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Characteristics of undergraduate dental theses defended in Peruvian licensed universities and factors associated with their publication

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Introduction: In Peru, the defense of a university thesis allow to obtain a professional degree and demonstrate the research skills of the aspirant.

Objectives: To characterize the undergraduate dental theses defended in Peruvian universities and those published in scientific journals, as well as to identify the factors associated with their publication.

Methods: A cross-sectional, analytical and observational study was conducted using a search strategy in Google Scholar. We ascertained whether the theses defended between 2015-2018 had been published in scientific journals. Prevalence ratios (aPR), 95% confidence intervals (CI 95%) and p-values were obtained using generalized linear models.

Results: Most of the theses were defended in private universities (65.9%), located in the provinces (76.7%), in 2017 (32.1%). The most studied line of research was Dental Education ($n = 418$; 18.4%). Of the total number of defended theses ($n = 2,267$), only 130 (5.7%) were published, in a total of 41 scientific journals, of which 22 are specialized in the dental field. The 130 articles received 443 citations, with an average of 3.4 citations per document. The Universidad Católica Santa María was the institution that defended the most theses ($n = 372$); however, the Universidad Científica del Sur presented the highest percentage of published theses (36.4%). Theses with case-control (aPR: 2.74; CI 95%: 1.07-7.01; $p = 0.036$) and cohort (aPR: 3.51; CI 95%: 2.02-6.11; $p < 0.001$) methodological design had a higher frequency of publication; on the contrary, those executed in the community were less frequently published (aPR: 0.39; CI 95%: 0.17-0.93; $p = 0.033$), as well as, those with two researchers (aPR: 0.41; CI 95%: 0.18-0.92; $p = 0.031$), adjusted for two variables.

Conclusion: Only one in twenty theses was published. Publication was associated with the type of methodological design, the place of execution and the number of researchers.

KEYWORDS

academic thesis, dentistry students, dentistry, observational study, dental education

1 Introduction

University higher education programs are concluded with the presentation of a final research report, which in most cases takes the form of a thesis and is prepared by the student and his or her advisors. The latter are considered of vital importance for the conduct of the manuscript and timely guidance of the student until the final process of scientific publication (Benito, 2019a; León et al., 2020).

In Peru, the frequency of publication by these advisors in schools of Medicine (Alarcón-Ruiz and Quezada, 2018; Contreras-Cordova et al., 2021), Nursing (Mamani-Benito and Farfán-Solis, 2020), and Psychology (Mamani-Benito O. et al., 2019; Mamani-Benito O. J. et al., 2019) and by teachers making up the jury examining students' theses is low (Mamani-Benito O. et al., 2019; Mamani-Benito O. J. et al., 2019). This has an unfavorable impact on students because they do not have the advice of professors with experience in the scientific publication process (Castro-Rodríguez, 2018).

Universities should promote the practice of research and establish that the theses for obtaining the medical degree should focus on health research priorities in the interest of directing intellectual resources and their impact on national health needs (Quispe et al., 2019; Moromi-Nakata et al., 2022). In addition, they should encourage scientific publication from the undergraduate level, as the benefits of this research practice are widely recognized (Gutiérrez and Mayta, 2003; Castro-Rodríguez, 2019a,b; Corrales-Reyes et al., 2019).

The evidence indicates that there are various factors related to the perception and limitations that students experience in scientific research, which have an unfavorable impact on their training as future members of the scientific community. Castro-Rodríguez et al. (2018a,b) reported regular self-perception about the knowledge involved in scientific research in undergraduate students of a Peruvian university. Similarly, belonging to scientific societies, participating in research seedbeds, motivation, and other related factors contribute favorably to student scientific production (Corrales-Reyes et al., 2017; Habib et al., 2018; Castro-Rodríguez, 2019a,b).

At the undergraduate level, there are several opportunities to conduct research and contribute to scientific knowledge. However, many of these investigations fall into oblivion because their results are not disseminated through scientific publication. In the specific case of the thesis, in the Latin American context, several studies report low frequencies of publication, as is the case of studies developed in Chile (Werlinger-Cruces et al., 2014), Colombia (Cruz Mosquera et al., 2021), and Brazil (Nunes et al., 2022). However, Peru is the country that has contributed the most evidence to this line of research. For example, there are reports on the reasons that influence the intention to do or not to do a thesis and the factors associated with this decision (Ramos-Rodríguez and Sotomayor, 2008); the characteristics, motivations, and perceptions of this type of degree in medical schools in Lima (Mejía et al., 2014); and the characteristics of the theses presented at the undergraduate level in health sciences and their limited frequency of publication in scientific journals (Taype-Rondán et al., 2012; Atamari-Anahui et al., 2015; Castro-Rodríguez et al., 2020; Mamani-Benito et al., 2020; Aragón-Ayala et al., 2023).

In the field of Dentistry, there are also references in the international scientific literature. For example, in Croatia, Delić and Kero (2023) investigated to what extent the Introduction, Methods, Results, and Discussion (IMRaD) structure of diploma theses is

compatible with that of original articles published in five scientific journals. These researchers found that the IMRaD structure of the theses differs from the structure of the original research articles published in the evaluated journals. In addition, the theses have a comparatively longer introduction and a shorter discussion section than the original research articles.

A study in Finland examined the publication pattern and usefulness of theses defended at one university and paid particular attention to supervision, nature, and quality and whether they were subsequently published in scientific journals. These researchers report that a high proportion of the theses were essentially statistical in nature and were often combined with an extensive literature review or the development of a laboratory method (Nieminen et al., 2007).

Eslamipour et al. (2015) investigated the satisfaction of dentistry students who passed the thesis educational course at Isfahan Dentistry School in Iran and found that to increase students' satisfaction for passing thesis courses, it is necessary to improve the intellectual climate in dental schools and also increase the research budget to obtain more financial support from students to carry out their projects.

