

## ORIGINAL RESEARCH

# Barriers and limitations to publishing undergraduate theses and factors influencing the intention to publish among new medical graduates from Peruvian universities

*Barreras y limitaciones para publicar tesis de pregrado y factores asociados a la intención de publicarlas en un grupo de médicos recién egresados de universidades peruanas*

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## Abstract

**Introduction:** Scientific research works, including theses, must be published in a scientific journal in order to be considered as a contribution to the academic community.

**Objectives:** To identify the barriers and limitations to publishing undergraduate theses in indexed scientific journals encountered by new medical graduates from Peruvian universities and to determine the factors associated with their intention to publish.

**Materials and methods:** Cross-sectional study conducted in 167 physicians who graduated in 2021 from 7 Peruvian universities and answered an online questionnaire asking about general data, perceived barriers to publish the thesis, and intention to publish the thesis in a scientific journal. Crude and adjusted prevalence ratios (aPR) were calculated using Poisson regression models to identify the factors associated with the intention to publish.

**Results:** The questionnaire response rate was 39.57% (167/422 physicians graduated in 2021). Participants' median age was 25 years (P25-75=24-27) and 55.09% were women. 42.52% of the participants intended to publish their undergraduate thesis (28.74% reported having the intention to do so, 11.38% were in the process of publishing it, and 2.40% had already published it in a scientific journal). The most commonly reported barriers to thesis publication were insufficient knowledge about how to make a submission to a scientific journal (71.85%) and lack of access to advisors with expertise in scientific research (68.26%). In the adjusted Poisson regression model, it was observed that the older the age, the lower the intention to publish (aPR: 0.62; 95%CI: 0.51-0.75).

**Conclusion:** The thesis publication rate was low and less than half of the physicians had the intention to publish their thesis. The most commonly reported barriers to publication were lack of knowledge about how to make a submission to a scientific journal and lack of access to experienced research advisors. Being older was associated with a lower intention to publish the undergraduate thesis.

## Resumen

**Introducción.** Toda investigación científica, incluyendo las tesis, requiere ser publicada en una revista científica para que sea considerada como un aporte a la comunidad académica.

**Objetivos.** Identificar las barreras y limitaciones para la publicación en revistas científicas indizadas de las tesis de pregrado de médicos recién egresados de universidades peruanas y determinar los factores asociados con la intención de publicarlas.

**Materiales y métodos.** Estudio transversal realizado en 167 médicos que se graduaron en 2021 de 7 universidades peruanas y respondieron un cuestionario en el que se preguntó sobre datos generales, intención para publicar la tesis en una revista científica y barreras percibidas para su publicación. Se calcularon razones de prevalencia crudas y ajustadas (RPa) mediante modelos de regresión de Poisson para identificar los factores asociados a la intención de publicación.

**Resultados.** La tasa de respuesta del cuestionario fue de 39.57% (167/422 médicos egresados en 2021). La mediana de edad fue 25 (P25-75: 24-27) años y el 55.09% de los participantes fueron mujeres. El 42.52% tenía intención de publicar su tesis de pregrado (28.74% reportó tener la intención, 11.38% estaba en proceso de publicarla y 2.40% ya la había publicado). Las barreras para la publicación de las tesis más comúnmente informadas fueron falta de conocimientos sobre cómo realizar un envío a una revista científica (71.85%) y falta de acceso a asesores con experiencia en investigación científica (68.26%). En el modelo de regresión de Poisson ajustado se observó que a mayor edad hubo una menor intención de publicación (RPa: 0.62; IC95%: 0.51-0.75).

**Conclusión.** La tasa de publicación de la tesis fue baja y menos de la mitad de los médicos tenían intención de publicarla. Las barreras para la publicación más comúnmente reportadas fueron la falta de conocimientos sobre cómo realizar un envío a una revista científica y la falta de acceso a asesores con experiencia en investigación. Tener mayor edad se asoció con una menor intención de publicar la tesis.



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## Introduction

Training medical students in research is of paramount importance, as it allows them to develop the skills necessary to carry out their clinical practice, such as bibliographic search, critical reading, hypothesis formulation, and decision making.<sup>1</sup> Thus, in medicine, undergraduate theses are part of the initial research experience and are a strategy used to increase university scientific production.<sup>2</sup> Worldwide, however, the publication rate of these studies is less than 33%,<sup>3,4,5</sup> which hinders the validation and dissemination of the findings made by the students and halts the research process.

In Peru, the Peruvian Association of Medical Schools established that the undergraduate human medicine curriculum should include an applied research component with emphasis on research methodology.<sup>6</sup> Likewise, the University Law in force (Law 30220 of 2014), which governs the operation of universities in the country, establishes that the submission of a thesis is mandatory to obtain a bachelor's degree or professional degree.<sup>7</sup>

At present, the scientific research process, which includes theses, is complete only if the works are published in an indexed scientific journal, since their publication helps to disseminate knowledge and submit the research to a quality evaluation by academic peers.<sup>2,8</sup> However, it has been reported that the frequency of publication of medical undergraduate theses in indexed journals in Peru is very low, ranging from 1% to 23.6%.<sup>9-17</sup>

Likewise, Peruvian studies have identified barriers and limitations to the completion of theses by undergraduate medical students, which include administrative procedures, preparation and submission of the thesis, approval of the research protocol, request for the assignment of a thesis advisor, nomination of the thesis jury,<sup>18,19</sup> self-perceived lack of research knowledge, insufficient time or resources,<sup>20</sup> and unavailability of trained advisors.<sup>21</sup> However, there are no studies addressing the barriers and limitations perceived by new graduates regarding the publication of their theses, which is relevant both to understand the current context of medical programs and to implement measures aimed at encouraging the publication of undergraduate works in scientific journals.

