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Original article

Investigating Iranian Information Gatekeepers in the Field of Medical Genetics Using Network Structure Analysis

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Abstract

Introduction: In the flow of information and scientific communication, two formal and informal relationships are measured through co-authorship. The present study aims to discover the gatekeeper nodes in both types of scientific communication and seek to strengthen the health cycle of medical genetics information.

Methods: This research is applied in terms of purpose, and in terms of nature and method, it is a kind of mixed research, including survey method, scientometrics, and interview and social network analysis. The research population was the researchers in the field of medical genetics in seven selected centers. First, using centrality indicators, gatekeepers were discovered in the formal communication structure. Then, interviewing formal gatekeepers, the gatekeeper's agents were identified in informal communication. The effectiveness of each gatekeeping factors in the informal scientific communication process was determined using the questionnaire.

Results: The network size represents an average degree of 122. Opinion leaders were extracted based on centrality indicators. By interviewing with leaders, 15 units were identified as target nodes in the centers. Among them, the educational deputy had the most positive effect, and the ethics committee had the least positive effect on the research process. Six stages of informal communication and 24 gatekeeping factors were identified through interviews. Financial factors and time has played a more significant gatekeeping role. According to the degrees of betweenness and Eigenfactors, the most effective nodes on unofficial communications have been laboratories. Based on the closeness indicator and Eigenfactor, the Vice-Chancellor and the Ethics Committee have shown an inconsiderable impact on the research process.

Conclusion: The low amount of degree indicators revealed that the medical genetic communication network is not efficient. Accordingly, most of the negative, informal communication issues are human communication factors such as professors' characteristics. In the research process, some institutions, such as the Ethics Committee, are an inhibitor of communication.

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Introduction

The concept of information gatekeeper was first developed by psychologist Kurt Lewin about family life habits. Lewin's definition of a gatekeeper in a communication network is a person who can control the movement of a news item in certain communication channels (1). Freeman states that when a person is located between others in a network, he or she had the potential for control of their communication and was therefore somehow central (2). A gatekeeper can be defined as a person who links people to information and controls a channel by filtering (3). The gatekeeping process means deciding, facilitating, or imposing decisions on passing information through the gate (4). For more than a half-century, journalism scholars have investigated the dynamics of gatekeeping. Other disciplines, such as anthropology, information science, management, political science, and sociology have also studied gatekeeping for decades, but mainly within their specific fields' boundaries (5). In information science, at first, gatekeeping referred to the judging of manuscripts and the editing of publications (6).

However, the complexity of scientific communication and the change in the rules of these communications, due to the deformation and nature of information carriers in the information

society, has given new dimensions to this concept (4) and the gatekeeper processes applied to communication networks go beyond judging articles that are published throughout the information cycle. If according to McGinty, the gatekeepers are responsible for the mechanisms (factors) that allow some resources to enter (the gate) and prevent others from entering, the role of this concept in the information cycle will become clear (6).

Research has been conducted to identify medical gatekeepers in the medical field who have used co-authorship networks for this purpose; for example, Sattarzadeh, Galyni Moghaddam, and Momeni analyzed the structure of the scientific cooperation network of researchers in the field of basic medical sciences in Iran in the science citation index in the period 1996 to 2013. The results showed that the network of cooperation in basic medical sciences was not sufficiently cohesive, and the necessary scientific communication and cooperation between researchers was not done (7). Soheili, Sohrabi, and Atashpaykar examined the co-authorship network of researchers in the field of medical sciences in Iran. The study results also showed that the social network of Iranian medical journals indexed in WOS is co-authored by researchers in low-density medical journals (8). Mohammadian and Vaziri have designed a co-authorship network of the Ministry of Health-affiliated medical universities. In terms of centrality measures, Tehran, Shahid Beheshti, Isfahan, Tabriz, and Shiraz Universities of Medical Sciences have the essential positions in the co-authorship network of medical universities, respectively (9). Gonzalez et al. examined the evolution of the pattern of collaboration in Medline articles between 1942 and 2013.

