

FACTORS ASSOCIATED WITH KNOWLEDGE OF SCI-HUB IN PERUVIAN DENTAL STUDENTS.

Factores asociados al conocimiento del Sci-Hub en estudiantes peruanos de odontología.

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ABSTRACT:

Introduction: It is necessary to keep up to date regarding scientific advances, even when having controversial options such as Sci-Hub. The scientific literature is generally limited to opinions about the website and it is likely that certain personal or academic characteristics of undergraduate students are related to its knowledge.

Objective: To identify some socio-educational and scientific factors associated with knowing Sci-Hub in Peruvian dental students.

Material and Methods: The study uses a cross-sectional secondary data analysis design. In regard to the main variable, we asked about knowledge of the existence of Sci-Hub and calculated association statistics.

Results: There were 263 participants and the average age was 21.7. Of the total, 75% were female, and 59% knew about Sci-Hub. The multivariate analysis showed that knowing scientific journals (aPR: 2.35; 95% CI: 1.43-3.84; $p=0.001$), publication of scientific articles (aPR: 1.24; 95% CI: 1.00-1.54; $p=0.046$) and bibliographic search training (aPR: 1.45; 95% CI: 1.14-1.86; $p=0.003$) were factors associated with a greater level of knowledge in regard to Sci-Hub. In contrast, there was a lower level of knowledge among those with a basic level of English (aPR: 0.64; 95% CI: 0.50-0.82; $p=0.001$), adjusted for three variables.

Conclusion: Slightly more than half of the students know this resource used for obtaining scientific information, and it was predominantly associated with having a scientific background.

KEYWORDS:

Sci-Hub; Knowledge; Information; Dentistry; Students, dental; Open access publishing.

RESUMEN:

Introducción: Es necesario estar actualizados en los avances científicos, habiendo incluso opciones que son controversiales, como lo es Sci-Hub. La literatura científica generalmente se circunscribe a opiniones sobre el sitio web y es probable que ciertas características personales o académicas de los estudiantes de pregrado se relacionen con su conocimiento.

Objetivo: Identificar algunos factores socioeducativos y científicos asociados al conocimiento de la existencia del Sci-Hub en estudiantes peruanos de odontología.

Material y Métodos: El diseño utilizado fue transversal de análisis de datos secundarios. Para la variable principal se preguntó sobre el conocimiento de la existencia de Sci-Hub y se calcularon estadísticas de asociación.

Resultados: En los 263 participantes, el promedio de edad fue de 21,7 años, el 75% era del sexo femenino y el 59%

conocía el Sci-Hub. En el análisis multivariado, el conocimiento de revistas científicas (RPa: 2,35; IC 95%: 1,43-3,84; $p=0,001$), la publicación de artículos científicos (RPa: 1,24; IC 95%: 1,00-1,54; $p=0,046$) y la capacitación en búsqueda bibliográfica (RPa: 1,45; IC 95%: 1,14-1,86; $p=0,003$) fueron factores asociados a un mayor conocimiento del Sci-Hub; por el contrario, hubo un menor conocimiento entre los que tenían inglés en nivel básico (RPa: 0,64; IC 95%: 0,50-0,82; $p=0,001$), ajustado por tres variables.

Conclusión: Algo más de la mitad de los estudiantes conoce este recurso para la obtención de información científica, estando asociado predominantemente al tener antecedentes científicos.

PALABRAS CLAVE:

Sci-Hub; Conocimiento; Información; Odontología; Estudiantes de odontología; Publicación de acceso abierto.

INTRODUCTION.

Information skills are the basis for problem solving, communication and teamwork, continuous learning, decision making and the exercise of any profession. When you aspire to lifelong learning, from the university stage you have to learn to use resources to obtain scientific information;¹ however, in many universities the development of skills that allow access to quality scientific literature is neglected.²

For some time, the practice of the dental profession was based on accumulated personal clinical knowledge and adherence to historically supported procedures, in what could be called "experience-based dentistry". With the paradigm shift, dental practice went from being based on experience to being based on evidence, thus giving rise to Evidence-Based Dentistry (EBD).³ Access to scientific information is essential to guarantee

EBD. Although much of the scientific literature is published in open access journals, another part has subscription costs to access the content, which are often not affordable by readers and authors.³ Faced with this situation, alternatives emerged that guarantee free access for quality scientific information, among which is Sci-Hub.

