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The Landscape of Medical Education Internationalization in Iran Through a Scientometrics Lens

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Abstract

Background: The internationalization of medical education is essential for preparing healthcare professionals to address global health challenges. In Iran, while this initiative has become a strategic priority, a systematic understanding of research trends in this area remains elusive. Therefore, we quantified the trend of research outputs in this domain by identifying publication trends, influential contributors, and key thematic developments.

Methods: This scientometric study was conducted based on a systematic analysis through the international databases PubMed and Scopus, without time limitation. Using validated strategies, duplicate records were removed, and eligible publications were analyzed using scientometric indicators: publication growth, citation impact, and collaboration networks. Data visualization was performed with VOSviewer to map co-authorship and thematic networks.

Results: A total of 94 publications were analyzed, revealing a significant upward trend in research over the past decade. The average number of citations per publication was 2.32. Thematically, the core research areas included "internationalisation," "faculty mobility," and "higher education," while emerging topics highlighted "artificial intelligence" and "digital entrepreneurship." Tehran and Kerman universities of Medical Sciences emerged as leading contributors, although international collaborations accounted for only 4.3% of the publications.

Conclusion: While research on the internationalisation of medical education in Iran is growing, it is still in its nascent and developmental stage. Strengthening global partnerships, enhancing interdisciplinary collaborations, and prioritizing publications in high-impact journals are critical to increasing the field's global influence. Future research should integrate Iranian initiatives into international networks and focus on cross-regional comparisons to address the existing gaps.

Keywords: Internationalisation, Medical Education, Scientometrics, Iran, Higher Education

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Introduction

The internationalization of medical education has become an essential strategy for developing healthcare professionals capable of addressing the complex health challenges of an increasingly globalized society (1). Accordingly, by integrating global perspectives, cross-cultural competencies, and adherence to international standards,

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↑What is "already known" in this topic:
In Iran, the internationalisation of medical education has gained significant importance, reflecting the country's commitment to enhancing healthcare professional training in alignment with global standards.

→What this article adds:
Medical education internationalization in Iran has experienced substantial growth in research output over the past decade. Research has primarily focused on faculty mobility and higher education themes, while emerging areas like artificial intelligence reflect a shift toward addressing contemporary global challenges. Advancing the field requires fostering global partnerships, expanding interdisciplinary collaborations, and increasing the presence of Iranian research in high-impact international journals to amplify its global influence.

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medical institutions strive to produce graduates equipped for diverse healthcare environments (2).

In Iran, the internationalization of medical education has gained significant importance, reflecting the country's commitment to enhancing healthcare professional training in alignment with global standards and competencies (3). Over recent decades, Iran has placed greater emphasis on internationalization, driven by policies that encourage academic collaboration, knowledge exchange, and alignment with international medical education standards (3-5). Despite this strategic focus, a systematic understanding of the scope, impact, and development of internationalization efforts within Iran's medical education system remains limited and has yet to be achieved.

In this regard, an Asian study calls for making "Asia's voice heard in the world of higher education (6). Accountability, governance, internationalization, ranking, and the development of world-class universities are among the key challenges facing higher education systems in the Asian region (7).

The field of internationalization research is diverse, with many facets to explore. Scientometrics offers a robust approach to examining the evolution of internationalization in medical education (8). By analyzing publication trends, identifying core themes, and assessing the discourse surrounding this subject, scientometric methods enable the systematic mapping of research activity. This includes identifying key contributors, influential publications, and providing a comprehensive view of how internationalization in medical education is being studied in Iran (9).

This study applies scientometric techniques (10) to characterize the research landscape of internationalization in Iranian medical education. By analyzing bibliometric indicators, such as publication growth, citation impact, and coauthorship networks, we aimed to delineate the developmental trajectory of this research domain in Iran. The aim was to identify leading themes, uncover emerging trends, and highlight strengths, gaps, and opportunities for future research and policy development to enhance global competencies in medical education in Iran.

Methods

Study Design

This study employs a scientometric approach to analyze research trends on the internationalisation of medical education in Iran. The scientometric analysis, as a quantitative technique, has been conducted to study patterns in academic publications, citations, and collaborative networks within the study's field (11).

Data Collection

Data were collected from 2 international databases, PubMed and Scopus, which encompass knowledge products along with valid citation reports, which are widely used for comprehensive scientometric studies (12).

We developed search strategies for each database by considering the 3 main domains: "internationalization," "medical education," and "Iran." These strategies were validated by an external scientific group (Table 1). No language or time limitations were imposed on the search to capture the most relevant publications in the field.

