

Medical Principles and Practice, 1989-2003: A Bibliometric Study of Research Articles

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Abstract: The purpose of this study is to examine and analyze the 'original' research articles published in *Medical Principles and Practice*, provide a profile of its contributors, and determine evolving patterns and trends. The study will also apply several bibliometric principles to ascertain the research activity of the journal. The data set consisted of 331 research articles from the first 12 volumes (1989 to 2003), excluding articles published in supplementary issues. For each article, the average number of references per paper, length and number of keywords per article, research design, primary subject, author characteristics, and citation data were analyzed. The growth pattern of the journal was also examined. For purposes of comparison, the time-span covered was divided into three periods with an equal number of volumes per period. Data were coded and stored in a ProCite database for analysis. The primary subject areas totaled 29, with the majority focusing on microbiology and public health issues. Cross-sectional research designs dominate the publications. Author collaboration is strong (93.7%). Papers with at least one female author account for 60.6%. The majority of authors (77.3%) are Kuwait-based. Individuals affiliated with universities continue to be the most frequent contributors to the journal (65.3%). Age of the cited literature has a Price Index value of 33. The journal is evolving towards a mature publication with scientific integrity. The research behavior of the authors follows accepted scholarly practices. Some recommendations proposed are more journal exposure, standardization authors' names, and the pursuit of more experimental research methodologies.

Key words: Bibliometrics, Kuwait, Medical literature, Scientific journals

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Introduction

The scientific journal is considered to be the epitome of scholarly communication. It provides researchers with a myriad of opportunities to share and discuss varied points of interest, to establish bodies of knowledge in their known profession, and to gain recognition for accomplished activities. Within this same framework, the scientific journal is read by members of its profession seeking scientific inquiry for “intellectual stimulation”, and at times for relaxation. Yet, scientific journals can vary in purpose, scope, authority, and audience (Huth, 1991). The non-homogeneous nature of medical journals raises the question of how one assesses the scientific value of a journal, or how the research activities as reported in scientific papers are determined.

Evaluating a journal's characteristics and merits based on experience and observation alone can become biased and reflect partiality (favoritism, one-sidedness). Such judgments according to Huth (1991) are subjective and impressionistic and rarely provide a clear picture of the relationships between journals or how medical information is disseminated through literature. He further states that “objective and quantitative methods for assessing journals' qualities and how journals relate to each other may offer more reliable and consistent judgments and a more detailed picture than those derived from subjective, impressionistic, ad hoc judgments” (Huth, 1991: 81). Such methods known as bibliometrics apply mathematical and statistical techniques to the study of scholarly communication processes.

Quantitative methods have been used systematically in journal research throughout the past several decades. They are used to provide a general indicator of the research activities of a particular group of scientists, to investigate the research trends within a discipline, to examine particular characteristics of a journal, and to assess the maturity and scientific level of the journal.

Previous Studies

In health sciences, many studies have examined the content of biomedical journals. Earlier studies have focused on a particular bibliometric characteristic. Fletcher and Fletcher (1979) studied the frequency of various research designs in the clinical literature covering a 30-year perspective. Original articles in three well-known journals were

selected for review. The results showed that over this period, cross-sectional studies accounted for the largest percentage of research designs used, while the number of research papers applying the cohort design decreased, and with randomized controlled trials still being the least applied methodology. Another study also examined original papers published in *The New England Journal of Medicine* to determine the type of research design used as well as the type of statistical analysis applied (Alvarez-Dardet et al., 1985). Similar trends were found, and it was concluded that despite an increase in sophisticated statistical techniques, there was still a weakness in research design in general medical journals. Satyanarayana and Ratnakar (1989) analyzed multiple authorship patterns of research papers in 17 biomedical high-impact journals. They found that medical sciences journals had substantially more authors per paper, ranging from 3.21-5.35, than did life sciences journals, which had an average of 2.8-3.7 collaborators. The findings also showed that general and biomedical sciences papers were relatively longer as compared to medical research with a clinical orientation.

More recent studies have examined several bibliometric aspects of “original” research published in a journal. In one study, Paige and Johnson (1994) analyzed author data, research methods, statistical methods, and subject content of 76 articles published in the National Medical Association’s Journal. Most of the literature focused on biomedical aspects of health and the majority of articles were derived from physicians in university settings. They also found that experimental research methods were used in only five of the original research articles. Bergman (1998) compared the first two volumes (1948-1949) of *Pediatrics* to the 1996-1997 volumes. He not only compared subjects covered and not covered in the Journal but also examined the quality of medical writing. The most notable difference in articles was the deterioration in medical writing styles, which reflected that papers in earlier volumes were easier to read.