In view of the foregoing, the objectives of this research were to identify the barriers and limitations to publishing undergraduate theses written by recently graduated physicians from seven Peruvian universities in indexed scientific journals and to determine the factors associated with their intention to publish.

## Materials and methods

### Study type and population

Analytical cross-sectional study conducted in July 2021. The study population consisted of recently graduated physicians (year of graduation: 2021) from 7 of the 33 universities of Peru: Universidad Nacional de San Antonio Abad del Cusco (UNSAAC) and Universidad Andina del Cusco (UAC), located in Cusco; Universidad Católica De Santa María (UCSM) and Universidad Nacional de San Agustín de Arequipa (UNSA), located in Arequipa; Universidad Privada Antenor Orrego (UPAO), with two campuses located in Trujillo and Piura; Universidad Nacional de Piura (UNP), located in Piura; and Universidad Peruana Unión (UPeU), located in Lima (N=422). The final sample included the 167 physicians who responded to the survey (process described below).

It should be noted that the seven universities were selected for the following reasons: UNSAAC, UNSA, and UPEU because the authors of this study worked at those institutions; UAC, UCSM, UPAO, and UNP because the authors were in contact with collaborators who

worked at those institutions. In other words, the selection of the universities was based on convenience, conditioned to the feasibility of the researchers.

### Procedures

The authors and collaborators of the study reached out to student representatives, delegates and members of scientific societies from the 2021 graduating class of each of the included universities and asked them for the contact details (e-mail addresses or telephone numbers) of all physicians who completed their final year of study in 2020 and, therefore, were likely to graduate in 2021. From this, a list of potentially eligible graduates until July 2021 was obtained.

Once the list of all graduates was compiled, each graduate was forwarded an online survey (in Google Forms) via e-mail or WhatsApp, which was available for 22 days (from July 6 to July 27, 2021). It should be noted that this methodology was applied due to limited attendance at the academic activities of the universities included due to the difficulties generated by the COVID-19 pandemic.

### Questionnaire and variables

The home page of the survey in Google Forms included a summary of the research, a request for informed consent, and instructions for completing the survey. Subsequently, the questionnaire was displayed (Annex 1), which was designed ad hoc based on previous studies.<sup>8,19,22</sup> The information collected was analyzed taking into account the following dimensions:

*General data:* sex (female and male); age categorized into tertiles (23-24 years, 25-26 years, and 27-33 years); university characteristics (public and private); participation in research activities during undergraduate training (participation in a student scientific society [no and yes], participation in extracurricular research courses [no and yes], participation in the scientific writing of a research project or paper [no and yes], participation in research projects [no and yes], and authorship in scientific publications [no and yes]).

The following aspects related to the preparation of the undergraduate thesis were also evaluated in this dimension: a) whether they received help from anyone other than the advisor for the completion of the thesis (in any section of the thesis [no and yes], in the statistical analysis [no and yes], in the sample size calculation [no and yes], in the data collection [no and yes], in the writing of their thesis [no and yes], or in all sections of the thesis [no and yes]); b) whether they committed any type of scientific fraud other than plagiarism (fabrication or falsification) in any part of their thesis (whether they fabricated or falsified: any aspect of the thesis [no and yes], the number of respondents [no and yes], the responses of the participants [no and yes], the sampling technique [no and yes], the validation of the instrument [no and yes], or the measures of statistical association [no and yes]); and c) if they plagiarized or copied any section of the thesis (whether they committed plagiarism or copied information: in any section of the thesis [no and yes], in the methodology [no and yes], in the introduction [no and yes], in the results [no and yes], in the discussion [no and yes], or in the conclusions [no and yes]).

*Intention to publish the thesis in a scientific journal:* This dimension was evaluated by asking “Do you intend to publish your thesis?”. The response options were “No”; “Yes, I intend to publish it”; “Yes, I am in the process of publishing it”; or “Yes, I will publish it in a scientific journal”. All the answers, except for the option “No”, were considered as intention to publish.

*Perceived barriers and limitations to undergraduate thesis publication in scientific journals:* Limitations were defined as the internal difficulties perceived by the respondents, and barriers were defined as all external difficulties perceived by the respondents. To evaluate

these two aspects, the following question was asked: “Do you perceive the following situations as barriers or limitations in the process of publishing your thesis in a scientific journal?” The response options consisted of 14 items that had to be rated on a Likert scale according to the degree of agreement with the situation described (strongly disagree, disagree, neutral, agree, and strongly agree) (Annex 1).

For the validation of the questionnaire, the authors preliminarily evaluated the responses of 10 undergraduate students and based on their recommendations, restructured the syntax of the questions and response options. In addition, the final version of the questionnaire was validated by three medical experts with experience in research or medical education. Finally, Cronbach’s alpha was calculated with the information collected to evaluate internal reliability, obtaining a value of 77.57% for the questionnaire in general and 75.53% for the section on barriers and limitations.

### Statistical analysis

The response forms were downloaded into a Google Spread Sheets file and data were analyzed in Stata software (version 16.0). The descriptive analysis of the data used absolute and relative frequencies for categorical variables and medians and 25<sup>th</sup>-75<sup>th</sup> percentiles for continuous variables.

