety lies in its relation to the behavior of the patient receiving dental care and the dental student or dentist providing treatment. For example, if the patient's subjective experience is negative, there is a higher likelihood they will discontinue or reject the treatment plan,¹⁵ with consequent implications for both the patient and the treating dentist.

It is also relevant to consider the cultural stigma historically associated with dental practice, where it has often been linked to fear, pain, and anxiety.¹⁶ This cultural context surrounding anxiety related to treatment performed by the dentist can be attributed to various factors and combinations of anxiety types. Examples include pain, the proximity of the operator's head to the oral

cavity, fear of dental instruments, persistent auditory fear during treatment, and tactile discomfort when touching teeth. In practice, understanding anxiety from this social perspective helps explain the different ways in which its dimensions are measured in the context of the work of dental students.

Various anxiety instruments and scales have been validated and documented since 1969. A natural assumption that might guide reasoning is that each new or most current instrument improves upon its predecessors, in the pursuit of accurately measuring anxiety in dental students. However, literature suggests that each instrument addresses anxiety using different scales, with its own criteria and perspectives. This variation stems from the lack of a clear definition of what is meant by anxiety, which remains an intangible and complex concept, difficult to understand and, therefore, difficult to measure.

One limitation observed in the various validated instruments is the difficulty in determining cutoff points and limits in distinguishing between the presence and absence of anxiety. Additionally, comparing study results is difficult due to variability in the dimensions of anxiety assessed by these instruments. Clearly, it is essential to consider the sensitivity of each instrument and the potential biases inherent in the instrument itself or in its application.¹⁷

Most of the articles are published in Q2 journals, particularly those specializing in dental education. This underscores the importance of conducting research on mental health in vulnerable populations, such as dental students, not only in niche journals but also in broader, cross-disciplinary contexts that help raise awareness of this topic.

According to the WHO, mental health and anxiety mostly affect populations in low-income or developing countries. However, in this study, the evidence is primarily drawn from studies conducted in Europe and Asia, with Brazil being the only representative from South America.

The concentration of articles, mostly from Europe or Asia, could be partly due to the use of the *PubMed* platform, which includes limited contributions from Latin America. Another plausible explanation for the lower presence of studies conducted in South America is the inclusion criterion of considering only articles published in English. In specific fields, such as Bioethics, authors often prefer to publish in regional journals, which are not typically indexed in databases like *PubMed*.¹⁸

The scientometric search was conducted using the *PubMed* platform, which represents a limitation of this study and should be considered when interpreting the results. Although this study describes state-of-the-art instruments used to measure anxiety in dental practice over the past 20 years available on *PubMed*, it is limited by the search criteria outlined in the previously described methodology. It would be advisable to complement this study with search in other databases and platforms such as Scielo, which includes a significant number of Latin American contributions and would provide a more comprehensive view of the topic.

CONCLUSIONS

This study concludes that there is a considerable frequency of self-developed instruments for measuring anxiety in dental education, and approximately one-third of the instruments identified have not been validated. It is recommended that these instruments be used with caution in research settings.

The prevalence of publications in journals in the Q2 quartile suggests a growing scientific interest in the topic. Moreover, the geographic concentration of research in Europe and Brazil reveals a knowledge gap compared to other regions, emphasizing the need to conduct contextually relevant studies in other parts of the world, such as Latin America, Asia, and Africa.

From a clinical perspective, this study provides valuable evidence to support the implementation of psychological assessment and support strategies within dental training programs. Early recognition and management of anxiety can improve not only students' quality of life but also their clinical performance and patient safety, especially during practical training in real-world settings. Therefore, it is necessary to move toward the standardization and cross-cultural validation of anxiety measurement instruments.

CONFLICT OF INTERESTS

The authors have no conflicts of interest.

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It is not necessary

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AUTHORS' CONTRIBUTIONS

Sebastian Zamorano: Study design and development of the search strategy.

Juan Carlos Caro: Data analysis and manuscript writing

Nicolas Ponce: Variable coding and database management.

Patricia Moya: Critical review of the manuscript and methodological contributions.

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