Other studies focused on analyzing the entire content of a journal, including original papers, review articles, and case reports. Menz (2002) investigated changing patterns of publication activity in a podiatric medical journal. Two significant trends resulted from his research: an increase in international authors as well as an increase in original research papers. In another study, Thompson (1996) analyzed the nature

of articles published in a sports medicine journal. His findings showed that there were few randomized control studies, authors came from 35 different countries, and a wide range of subjects were covered. Cromer and Stager (2000) compared two decades of research articles published in an adolescent health journal. The study sample consisted of 582 articles published from 1980-1998. The basis of the sample was selected to reflect 2-year blocks with a periodicity of 3 years. They examined the subject content, research design, author information, and citation data of original articles, case reports, scientific reports, briefs, and forums. Significant changes had occurred in a shift from medical topics to psychosocial topics and in a shift in research designs from retrospective to cross-sectional and longitudinal designs. They also found that the professional background of authors had diversified.

Few studies have addressed the research activities of the countries in the Arabian Gulf region. Tadmouri and Bissar-Tadmouri (2003) investigated the geographical origin of biomedical publications in 23 Arab countries from 1988-2002. They studied the total number of publications indexed in *MEDLINE*, normalizing the data to population size or gross national product. Based on this normalization process, it was found that smaller countries such as Kuwait were more productive than larger countries. More specifically, Aman (1998) explored the research activity of scientists in Kuwait by examining the citations to their published works. He gathered the data using citation indexes covering the period from 1986 through 1995. He found that researchers in the areas of science and medicine were cited more frequently than those in social sciences and humanities, and that they preferred to publish in American and European journals.

Rationale for the Study

No studies have investigated the characteristics of research papers of English language health science journals published in the Gulf Cooperative Council (GCC) countries. A perusal of entries in the electronic version of *Ulrich's International Periodicals Directory 2003* (2003) for medical journals published in GCC countries listed approximately 11 titles whose texts were in English. The majority of these journals were either irregular publications, not refereed, or both. One of the exceptions was *Medical Principles and Practice (Med Princ Pract)*.

Only one study investigated this journal's citation patterns from 1989-2000 (Al-Qallaf, 2003). The author examined 4,740 references and found that most of the cited literature was in English with few citations in Arabic; the most heavily cited journals were American or British publications, the degree of immediacy was below the norm for medical literature, and self-citation was not common.

For more than a decade, *Med Princ Pract* has been a leading source for the dissemination of scientific research in English to health care professionals in Kuwait and the Arabian Gulf region. This is the official journal of the Kuwait University Health Sciences Centre. As stated by the editors, the objectives of the journal are: (1) "to publish original research in the health sciences" and (2) "to publish peer-reviewed articles of current international interest in the form of papers, solicited reviews, reports, short communications, conference proceedings, discussion forums and letters." The journal, published by S. Karger AG, has a frequency rate of six-times per year. Prior to 2004 (the period under study), the journal was issued quarterly. The journal is indexed in *EMBASE/Excerpta Medica*, *Science Citation Index*, *IMEMR (WHO)*, *Update*, and beginning in 2002 in *Index Medicus/MEDLINE*. Electronic accessibility to *Med Princ Pract* is available via the Karger web site. The earliest journal impact factor (IF) recorded for *Med Princ Pract* is 0.125 in 1998 (Institute for Scientific Information, 2003) and the latest is 0.194 reported in 2003 (ISI Journal Citation Reports: JCR Science Edition 2003, 2005).

This study will analyze the journal's research papers from its inception through 2003 to provide an indication of the research activities in the region. Variables such as primary subject interests, methodologies used, and country of origin will be identified. The study will also present some bibliometric characteristics about the journal itself in terms of growth, number of keywords per article, author data, and referencing behavior. A study of this nature will illustrate key interests and provide future directions for the editorial board, researchers, and authors as well as facilitate communication within the health care community.

Purpose of the study

The purpose of this study is to examine and analyze the 'original' research articles published in *Med Princ Pract*, provide a profile of its contributors, and determine evolving patterns and trends. The study will

also apply several bibliometric principles to ascertain the “research front” of the journal. Specifically, the study addresses five areas of questions:

- 1) What are the main characteristics of the journal?
 - a) Growth rate of the journal
 - b) Length of articles
 - c) Number of keywords assigned to each article
 - d) Frequency that authors cited previous literature
 - e) Ratio of cited items to source articles
 - f) Journal’s comparability to the norms of scholarly communication
- 2) What research methodologies do authors prefer when conducting their research?
- 3) What are the primary research interests of the authors?
- 4) Who are the contributing authors in terms of total number of contributors, prolificacy of the authors, author collaboration, gender, the institutional affiliation of lead contributors, number of affiliations per paper, country of origin of lead authors, and collaboration between Kuwait-based authors and authors from other countries?
- 5) What are the characteristics of the cited literature in terms of publication form and the age of the cited literature?