Inclusion and Exclusion Criteria

Publications were included if they specifically addressed aspects of internationalization within medical education in Iran, such as curriculum internationalization, cross-border medical collaborations, and student or faculty exchange programs. Studies outside the field of medical education or those that did not focus on internationalization were excluded from the analysis.

Data Processing and Analysis

Data were exported in CSV and RIS formats and processed using Clarivate EndNote 21 software. As there is an overlap in some records between the international databases, duplicate entries were removed. The remaining records were then screened based on their titles and abstracts. The included results were analyzed according to publication trends, citations, publication sources, document types, responsible institutions, authorship and collaboration networks, keywords, and research themes. This process was conducted by 2 researchers independently. The assessment results were compared, and cases of agreement were included. In cases of discrepancy, a third party's opinion was considered. The primary categorizations were based on Scopus, and additional cases were considered by consensus.

Citation and impact indicators for the retrieved publications were assessed using Harzing's Publish or Perish 8.16 (Windows GUI Edition) (13). To ensure data accuracy and reliability, all search queries and data extraction processes were repeated by researchers. Discrepancies in data coding

Table 1. Search strategies for retrieve publications on medical education internationalisation in Iran

Database	Search strategy
PubMed	("Medical education"(Title/Abstract) OR "Premedical Education"(Title/Abstract) OR "Bachelor of Medicine and Bachelor of Surgery"(Title/Abstract) OR "MBBS"(Title/Abstract) OR "education, medical"(MeSH Terms) OR "education, premedical"(MeSH Terms)) AND ("internationalization"(Title/Abstract) OR "internationalisation"(Title/Abstract) OR "international Educational Exchange"(MeSH Terms) OR "international cooperation"(MeSH Terms) OR "international applicant*"(Title/Abstract) OR "International collaboration"(Title/Abstract) OR "international cooperation"(Title/Abstract) OR "Study abroad"(Title/Abstract) OR "recruiting student*"(Title/Abstract) OR "student* mobility"(Title/Abstract) OR "student* recruitment"(Title/Abstract) OR "foreign student*"(Title/Abstract) OR "visiting student*"(Title/Abstract) OR "international student*"(Title/Abstract) OR "international student* mobility"(Title/Abstract)) AND ("iran"(MeSH Terms) OR "iran"(All Fields) OR "IR.Iran"(Title/Abstract) OR "I.R.Iran"(Title/Abstract))
Scopus	TITLE-ABS-KEY ((internationali?ation OR "international applicant*" OR "International collaboration" OR "International cooperation" OR "Study abroad" OR "recruiting student*" OR "Student* mobility" OR "scholar mobility" OR "Student* recruitment" OR "curriculum partnership" OR "Oversea student*" OR "Foreign student*" OR "Visiting student*" OR "International student*" OR "international student* mobility") AND ("Medical education") AND Iran)

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or categorization were resolved through consensus discussions. Sensitivity analyses were also conducted to test the robustness of the findings by slightly modifying the search terms and inclusion criteria.

To visualize collaborative and thematic networks, we used VOSviewer software (14) developed by the Centre for Science and Technology Studies at Leiden University, Netherlands. For each term meeting the established threshold, a relevance score was calculated, and the most pertinent terms were selected. The resulting maps were generated based on information from the title, abstract, and author fields. Using VOSviewer and considering thresholds involving at least 1 fractionally counted paper per word, maps of co-authorship and keyword networks were created.

VOSviewer automatically assigns nodes within a network to clusters, where a cluster represents a group of closely related nodes. The size of bubbles represents the frequency of appearance of a term. In addition to standard attributes such as links and total link strength, items can also be assigned custom weight attributes. Density visualizations offer a rapid overview of key areas within a bibliometric network, while overlay visualizations can illustrate trends and developments over time (14). In this way, the emerging topics have been revealed by small circles that are not strongly linked to the main circles.

Results

Publication Trend and Analysis

A total of 186 publications on the internationalization of medical education in Iran were identified from 1971 to 2024. Due to overlap in the databases, 61 duplicate records were excluded. After screening the titles and abstracts, 94 records remained (PubMed: 26, Scopus: 65), which were considered for further analysis. These publications consist of 87 journal articles, 6 books, and 1 conference paper. Of these, 92% were published in English, while the remainder were in Persian.

The earliest publication, titled “A Personal View of Recent Medical and Educational Developments in Iran,” was published in 1971 in the British Journal of Medical Education (15). Three articles were published before the year 2000 (15-17). However, a rising trend in publications has been observed in the last decade (Figure 1).

