Iran’s international collaborative articles in medical sciences

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Abstract

Background: Forecasting is the process of predicting future behavior. In reviewing databases, no predicted value associated with international collaboration publications in Iran was found. Thus, the present study aimed at forecasting Iran’s international collaborative articles in medical sciences.

Methods: The number of Iran’s articles and international collaborative articles in medical sciences written over 56 years was extracted from SCOPUS. Data were extracted from 1960 up to 2016. The time series method was used for forecasting using the Minitab software Version 17.

Results: There was no increase in the number of medical articles from Iran from 1960 to 2001. However, the data showed incremental growth between 2001 and 2016. This was similar to Iran’s medical sciences international collaboration articles. In 2016, the percentage of Iran’s international collaboration articles was 15.2, which is expected to reach 19.9 in 2025.

Conclusion: An investigation was performed on the number of international collaboration articles in the field of medical sciences in Iran. Future trends show an incremental growth. The number of Iran’s articles can be increased with international cooperation. However, an increase or decrease in Iran’s articles without international cooperation has to be investigated.

Keywords: Forecasting, International cooperation, Interrupted time series analysis, Medicine, Iran

Introduction

Change is happening at an ever faster rate today. Thus, it is necessary for governments, businesses, organizations, and the public to improve their understanding of change and the future, and through this, they can positively influence the future (1). To assist people in choosing and creating their most desirable future, futurists discover possible, probable, and preferable futures (2). There are a number of methods that futurists use, such as forecasting with time series and trend analysis (3, 4). Forecasting is the process of predicting future behavior (4). In forecasting, the future is predicted from the past (5). Trend analysis is a method of future study (4). Trend analysis of research publication...
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activity within a period of time provides information to decision-makers and researchers. It provides a more informed understanding of development in a field and allows for simulation and scenario building using forecasting methods (4).

International cooperation has a long history. International cooperation is an important source of knowledge in outstanding science in Europe since the 1950s (6). International cooperation network was initially launched by several European countries and the United States. Currently, all countries are involved in international cooperation (7). International cooperation in science has grown in recent years (7-9). For example, studies show that the contribution of South Korea, China, and Japan in writing international collaborative articles has increased (7, 10, and 11). According to the SCImago ranking system, the percentage of international collaborative articles in the United States, China, United Kingdom, Germany, Japan, and Iran was 17.59%, 17.59%, 50.57%, 47.79%, 26.22%, and 21.02%, respectively, in 2014 (12-17).

Forecasting international collaboration scientific publications is important, but it has not received enough attention. One study showed that India’s number of overall scientific publications has increased significantly in recent years, with 119 76 in 1995, 39 407 in 2005, and 99 771 in 2012. It is expected that India generate 178 796 research papers by 2020 (4). In that study, it was mentioned that in India, the number of internationally collaborated scientific publications was 1357 in 1995, 11 475 in 2005, and 30 213 in 2012 and predicted that the number of India’s research papers increase to 62 599 in the year 2020. The role of international collaboration in Indian scientific publications has shifted from a position of little importance to that of significant importance (4). Indian publication activity shows a significant annual growth. The growth of internationally collaborative papers is faster than the growth of overall Indian papers (4).

Information about the article presented above applies to all fields. The statistics of international collaboration publications in the field of medical sciences need special attention. In this regard, one study was conducted on 50 medical institutes of India and found that the growth of national research output has doubled and the growth of research with international collaboration has grown 4 times during 2003 and 2012 (18). In reviewing the data-bases, no predicted value associated with medical sciences international collaboration publications in Iran was found. Iran plans to improve the internationalization of medical sciences. One component of internationalization is international collaborative articles. If Iran wishes to expand its symbol and compete with regional countries, it should increase international collaboration. Iranian medical authorities would like to know where they will stand if the current trend continues in the articles and how much the articles should increase. Therefore, the present study aimed at forecasting Iran’s international collaborative articles in medical sciences.

Methods

In this futures study, an explorative approach was used for forecasting. The trend analysis method was used for depicting the trends. A time series method was used for forecasting using Minitab software Version 17. Smoothing method and forecasts by Holt double exponential smoothing were used. This procedure can work well when a trend is present, but it can also serve as a general smoothing method (19). To minimize the sum of squared errors, we fitted an ARIMA (0, 2, 2) model for Iran’s number of medical sciences articles and its number of medical sciences international collaboration articles.