Methodology

A bibliometric study of research articles published in *Med Princ Pract* from its inception in 1989 to 2003 (volumes 1-12) was conducted, excluding articles published in supplementary issues. The data set contained 331 articles labeled an original paper by the journal itself. Each paper was examined to determine (1) average number of references per paper, (2) length of article, (3) number of keywords, (4) research design, (5) primary subject, (6) author characteristics, and (7) citation data. The growth pattern of the journal was also analyzed.

For the purpose of this study, the publication period was divided into three ranges each covering four volumes (Table 1). The yearly publication pattern of the journal has been inconsistent. In 1989 and 1990, volumes one and two were produced. Due to the Iraqi occupation, no volume was generated during 1991. From 1992 through 1995, the journal was published every two years resulting in volumes three and four. Since 1996, the journal had produced one volume annually.

Table 1
Profile of original papers in *Med Princ Pract*, 1989-2003

Variable	1989-1995 v. 1-4	1996-1999 v. 5-8	2000-2003 v. 9-12	Total
Number of original papers (%)	101 (30.5)	104 (31.4)	126 (38.1)	331 (100)
Number of references (%)	1,999 (27.8)	2,271 (31.6)	2,915 (40.6)	7185 (100)
Number of references < 6 years (%)	599 (8.3)	721 (10.1)	1,009 (14.1)	2329 (32.5)
Articles with 1 author (%)	10 (3.0)	6 (1.8)	5 (1.5)	21 (6.3)
Articles with 2 authors (%)	15 (4.5)	17 (5.2)	11 (3.3)	43 (13.0)
Articles with 3-4 authors (%)	46 (13.9)	48 (14.5)	53 (16.0)	147 (44.4)
Articles with ≥ 5 authors (%)	30 (9.1)	33 (10.0)	57 (17.2)	120 (36.3)
Articles w/at least 1 female author (%)	47 (14.5)	61 (18.8)	84 (25.8)	192 (59.1)
Mean number of authors	3.7	3.9	4.6	n.a.*
Mean number of pages	6.6	6.8	5.7	n.a.
Mean number of keywords	4.1	4.3	4.1	n.a.

*n.a. = not applicable.

The method for determining the categories of research designs was adopted from the monograph, *Practical Statistics for Medical Research* (Altman, 1999). This text was selected because the author is a renowned researcher in the medical community and the book has received outstanding reviews from highly rated medical journals. Research designs were divided into three major categories: experimental, observational, and miscellaneous. Experimental research designs included clinical trials and animal / human laboratory studies. Observational studies were subdivided into prospective cohort studies, case-control, and cross-sectional (e.g., surveys, and clinical presentations of disease processes, diagnosis, and treatment). The last category, miscellaneous, covered case reports.

In determining the subject areas, *EMTREE*, the controlled indexing structure of the *EMBASE* database was used. Primary subjects of the articles were identified by selecting the first major medical descriptor assigned to the *EMBASE* citation. These descriptors were categorized by accessing the online *EMBASE* thesaurus to establish the preferred subject areas.

Data were coded and stored in a ProCite database for analysis. Descriptive statistics were applied to each data category.

Results

A total of 331 original papers were published in *Med Princ Pract* from its inception in 1989 through 2003. As shown in Table 1, there was an increasing trend in the number of original papers published among the three periods. Although the increase in the number of research articles between the first and second period was slight (3.0%), there was an overall increase from period one to period three of 24.8%. Consistent with the growth in research papers, the number of references also increased 45.8% from the first to the last period. The distribution of the total number of references to source articles for the three periods was 7,185. All source articles contained references, with an average of 22 references per paper. The majority of authors ($n = 204$; 61.6%) cited 22 or less sources while 127 (38.4%) authors cited more than 22 references. Table 1 also shows that the mean number of pages per article between period one and period three decreased slightly, while the number of keywords assigned to each article remained the same. With respect to the slight decrease in article page length, the shift is most probably due to the journal's change in policy to limit the size of articles.

Research Designs Used

The data indicated that there were very few changes in the different research designs used by the authors for the three periods under study. Consequently, the data was amalgamated and examined collectively as one period. Table 2 presents the relative frequencies of the various research designs indicating that observational studies were more dominant than experimental. The most commonly used design was a cross-sectional methodology, accounting for 50.8% ($n = 168$) of all articles. The next most used method was experimental laboratory studies comprising 23.3% ($n = 77$) of the articles. Case-control and prospective-cohort methodologies represented an almost equal amount of the studies with a contribution of 9.3% ($n = 31$) and 8.8% ($n = 29$) respectively. Only 4.8% ($n = 16$) of the papers were clinical trials. Three percent ($n = 10$) of all studies reviewed were case reports. Other studies such as Alvarez-Dardet et al. (1985), Fletcher & Fletcher (1979), and Paige & Johnson (1994) reported similar findings, where the majority of the papers published in general health sciences research journals also used less experimental research methodologies.