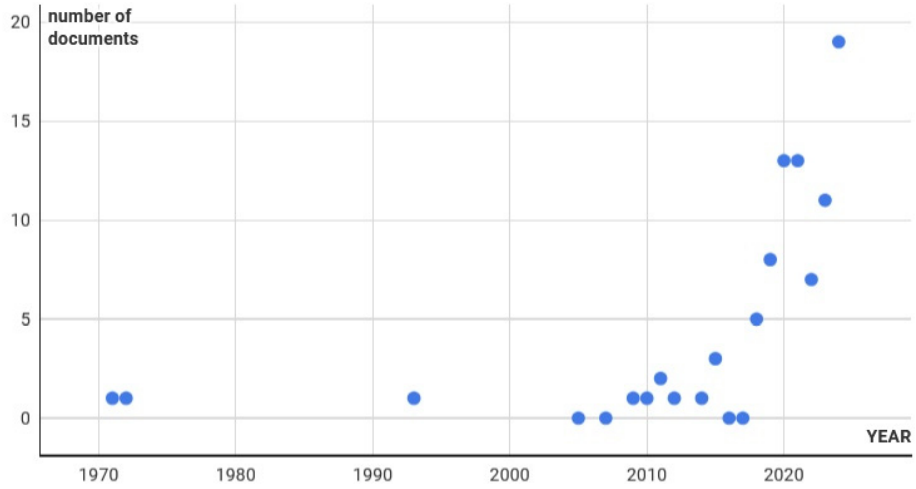

Figure 1. Time trend of the number of publications on the internationalization of medical education in Iran

Table 2. Citation Metrics based on Harzing’s Publish or Perish analysis report

Citation Metrics	Description	Measure
Publications	Total number of currently selected results	94
Citations	Sum of the citation counts across all currently selected results	216
Cites/year	Average number of citations per year	14.4
Cites/paper	Sum of the citation counts across all papers, divided by the total number of papers	2.32
Cites/author	Average number of citations per author	82.81
Papers/author	Average number of papers per author	37.5
Authors/paper	Average number of authors per paper	3.67
h-index	The h-index is the largest number h such that h articles have at least h citations each.	7
g-index	It is defined as the largest number n of highly cited articles for which the average number of citations is at least n.	10
hI,norm	It first normalizes the number of citations for each paper by dividing the number of citations by the number of authors for that paper, then calculates hI,norm as the h-index of the normalized citation counts.	4
hI,annual	The hI,annual is an indicator of an individual's average annual research impact	0.27
AWCR	Age-weighted citation rate is the number of citations to a given paper divided by the age of that paper.	101.42
AW_index	The AW-index is defined as the square root of the AWCR to allow comparison with the h-index.	10.07

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Citation Analysis and Influential Publications

Our study found that the total number of citations for the 94 included publications was 216. Citation metrics indicated that 2 publications have been particularly influential within this research domain, each with 16 citations. These highly cited works address the impact of the coronavirus disease 2019 (COVID-19) pandemic on medical education in Iran (Field weighted citation impact: 1.84, captures: 63) (18), and the globalization of national journals, investigating the growth of international authorship (Field weighted citation impact 0.83, captures 10, and 1 policy citation) (19). The scientometric indicators for the included publications are presented in Table 2.

