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REVISIÓN BIBLIOGRÁFICA

World trends in health science student publications

Tendencias mundiales en publicaciones de estudiantes de ciencias de la salud

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ABSTRACT

Background: the training and promotion of new researchers as an essential contribution in the construction of science is now a crucial aspect in higher education.
Aim: to characterize communication patterns and impact of medical science student scientific output worldwide.
Methods: a bibliometric study was carried out on student scientific output in health sciences, using the Scopus database. It was defined as "article with student participation" those in which at least one author who declared in his affiliation to be a student of one of the careers in health sciences (Medicine, Dentistry or Nursing) appeared.
Results: Were retrieved 21162 documents, 94,77 % were original, followed by reviews (8,25 %) and letters (5,30 %). The most productive region was the Middle East. The Biomedical categories prevailed in the study, headed by Medicine.
Conclusions: the pattern of student scientific communication at a global level is characterized by a tendency to increase scientific output with a high leadership of authors from the Middle East and North America. These results reflect the rise of the scientific student movement in recent years, in terms of raising the scientific quality of graduates of health sciences careers.

Keywords: Bibliometrics; Medical Student; Dentistry Student; Nursing Student; Scientific output; Student Publication; Student Research.

RESUMEN

Antecedentes: la formación y promoción de nuevos investigadores como contribución esencial en la construcción de la ciencia es hoy un aspecto crucial en la educación superior.
Objetivo: caracterizar los patrones de comunicación y el impacto de la producción científica de los estudiantes de ciencias médicas en todo el mundo.
Métodos: se realizó un estudio bibliométrico de la producción científica estudiantil en ciencias de la salud, utilizando la base de datos Scopus. Se definió como "artículo con participación de estudiantes" aquel en el que aparecía al menos un autor que declaraba en su filiación ser estudiante de alguna de las carreras de ciencias de la salud (Medicina, Odontología o Enfermería).
Resultados: se recuperaron 21162 documentos, el 94,77 % eran originales, seguidos de revisiones (8,25 %) y cartas (5,30 %). La región más productiva fue Oriente Medio. Las categorías Biomédicas predominaron en el estudio, encabezadas por Medicina.
Conclusiones: el patrón de comunicación científica estudiantil a nivel global se caracteriza por una tendencia al aumento de la producción científica con un alto liderazgo de autores de Oriente Medio y Norteamérica. Estos resultados reflejan el auge del movimiento estudiantil científico en los últimos años, en términos de

elevar la calidad científica de los egresados de las carreras de ciencias de la salud.

Palabras clave: Bibliometría; Estudiante de Medicina; Estudiante de Odontología; Estudiante de Enfermería; Producción científica; Publicación estudiantil; Investigación estudiantil.

INTRODUCTION

The path towards the desire for scientific research usually begins in university life or perhaps much earlier in the sense of knowing or disclosing new discoveries.[1]

The training and promotion of new researchers as an essential contribution in the construction of science is now a crucial aspect in higher education.[2] In medical education, scientific research is one of the fundamental pillars, becoming increasingly attached to the curricular and abandoning the term of extracurricular activity already in the present century.[3]

Taking into account that the health professional from interrogation to therapeutics is closely linked to the research[4] and not only that, it contributes to the training of students of professional capacities of great importance as: creativity, critical thinking, achievement orientation, ethical sense, quantitative reasoning and autonomous learning, which is why the current medical university assumes important strategies for the formation of research skills from the undergraduate level[5] by constituting an element decisive for the professional future in the development of different social contexts,[6] and to be considered at present as the fundamental axis of said education.[7]

The scientific activity in the undergraduate program has had a significant increase for several decades, especially with the contribution of the scientific student societies as groups that bring together young people with common sense for science.[8,9]

The inclusion in the curriculum of the different content careers that in an articulated manner give students the necessary competencies to carry out research work, including the publication process, is currently a controversial topic.[10] In correspondence with this, several training and promotion strategies for student research and publication have been proposed.[4,11,12]

Student scientific publication is one of the most important elements in the process of scientific training of health science professionals, giving the possibility of publishing their own work and publicizing their research.