Table 2
Summary of research designs in *Med Princ Pract* from 1989-2003

Type of study	Number of articles (%)
Experimental	
Laboratory studies	77 (23.3)
Clinical trials	16 (4.8)
Subtotal	93 (28.1)
Observational	
Cross-sectional	168 (50.8)
Case-control	31 (9.3)
Prospective-cohort	29 (8.8)
Subtotal	228 (68.9)
Miscellaneous	
Case reports	10 (3.0)
Total	331 (100.0)

Subject Coverage

A breakdown by primary subject shows that the research articles in *Med Princ Pract* are classified into twenty-nine subject categories (Table 3). The top twelve subjects comprised 73.7% (n=244) of all research, while the remaining 17 subject categories were represented by only 87 papers (26.3%).

Table 3 also showed that throughout the three defined periods, the subject content most represented was microbiology and public health. For these two subject areas, there was an increase in the number of papers for every period, while this was not the case for the other ten subjects. Furthermore, in order to provide an indication of growth tendencies in a particular subject area, the change in the number of papers between the first and last periods within that subject was examined. There was a greater increase in subjects such as chest diseases, radiology, cancer, clinical and experimental pharmacology, public health, and urology. They increased significantly by 200%, 133.3%, 125%, 125%, 112.5%, and 100% respectively between the first and the last

period. The number of research articles that focused on human genetics remained relatively the same, while those in endocrinology stayed constant. Papers in obstetrics and gynecology (OBGYN) and cardiovascular diseases, however, declined by at least 25%.

Table 3
Distribution of subject areas of original papers

Subject area	Total n (%)	Rank	Time Period		
			1989- 1995 n	1996- 1999 n	2000- 2003 n
Microbiology: bacteriology, mycology, parasitology, and virology	41 (12.4%)	1	11	14	16
Public health, social medical, epidemiology	37 (11.2%)	2	8	12	17
Obstetrics and gynecology	22 (6.7%)	3	8	8	6
Cardiovascular diseases and cardiovascular surgery	20 (6.1%)	4	7	8	5
Human genetics	19 (5.8%)	5	6	6	7
Cancer	17 (5.1%)	6	4	4	9
Urology and nephrology	17 (5.1%)	6	4	5	8
Gastroenterology	16 (4.8%)	8	5	3	8
Chest diseases, thoracic surgery, and tuberculosis	15 (4.5%)	9	3	3	9
Clinical and experimental pharmacology	15 (4.5%)	9	4	2	9
Radiology	13 (3.9%)	11	3	3	7
Endocrinology	12 (3.6%)	12	4	4	4
Other subjects (17)	87 (26.3%)	n.a.*	n.a.	n.a.	n.a.
Total	331 (100.0)	n.a.	n.a.	n.a.	n.a.

*n.a. = not applicable.

Due to the stochastic distribution of the number of papers for the other 17 subjects, dispersion among the three periods was not warranted. The data, however, showed that subject coverage with the least number of articles was nutrition, otorhinolaryngology, and dentistry accounting for only 1.5% ($n = 5$) collectively.

Author Characteristics

This section provides a profile of *Med Princ Pract* contributors. Specific characteristics examined were the total number of authors, frequency of publications by a given author, author collaboration, gender of lead author, extent of female participation, country and institutional affiliation of lead author, collaboration between Kuwait-based authors and authors from other countries, and multi-institutional teamwork.

There did not appear to be a journal standard for the listing of authors' names. Authors sometimes listed their first name and surname or only their initials and surname. This became problematic when trying to determine the number of times an author had papers published in *Med Princ Pract* and also when determining author gender. Out of the total data set, the co-author's gender in six cases could not be determined.

For the period under study, there were 937 contributors including primary authors and co-authors, of which 709 authors (75.7%) contributed only one article. Less than 10% ($n = 85$) had three or more articles and 15.4% ($n = 143$) had two papers published in the journal. The most prolific contributor to the journal had 12 articles. Furthermore, Table 1 indicates that there is a steady increase in the mean number of authors per four-year period.

The results also show that there is a preference for author collaboration (Table 1). Out of the 331 research papers studied, 93.7% ($n = 310$) were co-authored. The number of collaborating authors ranged from two to ten. Further analysis of the data identified 37 (11.2%) articles in which collaboration between Kuwait-based authors and those outside Kuwait occurred.