In Latin America, Werlinger-Cruces et al. (2014) characterized the methodology of the defended theses in a Chilean university and their visibility in the dissemination media recognized by the dental scientific community. These researchers report that only 11.6% of the theses were published in scientific journals and this percentage is reduced to 3.3% if only journals indexed in mainstream scientific databases are considered. In Peru, Castro-Rodríguez (2018) described the main bibliometric indicators of the thesis written by students of the Faculty of Dentistry of the Universidad Nacional Mayor de San Marcos, as well as the frequency of publication in scientific journals (Castro-Rodríguez et al., 2018a,b, 2023a,b) and the satisfaction and motivations of the thesis writers (Castro-Rodríguez et al., 2023a,b), whereas Moromi-Nakata et al. (2022) performed a descriptive analysis of the undergraduate theses in Dentistry defended in Peruvian universities.

Although this background information is available, it is necessary to continue generating evidence to help in decision-making in dental education to promote undergraduate research. Further research on the characteristics of dentistry theses and the factors associated with their publication is important for a number of reasons. Research in Dentistry is fundamental to the advancement of the discipline and the understanding of oral diseases and their treatments; in this context, theses can generate knowledge. Knowing the characteristics of theses can add evidence to the scientific literature, which benefits the scientific community and society in general. In addition, it can help to evaluate the quality of academic programs and suggest improvements. Research in this field is essential for its advancement and the training of high-quality professionals, which would ultimately translate into improved patient care. There is a gap in the knowledge of the characteristics of the theses defended by dentistry students at the national level in Peru, whether they conclude the research cycle with the respective publication and whether there are factors associated with this. Thus, this study aims to characterize the undergraduate dental theses defended in Peruvian universities and those published in scientific journals and identify the factors associated with their publication.

2 Materials and methods

2.1 Design

An observational, analytical, and cross-sectional research was carried out. The universe was constituted by the dataset that represents all the dental theses ($N=2,385$) defended in the period 2015–2018 in the 28 Peruvian universities licensed by the National Superintendence of Higher University Education (SUNEDU, from the Spanish initials) up to the date of data collection. All theses from dentistry courses were included, which have been supported by Peruvian universities, which are in the repository of their university, and which have been supported in the period 2015–2018. Those not accessible in full text in PDF format and those lacking the identifying data necessary for the study (total number of exclusions for these two causes, $n=118$; 4.9%) were excluded. Thus, the sample to be studied was obtained ($n=2,267$). The sampling was non-probabilistic and intentional, in accordance with the aforementioned criteria.

Publication in a scientific journal of the defended thesis was the dependent variable. To declare that a thesis was published, the coincidence between the defended thesis and the published article was evaluated with respect to the topic, place of the study, main results, and the thesis writer who submitted it. The thesis was collected from the academic repositories of the universities with faculties of Dentistry, verified from the web directory of the Peruvian Dentistry Association.¹ Similarly, the licensing of the universities was examined through the SUNEDU website.²

2.2 Characteristics of the evaluated theses

Each thesis was analyzed, and a database was generated in the Microsoft Excel program in which the independent variables of the study were recorded: the university where the thesis was defended, the type of university (public or private), the location of the university (Lima or province), the year of completion of thesis (2015–2018), the lines of research, the sex of student (the number of authors in the thesis can be 1 or 2; thus, the authors can include both female and male students), and the target population (students, professionals, patients, community, documents, and others). The following lines of research were considered: Basic Sciences, Orthodontics and Maxillary Orthopedics, Cariology, Endodontics, Oral and Maxillofacial Surgery, Implantology, Periodontics, Oral Rehabilitation, Radiology, Pediatric Dentistry, Legal and Forensic Dentistry, Dental Education, Oral Medicine, Natural and Traditional Medicine, Biomaterials, Odontogeriatrics, and Traumatology. The theses were assigned to a single topic by reading the title and abstract. The complete reading of the thesis made it possible to select the predominant theme in those with a mixed character.

In addition, the methodological characteristics of the theses were evaluated and classified according to the following: (a) timing of observations (according to the time at which the data were collected): retrospective, prospective, retroprospective, or not applicable; (b) type

of data analysis: descriptive, analytical, or not applicable; (c) type of study: observational, quasi-experimental, experimental, or not applicable; (d) quantity of measurements: 1, ≥ 2 , or not applicable; (e) type of design: cross-sectional, case-control, cohort, experimental, bibliometric, or other designs; (f) number of researchers in the thesis project (the advisor was also considered); (g) sample size (≤ 50 , 51–200, 201–400, ≥ 401 , does not apply); and (h) multicenter thesis (research conducted in more than one center under the same methodological procedures).

Using a search strategy in Spanish and English in Google Scholar, we identified whether the theses were finally published. For this purpose, terms that included the topic and place of study, as well as the name of the thesis writer, were combined as follows: (“topic of study” AND “place of study”) AND (name of thesis writer). Characteristics of the articles and the journals where they were published were studied: in the articles: language, typologies (original article or note), whether there were changes in the title in relation to the theses, the year of publication, the relation between the year of publication and the defense one (before, during, or after), and the citations received in Google Scholar; for journals: the type of journal (refers to whether the journal is edited by students or professionals) and the country of publication and its indexing (SciELO, Web of Science, PubMed/MEDLINE, and Scopus). The searches were conducted in the period from August 15 to October 15, 2022.

2.3 Statistical analysis

For data analysis, tables/figures of absolute and relative frequencies were generated showing the characteristics of the defended theses, the lines of research addressed, the characteristics of the theses published, as well as the distribution of the defended theses, published and the percentages of publication according to universities. The frequency tables were then generated, where the chi-square test was used for an initial bivariate analysis (to analyze the association of the main variables (thesis was published) with the explanatory variables (type of university, location of university, year of completion of thesis, sex of student, target population, multicenter thesis, timing of observations, type of data analysis, type of study, quantity of measurements, type of design, number of researchers and sample size)), which would be used to generate the final table. The statistical method used to obtain association statistics was the one commonly used for cross-sectional analytical studies (logistic regression was not used because this analysis method is reserved for case-control studies or only for analytical cross-sectional studies that have a low prevalence of their dependent variable); with this, the crude prevalence ratios (cPR), adjusted prevalence ratios (aPR), 95% confidence intervals (CI 95%), and value of ps were obtained using generalized linear models (Poisson family, log link function, robust variances and adjusted for the universities). For this analysis, a bivariate cross was first made (taking the dependent variable versus each of the independent variables already mentioned), and the variables that had a value of $p < 0.30$ were those that entered the final model (this is because we consider a statistical criterion for the variables to enter the final model). In the final model, 0.05 was considered as the cutoff point to determine statistical significance. The statistical program Stata v.11.1 (StataCorp LP, College Station, TX, United States) was used.