Every effort that attempts to demonstrate the status of student publication in journals, whether student or not,[13] and mechanisms to improve it, should be encouraged, bearing in mind that it is the only aspect to evaluate scientific output.[14]

Scientometric has emerged in recent decades as a necessity in the face of the immense scientific development achieved by humanity. Nowadays, it is an effective tool to measure scientific output and consequently to evaluate the development of science.[15] Among the most important advantages are the facilitation of elements of judgment and quantitative results aimed at drawing up policies for development.[16]

The heterogeneity of the evaluation studies of the scientific student publication that in many cases makes comparison impossible, it is pertinent to develop a study that allows to approximate its dimension at a global level, that is why the present investigation was carried out with the objective of to characterize communication patterns and impact of medical science student scientific output worldwide.

METHODS

A bibliometric study was carried out on student scientific output in health sciences (careers in Medicine, Dentistry and Nursing), using the Scopus database.

It was defined as "article with student participation" those in which at least one author who declared in his affiliation to be a student of one of the careers in health sciences (Medicine, Dentistry or Nursing) appeared. This methodology has been used previously by other authors.[17,18]

The methodology developed in this study consisted in the analysis of the articles through the search strategy (see Appendix A); since one has reference in Scopus database from 2000 to the 2021.

The countries were added in 8 regions (Africa, Asia, Eastern Europe, Western Europe, Latin America, Middle East, North America and Pacific).

Bibliometrics indicators:

- Number of documents of any type of document (Ndoc).
- Percentage of documents (% Ndoc).
- Number of citable documents: Originals, Reviews and Conference Proceedings (Ndocc).
- Number of citations received by any type of document (Ncit).
- Average number of citations per document (Cpd).

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- Percentage of cited documents (% Ndoc-cit).
- Index H.

The co-occurrence matrices for the analysis of social networks between authors and terms were developed with the Gephi and VOSviewer programs were used to visualize the relationships between these networks. For the representation of these networks of authors and terms by means of bibliometric maps, those where there was co-occurrence for terms and for authors.

The statistical processing was performed in Microsoft Office Excel 2016. The results are presented summarized in tables and graphs.

RESULTS

Were retrieved 21162 documents, 94,77 % were original, followed by reviews (8,25 %) and letters (5,30 %). The rest (8,55 %) corresponds to the notes, editorials, conference article, book chapter, errata and others. The figure 1 show the number of documents by year and Figure 2 the number of documents by country.

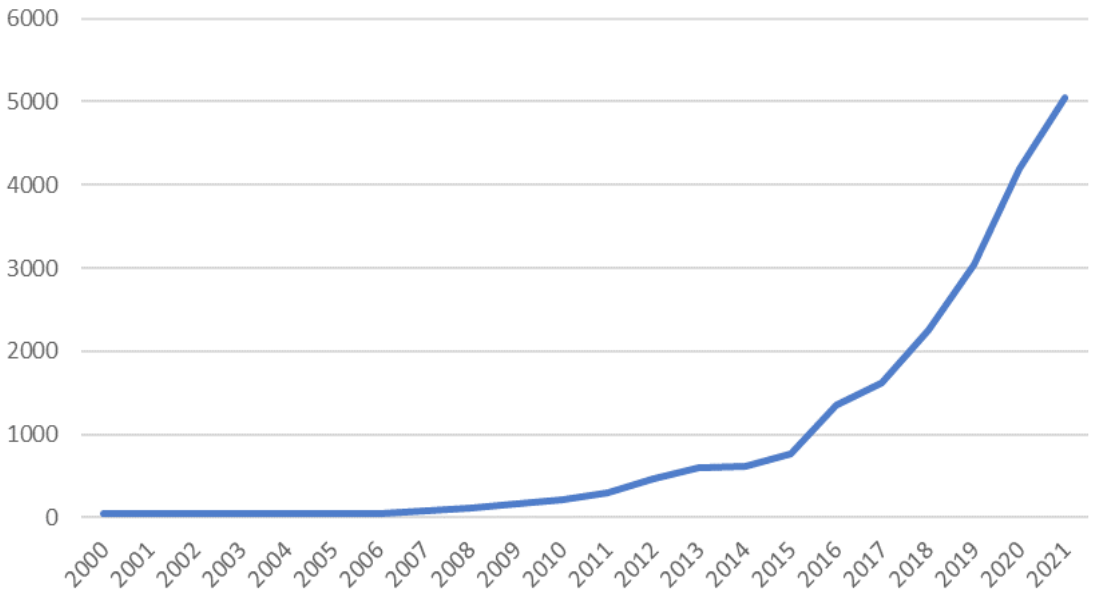

Figure 1. Number of documents by year.

