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Trend in dental research output in Iran over a period of 20 years (1990–2009)

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Introduction: The number of scientific papers is a conventional metric for the measurement of a country's research performance in a particular area. **Objective:** To evaluate the trend in Iranian publications of dental research results in peer-reviewed international scientific journals over the period 1999–2009, using national and international databases, and to compare the results with other countries. **Methods:** The search process was performed by two independent persons in PubMed and Iranian Medline (IranMedex). Data extraction included the year of publication, total number of dental papers in each year, total number of Iranian dental papers in each year and number of papers with a high level of evidence; these were compared with those in other Asian countries. **Results:** The total number of dental articles indexed in PubMed during the studied period was 207,689, with 671 being written by researchers who stated their affiliation as Iran. Although the proportion of Iranian dental articles to all published dental articles was 0.01% in 1990, this increased to 1.4% in 2009. Of all clinical trials indexed in PubMed from 1990 to 2009, only 0.62% had an author from Iran. The collaboration rate of authors ranged between 1 and 10. Turkey and Iran had a larger number of dental research publications compared with other Asian countries assessed in this study. **Conclusion:** During the last two decades, there has been a considerable increase in the number of dental papers by Iranian researchers indexed in the PubMed database.

Key words: *Dental, research, Iran*

Scientific articles and publications represent one of the main indicators showing the scientific development and progress of a country; indeed, scientific papers record the published efforts in each country[1,2], and therefore it is obvious that scientific papers are important for assessing a country's growth and development[3].

Publication counts and the number of papers represent a conventional metric of scientific output, and even a measure of success in research[3,4]. There are many quantitative methods for the evaluation and measurement of research development. Bibliometric analysis is a method which is increasingly being used in analyses of scientific research results[5], and can be employed to assess information availability and how research output is changing. Bibliometric analysis can be defined as a set of mathematical and statistical methods used to analyse and measure the quantity and quality of books, articles and other forms of publication[6]. In other words, an evaluation of the number and trend of published articles is used as an adjunct to evaluate the scientific performance of a country[7–9]. Many research fields use bibliometric methods to explore the impact of their field, the impact of a set of researchers or the impact of a particular paper. This methodology has been employed in multiple fields, such as dermatology, psychology, pharmacology, health education, public health, paediatric dentistry and other sciences, to determine the research and progress of a discipline through production and citation analysis[9–15].

In recent years, Iran has undergone outstanding growth in the medical sciences[16], including dentistry. Although, before 1979, there were only five undergraduate dental schools in Iran[17], now there are 23 (http://dme.behdasht.gov.ir). The first journal of dentistry in Iran was published in 1951[18]; at present, there are 16 journals allocated to dentistry, nine of which have research-scientific rank (available at http://www.Magiran.com).

As dentistry is one of the medical sciences that plays an important role in public health, and as developments in this field affect the quality of life of the population, bibliometric analysis of academic output in this field is vital; indeed, this type of evaluation has received considerable interest in recent years. Although, according to the search literature, there have been only two papers evaluating dental research in the national databases of Iran, in 2001 and 2009[19,20], an assessment of the trend in Iranian dental papers published in

international scientific journals is necessary. The purpose of this study is to analyse dental papers from Iranian researchers published in national and international journals, in comparison with those of other Asian countries, during 1990–2009.

MATERIALS AND METHODS

Dental papers from Iranian researchers between 1990 and 2009 were extracted using web-based databases: Medline/PubMed (international database) and IranMedex (national database).

The search process was performed by two independent persons who were familiar with the data extraction process in May 2010.

Data extraction from the PubMed database consisted of the total number of dental papers in each year and the total number of dental papers in each year with affiliations of Iran, Turkey, Saudi Arabia, Egypt, Jordan, Oman, Cyprus, United Arab Emirates, Qatar, Iraq, Syria, Bahrain, Kuwait, Yemen, China, India, Pakistan, Afghanistan and Japan. We also extracted the total number of clinical trials, systematic reviews, case reports and reviews of literature articles, mean number of authors collaborating in each paper and university affiliations in Iranian dental papers.