With respect to the gender of the lead author, 75.8% ($n = 251$) were male and 24.2% ($n = 80$) were female (Table 4). The low incidence of female authors could be attributed to the regional culture, compounded with the phenomena that the health sciences profession is more male-

oriented. Table 4 also shows that as the journal grows, so does the increase in lead female participants, while lead male authors stay almost the same. From the first period to the second period female authors increased by 73.3%, and from the second period to the third period by 50%. Overall, from period one to period three, there was a 160% increase in articles where the primary author was female. Furthermore, 59.1% (192 of 325) of articles published in *Med Princ Pract* from 1989-2003 were women who were either the lead author or participated as a co-author (Table 1).

Table 4
Demographics of Lead Authors

Variable	1989-1995 N ₁ = 101	1996-1999 N ₂ = 104	2000-2003 N ₃ = 126	Total N = 331
	n (%)	n (%)	n (%)	n (%)
Gender of Primary Author				
Male	86 (85.0)	78 (75.0)	87 (69.0)	251 (75.8)
Female	15 (15.0)	26 (25.0)	39 (31.0)	80 (24.2)
Country of Origin				
Inside Kuwait	86 (85.0)	91 (87.5)	79 (62.7)	256 (77.3)
Outside Kuwait	15 (15.0)	13 (12.5)	47 (37.3)	75 (22.7)
Institutional Affiliation				
Academic institution	66 (65.3)	70 (67.3)	80 (63.5)	216 (65.3)
Hospital / Clinic	35 (34.7)	32 (30.8)	33 (26.2)	100 (30.2)
Medical institute	0	2 (1.9)	11 (8.7)	13 (3.9)
Non-medical agency	0	0	2 (1.6)	2 (0.6)

An examination of the geographic distribution of first authors showed that the largest percentage of research articles (n = 256; 77.3%) originated from individuals based in Kuwait (Table 4). This high percentage is more likely because the journal under investigation originates in Kuwait and has not had enough international exposure. Nineteen papers (5.8%) were from eight other Arab countries. The

authors of the remaining papers (n = 56; 16.9%) were located in 22 other countries.

A final demographic variable examined was the institutional affiliation of only the first author. Institutional categories included academic institutions, hospitals/clinics, medical institutes, and non-medical agencies. As can be seen from Table 4, no major fluctuations occurred between periods in the relative frequencies of authors affiliated with hospitals or non-medical agencies. There was a slight increase (21.2%) in authors associated with university settings from the first to the last period. Researchers connected to medical institutes increased from 2 to 11 papers between periods two and three. The increase was associated with the rise in international papers. Overall, a large majority of all first authors (n = 216; 65.3%) were associated with academia, followed by hospital-based practitioners (n = 100; 30.2%). The remaining affiliations such as other institutes and non-medical agencies comprised less than 5% (n = 15). Further analysis of the data revealed that 51.1% (n = 169) of the articles were written by authors affiliated with Kuwait University's College of Health Sciences and 25.1% (n = 83) were from authors associated with Kuwaiti hospitals. In 74.3% of all the cases (n = 246), teamwork between more than one institution was apparent.

Citation Characteristics

The final bibliometric characteristic examined was how authors interacted with existing knowledge through their cited literature. Reference data studied included the format of the references and the age distribution of cited literature.

Of the 7,185 references recorded, 6,507 (90.6%) were cited to journal literature. The remaining cited material was to books (n = 489; 6.8%), reports (n = 124; 1.7%), Web-based sources (n = 2; 0.02%), and other materials (n = 63; 0.88%).

Age data was available for 7,173 of the cited items. The recorded age of the supporting literature was calculated by subtracting the year of publication of the cited item from the year of publication of the source item. Table 5 summarizes the age distribution of references used by authors in *Med Princ Pract*. Almost two-thirds (n = 4,443; 62%) of the references were 0-10 years old and an additional 26.7% (n = 1,914) were 11-20 years old, accounting for the majority of the cited items (n = 6,357;

88.7%). Only 11.3% (n=816) of all the cited literature was to works older than 20 years. References that were five years old or less at the time of publication of the citing article accounted for approximately 33% (n=2,329) of the citations. For the period under study such cited literature increased by 68.5% from the first period to the last (Table 1).

Table 5
Age distribution of the cited literature (N=7,173)

Years	Number of references	Cumulative number	Percentage of references	Cumulative percentage
0*	70	70	1.0	1.0
1-5	2,259	2,329	31.5	32.5
6-10	2,114	4,443	29.5	62.0
11-15	1,209	5,652	16.9	78.9
16-20	705	6,357	9.8	88.7
21-25	378	6,735	5.3	94.0
26-30	181	6,916	2.5	96.5
31-35	108	7,024	1.5	98.0
36-40	59	7,083	0.8	98.8
41-45	38	7,121	0.5	99.3
46-50	15	7,136	0.2	99.5
> 50	37	7,173	0.5	100.0

*Same year.