1 <https://www.cop.org.pe/directorio-de-facultades-de-odontologia>

2 <https://www.sunedu.gob.pe/lista-de-universidades-licenciadas/>

TABLE 1 Characteristics of dental theses defended between 2015 and 2018 in Peruvian licensed universities.

Variable	<i>n</i>	%	Variable	<i>n</i>	%
Type of university			Type of data analysis		
Public	772	34.1	Descriptive	1,626	71.7
Private	1,495	65.9	Analytical	641	28.3
Location of university			Type of study		
Lima (capital)	529	23.3	Observational	1820	80.3
Province	1738	76.7	Experimental	297	13.1
Year of completion of thesis			Quasi-experimental	150	6.6
2015	442	19.5	Quantity of measurements		
2016	405	17.9	1	1923	84.8
2017	728	32.1	≥ 2	344	15.2
2018	692	30.5	Type of design		
Student's gender			Cross-sectional	1801	79.4
Male (s)	749	33.0	Cases and controls	15	0.7
Female (s)	1,462	64.5	Cohort	14	0.6
Both	56	2.5	Experimental	389	17.2
Target population			Another design	48	2.1
Students	568	25.1	Number of researchers		
Professionals	91	4.0	1	411	18.1
Patients	932	41.1	2	1,582	69.8
Community	195	8.6	≥ 3	274	12.1
Others	377	16.6	Sample size		
Documentary	104	4.6	< 50	684	30.2
Multicenter thesis			51–200	1,144	50.4
No	2,201	97.1	201–400	312	13.8
Yes	66	2.9	≥ 401	96	4.2
Timing of observations			Does not apply	31	1.4
Retrospective	413	18.2	Thesis was published		
Prospective	1827	80.6	No	2,137	94.3
Both	27	1.2	Yes	130	5.7

2.4 Ethical aspects

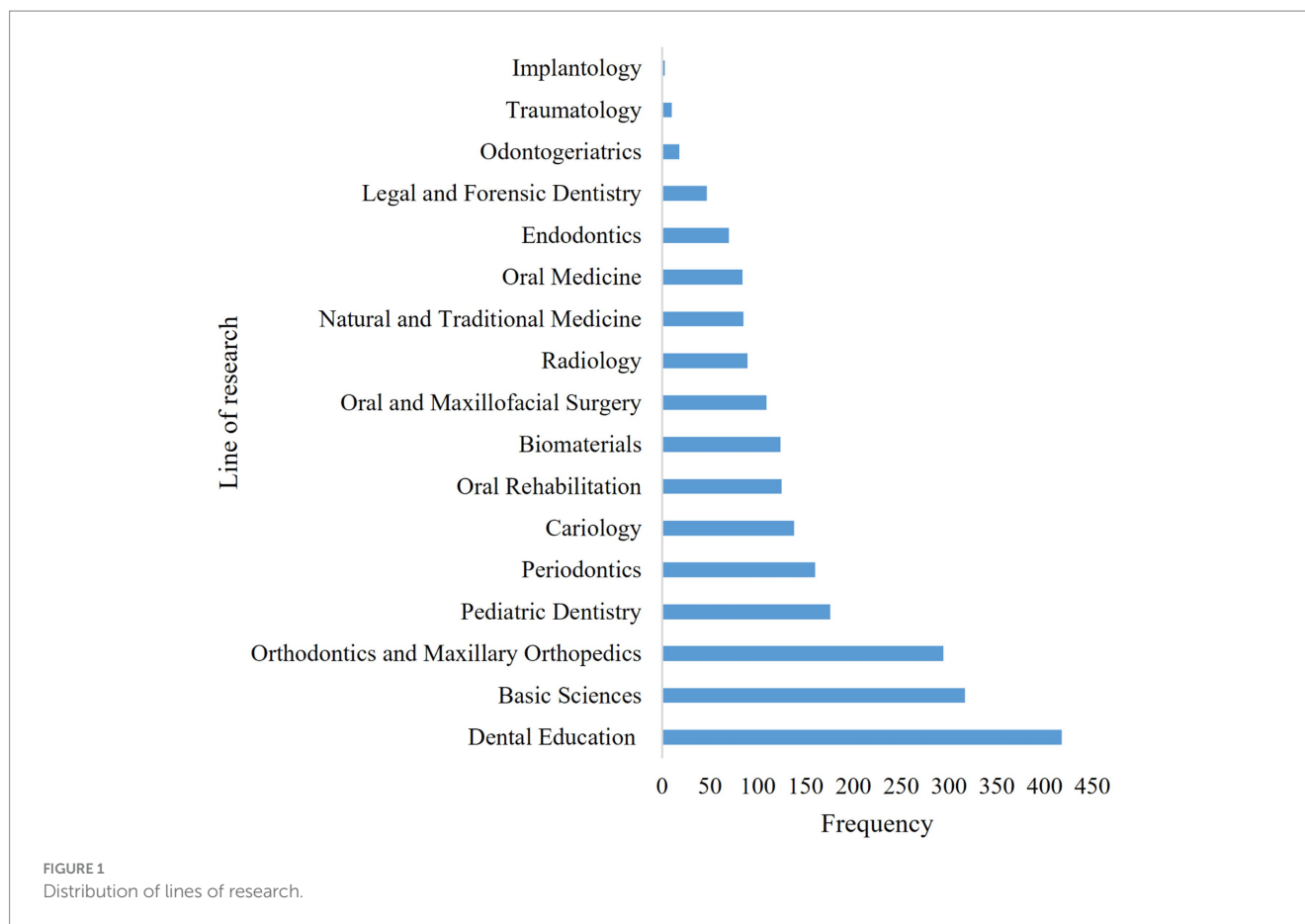
The study involving human data was approved by the Institutional Research Ethics Committee of Norbert Wiener University (Exp. N° 1,231–2021). Written informed consent was not required in accordance with the institutional requirements and local legislation as the analyzed data were obtained from public records.

