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Association between scientific production of the advisor and publication of medical theses in indexed journals.

Asociación entre producción científica del asesor y publicación de tesis de medicina en revistas indexadas.

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Summary: Undergraduate theses are a requirement to obtain a professional degree, but they are often not published beyond institutional repositories. Among the associated factors, the influence of the advisor or tutor is mentioned. Therefore, the objective was to determine the association between the scientific production of the advisor and the publication of the thesis in an indexed journal. A retrospective cohort study was carried out. The advisor's production was evaluated using the H index and the publication of the thesis in indexed journals was determined using a search method proposed in the study. To estimate the association, Poisson regression was used and relative risk ratios with their 95% confidence intervals were estimated. 316 medical theses supported between 2015 and 2019 were analyzed. For each point in the advisor's H Index, the probability of publishing the thesis increases by 3% (adjusted RR=1.03, 95%CI:1.02 -1 .05). The university of origin, the year of support or publication and the sex of the authors were associated variables. 26.3% of the theses were published and the average time elapsed was 9.9 (SD: 1.4) months. Low publication of theses is evident. The advisor's scientific production was associated with a greater probability of thesis publication in indexed journals.

Keywords: Academic thesis; Scientific production; Medicine students; medical education; teachers.

Resumen: Las tesis de pregrado son requisito para obtener el título profesional, pero a menudo no se publican más allá de los repositorios institucionales. Dentro de los factores asociados se menciona la influencia del asesor o tutor. Por lo tanto, el objetivo fue determinar la asociación entre la producción científica del asesor y la publicación de la tesis en una revista indexadas.Se realizó un estudio de cohorte retrospectiva. Se evaluó la producción del asesor utilizando el índice H y se determinó la publicación de la tesis en revistas indexadas mediante un método de búsqueda propuesto en el estudio. Para estimar la asociación se utilizó la regresión de Poisson y se estimaron razones de riesgo relativo con sus intervalos de confianza al 95 %. Se analizaron 316 tesis de medicina sustentadas entre el 2015 al 2019. Por cada punto del Índice H del asesor, la probabilidad de publicar la tesis se incrementa un en 3 % (RR ajustado=1,03, IC95 %:1,02 -1,05). La universidad de procedencia, el año de sustentación o publicación y el sexo de los autores fueron variables asociadas. El 26,3 % de las tesis se publicaron y el tiempo promedio transcurrido fue de 9,9 (DE: 1,4) meses. Se evidencia baja publicación de las tesis. La producción científica del asesor se asoció a mayor probabilidad de publicación de tesis en revistas indexadas.

Palabras clave: Tesis académica; Producción científica; estudiantes de Medicina; Educación médica; docentes.

1. Introduction

Research from the undergraduate level plays a fundamental role in the development of learning skills, academic competitiveness and the strengthening of scientific reputation (1). However, low scientific production has been reported among medical students in Peru and Latin America (2-3). In this context, theses play a crucial role, since they represent original research works that mark the culmination of university training and often constitute the only research contribution of students (4). In Peru, University Law No. 30220 requires that theses be supported to obtain the professional title (5). With the aim of strengthening student scientific production, several universities have adopted the thesis modality in scientific article format (4). In addition, strategies have been implemented such as the strengthening of scientific societies and the inclusion of critical reading and scientific writing courses (6-7). However, despite these advances, many theses are not published outside of institutional repositories (8–11).

Previous studies of associated factors found that having an advisor with previous publications increases the probability of publication of the thesis (10, 12-13). However, it has been shown that universities have medical thesis advisors with varied scientific production, with the majority of them having low and medium scientific production. According to the results of the study by Mejía et al., low production (0 to 1 publication), medium production (2 to 4 publications) and high production (more than 5 publications) (14-15). Advisors play a crucial role in the training of researchers, as their accumulated theoretical and practical experience gives them the credibility necessary to impart knowledge (16).

Due to this, the objective of the present study was to evaluate the association between the scientific production of the advisor and the publication of undergraduate theses from three Peruvian schools of Human Medicine in an indexed journal. Additionally, identify variables associated with the publication of the thesis and describe characteristics of the published theses.