Figure 1 presents the graphical distribution of the age dispersion of cited sources where each point on the graph reflects a 5-year interval. The first point on the semi-log scale represents the most recently cited material, five years old or less. The final point is an accumulation of all references older than fifty years and is given the value of the oldest interval extending to 137 years. By giving logarithmic values to the ages of cited items as the materials age, Figure 1 clearly shows the decline in their use. The distribution of cited material by age begins tapering off at the 36-40 year mark.

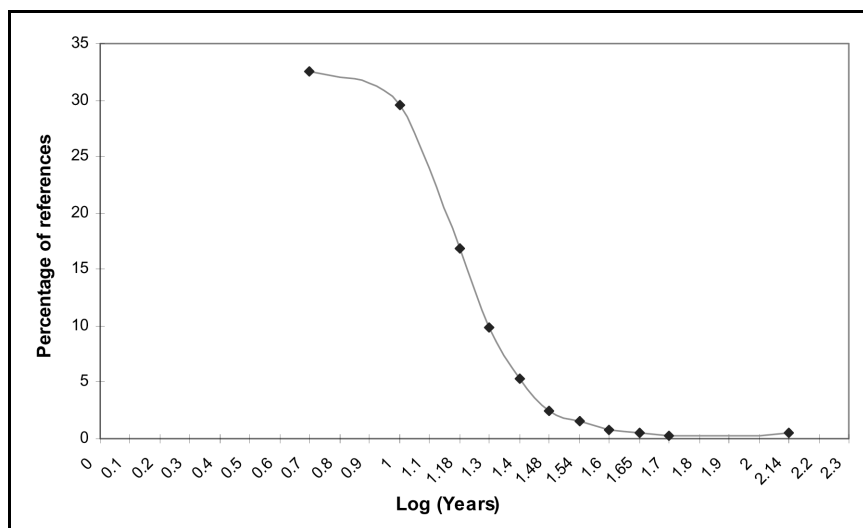


Figure 1. Age Dispersion

Also seen in Figure 1, the percentage of cited items five years old or less is approximately 33%. This percentage of 33 represents the value of Price's Index (PI) used to determine the archival or research front of a discipline, journal, author, etc. (Price, 1970). In applying Price's theory, this value of 33 fell in neither the lower quartile (archival; soft science) nor the upper quartile (high research front; hard science). This is indicative that the cited literature has a normal research front, and can be considered a "medium science".

Discussion

This study demonstrates a steady growth in the volume of papers published in *Med Princ Pract* that clearly reflects an increase in scholarly and scientific activities in the region. Analysis of the publishing pattern of the journal indicates that it is evolving towards a mature publication with scientific integrity. The journal is a strong tool for the dissemination of scholarly communication that addresses a wide variety of health issues affecting people in this part of the world (Arab Gulf countries) as well as reporting on scientific activities to the international community.

Findings from this study show that as a research community, authors in *Med Princ Pract* operate within the standard practices of biomedical research journals. First, there is a distinct trend towards

collaborative research as well as an increase in the number of collaborators per paper. The high incidence of multiple-authorship and the increase in the average number of authors per article is in agreement with that occurring in the global arena (Epstein, 1993). This pattern is also consistent with international figures published by *Science Citation Index (SCI)* (Institute for Scientific Information, 2004). According to *SCI*, the average number of authors per source item in scientific disciplines has risen steadily from 3.12 in 1989 to 4.27 in 2003. Figures show that the average number of authors per paper in *Med Princ Pract* rose from 3.7 to 4.6 for the same period.

Another trend is that the steady increase in the average number of references per scientific paper also corroborates with *SCI* statistics (Institute for Scientific Information, 2004). Thirdly, the core of first authors and their correlating institutional affiliation has not changed much since the journal's inception. The authors are predominately associated with university settings. This is not surprising since the general pattern found in the biomedical literature is that most research normally is derived from academia (Keating et al., 1998; Paige & Johnson, 1994). Finally, the results indicate that this group of researchers is no different from their peers in that they also base the majority of their research on observational research designs rather than experimental methodologies. This finding is supported by similar studies in the literature (Alvarez-Dardet et al., 1985; Fletcher & Fletcher, 1979; Thompson, 1996).

Other patterns characterizing the journal's research culture are a noticeable rise in the number of authors not based in Kuwait and an increase in female lead authors and co-authors. These modest yet encouraging trends suggest that *Med Princ Pract* has a small, but increasing international profile, and female contributors are becoming a more contributing force.