Sci- Hub aims 'to remove all barriers in the way of science'. This is a pirate website that has a large volume of scientific articles from different sources and offers free access on a global scale. This site is one of the most controversial and questioned by the scientific community. This situation occurs due to the lack of an ethical approach, from the point of view of many researchers, as it is illegal because of the service it provides.²

However, many scholars defend its use arguing that the use of this site is a consequence of the lack of free access because of the high costs

imposed by journals and publishers in regard to their publications.^{4,5}

Thousands of articles are obtained daily through Sci-Hub, which could lead to the loss of important information. This is, libraries cannot keep record of the access, downloading and use of the resources. That may end up interrupting issues that are essential for their institutions. As they cancel subscriptions, the ability of non-profit scientific societies to provide journals and support their research communities diminishes.^{6,7} Currently, many prestigious journals have agreed to publish issues or articles in open access, which benefits the scientific community, especially those sectors that do not have free access to these journals and are forced to seek other means to read them.^{5,8,9}

Despite the existence of the site, its growing popularity and use in recent years, it is still unknown, to some extent, in the academic community, especially among students who are beginning their research career.¹⁰ The scientific literature on Sci-Hub does not exceed a few reports^{4-6,8,9,11,12} or generally shows opinions regarding the site.¹³⁻¹⁸

A research conducted in 6632 medical students from six Latin American countries evaluated the use, knowledge and perception of the scientific contribution of the site. This research found that only 19.2% of study participants knew of Sci-Hub and its function, while the median use was twice a month. 29.9% of Sci-Hub-aware participants claimed they always find the desired scientific information in their Sci-Hub search; 62.5% of participants affirmed that Sci-Hub contributes to scientific investigation; only 2.2% reported that Sci-Hub does not contribute to science.²

An investigation conducted in Cuban dental students reported that the minority of those surveyed were aware of Sci-Hub. In addition, half of those who knew the site said that they always get the articles they are looking for and that Sci-Hub contributes substantially to the development of scientific research.¹⁰

It is necessary to continue generating evidence, because there are few studies in this topic. In ad-

dition, it is likely that certain personal or academic characteristics at undergraduate level are related to the knowledge of this website. That motivated the present investigation, with the aim of identifying some socio-educational and scientific factors associated with knowledge of the existence of Sci-Hub in Peruvian dental students.

MATERIALS AND METHODS.

An observational, cross-sectional and analytical study of secondary data was carried out. This research team investigated the interest toward scientific research in Peruvian undergraduate dental students selected through a non-probabilistic snowball sampling.

Students of both sexes from all years of study and universities who wished to participate were included. Exclusion criteria were not established. The interest toward scientific research was investigated using a 12-items anonymous scale designed to evaluate aspects of scientific writing and scientific publication, participation in events and interest in future research-related work.^{19,20}

A questionnaire was developed specifically for this study, where participants were asked to provide information about age, sex, year of study, university type, English level, as well as other scientific characteristics that were used as independent variables in this research. The questionnaire included the question used for generating the dependent variable studied in this article.

Knowledge of the existence of the Sci-Hub website (with the categories yes and no) was considered the dependent variable. This dichotomous variable was generated using the students' answers to the question "Do you know the Sci-Hub website?" The independent variables were age, sex, academic year, university type (public/private), level of English (lower than basic, basic, intermediate and advanced).

They were evaluated by self-reporting to the question "What is your level of English?" The following dichotomous questions (yes/no) were also studied:

having a scientific tutor/advisor, membership in a scientific society, participation in events, conducting curricular and extracurricular research, knowledge of scientific journals, publication of articles, and training in scientific writing and literature search.