To find dental articles, the 'Dental Journals' option in the 'Subsets' section of the 'limitation option' of PubMed was ticked.

Data extraction in the IranMedex database included the total number of dental papers in each year obtained using 'dental' or 'dentistry' as key words.

The number of Iranian dental scientific papers was compared with the number of dental papers from other countries.

RESULTS

In total, 207,689 articles related to the dental field were recovered during 1990–2009 from the PubMed database, 671 (0.32%) of which were written by authors with an Iranian affiliation. The total number of dental papers in the PubMed database from 1990 to 2009 is shown in *Figure 1*. The trend in the number of dental articles indexed in PubMed during this period was fairly steady and smooth. *Figure 2* shows the trend in

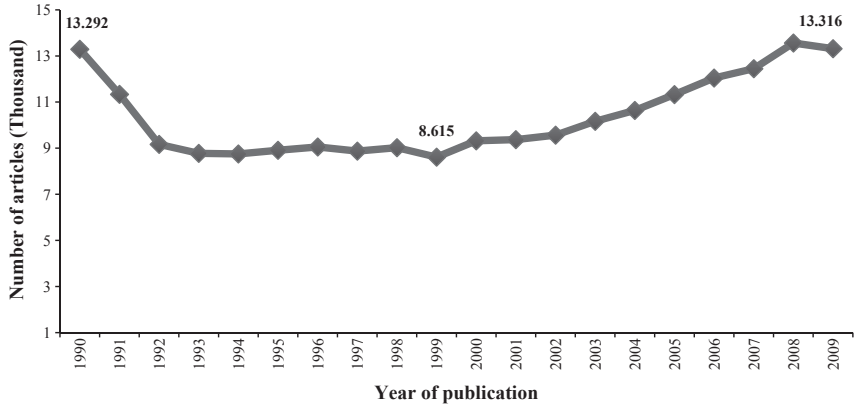

Figure 1. Total number of dental publications per year indexed in PubMed (Medline).

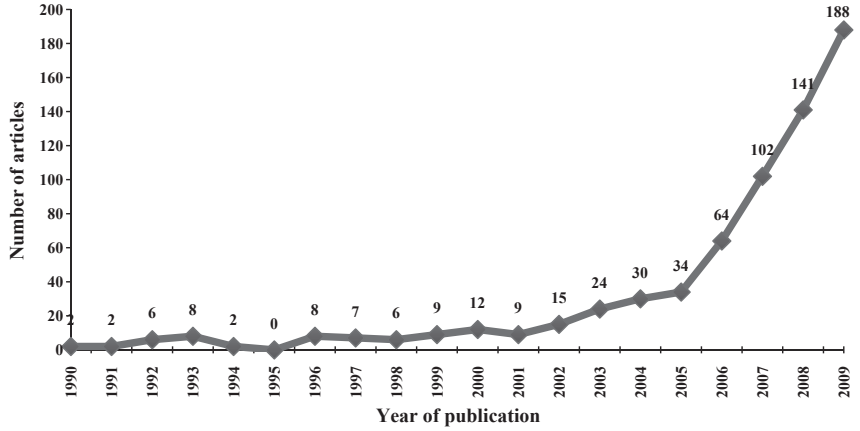

Figure 2. Trend in the number of Iranian dental publications per year indexed in PubMed (Medline).

Table 1 The proportion of articles published by Iranian dentists compared with the proportion of papers published by dentists of other countries

Year	All dental articles	Iranian dental articles	Percentage of Iranian dental articles
1990	13286	2	0.015
1991	11335	2	0.018
1992	9166	6	0.065
1993	8775	8	0.091
1994	8751	2	0.023
1995	8912	0	0.000
1996	9053	8	0.088
1997	8876	7	0.079
1998	9023	6	0.066
1999	8615	9	0.104
2000	9322	12	0.129
2001	9373	9	0.096
2002	9566	15	0.157
2003	10165	24	0.236
2004	10634	30	0.282
2005	11324	34	0.300
2006	12045	64	0.531
2007	12440	102	0.820
2008	13582	141	1.038
2009	13446	190	1.42
Total	207689	671	0.323

the number of published papers by Iranian researchers during this period. The number of dental articles published by Iranian authors increased dramatically during 2005–2009: the number of articles was two in 1990, and reached 188 in 2009 (*Figure 2*).