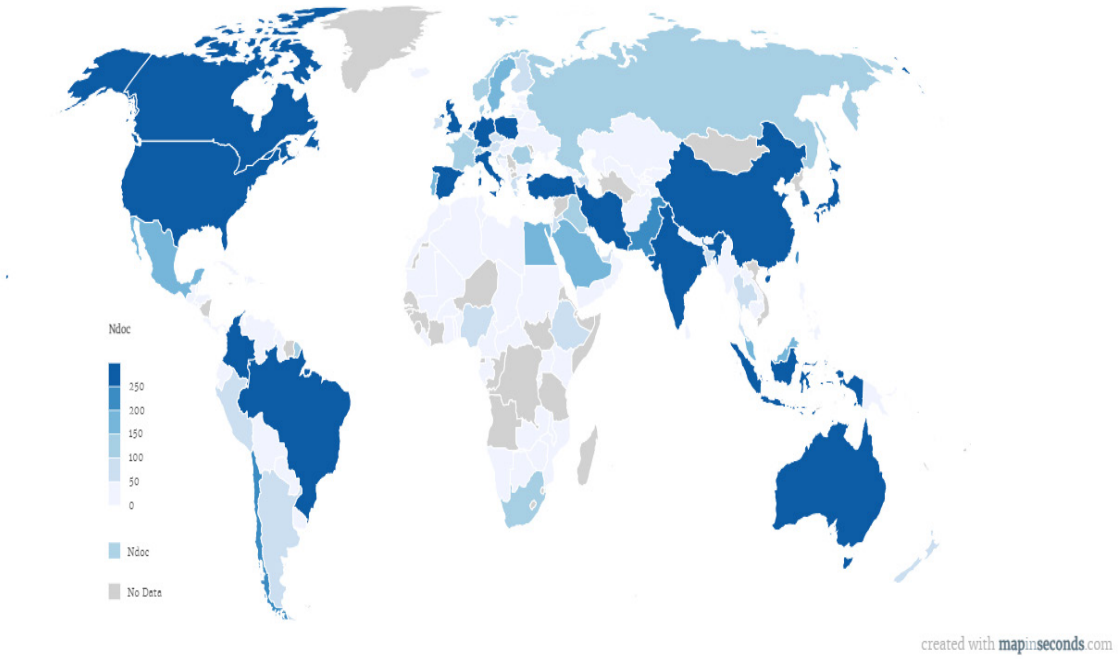

Figure 2. World map with Ndoc by countries.

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Table 1. Countries with the higher output in each region

Country	% Ndoc	Rank Ndoc
Latin America (14 countries)		
Brazil	2,81 %	5
Colombia	1,65 %	7
Chile	0,69 %	16
Mexico	0,66 %	17
Perú	0,29 %	24
North America (2 countries)		
United States	18,83 %	2
Canada	1,36 %	9
Eastern Europe (15 countries)		
Poland	2,16 %	6
Croatia	0,22 %	28
Bulgaria	0,16 %	30
Romania	0,10 %	34
Hungary	0,07 %	36
Russian Federation	0,07 %	36
Serbia	0,07 %	36
Western Europe (17 countries)		
United Kingdom	2,90 %	4
Netherlands	0,97 %	12
Germany	0,84 %	13
Spain	0,69 %	16
Sweden	0,49 %	20
Asia (15 countries)		
China	3,13 %	3
Japan	1,63 %	8
Taiwan	1,18 %	11
India	0,82 %	14
Pakistan	0,76 %	15
Middle East (14 countries)		
Iran	47,22 %	1
Turkey	0,64 %	18
Egypt	0,36 %	22
Saudi Arabia	0,32 %	23
Israel	0,13 %	32
Pacific Region (2 countries)		
Australia	1,34 %	10
New Zealand	0,09 %	35
Africa (10 countries)		
South Africa	0,09 %	35
Kenya	0,04 %	38
Nigeria	0,03 %	39

The students published in 160 sources (journals, conference proceedings or books), in table 2 they relate those who had 30 documents or more.