Due to social isolation measures during the survey phase, it was not possible to conduct the survey in person. Thus, we decided to use Google platform forms, where the scale was available for two months (October and November 2020). Through social networks (Facebook, Telegram and WhatsApp), participants were invited and told, through the invitation message, about the objective of the research and an informed consent was requested before starting to respond.

Ethical standards in research were respected at all times. Prior consent was requested from the respondents and we worked with total anonymity, in order to comply with the principles of internet-mediated research.²¹

The Ethical Review Board of the Carlos Manuel de Céspedes General University Hospital approved the study.

The data from the form were exported to a database created in Microsoft Excel (version 2019 for Windows). First, descriptive statistics were generated; for this, the frequencies and percentages of the categorical variables were generated; then the best measure of central tendency and dispersion of the quantitative variables was obtained.

The association between knowledge of the existence of the Sci-Hub website and the independent variables was evaluated using the Chi-square test and the generalized linear models, the Poisson family, log link function, models for robust variances and the use of the respondent's city as a cluster; this allowed determining which crosses were statistically significant in the bivariate model, so that they could enter the final multivariate model.

Table 1. Socio-educational characteristics according to knowledge of the existence of Sci-Hub in Peruvian dental students.

Variable	Do you know Sci-Hub?		p-value
	No (%)	Yes (%)	
Sex	Female	80 (40.8)	0.941
	Male	27 (40.3)	
Age (years)	20 (19-22)	22 (21-24)	<0.001
Year of study	First	20 (69.0)	<0.001
	Second	18 (62.1)	
	Third	23 (41.8)	
	Fourth	20 (35.1)	
	Fifth	16 (34.8)	
	Sixth	10 (21.3)	
University type	Public	88 (38.9)	0.154
	Private	19 (51.4)	
English level	Lower than basic	12 (40.0)	<0.001
	Basic	81 (50.6)	
	Intermediate	13 (24.5)	
	Advanced	1 (5.0)	

Crude prevalence ratios (cPR). 95% confidence intervals (95% CI) and p-values were obtained with generalized linear models, with Poisson family, log link function, models for robust variances and with the use of the respondent city cluster. Ref: reference category for comparison.

Subsequently, crude prevalence ratios (cPR), adjusted prevalence ratios (aPR), 95% confidence intervals (95% CI) and *p*-values were obtained, where values $p \leq 0.05$ were considered statistically significant. With this final multivariate model, it was possible to adjust for all the relevant variables for the crossing with the outcome (knowledge of the existence of Sci-Hub).

These statistical processes were used to be able to obtain the prevalence ratios (knowing that the Poisson family allows this), and the adjustment for the sample size was always taken (robust models). The statistical program Stata v.11.1 (StataCorp LP, College Station, TX, USA) was used.

RESULTS.

A total of 263 students from fifteen universities participated, with an average age of 21.68 years;

74.52% (n=196) were female; and 59.3% (n=156) knew about Sci-Hub. There was no difference in knowledge of its existence according to sex ($p=0.941$) or type of university ($p=0.154$).

However, there was a difference according to age ($p < 0.001$) and year of study ($p < 0.001$), (Table 1). According to scientific characteristics, there was a difference of knowledge of the existence of Sci-Hub among those who had a scientific tutor/advisor ($p=0.001$), those who belonged to a scientific society ($p=0.009$), those who had attended scientific events ($p=0.014$); those who knew scientific journals ($p < 0.001$), as well as among those trained in scientific writing ($p=0.002$), or in bibliographic search ($p < 0.001$). (Table 2)

When performing the bivariate analysis, we found an association between knowing about the existence of Sci-Hub according to age ($p=0.024$),

Table 2. Socio-educational characteristics according to knowledge of the existence of Sci-Hub in Peruvian dental students.