2. Methods

Study design

A cohort study was carried out, which allowed retrospective follow-up to evaluate the results related to the publication of the thesis and the associated variables. To carry out this analysis, the theses were obtained from the free access institutional repositories of three Peruvian universities: Universidad Cientifica del Sur (UCSUR) (17), Universidad Peruana de Ciencias Aplicadas (UPC) (18) and Universidad San Martín de Porres (USMP) (19) between the years 2015 to 2019. Universities with different thesis formats were selected that were classified in similar quintiles in terms of scientific production in medicine and health during the period 2013-2018, according to the databases of Wos and Scopus (20). In addition, they are in the Scimago Institutions Rankings 2021(21). Undergraduate theses in Human Medicine approved between 2015 and 2019 were included. This selection was made because a minimum follow-up of 2 to 3 years was required from the date of support or availability in institutional repositories. Theses with restricted access and with missing data on variables of interest were excluded.

Sample Selection

The selection of universities was for convenience. All theses available in their repositories were analyzed, totaling 316 theses. At UCSUR and UPC, the theses were in the format of scientific articles, following the standards of selected journals (4). While in USMP, they had a traditional format with extensive theoretical review (22). Statistical power was calculated with Open Epi ver 3.0.1 for a sample of 316 theses. The results showed a statistical power of 99.1% for the advisor's scientific production variable.

Procedures

The search for thesis publications in indexed journals was carried out in April and May 2022. The "Google Scholar" search engine was used in the Publish or Perish software ver 8.2 (Harzhing.com, London, UK). The search was based on the first author, using combinations of first and last names. If the publication was not found, information from the second or third author was searched with a keyword from the title in Spanish or English. As a last resort, the advisor's name was searched with a keyword from the title. The names of the authors, objectives, summary and keywords related to the thesis were verified. Two authors identified the articles independently, entering the data into a database in Microsoft Excel 2016. The results were compared and, in case of discrepancy, a new joint search was carried out. Finally, the two authors performed a final verification of the process.

Variables

The independent variable was the "scientific production of the advisor", measured with Hirsch's H index, which considers the quantity and quality of scientific publications based on the citations received (24). The Publish or Perish software ver 8.2 was used to calculate this index (25), based on the Google Scholar database. The name of the advisor was analyzed in said software, considering the date of publication of the theses in the repository. The variable was analyzed in two ways: numerically and categorized according to the median of the H index (<9 and ≥ 9) obtained in this study.

The dependent variable was the "thesis published in an indexed journal", which is found in information sources recognized for meeting high quality standards (26). A journal was considered indexed if it was present in databases such as Latindex, SciELO, Scopus, Medline/Pubmed or Web of Science. The variable was dichotomized into “yes” and “no” for analysis.

Variables related to the group of authors were included, such as sex (only men, only women, or mixed) and the number of authors (1, 2, or 3). Variables related to advisors were also included, such as gender (man and woman), the number of advisors per thesis (1, 2 and 3).

For the theses, the year of support of the thesis (2015-2019), the university (UPC, UCSUR and USMP), the format (scientific or traditional article), and the design (descriptive, analytical, experimental or systematic review) were recorded.). The results of the analytical and experimental studies were classified as negative or positive. In addition, characteristics of the published theses were considered such as corresponding author, language of publication (English or Spanish), access (open or closed), country of the journal (national or foreign), indexing in databases (Latindex, SciELO, Scopus and Web of Science), publication time (from the date of submission to publication in a journal) and quartile classification according to SCImago Journal & Country Rank (SJR).

Statistic analysis

The statistical software used was Stata version 16 for Windows. Categorical variables were summarized with frequencies and percentages, while the H index (only numerical variable) was summarized with the median and interquartile range (IQR), due to its non-symmetric distribution (Shapiro Wilk test <0.05). The association between the scientific production of the advisors and the publication of the theses was determined with the Mann-Whitney U test. To estimate the magnitude of the association, crude and adjusted Poisson regression models (with robust variance) were developed with 95% confidence intervals (95% CI). The selection of the variables that were included in the adjusted model was based on statistical criteria (p<0.05). For all analyses, a value of p<0.05 was considered statistically significant. Additionally, the presence of collinearity between the variables of the adjusted model was evaluated through the calculation of the variance inflation factor (VIF).

Ethical aspects

This study was reviewed and approved by the General Directorate of Research, Development and Innovation (DGIDI) of the Scientific University of the South, with code No. 144-2022-PRE-15. After collecting data from each advisor and authors, the names were removed from the database, leaving an anonymous list prior to analysis.