3 Results

Most of the theses were defended in private universities (65.9%), located in the provinces (76.7%), in 2017 (32.1%). Regarding the methodological design, 80.6% were prospective, 71.7% descriptive, 80.3% observational, and 84.8% cross-sectional. In 50.4% of the theses, the sample size ranged between 51 and 200 participants. The remaining characteristics are shown in Table 1.

The most studied line of research was Dental Education (18.4%), followed by Basic Sciences (14.0%) and Orthodontics and Maxillary Orthopedics (13.0%). Traumatology (0.4%) and Implantology (0.1%) were the least researched topics (Figure 1).

A total of 130 theses (5.7%) were published in a total of 41 scientific journals, 22 of which are specialized in the dental field. Overall, 0.8% ($n = 1$) of the theses were published before their defense, 26.2% ($n = 34$) were published the same year they were defended, and the remaining 73% ($n = 95$) were published after their defense. Specialized journals accounted for 63.1% ($n = 82$) of the published theses. The editorial destinations that published the most were the *Revista Científica Visión Odontológica* ($n = 21$; 16.2%) and *Revista Salud y Vida Sipanense* ($n = 17$; 13.1%). The theses were published in journals edited in 12 countries. Peruvian journals published the largest number of theses ($n = 93$; 71.5%). The main language of publication was Spanish ($n = 124$; 95.4%). The main publication format was the original article ($n = 129$; 99.2%). In 69.2% ($n = 90$) of the cases, the title of the articles changed with respect to that of the theses. The journals



were mainly indexed in SciELO ($n=36$; 27.7%) and Scopus ($n=17$; 13.1%) (Table 2).

The 130 articles have received 443 citations, with an average of 3.4 citations per article. Overall, 43.8% ($n=57$) of the articles have not been cited. The most cited article was published in 2017 in the *Revista de Odontopediatría Latinoamericana* published in Colombia and received 46 citations in the scientific literature. Articles published in specialized journals received the highest number of citations ($n=361$).

The institutions with the highest number of defended theses were Universidad Católica Santa María ($n=372$), Universidad Privada Antenor Orrego ($n=222$), and Universidad Nacional Mayor de San Marcos ($n=203$). On the other hand, the highest percentages of publications were found at Universidad Científica del Sur (36.4%), Universidad de San Martín de Porres (31.2%), and Universidad Andina del Cusco (16.2%). The average theses publication rate among the universities was 4.6, and 21 (75%) universities were below this indicator. In 39.3% ($n=11$) of the universities, the percentage of publication of theses was 0 (Table 3).

In the bivariate analysis, theses publication was associated with university location ($p<0.001$), type of study ($p=0.039$), type of design ($p<0.001$), and number of researchers ($p<0.001$) (Table 4).

In the final multivariate model, theses with case-control (aPR: 2.74; CI 95%: 1.07–7.01; $p=0.036$) and cohort methodological design had a higher frequency of publication (aPR: 3.51; CI 95%: 2.02–6.11; $p<0.001$). On the contrary, those executed in the community (aPR: 0.39; CI 95%: 0.17–0.93; $p=0.033$) and those developed by two

researchers (aPR: 0.41; CI 95%: 0.18–0.92; $p=0.031$), adjusted for two variables, were less frequently published (Table 5).

4 Discussion

The development of a university thesis is important because it facilitates the evaluation of the scientific competencies of those aspiring to the degree and contributes to social development after the generation of new knowledge and its dissemination through publication in scientific journals (Atamari-Anahui et al., 2015). It is at this point where the analysis of the characteristics of such research becomes relevant since it allows the generation of useful evidence for decision-making aimed at improving the quality of medical education and stimulating national scientific production. In addition, it allows the quality of research in this field in Peru to be evaluated. Identifying factors such as the methodology used, the scientific rigor, the originality of the topics addressed, and the relevance of the results obtained helps to determine the overall quality of the thesis and their contribution to knowledge in Dentistry.

In this study, most of the theses were defended in private universities (65.9%), which is similar to that reported by Moromi-Nakata et al. (2022) in Peru. This result is related to the higher number of private universities with dentistry faculties and, therefore, of enrollment and graduates who defend thesis. In addition, these types of academic institutions have characteristics that make them attractive to students, such as campuses in different cities, payment facilities and

TABLE 2 Characteristics of published theses ($n = 130$).

Variable	<i>n</i>	%
Journal		
Revista Científica Visión Odontológica	21	16.2
Revista Salud y Vida Sipanense	17	13.1
Revista Estomatológica Herediana	14	10.8
Odontología Sanmarquina	7	5.4
Pueblo Continente	5	3.8
Other journals	66	50.8
Type of journal		
Students	4	3.1
Professional	126	96.9
Country where the journal is published		
Peru	93	71.5
Spain	7	5.4
Cuba	6	4.6
Chile	5	3.8
Ecuador	5	3.8
Others	14	10.8
Language of publication		
English	6	4.6
Spanish	124	95.4
Type of publication		
Scientific article	129	99.2
Note	1	0.8
Change of title with respect to the thesis		
Yes	90	69.2
No	40	30.8
Indexing of journals*		
SciELO	36	27.7
Scopus	17	13.1
Web of Science	2	1.5
Pubmed/MEDLINE	2	1.5

*Percentages do not add up to 100% since they are separate relative frequencies.

scholarships, and better infrastructure than public universities. However, these are only hypotheses, so research with methodological designs that allow causality to be explained is needed to explain this result with more fundamentals.