The average degree in this study reached 10.97 over the years. The density of this network has decreased over time. The closeness centrality reported in this study also ranged from 0.042 to 0.032 (10). Chain et al. has made his research by claiming that the network is ambiguous in genetics at the international level. The density of this network in the sub-genetic domains is reported to be between 0.01 and 1. The degree centrality in sub-genetic domains was between 9 and 236, and the density was reported between 0.01 and 1. This study emphasizes the capabilities of network analysis in extracting co-authored networks (11). In 2018, Zarei et al. studied the Iranian medical genetics co-authored network to discover the structural holes in this field. Using the Pagerank index and the size of hubs and authorities, he extracted the network's structural holes. Two groups of indices are compared, and a meaningful relationship is found between them (12).

The previous studies show the lack of a comprehensive view of the gatekeeping phenomenon. Most previous studies have examined the issue of gatekeeping of formal communication and through co-authored maps. However, considering that this issue is also discussed in informal communication, the present study intends to have a comprehensive approach to the phenomenon of information gatekeeping. The present study's initial idea was formed by the emergence of the fundamental question of what possible filters are found in the passage of information through formal and informal communication channels and to become a scientific work. These filters are meant to be gatekeepers and gatekeeping mechanisms or factors which can be a facilitator and reinforcer or an inhibitor of communication during a scientific communication. Thus, the main question on the present research is what nodes act as gatekeepers during the transformation of an idea into scientific work and how effective they are on the research process.

Methods

This study is mixed research. Survey method, scientometrics, and interview and social network analysis were used in this study. For investigating the Iranian information gatekeepers in medical genetics, the first part of the research had a scientometrics approach. The research population included the whole articles of faculty members in seven selected centers active in medical genetics in Iran. The scientific publications of these centers were searched in the affiliation search section of Scopus. The results were limited to the type of articles and the publication year 2012 to 2017. The faculty members of the Medical Genetics Groups were taken from the universities, and their articles were extracted from the search results (Table 1).

Therefore, the faculty members who have participated in the production of more than ten articles were selected. Thus, the number of records extracted from 5483 reached 1976. This number of records was entered into the Sci2 software, and the co-authorship network of the articles was visualized using Sci2 and Gephi. The centrality indicators were calculated for the authors. The authors, which are at least two lists of more important authors based on centrality indicators, were identified as opinion leaders of medical genetics in Iran. A total of 125 people were identified as opinion leaders.

In the second step, to identify the gatekeeper nodes in informal communication, we used the grounded theory

Table 1. The number of faculty members and articles in medical genetics in Iran

University name	Number of faculty members in medical genetics departments	Number of articles
Isfahan University of Medical sciences	10	424
Mashhad university of Medical sciences	9	772
Tehran University of Medical sciences	23	2486
Tarbiat Modarres University	5	1368
Shahid Beheshti University of Medical Sciences	14	1911
National Institute of Genetic Engineering and Biotechnology	21	345
Royan	21	88
Total	**94**	**5483**

(interview) method. Theoretical sampling with an easy sampling approach was used to determine the population for the interview. First, several researchers in medical genetics who had extensive scientific connections were selected as the research population. These people were selected at the discretion of the researcher and with the criterion of more influence on the research process in the research environment, and sometimes they are the same opinion leaders. In selecting these individuals, opinion leaders were consulted. A total of 12 researchers were interviewed until the data was theoretically saturated. The interview texts were coded and analyzed using MAXQDA software. The gatekeeping units, gatekeeping process, and gatekeeping factors were identified in this step. The researchers found a list of information gatekeeping factors that have disrupted or reinforced the research path (gatekeeping process). In the end, the impact of gatekeeper units on the gatekeeping process was asked from the key nodes (opinion leaders and the head of the gatekeeper units) through a questionnaire. Some data were analyzed by descriptive statistics using Excel and SPSS software.

Results

According to a search conducted in December 2016 at the Scopus database, 5483 records were retrieved. These refer to the scientific publications of all researchers affiliated with the seven studied centers.

Discovering gatekeeper nodes of formal communication in medical genetics (opinion leaders)

To identify the opinion leaders in Medical genetics in Iran, the co-authorship network of Iran in this domain is visualized.

After the threshold of ten articles, the total number of authors was 5,047 (nodes), with 29 736 connections with each other (links).

A micro-analysis was performed separately for each node in the co-authorship networks by calculating the centrality indicators. The average degree for the network was calculated at 122.195. The value of degree centrality for network nodes varies between 0 and 1272.