3. Results

354 theses were identified, of which 7 were not addressed because they did not meet the requirements for a degree in medicine or were not approved between 2015 to 2019, and 31 were excluded without an advisor or with restricted access, leaving 316 theses for analysis (figure 1). . In the descriptive analysis, the majority of the theses belonged to UPC (57.9%), were sustained in 2019 (35.4%), the group of authors was made up only of women (56.6%) and only one author (56.6%). The majority of the advisors were men (85.4%) and participated as the only advisor (76.6%). Likewise, the majority had an analytical design (61.7%), a positive result (84.2%) and were presented in scientific article format (75.9%). Finally, the median advisor H-index was 9 (IQR: 1–16) and 26.3% of theses were published in an indexed journal (Table 1).

In the bivariate analysis, the university, year of support, sex of the authors, number of authors, study design and the format of the thesis were variables that were associated with the publication of the thesis (p<0.05). Likewise, the median H-index of advisors of published theses was 15 (IQR: 8-23) compared to the median H-index of advisors of unpublished theses, which was 8 (IQR: 1-14).), this difference being statistically significant (p<0.001) (table 2). The average of the intervention group and that of the control group did not show differences in the first evaluation; However, in the second, after the psychoeducational intervention, the group that received the intervention presented a higher mean score, with a statistically significant difference compared to the control group (Table 3).

In the model adjusted by university, year of support, sex of the author, number of authors, study design and thesis format; The incidence of publishing the thesis in an indexed journal increased on average 3% for each point of the advisor's H index (RR=1.03, 95%CI:1.02-1.05) (table 3). Likewise, theses whose advisors had an H index ≥ 9 were 67% more likely to be published in an indexed journal compared to theses whose advisor had an H index < 9 (RR =1.67; 95% CI:1.08– 2.62) (table 4).

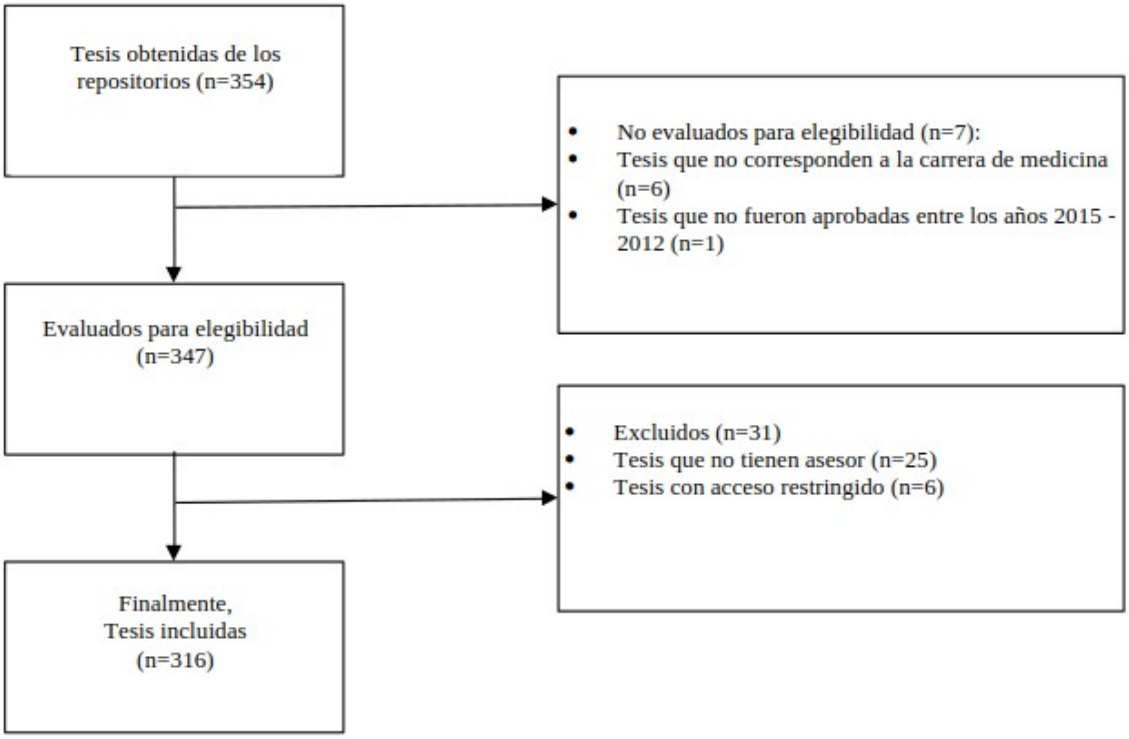

Figure 1. Flux of selection of theses included in the study.