To determine the factors associated with the intention to publish undergraduate theses, crude (cPR) and adjusted (aPR) prevalence ratios were calculated, with their corresponding 95% confidence intervals (95%CI), using robust Poisson regression models. The undergraduate training university was considered as a cluster in the crude and adjusted models. In the adjusted model, variables with a  $p < 0.20$  in the crude model were included.

### Ethical considerations

The primary study protocol was evaluated and approved by the institutional ethics committee of the Universidad Peruana Unión according to code 2021-CEUPeU-0064 of July 1, 2021. Moreover, the study followed the ethical principles for biomedical research involving human subjects established in the Declaration of Helsinki.<sup>23</sup> All participants signed an informed consent form, the survey was anonymous, and the data obtained were kept confidential at all times.

### Results

The median age of the participants was 25 years (P25-75: 24-27) and 55.09% were female. The response rate of the questionnaire by medical graduates was 39.57% (167/422) distributed as follows: 80.00% from UNSAAC (32/40), 42.50% from UPAO (34/80), 39.09% from UCSM (43/110), 35.71% from UAC (15/42), 40.00% from UNP (8/20), 26.00% from UPeU (13/50), and 27.50% from UNSA (22/80). Furthermore, 63.47% studied at a private university and UCSM was the university with the highest participation (25.74%), followed by UPAO (20.35%), and UNSAAC (19.16%) (Table 1).

Regarding participation in research activities during their undergraduate studies, 38.92% of the physicians were members of a student scientific society, 36.53% took extracurricular research courses, 35.93% participated in the scientific writing of a text, 26.35% participated in research projects other than their thesis, and 10.78% published at least one scientific text during their undergraduate studies (Table 1).

Regarding the aspects related to the elaboration of the thesis, 59.88% of the participants reported having received help in the completion of some part of the thesis, with statistical

analysis being the section in which most help was received (49.10%). On the other hand, 24.55% reported having committed scientific fraud other than plagiarism (fabrication or falsification) of some section in their thesis, with the number of respondents (14.97%) and the respondents' answers (11.38%) being the most altered data. Also, 17.37% reported having plagiarized or copied some section of their thesis, with the methodology (13.77%) being the section with the highest percentage of plagiarism or copying. Finally, 42.52% had the intention of publishing their undergraduate thesis; of these, 28.74% reported only having the intention of publishing it, 11.38% were in the process of publishing it, and 2.40% had already published it (Table 1).

**Table 1.** Variables evaluated in the dimensions General data and Intention to publish the thesis in a scientific journal of the questionnaire used (n=167).

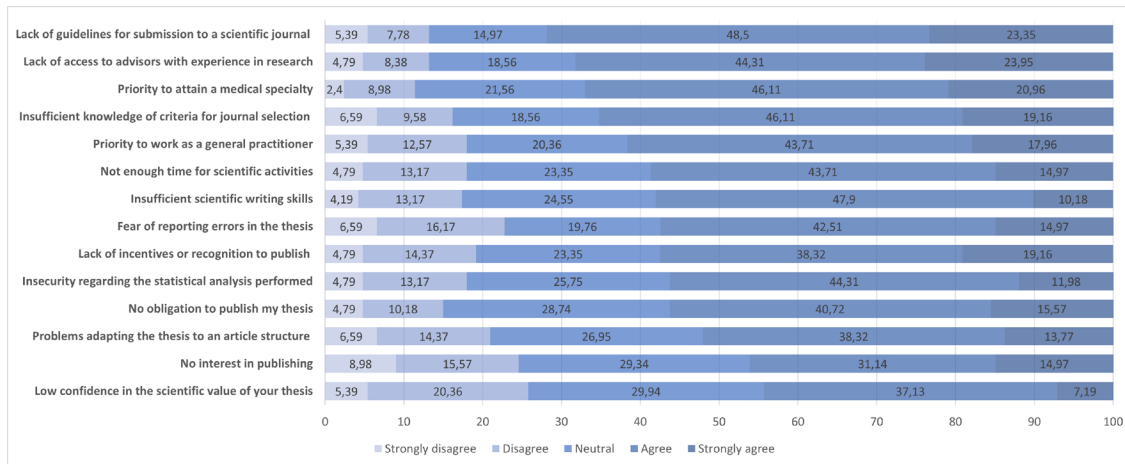
Variables		n (%)
Age		25 (24-27) *
Sex	Female	92 (55.09)
	Male	75 (44.91)
University (funding, city)	Universidad Católica de Santa María (Private, Arequipa)	43 (25.74)
	Universidad Privada Antenor Orrego (Private, Trujillo and Piura)	34 (20.35)
	Universidad Nacional de San Antonio Abad del Cusco (Public, Cusco)	32 (19.16)
	Universidad Nacional de San Agustín de Arequipa (Public, Arequipa)	22 (13.17)
	Universidad Andina del Cusco (Private, Cusco)	15 (8.98)
	Universidad Peruana Unión (Private, Lima)	13 (7.78)
	Universidad Nacional de Piura (Public, Piura)	8 (4.79)
Type of university depending on its financing method	Public	61 (36.53)
	Private	106 (63.47)
Participation in research activities during undergraduate studies (non-restrictive answers)	Participation in a student scientific society	65 (38.92)
	Participation in extracurricular research courses	61 (36.53)
	Participation in the scientific writing of a project or research work.	60 (35.93)
	Participation in research projects	44 (26.35)
	Authorship in scientific publications	18 (10.78)
Did you receive any help to complete your thesis (non-restrictive answers)?	In some section of the thesis	100 (59.88)
	In the statistical analysis	82 (49.10)
	In the sample size calculation	33 (19.76)
	In data collection	22 (13.17)
	In the writing of the thesis	20 (11.98)
	In all sections of the thesis	5 (2.99)
Did you fabricate or falsify any section of your thesis? (non-restrictive answers)	Some aspect of the thesis	41 (24.55)
	The number of respondents	25 (14.97)
	The responses of the respondents	19 (11.38)
	The sampling technique	12 (7.18)
	Validation of the instrument	11 (6.59)
	The measures of statistical association	6 (3.59)
Did you plagiarize or copy any part of your thesis? (non-restrictive answers)	Some section of the thesis	29 (17.36)
	The methodology	23 (13.77)
	The introduction	10 (5.99)
	The results	4 (2.39)
	The discussion	4 (2.39)
	The conclusions	0 (0.00)
Do you intend to publish your thesis?	No	96 (57.48)
	Yes, I intend to publish it	48 (28.74)
	Yes, I am in the process of publishing it	19 (11.38)
	Yes, I already published it in a scientific journal	4 (2.40)