Variable		Do you know Sci-Hub?		p-value
		No (%)	Yes (%)	
Do you have a scientific tutor/advisor?	No	93 (46.0)	109 (54.0)	0.001
	Yes	14 (23.0)	47 (77.0)	
Do you belong to a scientific society?	No	81 (46.3)	94 (53.7)	0.009
	Yes	26 (30.0)	62 (70.5)	
Have you participated in scientific events?	No	75 (46.6)	86 (53.4)	0.014
	Yes	32 (31.4)	70 (68.6)	
Have you done curricular research?	No	79 (44.1)	100 (55.9)	0.096
	Yes	28 (33.3)	56 (66.7)	
Have you conducted extracurricular research?	No	88 (43.1)	116 (56.9)	0.132
	Yes	19 (32.2)	40 (67.8)	
Do you know any scientific journals?	No	35 (77.8)	10 (22.2)	<0.001
	Yes	72 (33.0)	146 (67.0)	
Have you published scientific articles?	No	105 (42.0)	145 (58.0)	0.057
	Yes	2 (15.4)	11 (84.6)	
Have you been trained in scientific writing?	No	77 (48.4)	82 (51.6)	0.002
	Yes	30 (28.9)	74 (71.2)	
Have you been trained in scientific search?	No	60 (63.2)	35 (36.8)	<0.001
	Yes	47 (28.0)	121 (72.0)	

p-values were obtained through the Chi-square test.

Table 3. Bivariate analysis of socio-educational and scientific factors according to knowledge of the existence of Sci-Hub in Peruvian dental students.

Variable	cPR	CI 95%	p-value
Male sex	1.01	0.87-1.17	0.909
Age (quantitative variable)	1.05	1.01-1.10	0.024
Year of study	First	Ref.	Ref.
	Second	1.22	0.91-1.64
	Third	1.87	1.08-3.26
	Fourth	2.09	0.93-4.73
	Fifth	2.10	0.96-4.60
	Sixth	2.53	0.98-6.58
Private university	0.80	0.44-1.43	0.448
Level of English	Lower than basic	Ref.	Ref.
	Basic	0.82	0.67-1.01
	Intermediate	1.26	0.99-1.58
	Advanced	1.58	1.12-2.23
Do you have a scientific mentor/advisor?	1.43	1.04-1.96	0.029
Do you belong to a scientific society?	1.31	0.87-1.99	0.200
Have you participated in scientific events?	1.28	0.94-1.76	0.120
Have you done curricular research?	1.19	0.99-1.43	0.053
Have you conducted extracurricular research?	1.19	0.87-1.64	0.275
Do you know any scientific journals?	3.01	1.69-5.39	<0.001
Have you published scientific papers?	1.46	1.12-1.90	0.005
Have you been trained in scientific writing?	1.38	0.83-2.28	0.209
Have you been trained in scientific search?	1.95	1.28-2.98	0.002

p-values were obtained through the Chi-square test.

Table 4. Multivariate analysis of socio-educational and scientific factors according to knowledge of the existence of Sci-Hub in Peruvian dental students.

Variable	aPR	CI 95%	p-value
Age (quantitative variable)	1.02	0.99-1.04	0.133
Year of study	First	Ref.	Ref.
	Second	1.08	0.76-1.52
	Third	1.59	0.85-2.98
	Fourth	1.51	0.80-2.83
	Fifth	1.60	0.84-3.05
	Sixth	1.78	0.79-3.99
Level of English	Lower than basic	Ref.	Ref.
	Basic	0.64	0.50-0.82
	Intermediate	0.89	0.70-1.14
	Advanced	1.05	0.85-1.28
Do you have a scientific mentor/advisor?	1.10	0.86-1.42	0.452
Do you know scientific journals?	2.35	1.43-3.84	0.001
Have you published scientific articles?	1.24	1.00-1.54	0.046
Have you been trained in bibliographic research?	1.45	1.14-1.86	0.003

Adjusted prevalence ratios (aPR), 95% confidence intervals (95% CI) and p-values were obtained with generalized linear models, Poisson family, log link function, models for robust variances and with the use of the respondent city as a cluster.