The proportion of Iranian dental articles relative to all dental articles indexed in PubMed was 0.01% in 1990, and reached 1.42% in 2009. This means that the proportion of Iranian dental articles relative to all published dental articles has increased by approximately 140-fold over the past 20 years (*Table 1*).

In terms of studies with a high level of evidence, only one systematic review was published by Iranian researchers during this period. Of the total number of dental clinical trial articles (11,947) published in PubMed during this period, 74 (0.62%) were written by Iranian authors (*Figure 3*).

In terms of study design, most Iranian papers indexed in PubMed were case reports rather than other types of study, such as clinical trials and review articles (*Figure 4*).

The largest number of Iranian research publications in the PubMed database were from the dental school of Tehran University of Medical Sciences (TUMS) (*Figure 5*). The number of authors collaborating in each paper ranged between 1 and 10. It was found that co-authorship in the studied period had increased, with the highest co-authorship observed in 2005–2009.

Of the countries assessed, Japan showed the greatest number of papers indexed in PubMed (11,587), and Qatar, Cyprus and Afghanistan showed the smallest number of published articles (0); Iran was ranked fifth (*Figure 6*). The trend in the number of dental articles indexed in PubMed from certain Asian countries is shown in *Figure 7*. It seems that the trend in dental research performance has been best in Iran in recent years.

The total number of articles published in IranMedex during the period of the study was 3721. As shown in *Figure 8*, there was an increase in the number of published articles until 2006, but the number of articles decreased during 2006–2009.

DISCUSSION

The number of Iranian dental articles has increased in recent years, and the proportion of Iranian dental articles relative to all dental articles has increased approximately 140-fold during 1990–2009. During the last two decades, Iran has shown a considerably better performance in world science[2,16,17], particularly in physics[16] and biomedical[21] publications. It is obvious

Figure 3. The proportion of clinical trials by Iranian authors indexed in PubMed relative to all clinical trials published by authors of other countries.

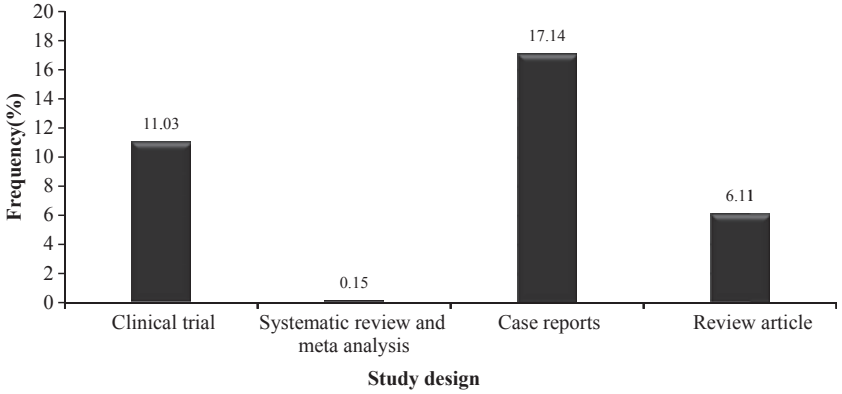

Figure 4. Frequency of Iranian articles based on study design.