\* Median (25<sup>th</sup>-75<sup>th</sup> percentile).

Source: Own elaboration.

Regarding barriers to thesis publication, participants mostly reported agreeing or strongly agreeing with insufficient knowledge on how to make a submission to a scientific journal (71.85%), failure to access advisors with experience in scientific research (68.26%), and priority to pursue a medical specialty (67.07%) (Figure 1).

Concerning the evaluation of the association between the intention to publish and the factors considered, the adjusted Poisson regression model found that the older the age, the lower the frequency of intention to publish, as it was lower in participants aged 27-33 years compared to those aged 23-24 years (aPR: 0.62; 95%CI: 0.51-0.75). The other factors did not show a statistically significant association (Table 2).



**Figure 1.** Perceived barriers to undergraduate thesis publication (n=167).

Source: Own elaboration.

**Table 2.** Association between the intention to publish undergraduate theses and the variables analyzed (n=167).

Variable		Intention to publish			
		No (n=96)	Yes (n=71)	cPR * (95%CI)	aPR * (95%CI)
Age	23-24 years old	25 (45.45%)	30 (54.55%)	Ref.	Ref.
	25-26 years old	34 (57.63%)	25 (42.37%)	0.78 (0.47-1.28)	0.77 (0.51-1.16)
	27-33 years old	37 (69.81%)	16 (30.19%)	0.55 (0.37-0.83)	0.62 (0.51-0.75)
Sex	Female	50 (54.35%)	42 (45.65%)	Ref.	Ref.
	Male	46 (61.33%)	29 (38.67%)	0.84 (0.67-1.05)	0.89 (0.72-1.11)
Participation in a student scientific society	No	64 (62.75%)	38 (37.25%)	Ref.	Ref.
	Yes	32 (49.23%)	33 (50.77%)	1.36 (0.87-2.11)	0.94 (0.71-1.26)
Participation in extracurricular research courses	No	68 (64.15%)	38 (35.85%)	Ref.	Ref.
	Yes	28 (45.90%)	33 (54.10%)	1.51 (0.95-2.38)	1.24 (0.85-1.81)
Participation in research projects	No	78 (63.41%)	45 (36.59%)	Ref.	Ref.
	Yes	18 (40.91%)	26 (59.09%)	1.61 (0.96-2.71)	1.34 (0.84-2.13)
Participation in the scientific writing of a project or research work.	No	66 (61.68%)	41 (38.32%)	Ref.	-
	Yes	30 (50.00%)	30 (50.00%)	1.30 (0.85-1.99)	-
Authorship in scientific publications	No	88 (59.06%)	61 (40.94%)	Ref.	-
	Yes	8 (44.44%)	10 (55.56%)	1.35 (0.73-2.50)	-
Receiving help to complete the thesis	No	41 (61.19%)	26 (38.81%)	Ref.	Ref.
	Yes	55 (55.00%)	45 (45.00%)	1.16 (0.95-1.40)	1.07 (0.85-1.37)
Fabricating or altering any section of the thesis	No	69 (54.76%)	57 (45.24%)	Ref.	Ref.
	Yes	27 (65.85%)	14 (34.15%)	0.75 (0.55-1.02)	0.99 (0.64-1.53)
Plagiarizing or copying any section of the thesis	No	73 (52.90%)	65 (47.10%)	Ref.	Ref.
	Yes	23 (79.31%)	6 (20.69%)	0.43 (0.17-1.09)	0.47 (0.17-1.29)

cPR: crude prevalence ratio; aPR: adjusted prevalence ratio.

\* Ratios calculated using robust Poisson regression models.

Source: Own elaboration.

## Discussion

The present study found that 6 out of 10 physicians (59.88%) received help to prepare their thesis, most frequently in the statistical analysis section (49.10%). In addition, 24.55% reported having committed some kind of scientific fraud (fabrication or falsification of information) when preparing some section of their thesis, with the number of respondents (14.97%) and the information collected (11.38%) being the sections that were most frequently altered. Plagiarism was also a common occurrence during the preparation of the theses, as it was established that 17.37% had engaged in this malpractice.

With respect to reported barriers and limitations to publishing their theses, lack of knowledge on how to do so (71.85%) and lack of access to advisors with experience in scientific research (68.26%) were the most reported by the participants. Finally, the frequency of publication of the theses was low (2.40%), although the frequency of intention to publish was considerable (42.52%).