The diverse subject content found in the articles supports the mission of the journal, that is, to include all fields in the health sciences. Not only are scientific aspects of biomedicine covered, but health-related social issues are of interest as well. Twenty-nine major subject fields are identified, with microbiology and public health issues receiving the most attention for all periods from all categories of researchers. Although research in OBGYN and cardiovascular diseases declined over the years, these subjects are still the next most represented group. Research

concerning chest diseases increased considerably (200%) and could suggest a rise in these types of diseases or a renewed interest in the field. Other subject specialties showing substantial increases in the number of research studies from the first period to the last are cancer, radiology, and pharmacology. The proportion of articles in nutrition, otorhinolaryngology, and dentistry are the least represented fields. In fact, dentistry has a negligible presence in the journal with only one paper. This could be because the majority of health sciences research emanates from academia and Kuwaiti higher education institutions did not offer a degree in dentistry. However, in the coming issues, one expects that there will be an increase in dentistry as well as nutrition research output as Kuwait University has since established programs in these disciplines.

One aspect of authorship that is worth noting is the lack of uniformity among authors' names. It was quite noticeable that when it came to the names of authors, the journal's editorial policy does not stipulate a consistent format for the assignment of the name to the article. Furthermore, the authors themselves also use variant spellings of their names and name combinations in their writings. In addition, it is quite common with Arabic names that many researchers in like fields have the same initials, if not the same name. Finally, names that have long-strings and typically are from non-English speaking countries present unfamiliarity to the citer (Kotiaho, 1999). Such is the case with Arabic names. Any or all of the factors mentioned above can lead to ambiguous access, confusion, and misrepresentation of the author. It has been documented that unfamiliar citations do cultivate errors and that there is a tendency towards making more errors when one is not accustomed to names from another language (Kotiaho, 1999). Consequently, this could result in an incorrect citation, which in turn could lead to under-citation or over-citation for the author.

The referencing behavior of the authors can be compared against several norms that characterize scholarly communication. First, the study shows, there is a relatively high level of source papers that contain cited literature. This is consistent with established theory that the majority of scientific communication in the health sciences community follows this medium. Secondly, the data also tests well against a bibliometric principle developed by Windsor and Windsor (1973). They argued that the ratio of source papers without references to those with references

could be used as a measure of the “scholarly status of a field.” As a result, if all papers included references, then the scholarly level would have a ratio of 0:100. This is the case in this study, which is an indication of the intellectual level of the journal. Thirdly, the average number of references per paper in *Med Princ Pract* is 22, demonstrating a healthy attitude towards scholarship. This is in line with Price’s theory where the higher the number of papers in a journal with a norm of ten to twenty-two references denotes a high level of scholarliness in the journal (Price, 1970). Furthermore, the PI value for *Med Princ Pract* was approximately 33. The same value was reported by a study that investigated the citation patterns of the journal (Al-Qallaf, 2003). The PI value of 33 fell in neither the lower quartile of a soft science nor the upper quartile of a hard science. Henceforth, the cited literature has a normal research front implying that the original papers in *Med Princ Pract* resemble a “medium science”.

The PI value also suggests that the citation practices of authors in *Med Princ Pract* more closely favor those of researchers in the social sciences rather than the pure sciences. This is surprising since health sciences are a discipline where current material is likely to be the most heavily used. For this group of authors, possibly this is because of the unavailability of more recent information or perhaps due to the nature of the research. Another reason might be that the majority of research being conducted follows observational research methodologies, which could account for the referencing of older literature. The results, however, did indicate a positive trend, in that during the 15-year period under study, there was a slow increase in the number of recent citations.

Overall, the scientific behavior of the journal concurs with research activity found in established research regions such as Europe and North America. The analysis suggests that *Med Princ Pract* is providing a viable forum for the dissemination of information to the health care community.

Conclusion

Med Princ Pract has successfully followed what deems general practices for medical journals to stay scientifically active. Such practices include English language publications that remain general in nature rather than becoming too specialized, that also provide a forum for

health policy research, and that strongly support research contributed by women (Smith, 1991).

In view of this study, several recommendations are presented:

First, despite the growing number of outside contributors, it is recommended that the editors need to generate exposure that is more global. The inclusion of *Med Princ Pract* in *MEDLINE* from 2002 is a positive step in this direction. Additionally, this could be achieved by encouraging local-based professionals to expand their research partnerships outside the country and by stimulating submissions from the international community. The editors should also try to strengthen the journal's circulation pattern by launching a proactive marketing campaign. Furthermore, editors could actively report research findings to the mass media, which will provide further journal awareness.