The frequencies of centrality indicators scores are shown in Table 2. The degree of centrality in most nodes is calculated less than the mean value. So that 87% of the nodes had a very low degree centrality. The same is true for other central indicators. 97% of the nodes have a very low betweenness centrality. 93% of the nodes have a low closeness centrality degree, and 83% of them have a low Eigenfactor centrality.

Table 2. Frequencies of node centralities in the co-authorship networks

Degree centrality			Betweenness centrality			Closeness centrality			Eigenfactor centrality		
score	Frequency	%	score	Frequency	%	score	Frequency	%	score	Frequency	%
0-20	4428	87	0-100000	4930	97	0-0.2	21	0.4	0-0.0005	4231	83.8
20-50	403	8	10001-300000	81	1.6	0.21-0.3	4741	93.9	0.0006-0.001	89	1.8
50-100	88	1.7	30001-500000	17	0.3	0.31-0.35	263	5.2	0.001-0.0900	621	12
+100	128	2.5	+50001	19	0.4	0.36-1	22	0.4	0.901-0.1	101	2

All the centrality indicators (closeness, degree, betweenness, and eigenfactor) to select the opinion leaders were considered. Moreover, the people whose scores in each indicator were much higher than the others (approximately 100 authors in each indicator) were extracted. By removing duplicates, 125 people were extracted as important authors. The selected individuals based on each indicator may have obtained a very low score in other indicators. It may also be an accident for a person to have a high index; for example, the result of his collaboration with an influential person during a period of his scientific activity. Some studies have pointed to this dichotomy in node rankings based on centrality indicators and significance index (13). Therefore, it seems that selecting key people based on only one index does not have reliable results. Therefore, out of 125 people, selected people have obtained the top score in at least two indicators. In other words, the authors whose names were repeated in more than one indicator were selected and made up a 53-person list of opinion leaders mentioned as supplementary.

Discovering gatekeeper nodes in informal communication

Semi-structured interviews were conducted to discover the gatekeepers in informal scientific communication with influential people and opinion leaders. Then, by analyzing the interview texts (implemented texts) using MAXQDA software, the texts were coded. In the first stage of the analysis of the interviews, 90 main codes were extracted along with the sub-codes, which totaled 542 sentences from the text of the interviews matched with the defined codes. After re-examination, the codes were rewritten, and the same were merged, and eventually, out of the remaining 79 codes, the main codes related to the gatekeeper units reached 15 items shown in table 3.

Stages of informal communication in the research (gatekeeping process)

The interviewees were asked to discover the stages of scientific communication in the publication to describe the steps they take to produce a scientific work in which they have informal scientific relationships. According to respondents, the steps or nodes that an idea goes through to become a scientific work can be summarized in eight steps. These steps are the same steps during which informal communication occurs. These steps can be summarized as a gatekeeping process in the form of a flowchart (Fig. 1).

Gatekeeping factors

According to the concept map, which was obtained from the output of MAXQDA software, the gatekeeping factors obtained from the analysis of the interviews were presented in Fig 2. A total of 24 gatekeeping factors were extracted from the interviews.

shown an almost positive approach to the research process. Ethical issues, which mainly refer to the plagiarism, showed