Table 1 . Characteristics of the theses included in the study (n = 316).

	n	%		n	%
University			**Number of advisors**		
CPU	183	57.9	1	242	76.6
UCSUR	57	18.0	2	63	19.9
USMP	76	24.1	3	11	3.5
Year of publication			**Study design**		
2015	40	12.7	Descriptive	95	30.1
2016	27	8.5	Analytical	195	61.7
2017	52	16.5	Experimental	7	2.2
2018	85	26.9	Systematic review	19	6.0
2019	112	35.4			
Authors' sex			**Study result**		
Men only	97	30.7	Positive	170	84.2
Only women	179	56.6	Negative	32	15.8
Mixed	40	12.7			
Number of authors			**thesis format**		
1	179	56.6	Scientific article	240	75.9
2	108	34.2	Traditional	76	24.1
3	29	9.2			
Sex of the first advisor			**Advisor H-index**		
Man	270	85.4	Median and Interquartile Range	**9***	**1-16**
Women	46	14.6			
Number of advisors			**Advisor H-index**		
1	242	76.6	<9	159	50.3

2	63	19.9	≥ 9	157	49.7
3	eleven	3.5			
Study design			**Publication of the thesis**		
Descriptive	95	30.1	No	233	73.7
Analytical	195	61.7	Yes	83	26.3
Experimental	7	2.2			
Systematic review	19	6.0			

The variable "Result of the study" had 202 data (from the designs: analytical and experimental).

Table 2. Statistical differences according to the publication of the thesis.

Characteristic	Thesis publication		p value
	No	Yes	
University			**<0.001**
CPU	114 (62.3)	69 (37.7)	
UCSUR	51 (89.5)	6 (10.5)	
USMP	68 (89.5)	8 (10.5)	
Year of support			**0.004**
2015	22 (55.0)	18 (45.0)	
2016	16 (59.3)	11 (40.7)	
2017	37 (71.2)	15 (28.8)	
2018	66 (77.7)	19 (22.3)	
2019	92 (82.1)	20 (17.9)	
Authors' sex			**0.028**
Men only	66 (68.0)	31 (32.0)	
Only women	142 (79.3)	37 (20.7)	
Mixed	25 (62.5)	15 (37.5)	
Number of authors			**<0.001**
1	148 (82.7)	31 (17.3)	
2	70 (64.8)	38 (35.2)	
3	15 (51.7)	14 (48.3)	
First advisor sex			**0.833**
Man	198 (73.3)	72 (26.7)	
Women	35 (76.0)	11 (24.0)	
Number of advisors			**0.632**
1	180 (74.4)	62 (25.6)	
2	44 (69.8)	19 (30.2)	
3	9 (81.8)	2 (18.2)	
Study design			**0.024**
Descriptive	80 (84.2)	15 (15.8)	
Analytical	133 (68.2)	62 (31.8)	
Experimental	5 (71.4)	2 (28.6)	
Systematic review	15 (79.0)	4 (21.0)	
Study result			**0.194**
Positive	113 (66.5)	57 (33.5)	
Negative	25 (78.1)	7 (21.9)	

thesis format			**<0.001**
Scientific article	165 (68.7)	75 (31.3)	
Traditional	68 (89.5)	8 (10.5)	
Advisor H-index	**8 (1-14)**	**15 (8-23)**	**<0.001**
Advisor H-index			**<0.001**
<9	134(84.3)	25 (15.7)	
≥ 9	99 (63.1)	58 (36.9)	

Table 3. Factors associated with the publication of theses, with numerical independent variable.

