

Original Article**Iranian research output in pediatrics: 1975-2007**

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**Abstract**

**BACKGROUND:** By providing a picture from published articles in a field, bibliometric studies can inform policy-makers in their challenging research funding decisions. In this regard, we applied bibliometric analysis to the Iranian pediatrics articles published in PubMed indexed journals between 1975 and 2007.

**METHODS:** We evaluated all pediatric articles that had been published from Iran in different PubMed indexed journals from 1975 to 2007. Journal data (i.e. date of publishing, journal name, impact factor of the journal, language), authors data (i.e. number of authors, international collaboration, affiliation of the corresponding author), and paper characteristics [i.e. type of article, research design, study population (neonate, infant, child, and adolescent), and specialty] were registered.

**RESULTS:** During this period of time, 819 articles from Iran had been published in PubMed indexed journals, with a sharp increasing trend after 2002. Impact factors were up to 25.8. Paper had an international co-author in 13.7%. Regarding study population, 24.1% of studies were published on neonates, 23.6% on infants, and the remaining 66.3% of studies were performed on children and adolescents from 2 to 18 years old. Infectious disease was the most frequent area of research, followed by public health and metabolic disease. Original articles were the most frequent type (89.7%) of the published articles. Study design was cross-sectional in 51.2%, retrospective in 36.3%, and prospective in 11.6%. Clinical trials made up 4.8% of the total papers.

**CONCLUSIONS:** Contribution of Iran in production of pediatrics science is showing a sharp increase after 2002, this pattern is in parallel with other research fields.

**KEYWORDS:** Periodicals as Topic, Biomedical Research, Pediatrics, Bibliometrics, Journal Impact Factor, Iran.

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Iran is a country in the eastern Mediterranean region with an area of 1648195 square kilometers and a total population of 73650 in thousands in 2009.<sup>1</sup> Infrastructures of biomedical research in Iran have experienced a dramatic increase both in budget and human resources.<sup>2</sup>

Scientometric indicators are increasingly employed to evaluate the pattern of research performed by researchers, institutes, and countries.<sup>3</sup> Since the 1960s and 1970s, when objective scientometric indices have defined for re-

search evaluation, there is an increasing interest in bibliometric studies to monitor scientists' interests and efforts.<sup>4</sup> These studies monitor different aspects of scientific outputs from number of published articles in each discipline.<sup>5,6</sup> Common bibliometric databases which are being used in such studies include Scopus, Web of Science, Google Scholar, and PubMed.<sup>7</sup> However, there are also some limitations for bibliometric studies, including the inappropriate use of impact factors for between-field comparisons.<sup>8</sup>

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PubMed was launched by the National Library of Medicine in the United States in 1997, years after the introduction of the first interactive searchable database (Medline) in 1971. This database covers journals dating from 1950 and has become one of the most reliable web based resources for clinicians and researchers in health and medicine. PubMed is easy, quick, and free to use, it is the most frequently used resource for information for biomedical sciences.<sup>7</sup> In July 2010, 5485 journals were indexed by Pubmed.<sup>9</sup>

Iran has become successful in its agenda to improve its international profile in biomedical sciences by constantly increasing the quantity and quality of articles published in peer-reviewed biomedical journals that are indexed by either Medline or Excerpta Medica database (EMBASE).<sup>2</sup> One study reported a 19-fold increase in the number of Iranian articles indexed by PubMed from 1997 through 2006.<sup>10</sup> Some bibliometric studies have focused on particular fields, such as transplantation,<sup>11</sup> nephrology,<sup>12</sup> mental health,<sup>13</sup> and dentistry.<sup>14</sup> A study of Iranian biomedical publications in 2004 reported that University of Shiraz and Baqiyatollah have published papers with highest IF in the country.<sup>15</sup>

Although pediatric bibliometric studies are available from other countries, based on our knowledge, there is a lack of international bibliometric report on Iran's contribution to the field of pediatrics. We sought to analyze Iran's scientific outputs appeared in PubMed between 1975 and 2007.

## Methods

This was a descriptive bibliometric study conducted by the Medicine and Health Promotion institute, Tehran, Iran. The study was conducted in January to April 2009. In one domestic report from this data which was published in Persian, we ranked universities of Iran, and we showed that Tehran University of Medical Sciences has published 1 of 4 PubMed indexed pediatric articles in Iran.<sup>16</sup>

All electronically available pediatric literature published in PubMed (a service of the

United State National Library of Medicine and the National Institutes of Health, available at: <http://www.pubmed.com>) was searched. The search included all PubMed publications between May 1<sup>st</sup>, 1975 and December 30, 2007. Abstracts of all the articles were first downloaded, and a hard copy was utilized for data collection.