Although there are no studies that evaluate the intention to publish undergraduate theses among newly graduated physicians, the frequency of publication of undergraduate theses in health science programs has been studied. In Peru, for example, Mamani-Benito *et al.*<sup>9</sup> conducted a study in which they analyzed 482 theses approved between 2016 and 2018 carried out by health sciences students (medicine, nursing, nutrition, and psychology) from 4 universities in the department of Puno, finding a publication rate in indexed scientific journals of 1% (5 theses).<sup>9</sup> In turn, Taype-Rondán *et al.*<sup>10</sup> reported that only 2.7% of the 74 undergraduate theses approved between 2000 and 2009 at the Faculty of Human Medicine of the Universidad San Martín de Porres were published. In the case of the Universidad Nacional Mayor de San Marcos, Valle & Salvador,<sup>12</sup> in a bibliometric study that included 93 human medicine theses written between 1998 and 2008, found that only 11.8% of them were published in an indexed scientific journal.

Studies conducted in other Peruvian universities have also documented a low frequency of publication of undergraduate medical theses. For example, Castro-Maldonado *et al.*<sup>13</sup> reviewed 221 theses completed between 2006 and 2014 at the Universidad Nacional Pedro Ruiz Gallo and found that only 9 (4.1%) were published, while Atamari-Anahui *et al.*<sup>17</sup> analyzed 398 theses from UNSAAC approved between 2000 and 2012 finding that only 20 (5.02%) were published. On the other hand, at the Universidad Peruana Cayetano Heredia, higher publication frequencies of medical theses have been reported: 17.6% of 482 theses and 19.79% of 192 theses in the periods 2000-2003<sup>17</sup> and 2006-2008,<sup>16</sup> respectively.

Other countries also report variable rates of thesis publication, although some studies report considerably higher frequencies. For example, in France, Benotmane *et al.*<sup>3</sup> reported a medical thesis publication rate of 11.3% among the 2 150 students who submitted theses between January 1, 2001, and December 31, 2007, at the Université de Lille<sup>2</sup>, while in Finland, Nieminen *et al.*<sup>4</sup> found that 23.8% of the 256 medical and dental theses submitted at the University of Oulu between 2001 and 2003 were published. Similarly, Al-Busaidi & Alamri<sup>5</sup> reported a higher publication rate of medical theses in New Zealand, as they found that 32.7% of the 153 theses accepted at Otago Medical School between January 1995 and December 2014 were published in scientific journals.

It should be pointed out that while 42.52% of the respondents in the present study intended to publish their thesis, it is likely that this intention will not lead to a scientific publication since 11.38% reported being in the process of publishing it and only 2.40% reported having already published it, and this publication rate is similar to the one reported in some of the studies mentioned above.<sup>9-11,13,17</sup> It should also be noted that the period between the completion of the theses and the possibility of publishing them

was short, so the final number of theses that were published may be underestimated. Moreover, it should be recognized that the universities evaluated are not the ones with the highest scientific production in Peru.

One finding worthy of note in the present study is that almost half of the respondents reported that they had received help in the statistical analysis during the elaboration of their thesis; however, no similar research addressing this aspect was found. This result is difficult to interpret since it could be concluded that the statistical analyses in some of the theses were advanced and therefore required specialized assistance, while in others, such analyses were not so complex.

Regarding scientific integrity, it was found that 17.37% of the participants in this study reported having committed plagiarism, mainly in the methodology and introduction sections. This finding differs from the report by Saldaña-Gastulo *et al.*,<sup>24</sup> who evaluated 33 theses of medical students from a public university in Peru, finding evidence of plagiarism in 81.81%. Bearing in mind that plagiarism in the present study was evaluated by means of self-reporting, it is to be expected that the frequency reported is lower than what would be found with objective evaluations such as the one carried out in the study by Saldaña-Gastulo *et al.*<sup>24</sup> or in studies using anti-plagiarism software. In any case, this highlights the need to improve thesis evaluation processes in the universities evaluated.

In the present study, 24.55% of the participants committed some type of scientific fraud, other than plagiarism, in some section of their thesis. Making up or misreporting the number of respondents and their responses were the most frequently reported unethical behaviors. In 2009, Fanelli,<sup>25</sup> through a systematic review and meta-analysis, reported a frequency of fabrication, modification or falsification of data or results of 1.97% (95%CI: 0.86-4.45) among US and UK scientists mainly, but other studies have found much higher frequencies, such as the one by Okonta & Rossouw,<sup>26</sup> in which 133 researchers attending a scientific conference in Nigeria in 2010 were surveyed using the Scientific Misconduct Questionnaire-Revised (SMQ-R), finding that 42% reported falsifying or plagiarizing data in their research.

Although the percentage of participants who committed plagiarism in the present study is within the range reported worldwide, this figure illustrates how much of a problem scientific fraud is in undergraduate medical thesis research in Peru. In this sense, although theses are part of the gray literature, it is advisable to incorporate scientific integrity committees following the recommendations included in the *Código Nacional de la Integridad Científica del Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica*<sup>27</sup> (National Code of Scientific Integrity of the National Council of Science, Technology and Technological Innovation, CONCYTEC by its acronym in Spanish) to ensure integrity, intellectual honesty and truthfulness in scientific research activities, as well as to enable a responsible execution and dissemination of the results of scientific research.