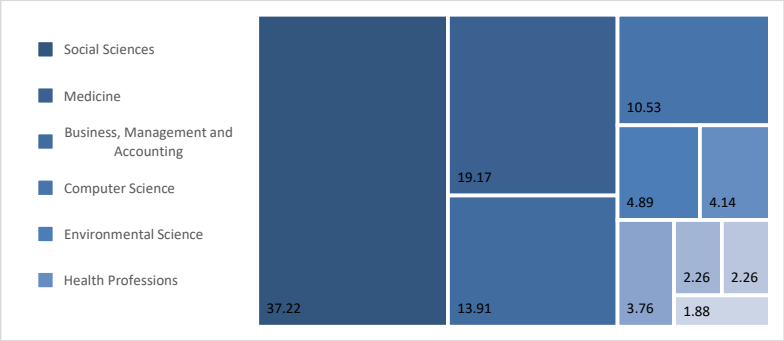
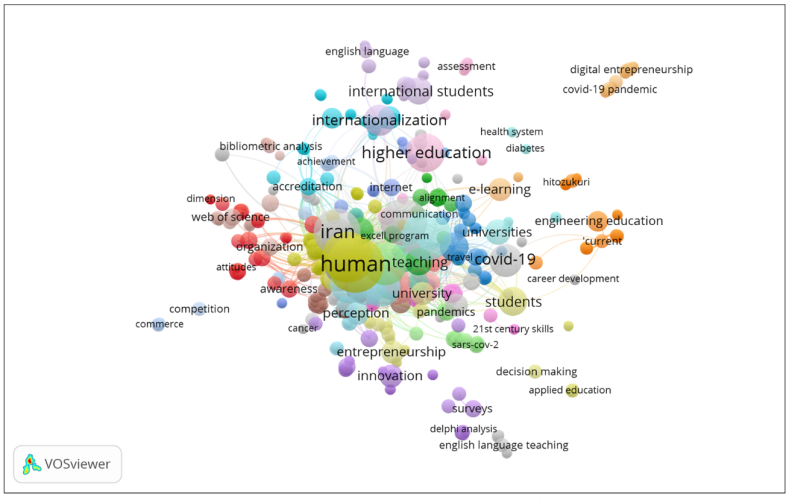
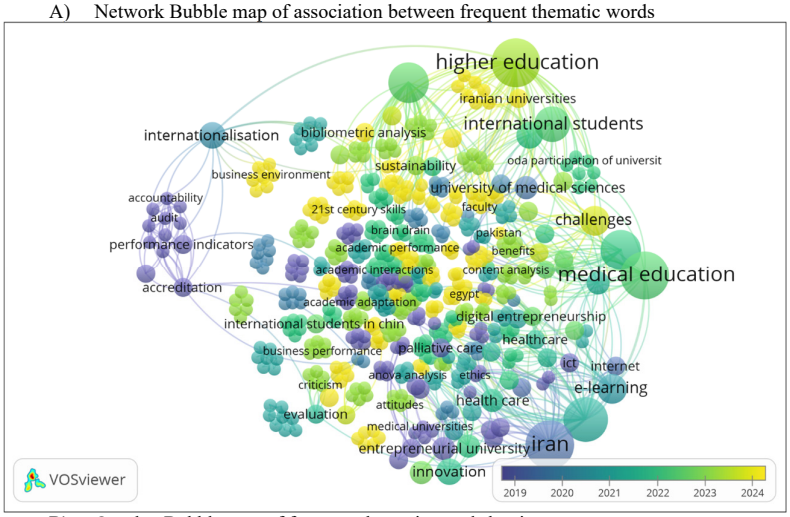


Figure 2. Percent frequency of core research themes in retrieved publications on the internationalisation of medical education in Iran



A) Network Bubble map of association between frequent thematic words



B) Overlay Bubble map of frequent thematic words by time

Figure 3. Bubble maps of frequent thematic words in retrieved publications on the internationalisation of medical education in Iran

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Core Research Themes and Keyword Analysis

Based on the subject area analysis, the core research themes were found to be in social sciences, medicine, business, management and accounting, computer science, health professions, and decision sciences (Figure 2).

Co-word analysis revealed 29 thematic clusters. The most frequently occurring keywords included "higher education," "medical education," "international student," "internationalization," and "faculty mobility." Recent emerging topics include "digital entrepreneurship," "artificial intelligence," and "dynamic assessment" (Figure 3).

The analysis of keywords highlighted "human experimentation," "curriculum," "teaching," "quality improvement," and "communication" as significant terms.

Authorship and Collaboration Networks

Analysis of authorship patterns revealed a network of prominent contributors, with Tehran University of Medical Sciences and Kerman University of Medical Sciences leading in the publication frequency. Notable authors (H.R. and B.A.) emerged as key figures in this research field (Figure 4). Only 4.3% of the included publications were written through collaboration with other countries.

Journal Distribution and Source Analysis

The publications were distributed across 73 journals, with 31% of them published in journals specializing in education. The top 2 journals were the Journal of Education and Health Promotion (Q2, H-index: 24, SJR 2023: 0.48) and the Journal of Medical Education Development (Q4, H-index: 4, SJR 2023: 0.15), which are published in Isfahan and Zanjan, respectively (20). The distribution of articles across other journals was scattered, with an average of 2 articles published per journal.

Discussion

This scientometric analysis of the internationalization of medical education in Iran offers an in-depth understanding of the field's evolution, impact, and key thematic developments. The results indicate a notable upward trajectory in scholarly output throughout the study period, with a significant acceleration observed in the past decade. This trend underscores both sustained and emerging interest in internationalization as a pivotal area of medical education reform and development (21, 22). Similar increases in research output have been reported in countries such as India and Thailand, which can be attributed to policy-driven initiatives aimed at globalizing education and attracting international students (23, 24). In contrast, scientometric analyses of European educational research indicate substantial discrepancies in knowledge production within this domain when compared with Iran during the same period (25). This disparity highlights the nascent stage of Iran's internationalization efforts, emphasizing the need for sustained investment to accelerate the research output and enhance the quality thereof.