## Search strategy

Our search strategy was based on two fields: MeSH (Medical Subject Headings) and AD (Affiliation). To find publications on pediatrics, the terms (pediatric or neonate or newborn or infant or child or children or adolescent or adolescence) were used in the MeSH field. To find Iranian publications, i.e. publications where the first author was of Iranian nationality, the following terms were used in the AD field: (Iran [AD] or Iranian [AD] or Persian [AD]). Therefore, the overall strategy was as follows: "(Pediatric [MeSH] or Neonate [MeSH] or Newborn [MeSH] or Infant [MeSH] or Child [MeSH] or Children [MeSH] or Adolescent [MeSH] or Adolescence [MeSH]) " and (Iran [AD] or Iranian [AD] or Persian [AD]).

## Data collection

A hard copy of abstracts from the pediatric articles was utilized to extract the following data from all the papers: title of journal and its impact factor (IF), year of publication, number of authors, first author's university, center or institution, paper language, existence of international collaboration, number of international collaborators, study population, paper type, study design, study type, and topic area.

The journals IF was extracted according to JCR (Journal Citation Report for 2006). Study population was categorized as neonate (age < 1 month), infant (1 month < age < 2 years), child (2 < age < 13), and adolescent (13 < age < 18). Study type was classified as original article, case report, case series, review article, and letter. Study design was divided into three categories: cross-sectional, retrospective, and prospective. Study design was categorized as test evaluation, interventional, descriptive, and

analytic; and analytic study type itself was classified as cross-sectional, case-control, cohort, and randomized clinical trial (RCT). Topic areas were comprised of public health, infectious disease, nephrology, gastroenterology, neurology, hematology, oncology, asthma allergy immunology, nutrition, cardiology, neonatology, endocrinology, pediatric surgery, urology, orthopedic, radiology, ophthalmology, dentistry, dermatology, psychiatry, genetics, and toxicology.

### Statistical analysis

The data that was obtained from the literature search were statistically analyzed using SPSS for Windows version 13 Statistical Package. The quantitative data were presented using mean and standard deviation, and the qualitative data were described using frequency tables.

### Results

Between 1<sup>st</sup> May 1975 to 30<sup>th</sup> of December 2007, 819 pediatric PubMed indexed articles were published from Iran. The number of publications showed an irregular increasing trend, with a pronounced trend after the year 2000 (Figure 1). The number of authors ranged from

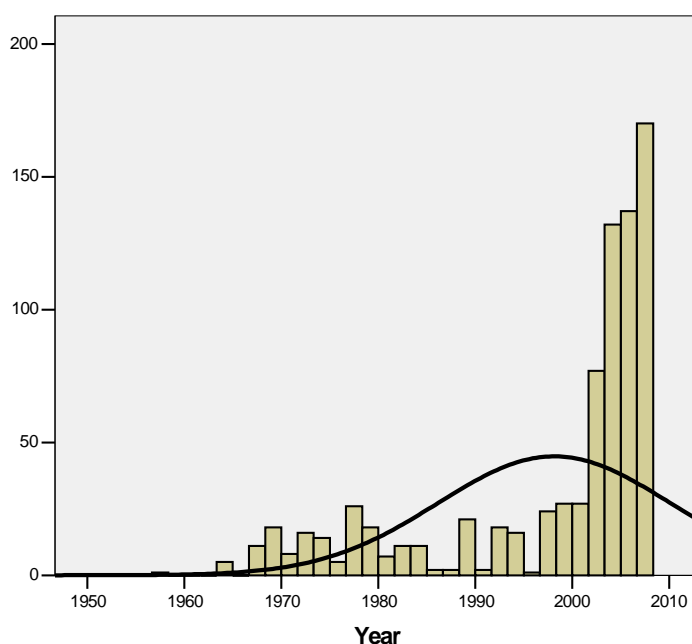
1 to 24 with a mean ( $\pm$ SD) of  $4 \pm 3$ ; with the first and third quartiles of 2 and 5, respectively.

In terms of affiliations, 112 (13.7%) articles were published by contribution of an author affiliated with another country. The journal with highest number of papers was Eastern Mediterranean Health Journal ( $n = 48$ , 5.9%), followed by Journal of Tropical Pediatrics ( $n = 27$ , 3.3%) and Archive of Iranian Medicine ( $n = 22$ , 2.7%) (Table 1).