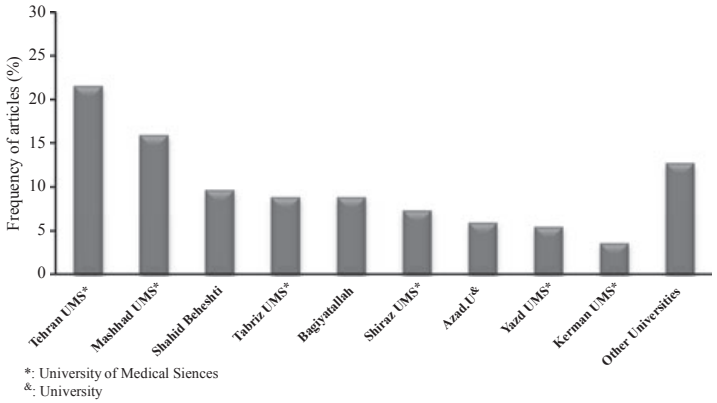

Figure 5. Frequency (%) of articles per year for each studied University of Medical Sciences (dentistry faculty) during 1999–2009.

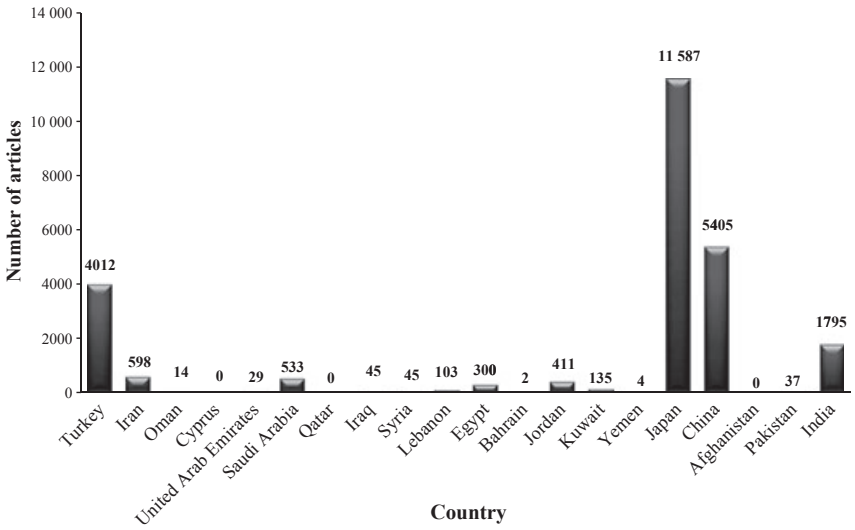

Figure 6. Number of articles from various countries indexed in PubMed during 1990–2009.

that a larger quantity of scientific papers equates to increased scientific development, but the quality of publications is also important. Moreover, knowledge translation (KT), which is the process of assessment, review and utilisation of scientific research, is increasing in importance. Policy makers, clinicians and researchers have recognised the need to facilitate the implementation of knowledge into practice.

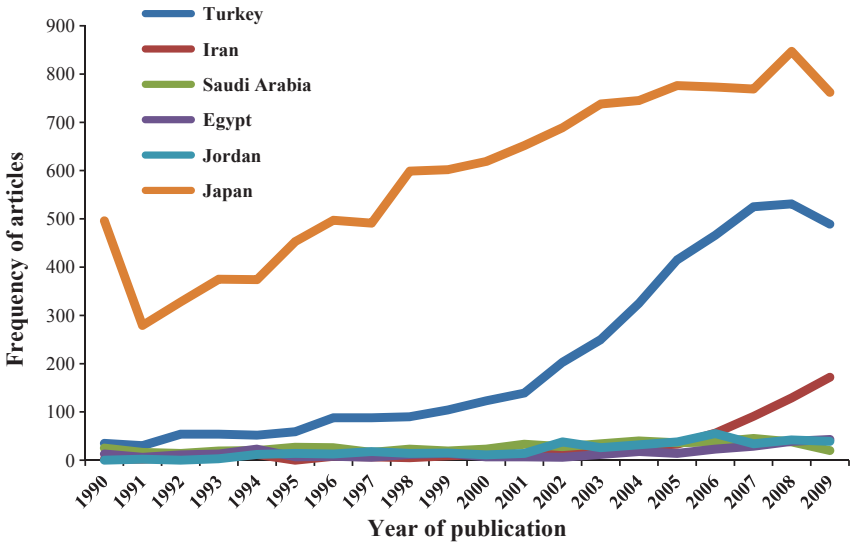

Figure 7. Contribution of certain countries to the number of dental publications, 1990–2009.