Thesis defended by women predominated, which coincides with what was reported by Castro-Rodríguez et al. (2018a,b, 2023a,b), and Moromi-Nakata et al. (2022) in their studies on the characteristics of defended theses in Peruvian universities with dentistry faculties but differs from what was found by Aragón-Ayala et al. (2023) in their analysis of undergraduate medical theses defended in a Peruvian university in the period 2011–2020. This result can be explained by the higher enrollment of female students, which means that they are the ones who mainly defend the theses.

When analyzing the methodological designs of the thesis, it was found that most of them were observational, descriptive, and

cross-sectional, which is similar to what has been reported in previous research on theses in undergraduate health sciences in Colombia (Cruz Mosquera et al., 2021) and Peru (Taype-Rondán et al., 2012; Mejia et al., 2014; Castro-Rodríguez et al., 2018a,b; Quispe et al., 2019; Castro-Rodríguez et al., 2020; Mamani-Benito et al., 2020; Moromi-Nakata et al., 2022; Angulo-Fernandez et al., 2023; Castro-Rodríguez et al., 2023a,b) but contrasts with what has been reported in another Peruvian study (Aragón-Ayala et al., 2023). This result may be due to the fact that these designs, in methodological terms, are less complex and do not require large investments or follow-ups as in other designs, making them more attractive and feasible for students and tutors (Gutiérrez and Mayta, 2003). Often the development of the thesis represents for students the beginning of the research field, so this type of methodological design is ideal. In addition, descriptive theses require less methodological knowledge and statistical analysis than analytical ones, which could be attractive when the degree process is perceived as problematic in some universities in the country (Manterola et al., 2019).

The analysis of the sample sizes of the theses is important and there are several precedents for this in the scientific literature (Quispe et al., 2019; Mamani-Benito et al., 2020; Cruz Mosquera et al., 2021; Aragón-Ayala et al., 2023). It is necessary to point out that many times the sample size is deliberately reduced due to the haste with which the data are intended to be collected, which can directly affect the quality of the final product. A small sample size can lead to erroneous or unreliable conclusions, while a sufficiently large sample size reduces the possibility of random error. Furthermore, an adequate sample size increases the statistical power of the study, which means that it is more likely to detect significant differences or patterns in the theses analyzed. In summary, an adequate sample size contributes to the representativeness of the study, the reliability of its results, its external validity, the minimization of biases, and the precision of its conclusions. Thus, the choice of sample size should be based on sound statistical and scientific considerations.

The analysis of the lines of research addressed in the theses can provide information on the advances, limitations, techniques used, and gaps to be covered in the various fields of knowledge. In this sense, the line of research most addressed was Dental Education, which contrasts with what was found in several reports in the scientific literature. In Colombia, Cruz Mosquera et al. (2021) found that the most frequent areas of research were Clinical Sciences and Public Health. In Peru, Atamari-Anahui et al. (2015) reported that the areas of research most addressed were Medicine and Public Health-Epidemiology. Other Peruvian studies developed in the dental field found that the main theses topics were Basic Sciences (Castro-Rodríguez, 2018; Castro-Rodríguez et al., 2018a,b), Pediatric and Social Stomatology (Moromi-Nakata et al., 2022), and Orthodontics and Maxillary Orthopedics (Castro-Rodríguez et al., 2023a,b). A Peruvian study even found that Medical Education was the area of research least developed by medical school thesis students (Quispe et al., 2019). This opens the debate about the interest being shown in research on this topic and the reasons for it so that further research is needed to investigate this result. Implantology, on the other hand, was the least developed thesis topic, which is striking because this is one of the dental areas that has undergone the greatest scientific development in recent years on a global scale (Cárcamo et al., 2016).

This shows that it is necessary to reorient research topics toward the priorities of oral health research at the national level, as well as

TABLE 3 Distribution of defended and published theses and percentages of publication according to universities.

University	Defended theses	Published theses	Percentage of publication
Universidad Católica Santa María	372	4	1.1
Universidad Privada Antenor Orrego	222	13	5.9
Universidad Nacional Mayor de San Marcos	203	28	13.8
Universidad Señor de Sipán	159	22	13.8
Universidad Andina del Cusco	136	22	16.2
Universidad Peruana Cayetano Heredia	128	10	7.8
Universidad Nacional del Altiplano	122	1	0.8
Universidad Privada de Huánuco	97	0	0.0
Universidad Norbert Wiener	78	2	2.6
Universidad Nacional de Trujillo	77	1	1.3
Universidad Peruana de Ciencias Aplicadas	73	7	9.6
Universidad Nacional de San Antonio Abad del Cusco	69	0	0.0
Universidad Nacional Hermilio Valdizán	66	0	0.0
Universidad Nacional Jorge Basadre Grohmann	62	2	3.2
Universidad Nacional Federico Villareal	62	1	1.6
Universidad César Vallejo	54	1	1.9
Universidad Nacional de la Amazonía Peruana	51	0	0.0
Universidad Privada de Tacna	46	4	8.7
Universidad Daniel Alcides Carrión	32	0	0.0
Universidad Peruana de Los Andes	31	0	0.0
Universidad Tecnológica de Los Andes	29	0	0.0
Universidad Nacional Toribio Rodríguez de Mendoza	28	3	10.7
Universidad Católica Santo Toribio de Mogrovejo	23	0	0.0
Universidad de San Martín de Porres	16	5	31.2
Universidad Privada San Juan Bautista	12	0	0.0
Universidad Científica del Sur	11	4	36.4
Universidad Continental	5	0	0.0
Universidad Privada de Huancayo Franklin Roosevelt	3	0	0.0
Total	2,267	130	5.7

toward those areas that are less explored and that undoubtedly have relevance, novelty, and global impact (Echevarria-Goche et al., 2023). Alternative topics for health-related professions student theses contribute to turning knowledge into practice (Salajegheh et al., 2023). The results reported in this study can serve as a guide for future researchers when selecting research topics and contribute to the advancement of knowledge in Dentistry in the Peruvian context.