The number of articles and international collaborative articles in medical sciences written over 56 years was extracted from Scopus. Data were extracted from 1960 until 2016. The subject areas included dentistry, health professions, immunology and microbiology, medicine, neuroscience, nursing, pharmacology, toxicology and pharmacy, biochemistry, and genetics and molecular biology. The document types were articles, reviews, letters, notes, editorials, press articles, conference papers, and short surveys.

Results

Iran’s number of articles and its number of international collaboration articles in the field of medical sciences were extracted from 1960 up to 2016. The number that Iran could reach by 2025 was also forecasted. Iran’s number of medical sciences articles and its number of medical sciences international collaboration articles from 1960 to 2016 are displayed in Table 1.

As Table 1 demonstrates, in 2016, Iran’s number of medical sciences articles and international collaboration articles from 1960 to 2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Iran’s number of medical sciences articles</th>
<th>Iran’s number of medical Sciences international collaboration articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>11 621</td>
<td>1 772</td>
</tr>
<tr>
<td>2015</td>
<td>11 485</td>
<td>1 677</td>
</tr>
<tr>
<td>2014</td>
<td>11 768</td>
<td>1 677</td>
</tr>
<tr>
<td>2013</td>
<td>11 716</td>
<td>1 555</td>
</tr>
<tr>
<td>2012</td>
<td>9 891</td>
<td>1 341</td>
</tr>
<tr>
<td>2011</td>
<td>8 172</td>
<td>1 163</td>
</tr>
<tr>
<td>2010</td>
<td>6 189</td>
<td>939</td>
</tr>
<tr>
<td>2009</td>
<td>5 459</td>
<td>854</td>
</tr>
<tr>
<td>2008</td>
<td>4 515</td>
<td>752</td>
</tr>
<tr>
<td>2007</td>
<td>3 565</td>
<td>597</td>
</tr>
<tr>
<td>2006</td>
<td>2 707</td>
<td>421</td>
</tr>
<tr>
<td>2005</td>
<td>1 922</td>
<td>352</td>
</tr>
<tr>
<td>2004</td>
<td>1 115</td>
<td>257</td>
</tr>
<tr>
<td>2003</td>
<td>919</td>
<td>207</td>
</tr>
<tr>
<td>2002</td>
<td>605</td>
<td>96</td>
</tr>
</tbody>
</table>

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medical sciences articles was 11,621 and its number of medical sciences international collaboration articles was 1172. Therefore, the percentage of international collaboration articles stood at 15.2.

The trend of Iran’s number of medical sciences articles from 1960 to 2016 is displayed in Diagram 1.
As Diagram 1 displays, Iran’s number of medical sciences articles showed no growth from 1960 to 2001. However, the trend shows an incremental growth from 2001 to 2016. The trend of Iran’s number of medical sciences international collaboration articles from 1960 to 2016 is shown in Diagram 2.

As Diagram 2 demonstrates, Iran’s number of medical sciences international collaboration articles showed no growth from 1960 to 2001. However, the trend shows an incremental growth from 2001 to 2016. Then, forecasting was done using the available data. Forecasting for Iran’s number of medical sciences articles and its number of medical sciences international collaboration articles from 2017 to 2025 are presented in Table 2.

As Table 2 displays, in 2025, Iran’s number of medical sciences articles will be 14,580 and Iran’s number of medical sciences international collaboration articles will be 2,905. Therefore, the percentage of international collaboration is 19.9.

Estimation of smoothing parameters and goodness of fit for models is demonstrated in Table 3.

As Table 3 displays, these models are appropriate. Also, after smoothing, the residuals diagram shows normality, variance stability, and independence of residuals for 2 models. Autocorrelation diagram also shows deleted autocorrelation in the residuals after exponential smoothing. Therefore, the models are appropriate.