among third year students ($p=0.026$), according to having an advanced level of English ($p=0.009$), if they knew about scientific journals ($p<0.001$), according to having published a scientific article ($p=0.005$), or if they were trained in bibliographic search ($p=0.002$). (Table 3)

The multivariate analysis showed that there was a higher level of knowledge of Sci-Hub among those who knew about scientific journals (aPR: 2.35; 95% CI: 1.43-3.84; $p=0.001$), according to having published a scientific article (aPR: 1.24; 95% CI: 1.00-1.54; $p=0.046$), or if they were trained in bibliographic search (aPR: 1.45; 95% CI: 1.14-1.86; $p=0.003$). In contrast, there was a lower level of knowledge among those with a basic level of English (aPR: 0.64; 95% CI: 0.50-0.82; $p=0.001$), all of these were adjusted for age, having a tutor and area of residence. (Table 4)

DISCUSSION.

Scientific articles are vital for students, professors and researchers in universities, research centers and other knowledge institutions worldwide. Many librarians and researchers have criticized the commercial nature of scientific publishing and its increasing costs. The costs of subscriptions to academic databases prevent many knowledge institutions from affording them.¹⁶ This restricted access to the best quality scientific literature has conditioned the search for alternatives to obtain scientific articles, including Sci-Hub. We conducted this research in order to identify some socio-educational and scientific factors associated with knowing Sci-Hub in Peruvian dental students.

Approximately six out of ten of the students knew about the Sci-Hub website, which is higher than what was reported by Mejia *et al.*,² as well as Corrales-Reyes *et al.*,¹⁰ who found knowledge frequencies of 19% and 15%, respectively. The lack of knowledge of the site may be related to the fact that it is considered illegal^{2,9} and its URL is constantly changing due to this reason.²²

Students who were familiar with scientific

journals, as well as those who had published scientific articles, had a higher frequency of knowledge of the existence of Sci-Hub. This is logical and expected, since it is necessary to review the existing literature on the subject in order to publish research results. The ideal thing to do is to consume the contents of the leading journals in the area of knowledge in order to practice, in this case, Dentistry based on the best available evidence. However, if the necessary access is not available, alternatives such as the use of pirate websites, among others, are sought.⁵

Training in bibliographic search was associated with a higher frequency of knowledge of the existence of Sci-Hub, although no studies have been recorded whose outcome is this. Trained students are more skilled in searching scientific literature by using different information resources (databases, search engines and pirate websites), which, in turn, allows them to acquire academic and research experience.^{10,23}

Students who reported a basic level of English had less knowledge of the existence of Sci-Hub when compared with students with lower than basic level of English. This result is opposite to previous studies,²³ which reported that students with better English skills were more interested in obtaining high quality information, which is generally published in English, considered the lingua franca of science. Hence, they use different resources to access this information.

Mejia *et al.*,² found that belonging to a student scientific society, as well as completing curricular or extracurricular research projects, was associated with a higher frequency of knowledge of the website in medical students from six Latin American countries. Although statistically similar results were not obtained in the present study, it is necessary to highlight the role of these societies in the training of researchers at the undergraduate level and in the training regarding various topics related to this.^{24,25}

It should be noted that the type of sampling we used constitutes a design limitation, which

prevents us from generalizing the results to the undergraduate dental population in Peru.

In addition, the study was carried out on the basis of a previously structured database, which made it impossible to evaluate other variables that could be important. These variables could be, for example, the average number of articles downloaded, the degree of satisfaction with the site, the reasons for using it, among others.

CONCLUSION.

Approximately six out of ten students knew about the Sci-Hub website. Knowledge of scientific journals, publication of articles and training in bibliographic search were factors associated with a higher frequency of knowledge of the site.

Conflict of interests:

The authors declare that they have no conflict of interest.

Ethics approval:

The study was approved by the Ethical Review Board of the Carlos Manuel de Céspedes General University Hospital.

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All authors contributed, read and approved the final version of the manuscript.

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