This could be explained by the fact that, as reported by Carnero *et al.*,<sup>28</sup> there are several factors in developing countries that can facilitate plagiarism in the context of higher education, such as lack of training in responsible research behavior; poor writing skills; tolerance of this practice during educational and professional activities; lack of institutional policies and supervision by academic centers and scientific journals; differences in the perception of intellectual property and of this misconduct; generalized corruption; and cultural differences in the perception of values. Furthermore, it has been described that the use of questionable research practices has been associated with students' attitudes towards such practices,<sup>29</sup> so it is necessary to strengthen research ethics competencies during undergraduate studies, as well as among health professionals, in the



country and in the region. Likewise, the frequency of falsification of information should be corroborated in further studies that evaluate this issue in more detail.

### Perceived barriers and limitations to publishing theses

In the present study, it was found that the main barriers to scientific publication of theses are related to factors such as insufficient knowledge of how to submit to a scientific journal and lack of advisors with experience in scientific research.

Accordingly, some of the barriers reported by the students could be counteracted by implementing counseling by trained researchers with experience in publication, who, besides providing methodological support, should maintain a good relationship with the thesis writers. This is described by Frishman<sup>30</sup> in a study conducted between 1981 and 1994 involving 69 fourth-year students at the Albert Einstein College of Medicine in New York, USA, in which it was reported that 91% of the participants claimed to have received adequate guidance from their mentor and that 90% of 69 research projects conducted by the same number of students were accepted for publication in peer-reviewed journals.

It should be noted that the advisors' limited experience in scientific publication is also a major obstacle for students to publish their theses. This could be reflected in the results of the present study since different universities in Peru have reported poor productivity among their advisors. Chachaima *et al.*<sup>31</sup> reported that, in 2016, 58.7% of 90 professors at the UNSAAC School of Medicine had published at some point in their careers in a scientific journal, but only 10.0% had done so in the last three years. Likewise, Mejia *et al.*<sup>32</sup> evaluated the scientific production of 806 advisors of undergraduate theses approved in 2019 in 29 faculties of human medicine, finding that less than 25% of the advisors in 20 faculties had published in journals indexed in Scopus. Thus, given the low availability of professors and thesis advisors with publishing experience in Peru, it is reasonable to think that thesis writers perceive this aspect as one of the most important limitations to publishing their work. It is therefore necessary to train and promote competencies in methodology, data analysis, interpretation of results, and scientific writing among teachers and students of Peruvian universities.

### Factors associated with the intention to publish the theses

In this study, it was found that older age was associated with less intention to publish the thesis, which could be explained by the fact that the older the age, the greater the priority to complete professional studies or the greater the need to pursue economic independence due to increased financial and family responsibilities, among others, as stated by Eliason *et al.*<sup>33</sup>

Similarly, although the association was not statistically significant, it was found that the intention to publish the thesis was higher among physicians who had participated in courses and research projects, as well as among those who did not report having committed plagiarism or falsified any section of their thesis. These factors should be evaluated in more detail in further studies using a larger sample size.

With respect to the limitations of this study, first of all, it should be acknowledged that the selection of universities was for convenience and that the response rate of the questionnaire in each university varied between 26% and 80.0%, which implies that the findings cannot be extrapolated. Also, it could be assumed that recent graduates from other universities in Peru, as well as graduates who did not respond to the survey, may consider

that there are other barriers to the publication of their theses, so it is necessary to carry out similar studies with a more representative number of medical schools in the country.

Furthermore, the present study included only 2021 graduates, who may have been negatively influenced by the context of the COVID-19 pandemic in their intention to publish their theses. Also, since the response rate was low in some universities, it was not possible to make comparisons between them, so the graduate's universities were considered as a cluster in both Poisson regression models. Finally, although the survey was anonymous, the responses collected may be subject to recall bias because it is a self-reporting instrument, as well as to social desirability bias because the questionnaire was administered online. However, these limitations were minimized by including only physicians who graduated between January and July 2021 and by guaranteeing the anonymity of their responses.

As strengths, according to the search performed, this is the first study that evaluates the intention to publish and the barriers to publishing theses among newly graduated physicians in Peru. In addition, it is expected that the reported findings will contribute to the understanding of such barriers in different national institutions and to the development of strategies to mitigate them. On the other hand, the fact that several universities in the country were included allows these results to have a broader scope. Finally, assessing ethical misconduct in thesis writing (plagiarism, falsification, or fabrication) allows taking the first step to understand the major obstacles to publishing theses and provides an opportunity to understand that there is a need to improve scientific integrity among medical undergraduate students.

## Conclusion

In the present study, less than half of the participants intended to publish their undergraduate thesis as a scientific article in indexed journals and the publication rate at the time of this study was low. The most frequently reported barriers to thesis publication were insufficient knowledge of how to make a submission to an indexed journal and lack of access to experienced research advisors. On the other hand, it was found that 24.55% of the respondents had committed scientific fraud other than plagiarism (fabrication or falsification of data) and 17.37% had committed plagiarism, which were important reasons for not considering the future publication of their theses. Finally, being older was associated with a lower intention to publish the thesis.

## Conflicts of interest

Some of the authors received academic training at some of the universities evaluated (UNSAAC, UNSA and UPEU); however, none of them declare any conflict of interest with respect to the preparation of this article.

