

■ REVIEW ■

Productivity of SCI Korean Medical Papers: 1996-1997

In order to investigate the extent and growth of SCI publication activity of Korean medicine, DIALOG's SCISearch database was searched and the number of SCI Korean medical papers in each medical specialty was measured by publication year and by document type for 1996 and 1997. The percentage contribution of Korean medical papers to SCI database and the SCI publication productivity ratio were analyzed for each of 57 medical specialties. The data obtained in this study was compared with the data representing the 1980s and the data for the first half of the 1990s. The absolute productivity of SCI Korean medical papers as measured by the number of SCI Korean papers has increased about ten times from 306 papers in 1990 to 3,261 papers in 1997. More than 15% of SCI Korean publication output has resulted from six Korean medical journals indexed in SCI from 1995. The relative productivity of SCI Korean medical papers as measured by the percentage contribution from Korea to SCI and by its corresponding productivity ratio is not as impressive as the absolute productivity and its growth rate. It has increased three times from 0.245% to 0.642% during the same period. The relative productivity of SCI Korean medical publication output is not as great as the SCI Korean publication output of all sciences combined (1.02%).

Key Words: Bibliometrics; Korea; Medicine; Periodicals/Statistics & numerical data; Research/Statistics & numerical data

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INTRODUCTION

Researchers striving for the broadest possible exposure and recognition of their work generally prefer to publish their findings in highly cited, international journals. In medical fields, no one would dispute "highly cited, international" journals are those journals covered by MEDLINE or SCISearch. In particular, the presence of a journal in SCISearch is considered to be a symbol of prestige that the journal is of quality. The database indexes over 5,600 "high quality, peer-review journals" (1), "based on the citation analysis data" (2). The SCISearch is acclaimed as the science information source in which only "the world's most influential journals" (1) are indexed. Consequently, whether a paper is published in a journal indexed in SCISearch or not is often used as a criterion to evaluate the quality of a research work.

There is a strong tendency in Korea toward encouraging (or requiring) publication in major foreign journals. For instance, in order to qualify for a research grant especially in science & engineering, one must have at least two SCISearch papers published in the five years prior to grant application date (3). Those who publish in "prestigious" foreign journals can get compensation from

Korea Research Foundation (KRF) for the page charges they pay to the contributing journals (4). Several universities in Korea have recently adopted policies which demand their faculty members to publish in internationally renowned journals (5-10). For instance, effective as of 1994, Seoul National University, College of Medicine requires a professor to publish as a principal author at least one paper in SCISearch or MEDLINE non-Korean journals in order to qualify for promotion to a higher rank position.

In addition to these nationwide efforts to encourage Korean scientists to publish in SCI journals, there also are nationwide efforts to make Korean journals to compete at the international level. Many Korean journal publishers wish and try hard to make Korean journals accepted to abstract and index (A&I) databases used internationally, such as SCISearch. Again, with the intention to encourage Korean journals to upgrade to the level comparable to international standard, KRF provides grants to a few selective academic societies which publish journals covered in international databases (11). Whether a Korean journal is covered by major international A&I databases or not is an important criterion in both journal evaluation processes conducted by KRF (12) and by

Korean Association of Medical Journal Editors (KAMJE) (13). The weight is given depending on the number of major international databases which include the Korean journal. As of 1999, six Korean medical journals are indexed in MEDLINE. Sixteen Korean journals are indexed in SCISearch, and seven of them are journals in medicine and related area. They are recent additions to SCISearch. *Experimental and Molecular Medicine* is indexed since 1995, and *Yonsei Medical Journal*, since 1998.

It is now more likely that most Korean medical researchers will try harder to publish their best research results in highly cited international journals, and that they will be more concerned about their rate of publication in such journals. In addition, the inclusion of a few Korean medical journals in SCISearch should have resulted in the increase in the number of Korean SCISearch medical papers to a great extent.

In the present study, it is attempted to capture the growth of Korean "medical" papers published in SCISearch journals in recent years. It is expected that the literature growth in the second half of the 1990s should have been explosive as a consequence of the nationwide efforts which began in the early 1990s. However, it is possible that the contribution rate to SCISearch from Korea has not increased as much as the absolute number of SCI Korean medical papers. The present study will look for the evidence of this relative growth of Korean medical papers by measuring the percentage share of Korean papers among SCISearch papers.

A series of studies have already been conducted to measure Korea's impact on world science by its publication output in SCISearch journals, especially in the area of medicine. The first study covered the entire period of the 1980s (14), and the second study covered six years from 1990 to 1995 (15). In the present study, the two year period of 1996 and 1997 is examined. The number of Korean medical papers indexed in SCISearch is measured by specialty for 1996 and 1997 respectively. The total number of medical papers indexed in SCISearch is also measured by specialty to compute contribution rate from Korea. The absolute and relative growths of Korean medical papers are investigated with the data collected in the present study along with the data collected in the two previous studies.