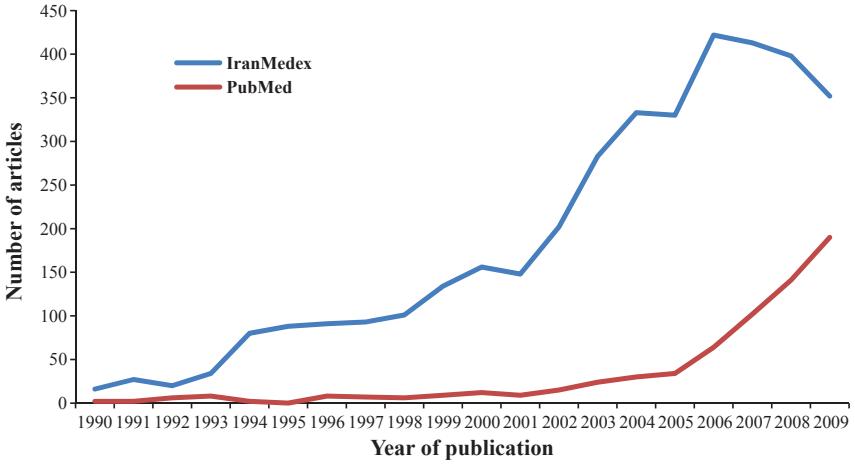

Figure 8. Comparison between Iranian papers published in PubMed and IranMedex.

In 2006, Gil-Montoya *et al.*[22] reported that Iran had experienced the greatest increase in the number of scientific publications among Middle Eastern countries, and the findings of the present study confirm these observations (*Figure 6*).

The strong performance of Iranian dental researchers relative to those of certain other countries, as shown in *Figures 6 and 7*, could be related to the new strict rules for academic staff promotion made by the Health Ministry, an increased knowledge of research methodology and statistics by Iranian dental researchers as a result of the numerous related workshops that have been held, and improved research technology and equipment.

The results indicate that most Iranian dental articles involve studies with a low potential to yield scientific evidence. Nevertheless, there has been an improvement in the published clinical trial studies. This finding was similar to the results of another article assessing the number of dental articles in the national databases of Iranian research[20]. When comparing the dental schools of the different medical universities in Iran, the results indicated that the dental school of Tehran University of Medical Sciences published the most indexed papers in PubMed. The dental school of Tehran University of Medical Sciences is the oldest school and has the largest number of academic staff relative to other dental schools in Iran.

One of the positive findings of the present study was the increased cooperation of Iranian dental authors in producing a scientific paper. Frequently, better team working aids in the conduct of better research.

Medline/PubMed is a database in which most published papers related to the medical sciences are found[23,24]. In addition, biomedical researchers and scientists use it for information seeking. Therefore, we

utilised this database as an international record to access the published dental research. To access academic papers in the local (national) record, we chose the IranMedex database (Iranian Medline), because it covers most Iranian dental journals. The analysis of articles published in Iranian Medline (IranMedex) revealed that the research output increased until 2006; however, the number of papers decreased from 2006 to 2009. Surprisingly, a careful review of *Figure 6* reveals that, at the same time, the number of dental articles indexed in PubMed increased. This finding shows an increased interest in submitting manuscripts to international scientific journals by Iranian dental researchers in recent years. International scientific journals have considerably more readers, and articles published in these journals generally have more impact in the scientific field.

Based on the findings of this study, it can be concluded that the dental research output of Iran increased considerably during the period 1990–2009. The number of dental articles published in the IranMedex database increased from 1990 to 2006, followed by a decrease thereafter. This was simultaneous with a strong increase in the number of articles indexed in PubMed.

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