Discussion

There has been increasing interest in research collaboration in recent years (20). Collaboration in science is already perceived as a national or regional phenomenon (21). Currently, collaboration has a wider scope between continents and often on a global scale (21). It is widely assumed that collaboration in research is ‘a good thing’ and it should be encouraged (22). Forecasting research publication activity provides information to decision-makers (4). If Iran wants to expand its symbol and compete with regional countries, it should increase international collaboration. Therefore, the present study aimed at forecasting Iran’s international collaborative articles in the field of medical sciences.

The results of the study showed that Iran’s number of medical sciences articles showed no growth from 1960 to 2001, which was similar to Iran’s number of medical sciences international collaboration articles.

Table 2. Iran’s number of medical sciences articles and Iran’s number of medical sciences international collaboration articles from 2017 to 2025

<table>
<thead>
<tr>
<th>Year</th>
<th>Iran’s number of medical sciences articles Forecast Lower</th>
<th>Upper</th>
<th>Iran’s number of medical sciences international collaboration articles Forecast Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>11919.4</td>
<td>11113.2</td>
<td>12735.9</td>
<td>1900.48</td>
</tr>
<tr>
<td>2018</td>
<td>12237.4</td>
<td>10914.8</td>
<td>13635.6</td>
<td>2014.47</td>
</tr>
<tr>
<td>2019</td>
<td>12559.5</td>
<td>10698.6</td>
<td>14569.5</td>
<td>2131.77</td>
</tr>
<tr>
<td>2020</td>
<td>12885.8</td>
<td>10478.2</td>
<td>15542.2</td>
<td>2252.40</td>
</tr>
<tr>
<td>2021</td>
<td>13216.3</td>
<td>10257.2</td>
<td>16550.0</td>
<td>2376.34</td>
</tr>
<tr>
<td>2022</td>
<td>13551.0</td>
<td>10037.0</td>
<td>17591.4</td>
<td>2503.60</td>
</tr>
<tr>
<td>2023</td>
<td>13889.9</td>
<td>9818.4</td>
<td>18665.8</td>
<td>2634.19</td>
</tr>
<tr>
<td>2024</td>
<td>14232.9</td>
<td>9601.6</td>
<td>19772.9</td>
<td>2768.09</td>
</tr>
<tr>
<td>2025</td>
<td>14580.2</td>
<td>9386.8</td>
<td>20912.4</td>
<td>2905.31</td>
</tr>
</tbody>
</table>

Table 3. Accuracy measures and smoothing constants of models

<table>
<thead>
<tr>
<th>Iran’s number of medical sciences articles model</th>
<th>Iran’s number of medical sciences international collaboration articles model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy measures</td>
<td>Smoothing constants</td>
</tr>
<tr>
<td>α (level)</td>
<td>γ (trend)</td>
</tr>
<tr>
<td>1.10271</td>
<td>0.47672</td>
</tr>
</tbody>
</table>
ences international collaborative articles. This can be due
to the fact that in this period, Iran was dealing with many
events. Iran had a monarchy from 1960 to 1979, and the
literacy rate was very low (23). In 1979, the backwardness
of the health of the country reached a point where Iran had
the worst doctor–patient ratio, the highest infant and child
mortality rates, and the lowest ratio of hospital beds to
population in the Middle East (24). In 1979, the number
of doctors in the country, both general practitioners and
specialists of different disciplines was 14,000. A significant
portion of this figure was foreign doctors (25). On the
other hand, there was a breach of educational justice in
geographical distribution and the literacy ratio between
urban and rural populations was very different (26). The
revolution of Iran occurred in February 1979. In April
1980, Iran’s cultural revolution occurred, which led to the
closure of universities and the deposal of hundreds of
teachers and thousands of dissidents, leftists, and liberal
students, and as a result, many intellectuals left Iran. Uni-
versities reopened after the cultural revolution in Decem-
ber 1982. In September 1980, the war with Iraq began and
ended in August 1988. After the war, the long process of
reconstruction was initiated (26–31).