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Table 2. Sources with bigger quantity of documents

Rank	Tittle	Ndoc	SJR	SJR Best Quartile	Country
1	Journal of Isfahan Medical School	270	0,132	Q3	Iran
2	Journal of Mazandaran University of Medical Sciences	135	0,229	Q3	Iran
3	Journal of Prosthetic Dentistry	113	1,047	Q1	United States
4	Journal of Oral and Maxillofacial Surgery	81	0,78	Q1	United Kingdom
5	International Journal of Pediatrics	78	0,11	Q4	Iran
6	Academic Medicine	75	2,267	Q1	United States
7	Research Journal of Pharmaceutical Biological and Chemical Sciences	58	0,223	Q3	India
8	Der Pharmacia Lettre	57	0,157	Q3	United States
9	Advanced Pharmaceutical Bulletin	56	0,608	Q1	Iran
10	Journal of Contemporary Dental Practice	55	0,23	Q3	United States
11	Asian Pacific Journal of Cancer Prevention	53	0,743	Q2	Thailand
12	JAMA The Journal of The American Medical Association	45	6,866	Q1	United States
13	Journal of Medical Education	40	0.145	Q3	Iran
14	JPMA. The Journal of the Pakistan Medical Association	39	0,258	Q3	Pakistan
15	Journal of Dental Education	38	0,408	Q2	United States
16	Life Science Journal	38	0,135	Q4	China
17	Iranian Red Crescent Medical Journal	34	0,431	Q2	Netherlands
18	Journal of Foot And Ankle Surgery	33	0,608	Q2	United Kingdom
19	Caspian Journal of Internal Medicine	31	0,588	Q2	Iran
20	Rhode Island Medical Journal	31	0,162	Q3	United States
21	Comparative Clinical Pathology	30	0,177	Q3	Germany

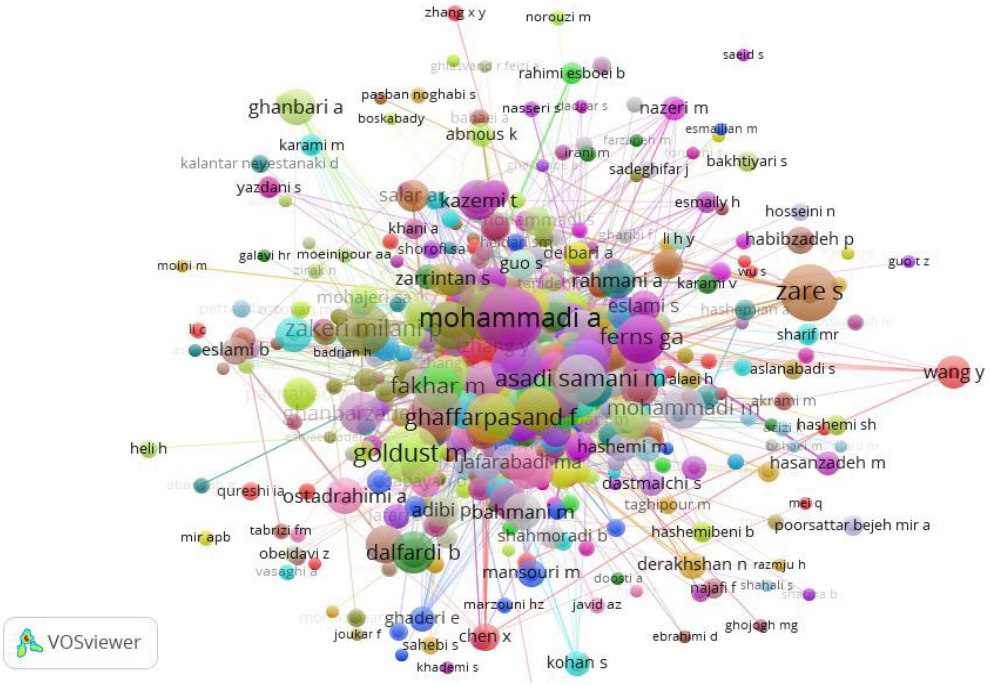

Figure 3. Co-authorship networks

As shown in figure 3, the co-authorship network was formed by 2797 authors given they collaborated in the production of at least two documents. The Figure 4 the main co-authorship represents 1 % of the author total (level 10 co-ocurrence, 10 or more colaborations).