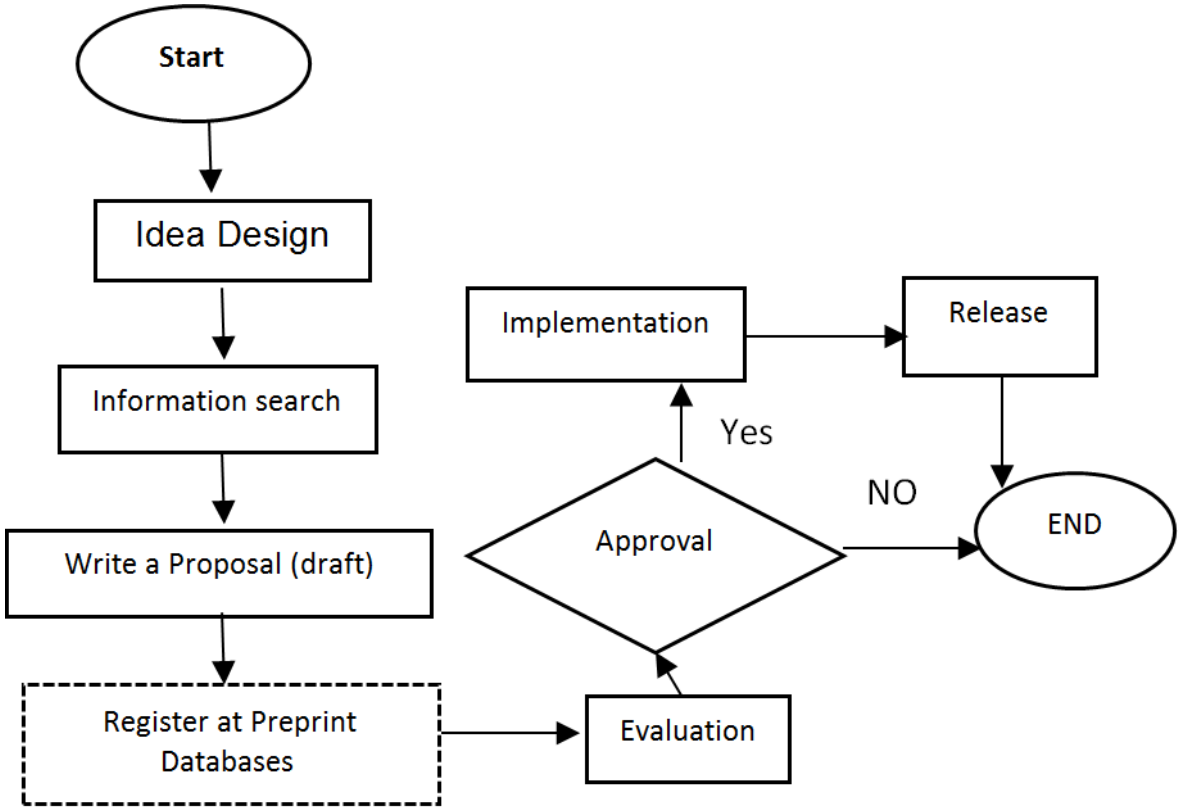

Figure 1. The Stages of informal communication in the research or gatekeeping process

a relatively negative research process score. Communicating with experts in other fields to get an idea has attracted more consistent views on this variable's positive impact.

The second step in the research process is the information search and retrieval stage. The views of both groups of respondents have positively assessed this gatekeeper's impact on the research process. Among its factors, the use of illegal sources of articles (such as password-providing websites) is known to be the most neutral variable. Perspectives on the variable of skill and personal experience are almost positive.

The next among the six steps of the research process is writing a proposal. As the respondents' opinions show, all of the variables in this process positively impact the research process. The highest positive score at this stage was related to acquiring scientific writing skills through formal and informal education. In contrast, proficiency in English had the lowest positive score.

After writing, it is time for the manuscript to be reviewed. At this stage, some factors were given a negative score from the respondents' point of view. Factors such as mafia in reviewing, national prejudices of reviewers, and the interference of the financial sponsors in reviewing have had the highest negative effect in the research process. In contrast, some factors, such as anonymous reviewing and reviewers' recommendations to authors, received a positive score.

At the approval stage, the time-wasting factor in the approval process (such as late sessions) had the highest negative score in the research process.

The final stage in the research process is known as the implementation stage. The role of informal relationships in judging and budgeting and providing a supplementary contract has the most negative score in the implementation process. The highest positive score at this stage was related to laboratory experts' cooperation and the unification of research conditions (matching of samples in the laboratory).

Key nodes and opinion Leaders perspectives on determining the Positive or Negative Impact of Gatekeeper units on the Informal Science Communication Network

Key nodes are the people who were at the top of each gatekeeper unit in studies centers, if such a unit existed. For example, the library manager for the library unit in the studies medical genetics centers. A total of 76 key nodes answered the questionnaire from which 12 were opinion leaders. According to the respondents' views, which are reported in Table 3, the Vice-Chancellor for Education has had the most positive effect among other variables with an average of 2.29. In contrast, the ethics committee had the lowest positive effect with an average of 3.18. Because it is used by Likert, the closer this score is to 5, the better, and the closer it is to 0, the weaker it is. Among the variables in this section, the negative effect was significantly lower, so that the average of none of the variables in the range of 7 out of 4 did not exceed.