Dissemination of thesis results through publication in scientific journals is the ideal way to socialize knowledge. However, only 1 out of every 20 theses defended was published. This low frequency of publication is similar to those previously reported in Peru (Atamari-Anahui et al., 2015; Castro-Rodríguez et al., 2020; Mamani-Benito et al., 2020; Angulo-Fernandez et al., 2023; Aragón-Ayala et al., 2023; Castro-Rodríguez et al., 2023a,b) and even lower than those found in other national studies (Castro-Rodríguez, 2018; Castro-Rodríguez et al., 2018a,b), as well as in research conducted in Chile (Werlinger-Cruces et al., 2014), Colombia (Cruz Mosquera et al., 2021), and Croacia (Delić and Kero, 2023).

There are several factors that cause theses never to be published and that end up being only decorative objects in libraries or institutional repositories. For example, many times, their development is tedious for students, so they only want to finish it to obtain their degree, without any real interest in research and publication in scientific journals. It is also pertinent to analyze the work and competencies of the advisors, who assume the responsibility of supervising the development of research work capable of generating new knowledge. However, the fact that these studies are not published and do not generate social impact reflects not only a poor scientific contribution due to basic or repetitive methodologies but also the negligent work of the advisors, as manifested in the advisory process (Benito, 2019b).

The importance of the advisor as a guide in the scientific research and publication process is a widely discussed topic in the scientific literature. For example, a Colombian study found that the number of tutors and their previous publication experience were associated with scientific dissemination (Cruz Mosquera et al., 2021); however,

TABLE 4 Bivariate analysis of factors associated with the publication of undergraduate dental theses defended between 2015 and 2018 in Peruvian licensed universities.

Variable	Thesis was published		p value
	No n (%)	Yes n (%)	
Type of university			
Public	736 (95.3)	36 (4.7)	0.115
Private	1,401 (93.7)	94 (6.3)	
Location of university			
Lima (capital)	479 (90.6)	50 (9.4)	<0.001
Province	1,658 (95.3)	80 (4.6)	
Year of completion of thesis			
2015	414 (93.7)	28 (6.3)	0.504
2016	381 (94.1)	24 (5.9)	
2017	694 (95.3)	34 (4.7)	
2018	648 (93.6)	44 (6.4)	
Student's gender			
Male(s)	712 (95.1)	37 (4.9)	0.069
Female(s)	1,369 (93.6)	93 (6.4)	
Both	56 (100)	0 (0.0)	
Target population			
Students	540 (95.1)	28 (4.9)	0.164
Professionals	88 (96.7)	3 (3.3)	
Patients	871 (93.5)	61 (6.5)	
Community	190 (97.4)	5 (2.6)	
Others	350 (92.8)	27 (7.2)	
Documentary	98 (94.2)	6 (5.8)	
Multicenter thesis			
No	2074 (94.2)	127 (5.8)	0.673
Yes	63 (95.5)	3 (4.5)	
Timing of observations			
Retrospective	392 (94.9)	21 (5.1)	0.719
Prospective	1712 (94.1)	108 (5.9)	
Both	26 (96.3)	1 (3.7)	
Type of data analysis			
Descriptive	1,529 (94.4)	90 (5.6)	0.520
Analytical	599 (93.7)	40 (6.3)	
Type of study			
Observational	1719 (94.8)	95 (5.2)	0.039
Experimental	264 (91.0)	26 (9.0)	
Quasi-experimental	142 (94.7)	8 (5.3)	
Quantity of measurements			
1	1801 (94.1)	114 (5.9)	0.340
≥ 2	328 (95.4)	16 (4.6)	
Type of design			
Cross-sectional	1708 (94.8)	93 (5.2)	<0.001

(Continued)

TABLE 4 (Continued)

Cases and controls	13 (86.7)	2 (13.3)	
Cohort	10 (71.4)	4 (28.6)	
Experimental	358 (92.0)	31 (8.0)	
Another design	48 (100.0)	0 (0.0)	
Number of researchers			
1	370 (90.0)	41 (10.0)	<0,001
2	1,507 (95.3)	75 (4.7)	
≥ 3	260 (94.9)	14 (5.1)	
Sample size			
< 50	638 (93.3)	46 (6.7)	0.192
51–200	1,091 (95.4)	53 (4.6)	
201–400	288 (92.3)	24 (7.7)	
≥ 401	91 (94.8)	5 (5.2)	
Does not apply	29 (93.6)	2 (6.4)	

The p-values were obtained with the chi-square statistical test.

multiple investigations report low frequencies of publication by these advisors in health science schools (Alarcón-Ruiz and Quezada, 2018; Benito, 2019a,b; Mamani-Benito O. et al., 2019; Mamani-Benito O. J. et al., 2019; Mamani-Benito and Farfán-Solís, 2020; Contreras-Cordova et al., 2021).

The thesis supervisors play a crucial role in the scientific community for several reasons. First, the supervisors provide guidance and expertise for the development of high-quality research, contributing to the advancement of knowledge in their field. They contribute to the training of new researchers, which is vital for the growth and continuity of the scientific community. The supervision of research quality is another of their roles, so they contribute to maintaining standards of excellence in the scientific community. On the other hand, they can promote collaboration among students and other researchers, fostering an environment of teamwork in the scientific community, while stimulating the publication of results, which contributes directly to the scientific literature.

In the United States, Coruth et al. (2019) investigated the perceptions of dental hygienists about thesis completion and found many factors influencing the thesis experience. The findings suggest a need to provide mentoring and support for thesis advisors and committee members to more effectively guide students through the thesis process. Effective modifications of these may improve the retention of students and facilitate the timely completion of thesis research.

Research has also been done on the perception and factors associated with dissatisfaction that recent Peruvian graduates have with their thesis advisors (Mejía et al., 2016). This shows that it is advisable for universities to value the knowledge and theoretical and practical experience of the professors during the selection process of thesis advisors so that they encourage the process of scientific publication and do not, on the contrary, become an obstacle to it.