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## References

1. Mabvuure NT. Twelve tips for introducing students to research and publishing: A medical student's perspective. *Med Teach*. 2012;34(9):705-9. <https://doi.org/fg35>.
2. Mayta-Tristán P. Tesis en formato de artículo científico: oportunidad para incrementar la producción científica universitaria. *Acta méd. peruana*. 2016;33(2):95-8. <https://doi.org/ks5m>.
3. Benotmane I, Glatz N, Bihan S, Legrand F, Gosset D, Boulanger E. Publications des thèses d'exercice soutenues à la faculté de médecine de Lille. *Presse Med*. 2012;41(7-8):e397-e403. <https://doi.org/ks5k>.
4. Nieminen P, Sipilä K, Takkinen HM, Renko M, Risteli L. Medical theses as part of the scientific training in basic medical and dental education: experiences from Finland. *BMC Med Educ*. 2007;7:51. <https://doi.org/cq3djd>.
5. Al-Busaidi IS, Alamri Y. Publication rates and characteristics of undergraduate medical theses in New Zealand. *N Z Med J*. 2016;129(1442):46-51.
6. Asociación Peruana de Facultades de Medicina (ASPEFAM). Seminario Internacional de Reforma Curricular. Por una Educación Médica de Calidad y con Compromiso Social. Lima: ASPEFAM; 2017 [cited 2023 Sep 12]. Available from: <https://www.aspefam.org.pe/series/serie2.pdf>.
7. Perú. Congreso de la República. Ley 30220 de 2014 (julio 3): Ley universitaria. Lima; 2014.
8. Gutiérrez C, Mayta P. Publicación desde el pre grado en Latinoamérica: importancia, limitaciones y alternativas de solución. *CIMEL*. 2003;8(1):54-60.
9. Mamani-Benito OJ, Ramos-Vilca G, Rodrigo-Ccaso DJ, Quispe-Mayta F, Chipana-Paye NS. Publicación científica y características de las tesis de salud de universidades del departamento de Puno, Perú. *Horiz Med*. 2020;20(3):e1149. <https://doi.org/ks5n>.
10. Taype-Rondán Á, Carbajal-Castro C, Arrunategui-Salas G. Limitada publicación de tesis de pregrado en una facultad de medicina de Lima, Perú, 2000-2009. *An Fac Med*. 2012;73(2):153-7. <https://doi.org/ks5p>.
11. Castro-Rodríguez Y, Hinojosa-Añorga M, Torres-Robles G, Roca-Sacramento C, Rojas-Ortega R. Tesis sustentadas y publicadas por estudiantes de las ciencias de la salud en Perú. *Edumecentro*. 2020;12(1):15-29.
12. Valle R, Salvador E. Análisis bibliométrico de las tesis de pregrado de la Facultad de Medicina de la Universidad Nacional Mayor de San Marcos. *An Fac med*. 2009;70(1):11-8.
13. Castro-Maldonado B, Callirgos-Lozada CC, Caicedo-Pífil MK, Plasencia-Dueñas EA, Díaz-Vélez C. Características de las tesis de pre-grado de Medicina de una universidad pública del Perú. *Horiz Med*. 2015;15(3):34-9.
14. Ticse R, Ygreña P, Samalvides F. Publicación de los proyectos de investigación para la titulación como médicos especialistas de una universidad peruana, 2007-2010. *Rev Peru Med Exp Salud Publica*. 2014;31(2). <https://doi.org/ks5q>.
15. Osada J, Loyola-Sosa S, Ruiz-Grosso P. Publicación de trabajo de conclusión de curso de estudiantes de medicina de una universidad peruana. *Rev Bras Educ Med*. 2014;38(3):308-13. <https://doi.org/ks5r>.
16. Arriola-Quiroz I, Curioso WH, Cruz-Encarnacion M, Gayoso O. Characteristics and publication patterns of theses from a Peruvian medical school. *Health Info Libr J*. 2010;27(2):148-54. <https://doi.org/fdhns2>.
17. Atamari-Anahui N, Roque-Roque JS, Robles-Mendoza RA, Nina-Moreno PI, Falcón-Huanchahuirí BM. Publicación de tesis de pregrado en una facultad de Medicina en Cusco, Perú. *Rev Med Hered*. 2015;26(4):217-21.
18. Mejía CR, Inga-Berrosipi F, Mayta-Tristán P. Titulación por tesis en escuelas de medicina de Lima, 2011: características, motivaciones y percepciones. *Rev Peru Med Exp Salud Publica*. 2014;31(3):509-14.
19. Zafra-Tanaka JH, Castillo S. Barreras percibidas por los estudiantes de Medicina Humana para la titulación por tesis en la Universidad Nacional Mayor de San Marcos, Lima, Perú, 2015. *An Fac Med*. 2016;77(2):143. <https://doi.org/ks5s>.
20. Ramos-Rodríguez MI, Sotomayor R. Realizar o no una tesis: razones de estudiantes de medicina de una universidad pública y factores asociados. *Rev Peru Med Exp Salud Publica*. 2008;25(3):322-4.
21. Alarco JJ, Aguirre-Cuadros E, Aliaga-Chávez Y, Álvarez-Andrade EV. Factores asociados a la realización de tesis en pregrado de Medicina en una universidad pública del Perú. *CIMEL*. 2010;15(2):66-70.
22. Díaz-Vélez C, Manrique-González LM, Galán-Rodas E, Apolaya-Segura M. Conocimientos, actitudes y prácticas en investigación de los estudiantes de pregrado de facultades de medicina del Perú. *Acta Méd Peru*. 2008;25(1):9-15.
23. World Medical Association (WMA). WMA Declaration of Helsinki – Ethical principles for medical research involving human subjects. Fortaleza: 64<sup>th</sup> WMA General Assembly; 2013.
24. Saldaña-Gastulo JJC, Quezada-Osoria CC, Peña-Oscuvilca A, Mayta-Tristán P. Alta frecuencia de plagio en tesis de medicina de una universidad pública Peruana. *Rev Peru Med Exp Salud Publica*. 2010;27(1):63-7. <https://doi.org/b65ztx>.