Investigating the gatekeeping factors influencing the gatekeeping process

In determining the gatekeeping factors influencing the gatekeeping process, it was determined that the first groups of gatekeeping factors are budget and financial factors during the analysis of the interviews. In general, financial factors have a relatively higher negative score on the research process than other factors. The next group of gatekeeping variables includes variables related to human factors. The researcher's insulting attitude towards the judges, the judges' insulting attitude towards the researcher, the professors' inattention to experts and students' capabilities, the dominance of the relationship on the rule among the variables in this section have had the most negative impact on the research process.

The three factors of system automation, access to research data, and access to high-quality Internet have been identified as the process factors with the most positive averages in the research process. Among the process factors, the multiplicity of faculty's tasks has been considered somewhat neutral, and the rest have been negative, such as lack of time and budget.

The seven influencing informal communication factors in the research process have had different effects on the research process. The "role of friendly communication between professors" factor has attracted the most positive views, among other factors. After that, the opportunity to discuss and exchange views between team members was positively evaluated.

Factors such as "the role of informal communication tools (such as Telegram) in the research process" and "ease of informal communication" are also ranked next with positive scores. In contrast, the thieves who stole the idea in scientific communication, lack of easy access to professors, had the highest negative impact on the research process from the two respondents' perspectives.

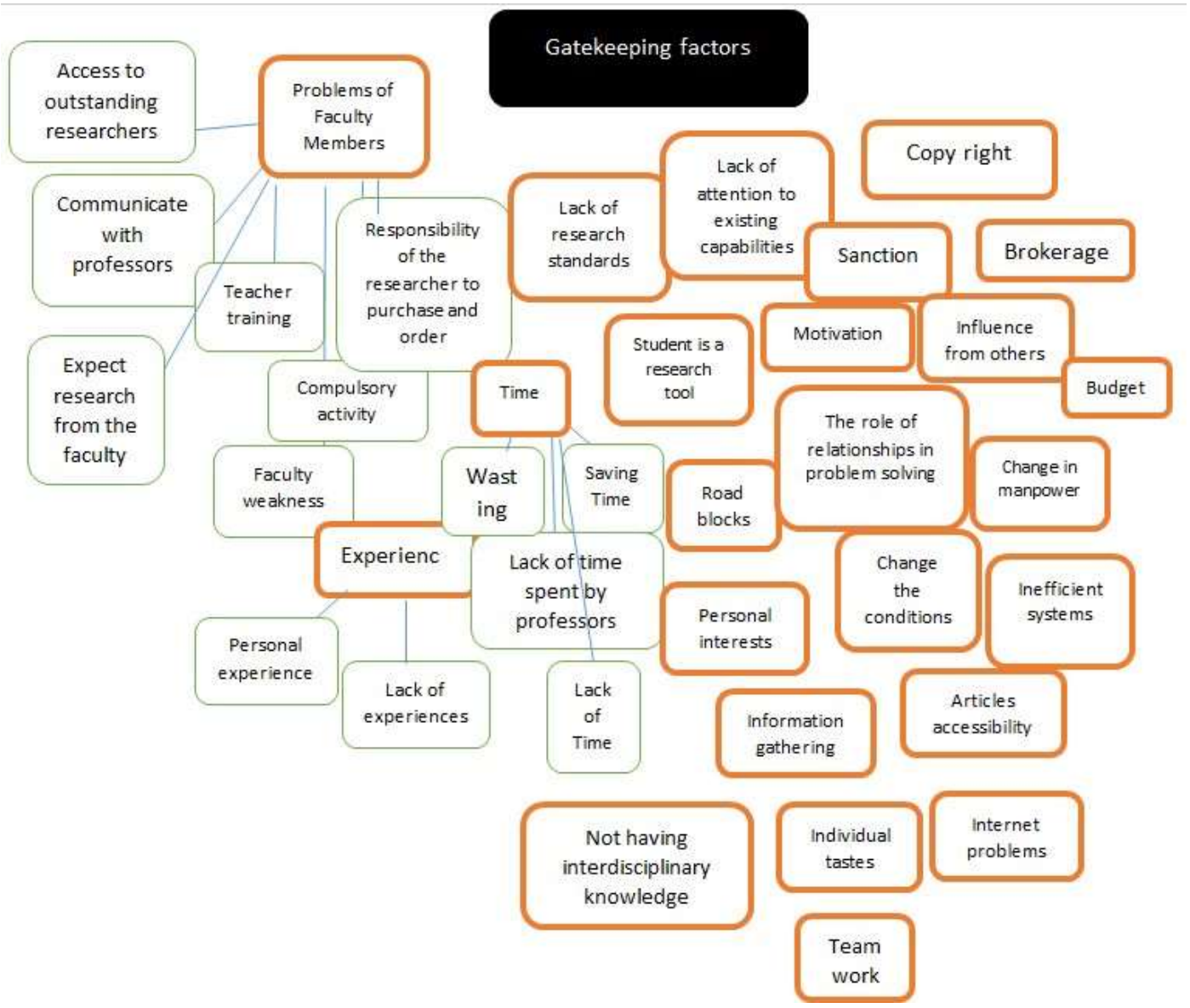

Figure 2. Gatekeeping factors

Table 3. the opinion leaders and key nodes scores about impact of gatekeeper units on informal Science Communication Network

Gatekeeping Units	The score by opinion leaders (rank)	The score by key nodes (rank)	The average score of both groups (rank)	Standard deviation
Vice-Chancellor for Research (experts, other research centers)	1.765	2.37 (3)	2.63(7)	1.83 (2)
Vice-Chancellor for Education (Graduate Management, etc.)	1.181	2.29 (1)	2.39 (4)	2.09(4)
Seminar and Congress Management	1.515	2.72(10)	2.86 (10)	2.43 (8)
Decision-making authorities (presidency, board of trustees, etc.)	1.544	2.68 (9)	2.59 (6)	2.86 (12)
Committees on International Relations	1.519	2.54(5)	2.87(12)	2 (3)
Student Research Committee	1.389	2.6 (7)	2.73 (9)	2.31 (6)
Ethics Committee	1.568	3.18 (18)	2.26 (2)	3 (13)