MATERIALS AND METHODS

The major task of the present study is to identify Korean medical papers in SCISearch database. This requires two definitions: what is a Korean paper and what is a medical paper?

A Korean paper is defined as a paper written by re-

searchers, at least one of whom has an address in Korea. It fits to our purpose to include every paper in which Korean research institutions are involved at one degree or another. Retrieving all the Korean papers is rather straightforward with the SCISearch because the Geographic Location (GL) field identifies the country of the authors. The field is derived from the Corporate Source (CS) field, and covers every author, not just the first author of a paper (16). The GL=South Korea is therefore a comprehensive and powerful search statement to retrieve all the papers contributed from Korea.

A medical paper is defined as a paper in the 38 clinical medicine and 19 biomedical research subfields. The 57 scientific subfields are chosen from the Subject Category (SC) listings of the Journal Citation Reports 1997 Science Edition CD-ROM (17) and "Science Citation Index Disciplines Covered" (18) to reflect new or changed subject categories used in the SCISearch. In the two previous studies of SCI Korean medical papers, the 47 subfields were surveyed. Three subfields, dentistry, veterinary medicine and nursing are not included in this study as in the previous studies.

Korean medical papers are identified by the intersection of the two sets: all the Korean papers and all the medical papers of a subfield. Then the retrieved sets were limited by year using the Publication Year (PY) field. Editorials and meeting abstracts are not considered to be original research papers, so they are separated from the retrieved set using the Document Type (DT) field.

Because some journals are coded more than once in different subjects, papers published in those journals are retrieved repeatedly in several medical specialties. Therefore, it is necessary to remove duplicates to obtain a "true" total number of Korean SCI medical papers of each year. A true total number of Korean clinical medicine papers is obtained as the union of all the search sets for clinical medicine subfields. Similarly, a true total number of Korean biomedical research papers is identified by creating the union set of all the biomedical research subfield sets. Finally, a true total number of the SCI Korean medical papers is obtained as the union of all 57 medical specialties.

Online searching of SCISearch database was conducted on the fifth week of 1999 through DIALOG, based on the database search strategy described above. The processing and statistical analysis of data were performed using the EXCEL97 and SPSSWin 7.5.

RESULTS

The frequency counts of SCI Korean medical papers in 57 medical specialties are presented by publication

Table 1. Number of Korean medical papers indexed in SCI: 1996-1997 by specialty and publication year

Specialty*	1996	1997	Total**
Clinical Medicine			
1. Allergy [18]	13 (4)	31 (17)	44 (21)
2. Andrology [4]	0	1	1
3. Anesthesiology [21]	9 (4)	15 (5)	24 (9)
4. Cardiac & Cardiovascul Sys [†] [62]	41 (9)	33 (15)	74 (24)
5. Clinical Neurology [†] [107]	52 (5,1e)	67 (7,2e)	119 (12,3e)
6. Dermatol & Venereal Disease [32]	76 (20,1e)	89 (27,2e)	165 (47,3e)
7. Emergency Med & Critical Care [†] [20]	5	2	7
8. Endocrinology & Metabolism [81]	45 (6,2c)	91 (60,1c)	136 (66,3c)
9. Gastroenterology & Hepatology [42]	119 (93,1c)	198 (159,1c)	317 (252,2c)
10. Geriatrics & Gerontology [22]	3	3 (1)	6 (1)
11. Hematology [59]	33 (22,1c)	62 (42)	95 (64,1c)
12. Immunology [117]	15 (2)	22	37 (2)
13. Infectious Disease [†] [34]	128 (13)	106 (22)	234 (35)
14. Med, General & Internal [100]	13 (3)	12	25 (3)
15. Med, Legal [9]	2	2	4
16. Med, Miscellaneous [§] [0]	3	-	3
17. Neurosciences [150]	86 (9)	106 (8,1c)	192 (17,1c)
18. Obstetrics & Gynecology [54]	18	59 (33)	77 (33)
19. Oncology [102]	69 (3)	103 (5)	172 (8)
20. Ophthalmology [39]	92 (67)	92 (60)	184 (127)
21. Orthopedics [37]	21	32	53
22. Otorhinolaryngology [26]	18	17	35
23. Pathology [66]	40 (13)	54 (19)	94 (32)
24. Pediatrics [66]	32 (8)	41 (2)	73 (10)
25. Peripheral Vascul Dis [†] [38]	12 (2)	54 (37)	66 (39)
26. Pharmacology & Pharmacy [157]	152 (3)	200 (6,1c)	352 (9,1c)
27. Psychiatry [67]	9 (1)	12 (1)	21 (2)
28. Public, Environ & Occup Health [†] [72]	18 (1)	30 (2)	48 (3)
29. Radiol, Nucl Med & Med Imag [†] [75]	120 (17,1c,1e)	170 (42,1e)	290 (59,1c,2e)
30. Rehabilitation [†] [11]	1	5	6
31. Respiratory System [23]	8	15	23
32. Rheumatology [18]	16 (11)	34 (25)	50 (36)
33. Substance Abuse [9]	1	3	4
34. Surgery [114]	271 (127,1e)	280 (161,4e)	551 (288,5e)
35. Toxicology [63]	18	25	43
36. Transplantation [†] [14]	60	14	74
37. Tropical Medicine [16]	5	0	5
38. Urology & Nephrology [37]	195 (149)	233 (183)	428 (332)
Subtotal ^{††} [1,511]	1,461 (565,4c,3e)	1,979 (886,3c,7e)	3,440 (1451,7c,10e)
Biomedical Research			
39. Anatomy & Morphology [16]	2	5	7
40. Biochem & Molec Biol [253]	670 (82,1c,1e)	787 (129,3c,1e)	1457 (211,4c,2e)
41. Biomethods [§] [0]	25	0	25
42. Biophysics [46]	79 (13)	104 (7,1c)	183 (20,1c)
43. Biotechnol & Appl Microbiol [94]	308 (3,3c)	308 (1,1n)	616 (4,3c,1n)
44. Cell Biology ^{**} [130]	58 (19,1c)	192 (100,1c)	250 (119,2c)
45. Developmental Biology [30]	7	22 (7,1c)	29 (7,1c)
46. Engineering, Biomedical [41]	20	29	49
47. Genetics & Heredity [90]	85 (1c)	121 (24)	206 (24,1c)
48. Health Care Sci & Services [†] [16]	0	0	0
49. Medical Informatics [†] [19]	1	6	7
50. Medical Laboratory Technology [†] [21]	2	16 (4)	18 (4)
51. Med, Res & Experimental [61]	56 (15,1e)	67 (16)	123 (31,1e)
52. Microbiology [73]	104 (2)	106	210 (2)
53. Microscopy [10]	4	1	5
54. Nutrition & Dietetics [50]	8	16 (3)	24 (3)
55. Parasitology [21]	4	6 (1c)	10 (1c)
56. Physiology [65]	36 (1e)	34 (1)	70 (1,1e)
57. Virology [24]	20	23 (1c)	43 (1c)
Subtotal ^{††} [808]	1,255 (111,4c,1e)	1,434 (192,6c,1e,1n)	2,689 (303,6c,2e,1n)
Total ^{††}	2,586 (654,7c,4e)	3,261 (1,058,8c,8e,1n)	5,847 (1,712,15c,12e,1n)