The average citation rate per publication of 2.32 suggests that Iranian research in this field is gaining traction and visibility within the global academic community. Notably, publications co-authored with international collaborators demonstrated significantly higher citation impact, reinforcing the importance of global partnerships in extending the reach and enhancing the influence of research (26, 27).

G-index 10 signifies that a small group of highly cited publications accounts for a significant portion of the field's total impact. Expanding regional networks and fostering institutional collaborations could further elevate this index and contribute to the overall scholarly output (28). The average of 3.67 authors per paper reflects a moderate level of cooperation, signaling the emergence of interdisciplinary efforts, although collaboration remains relatively constrained (29). The relatively high number of papers per author (ie, 37.5) and citations per author (ie, 82.81) indicate that a limited number of prolific researchers are central to this domain in Iran. Expanding the participation of early-career researchers and enhancing international collaborations could broaden the diversity of contributions and further elevate the field's scholarly impact.

Figure 4. Bubble map of association between authors of retrieved publications on the internationalisation of medical education in Iran

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The age-weighted citation rate (AWCR) of 101.42 and the AW-index of 10 signal a positive temporal trend, suggesting that more recent publications are receiving increasing attention. This finding is consistent with trends observed in other emerging research contexts where more recent works attract growing citations (30, 31). However, the relatively low HI annual value (ie, 0.27) indicates a slow rate of growth in the annual research impact, suggesting that while the body of work is expanding, the influence of individual publications on the field remains limited.

Studies in some developed countries face similar challenges in achieving high citation metrics, with the reliance on local journals often cited as a factor hindering international visibility (27). This observation highlights the need to focus on publishing in high-impact, internationally recognized journals to improve the global engagement of Iranian research.

The core themes identified in this study, including "internationalization," "faculty mobility," and "higher education," align closely with global priorities in medical education research. These themes are also prevalent in studies from Europe and North America, where faculty and student mobility are recognized as the essential elements of internationalization (32). Furthermore, a scientometric study conducted in Asia emphasized similar themes, including "Asian immigration and mobility," "transnational education," "international students and acculturation," and "international branch campuses" (6).

Emerging topics such as "artificial intelligence" and "digital entrepreneurship" demonstrate Iran's responsiveness to contemporary global challenges, such as the COVID-19 pandemic. These themes indicate a shift toward sustainable and remote models of internationalisation in medical education, responding to the increasing demand for digitalization and innovation in medical training (33, 34).

The analysis of collaboration patterns reveals a strong domestic focus, with Tehran University of Medical Sciences and Kerman University of Medical Sciences serving as key contributors to the internationalisation of medical education research in Iran. Arguably, expanding collaborations with international researchers can enrich the Iranian research landscape and enhance its global impact. The distribution of Iranian publications across 73 journals, with a concentration in education-focused journals, reflects a pattern commonly observed in emerging research fields. However, the relatively modest impact metrics of Iranian journals underscore the need for greater efforts to publish in higher-impact journals. This would enhance the visibility and citation potential of Iranian research.

This study has several strengths. First, it provides a comprehensive, multidimensional analysis over 5 decades, offering a detailed overview of the internationalization of medical education in Iran. Second, we used PubMed and Scopus databases for the most coverage in the health area. Third, as research in this area is scant, to the best of our knowledge, our study is one of the few scientometric studies on Iran's progress within a broader international context, offering actionable insights for policymakers and academics. However, this study has limitations, such as the presence of a multidisciplinary subject category and a little overlap between some areas that are considered in scientometric analyses by the VOSviewer software.

Conclusion

When contextualized within global benchmarks, the citation metrics of Iranian research on the internationalization of medical education reflect a field in its developmental stage. While the upward trend in publication volume and thematic relevance is promising, significant improvements are necessary, particularly in fostering international collaborations and publishing in higher-impact journals in this field.

Future research should focus on integrating Iranian initiatives into global networks, leveraging opportunities for cross-regional comparisons, and facilitating collaborative efforts. By addressing these gaps, Iran can further its contribution to the global discourse on medical education and its internationalisation.

Authors' Contributions

Conceptualization: E.SH., N.P. Data management: E.SH. Methodology/Data analysis: N.P. Project administration: E.SH., N.P. Writing the original draft: E.SH., N.P. Writing, reviewing & editing: E.SH., N.P.

Ethical Considerations

Ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy, have been completely observed by the authors.

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Declared none.

Conflict of Interests

The authors declare that they have no competing interests.

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