However, Iran’s medical sciences articles showed a
trend of incremental growth from 2001 to 2016. The situa-
tion was the same for Iran’s number of medical sciences
international collaboration articles. This incremental
growth can be attributed to the political, cultural, and sci-
entific stability of the country from 2001 to 2016. Nonethe-
less, this issue needs to be studied more. These results
could also be due to the global incremental trend of na-
tional and international collaboration articles in the world
from 2000 to 2016, and this reason confirms the incremen-
tal trend in India, Vietnam, Serbian, Morocco, Tunisia,
Algeria, Australia, UK, and USA (18, 32–35). One study concern-
ing national and international medical research of India showed that out of 50 medical institutes, 19 had average or above average annual growth rate in national research publications during 2003 and 2012. Only one institute had a negative growth rate for the same peri-
dode (18). Results of that study indicated that the growth of
medical research output has grown 2 folds during 2003
and 2012. In addition, 43 medical institutes have shown
positive growth in their international collaboration during
2003 and 2012, and only 7 medical institutes had a nega-
tive growth rate for the same period (18). In our study, we did
not investigate whether growth has occurred in all medical
universities, and this point needs to be reviewed in another
research.

Another study showed that the scientific publications of
Vietnam increased during 1996 and 2013 (32). By the
same token, articles published by Serbian researchers in-
creased during 2006 and 2013. In this period, the annual
number of published articles increased more than fivefold,
the number of articles increased from 934 articles pub-
lished in 2006 to 4855 in 2013. One reason for this in-
crease in Serbian articles was the change in the name of
Serbia in 2006 (33). Two-thirds of all Serbian’s articles
were published in collaboration. Half of these collabora-
tive articles were the results of collaboration between Ser-
bian researchers and researchers from abroad. The distri-
bution of those internationally collaborative articles indi-
cated that the most collaborating countries with Serbian
researchers were Germany and USA during 2006 and
2013 (33). In our study, we did not investigate which
countries have been partners in different years with Iran,
and there is a need for more research in this regard.

North African countries such as Morocco, Tunisia, and
Algeria also showed an incremental trend in total publica-
tion articles from 1996 to 2012 (34). For the year 2000,
SCImago indicated up to 1156 publications for Morocco,
738 for Tunisia, and 486 for Algeria. In 2012, the Moroc-
coan researchers published 3282 articles, Algerians 3800,
and Tunisiens 5170 (34). In medical sciences, the output
of the 3 countries remained very stable from 1996 to 2002.
Later, Tunisian outputs increased while the Moroccan
output stagnated or even decreased until 2006, when it
resumed increasing slowly (34). Another study showed
that the rates of international collaboration in medical ra-
diation science journals from Australia, the UK, and the
USA increased during 2012 and 2014 (35).

This upward trend seems to continue into the future. In
2016, the percentage of Iran’s international collaborative
articles was 15.2, which will reach 19.9 in 2025. These
results are consistent with the results of traditional Chi-
inese medicine (36). One study analyzed the literature for
traditional Chinese medicine articles in PubMed during
1995 to 2014 and predicted the number of the articles in
future. Findings revealed that in 1995, 711 articles were
published, while in 2013, the number of publications in-
creased to 3162. Based on the rising trend, it can be pre-
dicted that the number of articles on traditional Chinese
medicine will continue growing at a high rate in the future
(36). Many nations participate in international collabora-
tion (37). Thus, it can be stated that international collab-
oration grows in science, but little agreement exists about
dynamics of growth at the discipline level. Some suggest
that disciplines differ in their collaborative tendencies
(38).

Our findings indicated that the number of articles has
been increased in Iran with international cooperation.
However, an increase or decrease in Iran’s articles without
international cooperation has to be investigated.

The number of articles and international collaborative
articles in medical sciences was extracted from SCOPUS
database. However, such data may not be the same in dif-
ferent databases. Therefore, it is suggested that data be
extracted from the Web of Science.

Conclusion
An investigation into the trends of Iran’s number of
medical sciences international collaboration articles
showed incremental growth. The number of articles has
been increased in Iran with international cooperation.
However, the increase or decrease of Iran’s articles with-
out international cooperation needs to be investigated.

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Conflict of Interests

The authors declare that they have no competing interests.

References


23. Mohamadi M. [A review of Iran’s foreign policy or decision making in the Pahlavi era dominated system]. Tehran: Dodgehost; 1998. [Persian]


33. Ivanovic D, Fu H, Ho Y. Publications from Serbia in the Science Citation Index Expanded: a bibliometric analysis. Scimetrics. 2015;105:145–160.