Another point to consider is the format of the theses, which often consists of a long document plagued with repetitive information and an excessively developed theoretical framework, making the process of adapting it to the traditional format of a scientific article laborious. A mixed study analyzed the rhetorical structure of 272 dentistry degree

TABLE 5 Crude and adjusted models of factors associated with theses publication.

Variable	Crude model	Adjusted model
Private university	1.35 (0.38–4.80) 0.645	Did not enter final model
University in a province	0.49 (0.21–1.14) 0.098	0.45 (0.18–1.11) 0.080
Target population		
Students	Category of comparison	Category of comparison
Professionals	0.67 (0.21–2.12) 0.494	0.69 (0.22–2.15) 0.521
Patients	1.33 (0.78–2.25) 0.293	1.08 (0.69–1.70) 0.734
Community	0.52 (0.21–1.29) 0.158	0.39 (0.17–0.93) 0.033
Others	1.45 (0.80–2.64) 0.219	0.83 (0.33–2.12) 0.703
Documentary	1.17 (0.37–3.72) 0.790	0.83 (0.18–3.94) 0.816
Type of design		
Cross-sectional	Category of comparison	Category of comparison
Cases-controls	2.58 (0.85–7.88) 0.096	2.74 (1.07–7.01) 0.035
Cohort	5.53 (2.53–12.09) <0.001	3.51 (2.02–6.11) <0.001
Experimental	1.54 (0.83–2.88) 0.173	1.64 (0.74–3.64) 0.222
Another design	Does not converge	Does not converge
Number of researchers		
1	Category of comparison	Category of comparison
2	0.48 (0.20–1.15) 0.099	0.41 (0.18–0.92) 0.031
≥3	0.51 (0.17–1.56) 0.239	0.49 (0.17–1.43) 0.190
Sample size		
< 50	Category of comparison	Category of comparison
51–200	0.69 (0.49–0.98) 0.033	0.82 (0.51–1.33) 0.426
201–400	1.14 (0.70–1.87) 0.591	1.10 (0.55–2.20) 0.791
≥401	0.77 (0.37–1.62) 0.499	0.71 (0.25–2.06) 0.530
Does not apply	0.96 (0.35–2.66) 0.936	0.67 (0.26–1.71) 0.403

Values to the left of parentheses: Prevalence ratios. Inside parentheses: 95% confidence intervals. Right of parentheses: *p*-values. All were obtained with generalized linear models (Poisson family, log link function, robust variances, and adjusted by the university where they studied).

papers and theses presented in Spanish-American and Spanish universities and published on the web between 2000 and 2018. This study found that there is no standard format in the structure of the theses as there are relevant variations in the sections included and in their organization. These variations could be associated, among other factors, with the absence of academic writing programs based on the actual practice of the discursive community of dentistry, so it is suggested that in these programs the teaching of academic writing based on scientific evidence should be formalized (Morales et al., 2020).

It would be very positive if all theses were written directly in the format of a scientific article, as suggested by Mayta-Tristán (2016). Her proposal was adopted by several Peruvian universities, and different studies have reported the positive impact of this measure in terms of increasing national scientific production and the culture of communication. In addition, the graduate would culminate his or her professional studies with the experience of having published an original article and having learned scientific writing (Castro-Rodríguez et al., 2020).

When analyzing the characteristics of the journals where the theses were published, interesting results were found, similar to those reported in Peru (Castro-Rodríguez et al., 2018a,b; Castro-Rodríguez, 2019a,b; Castro-Rodríguez et al., 2020; Aragón-Ayala et al., 2023) and Colombia (Cruz Mosquera et al., 2021). Although the greatest number of publications were in dentistry journals published regionally, which is logical and expected, a third of the theses were published in non-specialized journals, which is a measure of the expansion of dental science and the interrelation with other fields of knowledge that communicate the results of research in multidisciplinary journals.

The low impact of the articles, expressed in terms of the citations they have received in the scientific literature, is similar to that reported in studies developed in Peru (Castro-Rodríguez et al., 2018a,b; Castro-Rodríguez, 2019a,b) and Finland (Nieminen et al., 2007). This may be conditioned by multiple factors such as (a) the topics investigated, which are often repetitive and did not address areas in full research development such as Implantology, as could be seen in this study so that they only have relevance at the local or regional level, (b) the methodological characteristics of the investigations, which were fundamentally descriptive, (c) the journals where they were published, which were fundamentally indexed in SciELO, which is a regional database that does not belong to the scientific mainstream, and (d) the channels of dissemination of science used by the authors, such as social and academic networks.

The predominance of publication in Spanish and in the original article format is similar to that reported in the scientific literature (Castro-Rodríguez et al., 2018a,b; Cruz Mosquera et al., 2021; Aragón-Ayala et al., 2023). With respect to language, this result is logical since it is the native language of the authors of the theses, in addition to the fact that most of the theses were published in regional journals edited in that language. However, actions are needed to stimulate publication in English because of all the known advantages that it has.

Regarding the typologies of the articles, it is expected that original articles will predominate since they communicate the results of a research process that ultimately results in a thesis, in which a contribution to scientific knowledge is required. However, considering the low frequency of publication found, an effective alternative to get started in the field of publication would be letters to the editor, which serve to communicate in a simple and accessible format for novice researchers the results of a given research process, as a preamble to the publication of articles of other more complex typologies (Cossio-Alva, 2021).

In this study, the most productive universities in terms of defended theses were not those that presented the highest percentage of publications. In addition, one-third of the institutions evaluated were below the overall average of thesis publication. Mayta-Tovalino et al. (2021) developed a bibliometric analysis of the academic production of all the dentistry schools in Peru and found the Universidad Científica del Sur among the 10 most productive institutions, which is similar to what was found in this research. It would be interesting to know the strategies that are being developed in this university, as well as in the most productive ones, to generate dissemination strategies that allow increasing scientific production. In general, it is necessary to point out that scientific production within an institution depends on the existing culture of scientific communication, so it is necessary that Peruvian universities promote the teaching of research and scientific publication as an indivisible process so that the results of the thesis are socialized through their dissemination in scientific journals.