Characteristic	raw model	p value	Fitted model*	p value
	RR (95% CI)		RR (95% CI)	
Advisor H-index *	1.04 (1.03-1.05)	<0.001	1.03 (1.02-1.05)	<0.001
University				
CPU	Reference		Reference	
UCSUR	0.28 (0.13-0.61)	0.001	0.41 (0.16 - 0.99)	0.057
USMP	0.28 (0.14-0.55)	<0.001	0.41 (0.17 - 0.92)	0.036
Year of support				
2015	Reference		Reference	
2016	0.90 (0.51-1.60)	0.733	--	--
2017	0.64 (0.37-1.11)	0.112	0.62 (0.41-1.19)	0.189
2018	0.50 (0.29-0.84)	0.009	0.45 (0.31-0.84)	0.008
2019	0.40 (0.23-0.67)	0.001	0.56 (0.29-0.79)	0.004
Sex of thesis students				
Men only	Reference		Reference	
Only women	0.65 (0.43-0.97)	0.037	0.63 (0.41-0.88)	0.010
Mixed	1.17 (0.71-1.92)	0.527	--	--
Number of thesis students				
1	Reference		Reference	
2	2.03 (1.35 - 3.07)	<0.001	1.06 (0.63 - 1.82)	0.833
3	2.79 (1.58 - 4.73)	<0.001	1.02 (0.51 - 2.03)	0.944
First advisor sex				
Man	Reference		--	--
Women	0.90 (0.52-1.56)	0.699	--	--
Number of advisors				
1	Reference		--	--
2	1.18 (0.74 - 1.81)	0.471	--	--
3	0.71 (0.16 - 1.98)	0.580	--	--
Study design				
Descriptive	Reference		Reference	
Analytical	2.01 (1.26 - 3.37)	0.005	0.916 (0.52 - 1.67)	0.768
Experimental	1.81 (0.39 - 5.50)	0.363	--	--
Systematic review	1.33 (0.46 - 3.23)	0.555	--	--
Study result				
Positive	Reference		--	--

Negative	0.65 (0.33-1.20)	0.225	--	--
thesis format				
Scientific article	Reference		Reference	
Traditional	0.34 (0.17-0.60)	<0.001	0.53 (0.25-1.13)	0.098
RR: relative risk, 95% CI: 95% confidence interval				

Table 4. Factors associated with the publication of theses, with dichotomized independent variable.

Characteristic	raw model	p value	Fitted model*	p value
	RR (95% CI)		RR (95% CI)	
Advisor H-index *				
<9	Reference			
≥ 9	2.35 (1.58 - 3.56)	<0.001	1.67 (1.08 - 2.62)	0.026
University				
CPU	Reference		Reference	
UCSUR	0.28 (0.13-0.61)	0.001	0.34 (0.13 - 0.80)	0.018
USMP	0.28 (0.14-0.55)	<0.001	0.35 (0.15 - 0.77)	0.012
Year of support				
2015	Reference		Reference	
2016	0.90 (0.51-1.60)	0.733	--	--
2017	0.64 (0.37-1.11)	0.112	0.61 (0.32 - 1.15)	0.131
2018	0.50 (0.29-0.84)	0.009	0.48 (0.26 - 0.90)	0.020
2019	0.40 (0.23-0.67)	0.001	0.55 (0.29 - 1.03)	0.060
Authors' sex				
Men only	Reference		Reference	
Only women	0.65 (0.43-0.97)	0.037	0.66 (0.43 - 1.00)	0.054
Mixed	1.17 (0.71-1.92)	0.527	--	--
Number of authors				
1	Reference		Reference	
2	2.03 (1.35 - 3.07)	<0.001	1.03 (0.61- 1.75)	0.922
3	2.79 (1.58 - 4.73)	<0.001	1.00 (0.48 - 1.93)	0.930
First advisor sex				
Man	Reference		--	--
Women	0.90 (0.52-1.56)	0.699	--	--
Number of advisors				
1	Reference		--	--
2	1.18 (0.74 - 1.81)	0.471	--	--
3	0.71 (0.16 - 1.98)	0.580	--	--

Study design				
Descriptive	Reference		Reference	
Analytical	2.01 (1.26 - 3.37)	0.005	0.91 (0.58 - 1.79)	0.994
Experimental	1.81 (0.39 - 5.50)	0.363	--	--
Systematic review	1.33 (0.46 - 3.23)	0.555	--	--
Study result				
Positive	Reference		--	--
Negative	0.65 (0.33-1.20)	0.225	--	--
thesis format				
Scientific article	Reference		Reference	
Traditional	0.34 (0.17-0.60)	<0.001	0.56 (0.25 - 1.23)	0.148
RR: relative risk, 95% CI: 95% confidence interval Own elaboration.				