With respect to language, full text was English in 784 (95.7%) articles, French in 11 (1.3%), German in 3 (0.4%), and Russian in 1 (0.1%). Due to lack of access to the paper, language of full text could not be determined in the remaining 20 papers (2.5%).

Regarding the study population, subjects were neonates in 197 (24.1%) article, infants in 193 (23.6%) and children or adolescents (age from 2 to 18 years) in 543 (66.3%) article. In 114 (14%) papers, more than one of the above age groups was enrolled.

The three main research fields were infectious diseases ( $n = 153$ , 18.7%), public health ( $n = 70$ , 8.5%), and metabolic disease ( $n = 68$ , 8.3%). All other fields composed less than 5% of the publications, however, that data is not shown here.



**Figure 1.** Trend of annual pediatric publications

**Table 1.** Journals where Iranian pediatrics publications were appeared

	Number of journals	Number of papers published by each journal	Percent of papers published by the journal	Percent of papers published by the journal	Percent of Cumulative published by the journal
Eastern Mediterranean Health Journal	1	48	5.9	5.9	5.9
Journal of Tropical Pediatrics	1	27	3.3	3.3	9.2
Saudi Medical Journal	1	24	3.0	3.0	12.2
Archives of Iranian Medicine	1	22	2.7	2.7	14.9
Psychological Reports	1	21	2.6	2.6	17.5
Indian Journal of Pediatrics	1	20	2.5	2.5	20.0
Journal of Tropical Pediatrics and Environmental Child Health	1	17	2.1	2.1	22.1
Annals of Human Biology	1	12	1.5	1.5	23.6
International Journal for Vitamin and Nutrition Research, Iranian Journal of Allergy, Asthma and Immunology, Journal of Tropical Medicine and Hygiene	4	11	1.3	5.4	29.0
The American Journal of Clinical Nutrition, Burns	2	10	1.2	2.5	31.5
The American Journal of Tropical Medicine and Hygiene, Pediatric Nephrology, Bulletin - World Health Organization	3	8	0.9	3.0	34.5
Medical Science Monitor	1	7	0.8	0.9	35.4
Group 1	5	6	0.7	3.7	39.1
Group 2	6	5	0.6	3.7	42.8
Group 3	12	4	0.4	5.9	48.7
Group 4	27	3	0.3	10.0	58.7
Other Journals		<3	363	35.4	64.6

Group 1: British Journal of Ophthalmology, British Journal of Haematology, Journal of Endocrinological Investigation, Public Health, Clinical Pediatrics

Group 2: Annales De Pediatrie (Paris), Journal of Indian Society of Pedodontics & Preventive Dentistry, Pahlavi Medical Journal, Public Health Nutrition, Hormone Research in Paediatrics, Vaccine

Group 3: Lancet, Archives of Disease in Childhood, Asia Pacific Journal of Clinical Nutrition, British Journal of Nutrition, Clinical Pediatrics, European Journal of Pediatrics, Journal of Clinical Immunology, Journal of Health, Population and Nutrition, Mycoses, Pediatric endocrinology reviews, Tropical & Geographical Medicine

Group 4: Acta Paediatrica, Acta Medica Iranica, Acta Tropica, American Journal of Human Biology, Annals of Saudi Medicine, Clinical Biochemistry, Clinical and Diagnostic Laboratory Immunology, Drug and Alcohol Dependence, Epilepsy & Behavior, European Journal of Clinical Nutrition, European Journal of Epidemiology, Indian Pediatrics, Indian Journal of Gastroenterology, International Journal of Dermatology, International journal of obesity and related metabolic disorders, Journal of Clinical Virology, The Journal of hygiene, Journal of Pediatric Hematology/Oncology, Journal of Pediatrics, Journal of Toxicology Clinical Toxicology, Monatsschr, Kinderheilkd, Journal of Pediatric Hematology/Oncology, Scandinavian Journal of Infectious Diseases, Transplant Proceeding, Urology Journal, World Journal of Gastroenterology

Case reports, letters to the editor and review articles comprised 30 (3.7%), 26 (3.1%), and 20 (2.5%) of literature, respectively. All other 743 articles (90.7%) were original studies. In respect to study design, 297 (36.3%) paper were retrospective, 95 (11.6%) were prospective, and in 419 (51.2%) papers the study design was cross-sectional. In 8 papers, (0.9%) we could not determine the study design. From the total 819 studies, 39 (4.8%) were clinical trials.