25. Fanelli D. How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. *PLoS One*. 2009;4(5):e5738. <https://doi.org/bn5pnj>.
26. Okonta P, Rossouw T. Prevalence of Scientific Misconduct Among a Group of Researchers in Nigeria. *Dev World Bioeth*. 2013;13(3):149-57. <https://doi.org/f5hc9s>.
27. Perú. Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica (CONCYTEC). Código Nacional de la Integridad Científica. Lima: CONCYTEC; 2019.
28. Carnero AM, Mayta-Tristan P, Konda KA, Mezones-Holguin E, Bernabe-Ortiz A, Alvarado GF, *et al*. Plagiarism, Cheating and Research Integrity: Case Studies from a Masters Program in Peru. *Sci Eng Ethics*. 2017;23(4):1183-97. <https://doi.org/gbsj4v>.
29. Krishna A, Peter SM. Questionable research practices in student final theses - Prevalence, attitudes, and the role of the supervisor's perceived attitudes. *PLoS One*. 2018;13(8):e0203470. <https://doi.org/ghqv5b>.
30. Frishman WH. Student Research Projects and Theses: should they be a requirement for medical school graduation? *Hear Dis*. 2001;3(3):140-4. <https://doi.org/cdbtmk>.
31. Chachaima-Mar JE, Fernández-Guzmán D, Atamari-Anahui N. Publicación científica de docentes de una escuela de medicina peruana: frecuencia y características asociadas. *Educ Médica*. 2019;20:2-9. <https://doi.org/gppn4g>.
32. Mejía CR, Mamani-Benito OJ, Condori-Loayza S, Tito-Betancur M, Ramos-Vilca G, Torres RR. Producción Científica de los Asesores de Tesis de las Facultades de Medicina Humana en el Perú. *Gac Med Bol*. 2022;45(1):45-50. <https://doi.org/ks5t>.
33. Eliason SR, Mortimer JT, Vuolo M. The Transition to Adulthood: Life Course Structures and Subjective Perceptions. *Soc Psychol Q*. 2015;78(3):205-27. <https://doi.org/f7p4xz>.

## Annex 1. Questionnaire

### Section 1: General information

1. How old are you?
2. What is your sex?
  - a) Female
  - b) Male
3. Which university did you attend?

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4. What year did you graduate from the university?

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5. During your undergraduate studies, were you a member of a society or research group?
  - a) No
  - b) Yes
6. During your undergraduate studies, did you participate in extracurricular courses on research?
  - a) No
  - b) Yes
7. During your undergraduate studies, did you participate in any extracurricular research project?
  - a) No
  - b) Yes
8. During your undergraduate studies, were you involved in the writing of scientific research work other than a thesis?
  - a) No
  - b) Yes
9. During your undergraduate studies, did you publish a research article in a medical journal?
  - a) No
  - b) Yes
10. Did you receive any help (other than from your advisor) in the completion of your undergraduate thesis?  
(You may choose more than one option)
  - a) Yes, I received help for sample size calculation
  - b) Yes, I received help for data collection
  - c) Yes, I received help for the statistical analysis
  - d) Yes, I received help for partially writing my thesis
  - e) Yes, I received help for the elaboration of my thesis (another person wrote it)
  - f) None
11. Do you think you modified or fabricated the information contained in any section of your thesis?
  - a) (You may choose more than one option)
  - b) Yes, the type of sampling used
  - c) Yes, the survey validation
  - d) Yes, the number of respondents or participants
  - e) Yes, responses or values in the database
  - f) Yes, the RR, OR, or PR value
  - g) Yes, the *p*-value
  - h) No

12. Do you think you copied or plagiarized any section of your thesis?

(You may choose more than one option)

- a) Yes, the statement of the problem or rationale for my thesis
- b) Yes, the methodology used
- c) Yes, the results reported
- d) Yes, the discussion
- e) Yes, the conclusions
- f) No

13. Do you intend to publish your thesis?

- a) No
- b) I could not publish it (in the case of students graduated more than 1 year ago)
- c) Yes, I intend to publish it
- d) Yes, I am in the process of publishing it
- e) Yes, I published it in a scientific journal

## Section 2: Perceived barriers and limitations to scientific publication of theses

14. Do you perceive the following situations as barriers or limitations in the process of publishing your thesis in a scientific journal?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Lack of access to advisors with experience in scientific publication					
2. Insecurity regarding the statistical analysis performed for the thesis					
3. Insufficient scientific writing skills					
4. Low confidence in the scientific value of my thesis					
5. Fear of reporting errors in the thesis					
6. Lack of instructions for the publication process					
7. Insufficient knowledge of criteria for journal selection (language, impact factor, indexing, type of publications, among others)					
8. Lack of knowledge of the scientific article structure					
9. No interest in publishing					
10. Not enough time to adapt my thesis to a journal style					
11. Lack of incentives or recognition					
12. Priority to attain a specialty over research					
13. Priority to work as a general practitioner over research					
14. No obligation to publish my thesis					