Table 5. Characteristics of theses published in indexed journals (n =83).

	n	(%)
Publication language		
Spanish	42	50.6
English	41	49.4
Magazine		
National	20	24.1
Foreigner	63	75.9
Access		
Open	63	75.9
Closed	20	24.1
Corresponding Author		
Student	44	53
Adviser	31	37.3
Others	8	9.6
Indexing database		
latindex	2	2.4
Sky	4	4.8
Medline/ Pubmed	0	0
Scopus	26	31.3
Web of Science	51	61.4
Magazine quartile		

Not listed in Scimago	11	13.2
Q1	19	22.8
Q2	20	24.1
Q3	24	28.9
Q4	9	10.8
Time elapsed since support until publication (months)	9**	1.4
**Mean (Standard Deviation: SD)		

4. Discussion

The present study found that 26.3% of the theses published in an indexed journal corresponded to advisors with greater scientific production, which increased the probability of publication. The university of origin, the year of support and the sex of the authors (only when the independent variable was numerical) were factors associated with the publication of the thesis. Our analysis revealed that those who had advisors with greater scientific production (H index ≥ 9) were 67% more likely to publish their thesis. This association has not been reported in previous studies. However, previous research found that having an advisor and prior publication by him/her increases the probability of publication (10, 12-13). Therefore, advisors could possibly play a fundamental role in improving the low publication rate of medical students' theses.

In a study on the publication of medical advisors, most institutions presented a low number of publications, with the exception of the UPC, where 95.7% of their advisors published and obtained a higher H index (15). . Furthermore, in a study on the characteristics of research courses in Peru, the UPC was the only institution that included the publication of the final product in a journal as a requirement at the end of the course, unlike other institutions (27). Our findings indicate that 83% of the published theses belong to this university. These results could be attributed to the presence of advisors with high scientific production, as well as their focus on research.

Likewise, it was identified that the university of origin is another factor associated with the publication of the thesis. This finding coincides with previous research where it was observed that coming from a different institution was related to a greater probability of publication (8). Since, in addition to teaching, one of the functions of the university is to promote scientific research and the generation of new knowledge (5). For example, through strategies such as the inclusion of related courses and workshops in the curriculum, financial support through research funding, access to libraries and electronic resources (6-7). In addition, universities also encourage the dissemination of research through publication in scientific journals and participation in conferences.

Regarding the characteristics of the published theses, a low publication rate has been observed (26.3%). However, compared to other previous studies, publication rates lower than 20% have been reported (8–11). It is probably due to University Law No. 30220, which establishes that theses must be supported to obtain the professional degree and eliminates alternatives, such as the degree exam among other degree modalities which

were frequent in medical schools (5). Which could increase the probability of publication of the theses.

A greater probability of publishing the thesis has been identified when there are advisors with greater scientific production. Advisors play a critical role in providing methodological guidance and support during the thesis publication process (16, 27). Therefore, it is suggested to have advisors who have solid scientific production, as this could improve the low thesis publication rate.

Limitations and strengths

In relation to the limitations of the study, first, a new method of searching for theses in indexed journals was used, the effectiveness of which is not supported. To mitigate this limitation, previous research methods were also used (23). However, the method proposed in this study quickly identified studies not detected by other methods. Furthermore, the selection of private universities was based on convenience, limiting the extrapolation of results. However, a power calculation was performed, which exceeded the 80% threshold. Another limitation was the use of the Google Scholar H-index, which can generate an overestimation of the results (28). To reduce this limitation, it was stratified according to the year of support of the thesis using the Publish or Perish software to compare results in different periods. However, the exclusive use of the Hirsch H index as a measure of the advisor's scientific production, which may not fully capture his research activity, since other metrics were not considered, such as the total number of publications or the number of citations in the last five years. Finally, the reasons for non-publication were not directly obtained, which implies the possibility that there are other variables not measured in this study. Therefore, variables associated with the publication of thesis that were found in previous research were included (10, 12-13). Despite the aforementioned limitations, to the best of our knowledge, this study is one of the first to measure the association of the advisor's scientific production, measured by the H index, and thesis publication in Latin America.

5. Conclusions

- It was found that having an advisor with greater scientific production increases the probability of publishing the thesis.
- The university of origin, the year of support and the sex of the authors were identified as associated factors (only when the independent variable was numerical).
- Only 26.3% of the theses were published in scientific journals.
- The average time elapsed between the support or registration of the thesis and its publication was 9.9 (SD 1.4) months.

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