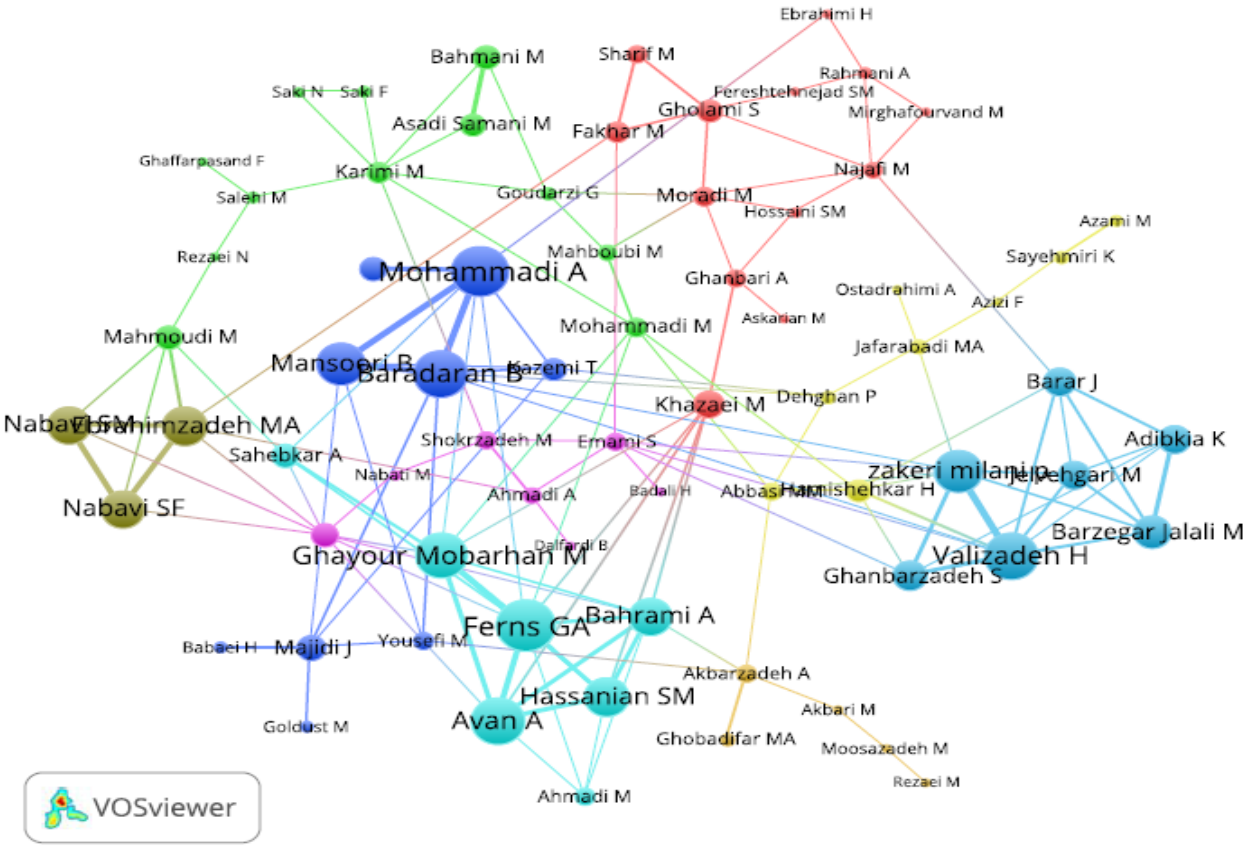

Figure 4. Main co-authorship networks

Visibility of student scientific output

Of the 21162 documents, 59,01 % received at least one citation. Figure 6 the main citation indicators by region.