Financial Management (accounting, employment, etc.)	1.487	2.58(6)	2.7 (8)	2.31 (6)
Laboratory Management (management and laboratory experts)	1.479	2.94 (14)	3.07 (13)	2.66 (10)
Department of Scientific Resource Management (Libraries, Science and Publishing)	1.484	2.32 (2)	2.41 (5)	2.14 (5)
Research Centers	1.73	2.79 (12)	3.28 (15)	1.71 (1)
Licensing Office	1.535	3.05 (2)	2.23 (1)	2.66 (10)
Office of Medical Statistics	1.255	2.67 (8)	2.82 (11)	2.34 (7)
Office of Industry and Community Cooperation	1.347	2.49 (4)	2.36 (3)	2.77 (11)
International Deputy	1.536	2.91 (13)	3.09(14)	2.51 (9)

Discussion

For identifying the opinion leaders in Medical genetics in Iran, the co-authorship network of Iran in this domain is visualized. Network size shows a large amount. Larger networks, usually containing more resources, provide more options for people seeking new information and will lead to better information search results than smaller networks (3). The co-authorship network analysis shows that more than 80% of the nodes had a very low amount of centrality indicators (degree, betweenness, closeness, and Eigenfactor). It indicates that most of the total 5047 authors impact the information process in this network.

An examination of the betweenness centrality in the network also shows that about two-thirds of the people in the network drawn with the Zero betweenness Index have no mediating role in science production. The betweenness centrality indicates the number of times that node is placed in the shortest path between the other two nodes in the network. High-betweenness nodes play an important role in network connection and information circulation in the network (14). The higher the social hierarchy one can reach, and the more diversified types of people one knows, the more likely one will have better choices in acquiring new and useful information (3). The ability to communicate with others depends on the distance between him or her and other nodes in the network. The closeness centrality value indicates the low power of the nodes in communicating with others on the network. The value obtained for the eigenfactor centrality does not show the desired value in the studied network, and this indicates that most nodes did not have an effective relationship with more effective nodes, and their communication was done without increasing the quality of the relationship. Chain Research is the closest research to the present study in terms of the subject. In his study, the degree centrality for different areas related to genetics was between 9 and 236, and for genetics in general, 97 were calculated (11). Accordingly, it is not consistent with the present study (degree centrality in the present study was between 2 to 18). This discrepancy can be attributed to the differentiated community of the two studies.