Secondly, there are several suggestions that can contribute to the scientific status of the journal. Researchers need to be encouraged to broaden the scope of their research efforts in terms of research designs. Frequently, quality and rigor of research are used as a barometer for a journal's scientific achievement. Although all types of research are necessary for the growth of health sciences knowledge, it is important that researchers use methodologies that are more exacting, and which will add enormous theoretical value to the journal as well as to the profession (Fletcher & Fletcher, 1979; Menz, 2002; Paige & Johnson, 1994; Thompson, 1996). Next, the citing of literature that is more recent will also have a positive impact on the journal's research front. In light of the extensive amount of information and technologies available, the citing of more electronic resources is also recommended.

Finally, the lack of standardization with regard to the format of authors' names could be remedied by adopting a formal editorial policy. One such approach would be to list the first three initials of the author's name followed by the family name. Another method would be to list the first name, two initials, and family name. Furthermore, the policy should include the creation of an authority file for author names to establish uniformity. The formulation of such a file would provide authority control over the variant spellings of author names, thereby determining and maintaining consistency and providing better access points to the author's research.

Since this study is the first attempt to analyze a health sciences journal published in a GCC country, it is hoped that this study will set a prototype and encourage other regional journal editors and researchers to conduct similar studies. It is also believed that the findings could generate common interests among peers and strengthen information transfer within and outside the region. In future studies, one would also hope to see increased attention given to the communicative behavior of scientists in Kuwait via the use of other bibliometric studies. Furthermore, it would also be worthwhile to examine the journal's degree of compliance to international standards developed by the International Organization for Standardization (ISO) in regards to the publication of scientific journals and representation of its contributions. Finally, for information professionals, especially those who provide information services and collection management, the findings about the journal's culture undoubtedly will assist them in addressing the eclectic nature of health care resources and services.

A similar study of the journal in ten years is worthwhile to determine whether the findings noted in this study will persist, or whether new trends will emerge.

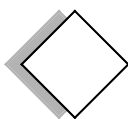
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مجلة الأسس والتطبيقات الطبية من عام 1998-2003: دراسة بيبليومترية لمقالات بحثية

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ملخص: تهدف الدراسة إلى مراجعة وتحليل للمقالات البحثية الأصلية التي نشرتها دورية Medical Principles and Practices، وتقديم نبذة عن المشاركين في كتابتها، وتحديد الأنماط والاتجاهات المحورية. وتطبق في الدراسة عدة مبادئ بيبليومترية للتأكد من النشاط البحثي للدورية.

تشتمل عينة الدراسة على 331 مقالاً بحثياً مأخوذاً من أول 12 مجلداً (من عام 1989 حتى 2003)، باستثناء المقالات التي نشرت في أعداد إضافية، وقد حلت جميع المقالات مع الأخذ بعين الاعتبار معدل عدد المراجع المستخدمة، وعدد المصطلحات الأساسية وأحجامها، والموضوع الرئيس وتصميم البحث لكل مقال، والخواص المميزة للمؤلف بالإضافة إلى تحليل المراجع المستخدمة. كما فحص نمط النماء للدورية. وللمقارنة قسم المدى الزمني للدراسة إلى ثلاث فترات زمنية، تحتوي كل منها على أعداد متساوية من المجلدات، ورُمزت المعلومات فضلاً عن تخزينها في قاعدة البيانات Procite ليصار إلى تحليلها.

وقد وصل إجمالي الموضوعات إلى 29 موضوعاً، يتركز معظمها على علم الميكروبيولوجي والقضايا المتعلقة بالصحة العامة. كما هيمنت طرق البحث غير التجريبية (cross-sectional research) على المقالات المنشورة.

وقد تميزت المقالات بتعدد المؤلفين (93,7%). وبلغت نسبة المقالات التي كان واحد من مؤلفيها - على الأقل - من الإناث 60,6%. في حين كان معظم المؤلفين ممن يعملون في الكويت (77,3%). وكان عدد الأفراد المنتسبين إلى الجامعات ما زال يمثل معظم المشاركين في الدورية (65,3%). إضافة إلى أن قيمة مؤشر برايس (Price Index value) بلغت 33 تقريباً.

بشكل عام، تميل الدورية إلى النشر العلمي الذي يتميز بالتكامل والنضج. ويتبع السلوك البحثي للمؤلفين قواعد علمية مقبولة. إلا أن هناك بعض التوصيات المطروحة المتعلقة بالدورية، مثل وضع أسماء المؤلفين طبقاً لمقاييس معيارية واتباع عدد أكبر من الطرق البحثية التجريبية.

المصطلحات الأساسية: علم البيبليومتري، الكويت، الأدب الطبي، المجلة العلمية.

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