Region	%Ndoc-cit	%Cit	Cpd	H Index
Middle East	48,62	52,17	18,70	33
North America	19,86	34,20	62,11	72
Asia	8,61	9,14	5,37	29
Western Europe	7,57	7,18	9,01	30
Latin America	6,44	6,76	1,73	15
Eastern Europe	2,93	3,00	1,32	13
Pacific Region	1,40	1,45	1,55	16
Africa	0,23	0,24	0,20	5

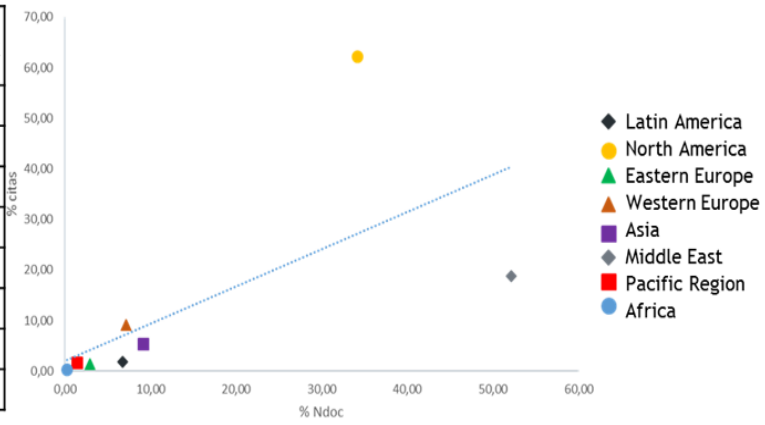

Figure 5. Citation indicators by region

The most influential articles (1 % most cited) constituted 62 articles, with an average of 150 citations per article.

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Qualitative and thematic analysis