Fifty-three authors were selected as the opinion leaders of medical genetics in Iran; most of them (19 faculties) is affiliated to Tehran University of Medical Sciences. Eleven faculties are from Shahid Beheshti, and nine are from Mashhad Universities of Medical Sciences. The other 14 were from other centers. Of these, only five have worked in medical genetics departments, and the rest have specialized in other subject areas. These authors are important in the scientific network and the information process of Medical Genetics in Iran. Communication messages flow from a source, via mass media channels, to opinion leaders,

who, in turn, pass them on to followers. They can potentially be known to diffuse an innovation (15).

Among the well-known units as gatekeepers, the units that deal with the first stage of producing a scientific work, namely cultivating an idea, were not observed. Much of the damage done to this stage is due to the lack of a single unit to control the information. For example, the possibility of theft of ideas in group meetings due to lack of supervision and weak research culture is more. The formation of an idea bank with its provider's specifications in the field can be suggested as a solution.

Factors related to human relations were among the factors that were mentioned as the most challenging factors in all stages of the interviews. Among these factors was the poor availability of faculty members for students and researchers. Many of these factors are individual and need to strengthen the research's cultural strength because there is no law that, for example, obliges a member of the faculty to be present at work full time or to prevent the theft of an idea.

Units related to library information searches are highly overlooked. Despite the interviewees' praise for the performance of libraries, especially in providing resources, it seems that the role of these units in the research process is not very effective. At the same time, one of the librarians' roles is research assistants or intermediaries. A liaison librarian with knowledge of research and methodology is highly valued. This person is trained at the master's or doctoral level (16). The lack of librarians' lack of effort to communicate with educational groups is one of the most important factors in this regard.

In the writing stage, most researchers write based on foreign articles. It seems that holding writing training workshops has not been effective so far.

In peer-reviewing, the most important factors are a waste of time in the refereeing process and the professors' relationships, which cause much damage to the refereeing process. The peer-review system is the most commonly used method to select manuscripts for publication, but it has several potential limitations. Faggion suggests some reforms in this system, such as communication between reviewers and focusing on the original idea in the review process (17).

All university research projects must be approved by the National Ethics Committee, which is a time-consuming process. In the present study, the most disruptive factors in the approval stage include prolonging the approval process. The ethics committee seems to have become a nuisance in the research process, rather than describing its core responsibilities. According to the interviews conducted, some studies are canceled due to delays in the ethics committee. Therefore, accelerating the work process of this committee is one of the most important issues that should be on the agenda and seriously pursued.

The most important barriers to the implementation section are financial factors. The main reason for this is inflation. Because inflation also occurs over time, it can be attributed to the prolongation of the research process. Therefore, the waste of time is an important factor at this stage.

The time lost at this stage is mostly due to executive factors. For example, in laboratory work, the preparation of materials is delayed, and the researcher spends several months experimenting. The issue of sanctions is another barrier and is also somehow related to the time factor. Hence, in this situation, the preparation of research materials and resources encounters obstacles and prolongs the research process. Efforts to interact more effectively between the employer, the researcher, and the resource provider can help this regard. To this end, some researchers' experience is invaluable, as experienced researchers complete work-related tasks in less time.

Labs have a more positive role to play in research. Laboratory experts are known to be effective in advancing research. Nevertheless, it seems that these people do not interfere with the preparation of items and equipment. Since these people are members of the research team and mainly have active and direct participation in the research, the centers should use them to provide equipment following their experience and high knowledge.

Conclusion

Based on the present study results, medical genetic groups in the country have performed poorly in terms of scientific communication. As for the interdisciplinary nature of this field, scientific communication is expected to be maximized to strengthen this field's foundations. Opinion leaders in this field have formed a network that does not have the necessary efficiency. The nodes that act as information intermediaries in this network are very few, according to betweenness centrality. Other centrality indicators also confirm the inefficiency of the network. Based on the results of the first part of the research, the country's bases of scientific cooperation are not provided.