Investigating the factors associated with the publication of theses can help to identify the characteristics of the theses that make them more likely to be published, as well as the barriers and challenges that researchers face when trying to publish their results. To identify the associated factors, Poisson regression was used because it adapts well to response variables that represent counts or events of interest in a cross-sectional study such as the one presented. Furthermore, the coefficients in a Poisson regression model have a direct interpretation in terms of percentage change in the response variable, which facilitates the interpretation of results in cross-sectional studies (Cvetkovic-Vega et al., 2020).

In this study, theses with case-control and cohort methodological design had a higher frequency of publication, which has several aspects to analyze. For example, these designs are considered one of the most solid and rigorous in the field of epidemiology and health research as they allow the study of exposures and outcomes over time, which provides greater internal and external validity to the results obtained. The use of a solid and reliable methodological design increases the credibility of the study and, therefore, may favor the publication of the theses. In addition, reviewers and editors of scientific journals usually value case-control and cohort-based studies positively because of their methodological rigor (Lazcano et al., 2019). With a sound and well-founded methodological design, the theses are more likely to be considered for publication in reputable scientific journals. However, it is important to note that the publication of a thesis also depends on other factors, such as the quality of the writing, the originality of the results, and the relevance of the topic in the current context.

In contrast, the theses executed in the community were published less. This could be because, many times, these investigations frequently address specific problems of a local community which, although important for this population, may lack relevance for a general public from the perspective of having sufficient impact to be considered for publication in a scientific journal. It is also possible that these theses have limitations in terms of their methodological design due to scarcity of resources and limited access to research infrastructure, which, by transitive nature, limits their publication in a scientific journal since they often receive a large volume of proposals for publication so that only research that reports the most relevant results and that may be of interest to a more general reading public is selected for publication. In any case, these are generalizations that do not apply to all the theses conducted in the community, so it is necessary to develop studies with methodological designs that allow us to explain causality to address this result with more certainty.

Finally, the development of a thesis by two researchers was a factor associated with a lower frequency of publication. This may be because, in some cases, a small number of researchers may limit the scope of an investigation, its sample size, the robustness of its methodological design, the analysis of the data, and the interpretation of the findings, so the results reported in the eventual scientific article are not considered sufficiently solid or relevant to be published in a scientific journal. However, it should be noted that research conducted by a single investigator or larger teams may face similar obstacles during the publication process.

In this context, it is necessary to address the role that dental education can play in promoting scientific research and publication in this field of knowledge. First, dental education can raise awareness among students and professionals of the importance of

research and publication as a way to improve patient care through evidence-based dentistry. Second, academic programs can incorporate research modules from early stages, encouraging students to develop research skills. Third, the provision of resources and institutional support, such as laboratories, access to databases, and scientific advice, can facilitate quality research. Fourth, the organization of conferences, symposia, and congresses can promote the exchange of ideas and the presentation of research, encouraging publication. Fifth, facilitating access to scientific journals and publishing resources can be essential for students and professionals to share their research. Sixth, establishing incentive systems, such as research awards, and recognizing high-quality research can motivate more people to participate in scientific research and publication. In summary, dental education has a responsibility to cultivate a culture of scientific research and publication, empowering students and professionals to contribute to the advancement of Dentistry through research.

This study is a valuable contribution to the field of Peruvian Dentistry since the analysis of the characteristics of the theses is fundamental to evaluate the quality of the research conducted in the terminal university stage, to identify the relevant areas, and those lacking more research, and to know the most productive institutions, which contributes to improve the quality of dental education. In the specific case of factors associated with publication, their investigation can lead to the implementation of strategies and policies to encourage scientific publication, such as supporting researchers in the writing and presentation of their results, strengthening research infrastructure, and promoting scientific collaborations.

The study had limitations inherent to the type of design and the form of data collection, and there could have been a possible information bias. But because this design is the most common for this type of data collection and each step was treated very strictly, following previous recommendations and making a good filter/quality control, it is considered that this bias was minimized as much as possible. Although the technical quality of the theses was not evaluated, it is recognized that research that is robust in terms of quality has a greater chance of being published in scientific journals compared to those that suffer from methodological and scientific writing errors. Thus, future research on the subject could evaluate this variable and generate evidence.

In conclusion, this study reports interesting characteristics of dental theses, namely, the predominance of methodological designs with a descriptive approach, research topics related to dental education, and the preference for specialized journals in the dental area to disseminate the results. The frequency of publication of theses is very low, and the case-control and cohort methodological designs were factors associated with a higher frequency of publication. An opposite result was obtained when the thesis was executed in the community and had only two investigators. It is necessary to implement strategies to enhance the socialization of the results of the theses through their publication in scientific journals. Some points to consider would be to offer scientific writing workshops and courses, appoint academic advisors with experience in scientific publication, encourage scientific collaboration, implement an internal peer review process to evaluate the quality of the theses and whether they are considered publishable, recognize effort and excellence in research with awards and distinctions to motivate students to publish their theses, among others.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The study involving human data was approved by the Institutional Research Ethics Committee of Norbert Wiener University (Exp. N° 1231-2021). Written informed consent was not required in accordance with the institutional requirements and local legislation as the analyzed data was obtained from public records.

Author contributions

BC-A: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. IC-R: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. GP-B: Conceptualization, Data curation, Investigation, Writing – original draft, Writing – review & editing. IL-M: Data curation, Investigation, Writing – original draft, Writing – review & editing. JS-O: Data curation, Investigation, Writing – original draft,

Writing – review & editing. NL-L: Data curation, Investigation, Writing – original draft, Writing – review & editing. JV-M: Data curation, Investigation, Writing – original draft, Writing – review & editing. CM: Data curation, Investigation, Writing – original draft, Writing – review & editing.

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