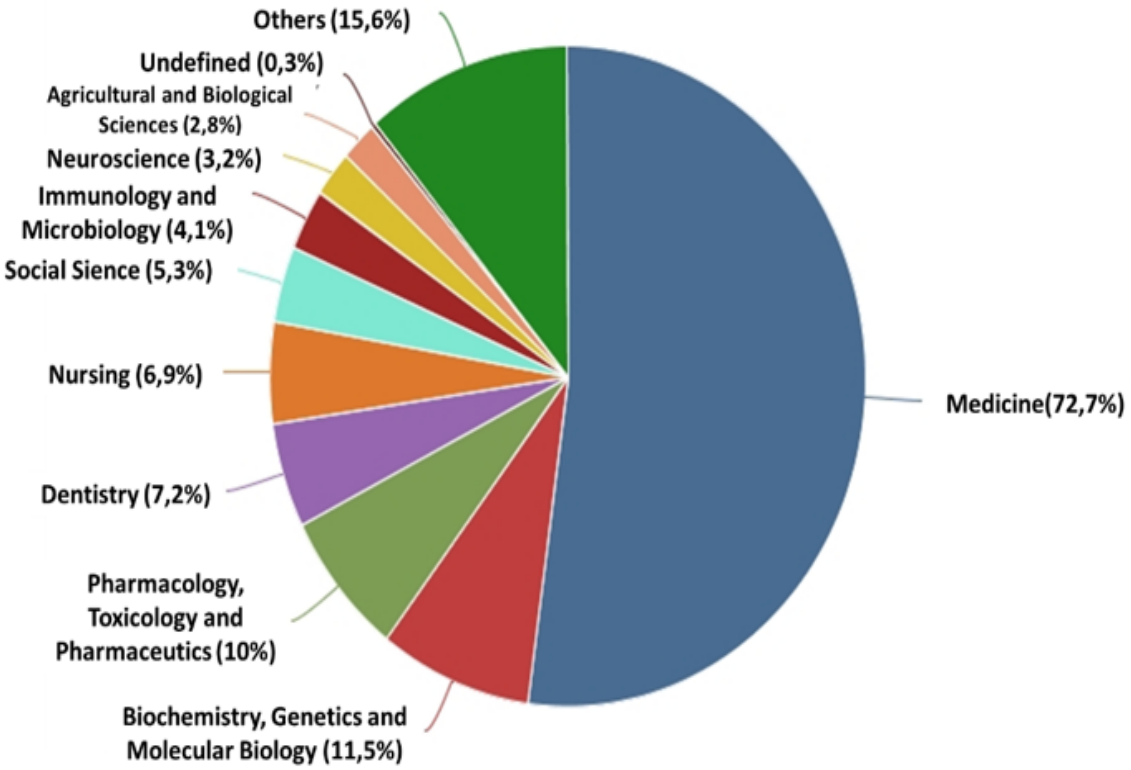

Figure 6. Distribution of the documents according to thematic area.

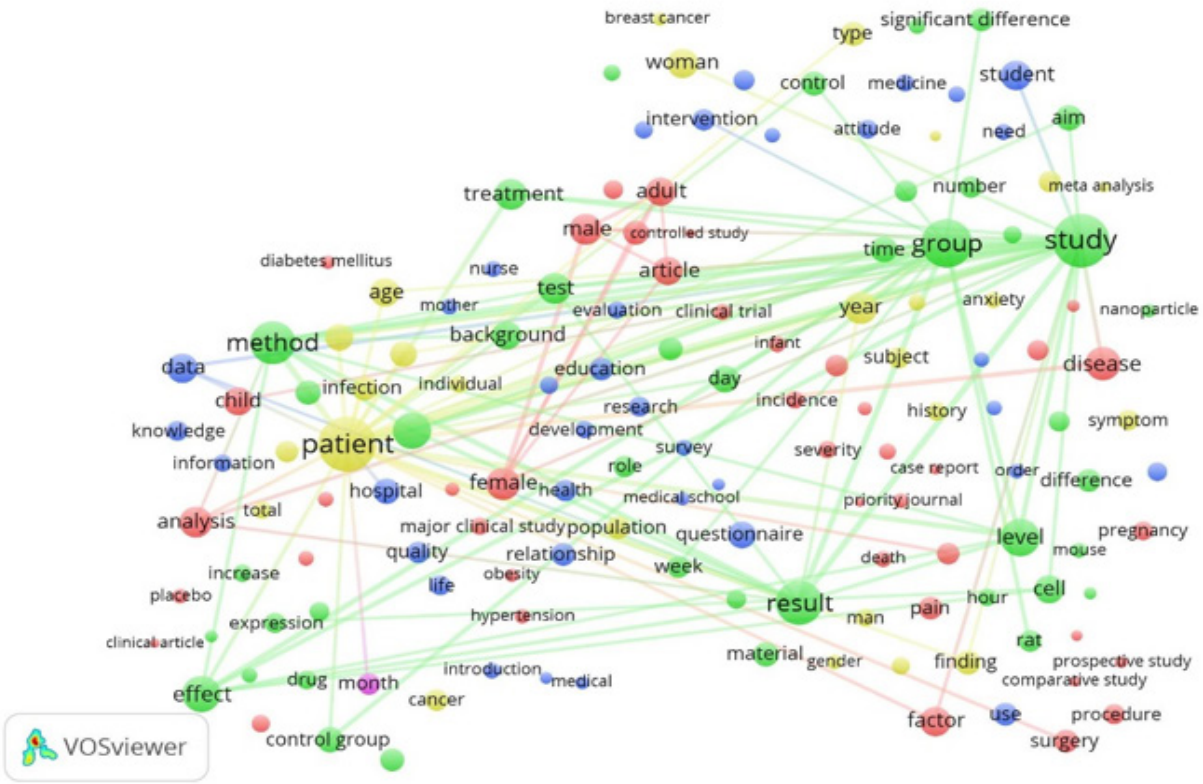

Figure 7. Visualization network of the term co-occurrence analysis associated to the student scientific output.

DISCUSSION

Despite the limitations described in the literature, ranging from denial of the submission just for being a

student, lack of interest or training in publication issues to the scarce publication of manuscripts derived from congresses;[19,20,21,22,23,24] the tendency of the scientific student production is to the growth, that is observed more marked then in the last 12 years where they published more than a hundred articles per year.