## Discussion

An increasing trend was observed in pediatric publications from Iran in PubMed indexed journals between 1975 and 2007, with a sharp increase following the year 2002. A rapid rise in the number of Iranian articles indexed under PubMed from 1997 through 2006 in other fields of Iranian research has been reported in transplantation and psychiatry researches.<sup>11</sup> Generally, Iran has shown an increasing for-

ward movement in the research.<sup>10</sup> Striking increase also has been reported for Iranian papers indexed in the ISI Web of Knowledge.<sup>17</sup> A bibliometric study illustrated that nearly half of the articles published in a 20-year period (1973-2002) in the field of psychology were published during the previous four years.<sup>17</sup> Similar pattern was also reported for non-medical research scholarly output.<sup>18</sup> Iran had the highest pace in growth of research publications among Middle Eastern countries in 2005.<sup>19</sup>

The recent rapid increasing trend in research output of the country can be attributed to the attention to research by country policy makers up to the highest level of leadership, which has caused a national commitment by research policy change which in turn has come with a drastic rise in research resources.<sup>20</sup> The research budget allocated to the health sector doubled between 1997 and 2005 and there was a considerable increase in health research faculty members from 1999 to 2002. The number of biomedical research centers in the country was boosted from 4 in 1997 to 64 in 2006.<sup>10</sup> Such achievements were a result of a national movement in Iran to upscale research in general.<sup>10</sup>

Be that as it may, two points must be taken into consideration in this regard. The first point is that our reported trend in publications is not necessarily parallel to the changes in research itself, given the time lag of publication. The second point is related to the initiatives inside Iran to promote peer-reviewed journals to increase their chance of being read and cited internationally. Within our study period, some domestic journals have been recently covered by PubMed; some of them are Archives of Iranian Medicine, Iranian Journal of Kidney Disease and Urology International which also publish pediatric papers.

Quantitative and qualitative developments in research centers involved in tissue transplantation<sup>11, 21</sup> nephrology,<sup>11</sup> and diabetes mellitus<sup>22</sup> are reported. Similarly, we believe that the trend of published articles in pediatrics is parallel to the rising number of clinical and research centers in pediatrics. In general, the increasing trend in scientific visibility of pedia-

trics research should be regarded as a proxy of development of this scientific field in Iran.<sup>23</sup>

According to the present study, the topic of infectious diseases account for the highest number of pediatric articles published from Iran. As Iran is a developing country with a high population of children, high proportion of pediatric health care goes to infectious diseases both in outpatient and inpatient setting. This may result in high research in this area. There is also a high demand for research based information in the country, based on high mortality of children due to infectious diseases.<sup>24, 25</sup> Availability of clinical data in infectious disease and ease of research in infectious disease may also contribute to the interest of researchers.

Among Iranian articles published in the field of pediatrics, randomized clinical trials represent a small proportion. This low proportion of trials from all publications is not a phenomenon limited to this field.<sup>10, 1</sup> For instance, one study could not find any clinical trial among articles having been internationally published in the field of renal transplantation over a relatively long period of time.<sup>21</sup> This might be related to the challenges and difficulties in designing and conducting such studies.<sup>26,27</sup>

The ultimate objective of research publication is informing clinicians and policy-makers. Many pediatricians utilize the internet as their first "port of call". They believe that web-based resources are essential to their medical practice and will improve their quality of practice.<sup>28</sup>

These publications, albeit important in international science production, might have little direct effect on health promotion and clinical improvement inside the country; because most of them have been written in English and most Iranian pediatricians do not have access to their full texts. Therefore, the myriad publications indexed in Iranian journals are of special significance.

Our study had some limitations. The focus of the present study was on PubMed publications, which are indeed only a minor portion of the numerous research studies carried out hitherto in Iran. The present study also did not

include citation analysis. In this study, impact factor was extracted according to the JCR report at the time of our study, not the impact factor of the journal on the year that the article was published.

To conclude, during this period of time, we can see a sharp increasing trend after 2002, in publications in PubMed indexed journals. Less than 5% were clinical trials, and most research was cross sectional in design. This information

is believed to help policy makers to improve pediatric research in Iran.

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### Conflict of Interests

Authors have no conflict of interests.

### Authors' Contributions

MRM, AK and FR Helping with data collection, and preparation of the draft, reading and approving the final draft. MML Designing the study questionnaire, revision of the paper, reading and approving the final draft. SA Study concept, reading and approving the final draft. BM Preparation of the first draft, reading and approving the final draft.

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