According to interviews, the culture of scientific cooperation has not settled in the country and has suffered great damage, including plagiarism. It seems that solutions should be considered to reduce the damage and increase this cooperation network's efficiency. If we can advance the process of informal communication in a codified and defined way in universities and centers that produce science, we can hope to improve the efficiency of the formal scientific communication network. Scientific communication models confirm that formal communication is formed after informal communication. So naturally, the promotion of the former leads to the improvement of the latter. Some of these models, including the Hurd and Garvey / Griffith combinations, support this claim (18). Efforts are currently being made in some centers. In this regard, considering places such as discussion and think tanks at the university to exchange ideas and topics of the day, holding regular journal clubs to provide a platform for exchanging ideas in order to form scientific cooperation groups, hold scientific meetings to exchange the latest achievements, and recording all of these events to prevent possible harms can be helpful.

According to the interviews, there were also common complaints about the obstacles to informal communication. The main issues raised by the interviewees are mainly related to the factors related to human relations. Concerning faculty members and students and professors in other fields, some injuries require in-depth behavioral studies. The regular presence of faculty members in this field was suggested to solve this problem and was one of the most important issues raised in interviews as a solution. Another challenge mentioned by faculty members was the multiplicity of educational and research tasks of these individuals. Increase the number of faculty members to reduce the burden of their multiple responsibilities can help solve this problem. Although these are all part of the faculty members' role, in some cases, according to the interviewees, they play an inhibitor role in the research process.

The final section of the study, which examines informal

communication between entities involved in science production, also contains some points. The presence of some entities in the cycle of scientific communication is very faint and imperceptible. For example, libraries and librarians, who could play one of the most important roles in science's gatekeeping, are completely abandoned. In contrast, the Vice-Chancellor for Research, Financial Affairs, Ethics Committee, and other gatekeeper units play more effective roles. However, these departments generally have executive duties. It seems that producing a scientific work is moving towards achieving an administrative and executive process, rather than moving forward to produce science. Therefore, most of the communication between administrative and executive affairs is going on instead of scientific sections such as libraries and research centers. Reducing the common bureaucracy in the research process can solve or alleviate many problems. The time lost in this process is one of the main complaints of researchers. Therefore, if the time spent to get approval from the authorities is allocated to the research project itself, the research efficiency will increase, and much sooner will be achieved.

As scientific communication between the understudy centers has been reported to be poor, special attention needs to be paid to the factors that have caused this situation. Based on the results of the present study, suggestions can be made in this regard. Adopt incentive policies to increase co-authorship and group projects, the cooperation of university centers with research centers to carry out joint projects and joint use of resources, Efforts to establish research links with persons with higher centralities, Accelerate the holding of meetings and assignment of projects, Standardization of research process, Creating opportunities for friendly communication between researchers, Strengthen social network infrastructure and use their capabilities in fast information transfer, Creating a suitable platform for research cooperation between the Ministry of Science and Health, Standardization of the peer review process, budget for review in research are recommended as a conclusion.

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Conflicts of Interests

The authors declare that they have no conflict of interests

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Appendix. Opinion leaders list:

Mohammad Soleimani, Fereydoon Azizi, Abbas Shafiei, Mohsen Amini, Amir Hossein Sahebkar, Khalil Abnous, Mohammad Reza Zali, Alireza Foroumadi, Baqer Larijani, Majid Ghayyur Mobarehan, Hossein Baharvand, Abbas Haghparast, Mohammad Salehi, Reza Malekzadeh, Alireza Estaghamati, Mohammad Ramezani, Fariba Khodagholi, Ardeshir Ghavamzadeh, Massoud Hooshmand, Mohammad Ismail Akbari, Mostafa Rezaei Tavirani, Mehdi Mahdavi, Mohammad Ali Faramarzi, Mahmoud Mahmoudi, Mohammad Reza Abbaszadegan, Mostafa Hosseini, Mehrdad Iranshahi, Hossein Hosseinzadeh, Nima Rezaei, Fatemeh Atyabi, Abolfazl Movafaq, Ali Mohammad Alizadeh, Massoud Amanloo, Amir Avan, Reza Mirfakhraei, Davood Khalili, Seyed Naser Ostad, Marzieh Ebrahimi, Mohammad Hossein Sanati, Ramin Heshmat, Farhad Farzadfar, Roya Kilshadi, Mohammad Ismail Motlagh, Iraj Nabipour, Kazem Mohammad, Goodarz Danaei, Amir Kasaian, Mahboubeh Parsaian, Afshin Ahmadvand, Abdullah Ghasemian, Arash Dehghan, Sadaf Ghajarieh Sepanlou, Nazal Sarrafzadegan