Very positive aspect is that about 95 % of student communications were original articles, since what represents a strength since they suppose results of relevant scientific research, are the vehicle most frequently used to communicate new knowledge and generally have a superior impact. No studies are reported with such a high percentage of originals, in most cases this type of article does not exceed 70 %, although the literature describes that the originals are generally the largest part.[26,27,28,29,30]

The most productive region was the Middle East, where there are numerous studies where student scientific output is analyzed from different angles and methodologies.[5,26,31,32,33,34]

Iran and the United States generated more than 50 percent of communications, the last one is considered the leader in scientific output in medicine worldwide.[35,36]

Praneeth Wickramasinghe et al.[37] found results similar to our study, but they do not delimit the most productive countries by region. Independently of this, one of the factors that could be influencing is the existence of few student journals.[38]

The Latin American region has the largest number of journals published by students,[38] giving the possibility that a considerable volume of them can publish their documents in them, however it is not among the least productive regions.[39,40] The studies on student publication reflect Chile, Colombia and Peru as the most productive.[18,28,41] It is striking that Brazil leads the group, although this is the most productive in the region in Biomedicine,[36,42,43] no articles were found that are identified even among the most productive.[44]

In the same way, numerous initiatives have been carried out in order to know and encourage student research and publication.[10,45,46,47,48,49] Equally, the realization of student exchanges and academic mobility constitutes another solid way of giving visibility to the different medical programs at regional, national and international level. Students from different countries have the opportunity to share their experiences, acquire the latest medical knowledge and skills in prestigious institutions.[50]

88,95 % were citable documents, similar but not superior figures are reported, Alnajjar et al.[26] reports 36,98 %, Ortega-Loubon et a.[51] 69,23 % and Gonzalez-Argote et al 84,20 %[17].

The presence of a large number of publications without citations or that received 10 or less is noticeable, this could be due to two main factors, its low impact or that are underestimated, given that its authors are students.[17,18,52]

Although the region of the Middle East accumulates 52,17 % of the citations, it is notable that communications from the United States and Canada have a higher overall impact given higher citations for documents and H index.

No similar impact indicators were identified, in analysis of impact indicators of scientific output in Public Health North America remains the leader (both in productivity and impact indicators),[36] followed by Europe of the West and Asia, not like that in the Middle East, which is in the penultimate position.

The Biomedical categories prevailed in the study, headed by Medicine, which was to be expected since the object of study was the students of the Health Sciences.

Study limitations and future research

As an external limitation of our study we have the use only of the Scopus database, which despite its wide thematic, linguistic and geographical coverage does not cover all the scientific output worldwide, in our study regional bases were not included, such as SciELO, Redalycs, Lilacs, Dialnet, IME or others, nor the student magazines since it was not methodologically feasible. The internal limitation was similar to other analyzes,[17,18,52] who declare that in this type of analysis there could be "ghost authors" since their authors being students they did not indicate it in their filiation.[53,54]

Given that the database does not provide indicators of international collaboration, it was not possible to use this valuable indicator in the analysis, so that it is necessary to carry out future research on the subject, although a high level of collaboration was observed in the main networks of research, however it is not possible to differentiate the type of collaboration, in general the studies found little or no collaboration in the articles with student participation.[17,18,55]

CONCLUSIONS

The pattern of student scientific communication at a global level is characterized by a tendency to increase scientific output with a high leadership of authors from the Middle East and North America.

These results reflect the rise of the scientific student movement in recent years, in terms of raising the scientific quality of graduates of health sciences careers.

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APPENDIX A

SEARCH STRATEGY:

(AFFIL(estudiante de medicina) OR AFFIL(medical student) OR AFFIL(medicine student) OR AFFIL(estudiante medicina) OR AFFIL(stomatology student) OR AFFIL(dentistry student) OR AFFIL(estudiante de estomatologia) OR AFFIL(estudiante estomatologia) OR AFFIL(dental student) OR AFFIL(nursing student) OR AFFIL(nurse student) OR AFFIL(estudiante de enfermeria) OR AFFIL(estudiante enfermeria))

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