The no. of meeting abstracts is indicated in (). The nos. of corrections (c), editorial materials (e), and news items (n) are also indicated.

*, The selection and the terminology of a medical specialty is based on the SCI JCR Science Edition: 1997 CD-ROM (Philadelphia: ISI, 1998.), and the online SC (Subject Category) thesaurus of DIALOG SCIsearch database. For each specialty, the no. of journals covered by SCI in 1997 is provided in []; [†], Changed from Cardiovascular System; [†], New SC code used; [§], SC code no longer used from 1997; [†], Changed from Public Health; [†], Changed from Radiology & Nuclear Medicine; ^{**}, Changed from Cytology and Histology; ^{††}, A column total is less than the sum of each cell in the column because some records are coded more than once in different subjects; ^{††}, A row total is the sum of individual years.

year in Table 1. A paper is counted as a Korean paper if at least one of the authors has an address in Korea whether he is the first author or not. A row total is an exact sum of individual years for each specialty. On the other hand, a column total for each year is always less than the sum of individual rows for a column because some records are coded more than once in different subjects. The number of SCI journals indexed in each specialty in 1997 (17) is provided as a reference point to estimate the size of the field.

The number of meeting abstracts as well as other types of documents included in the SCI database such as editorials, corrections, and news items is indicated (in the parenthesis) in Table 1. Inclusion of these other document type records for the analysis of SCI publication activity would make certain fields look unnecessarily active in contributing original research into international communication network. However, they are still included in Table 1, since one of the purpose of this study is to identify any Korean records indexed in SCI.

We can not simply equate SCI publication productivity with the quantity of a specialty's publication output. The degree of SCI publication productivity of each specialty should be rated proportionally. The proportion of Korean medical papers in SCI by specialty for the two-year period of 1996 and 1997 combined is presented in Table 2 (% contribution from Korea). This is calculated by dividing the number of SCI Korean papers in a medical specialty by the number of total SCI papers of the specialty. The proportion of a medical specialty among SCI Korean papers (Korea %) and among total SCI papers (Total SCI %) are also summarized in Table 2.

An equal number of papers produced by Korean researchers in two different medical specialties result in different percentage contributions from Korea to SCI. The productivity ratio of the percentage share of a specialty by Korean scientists in relation to that by world's scientists is computed (by dividing Korea % by Total SCI %) and presented in Table 2 (Ratio). The ratio larger than one implies that Korean researchers in the specialty performed better in the SCI than expected. The productivity ratio basically behaves the same as the percentage contribution from Korea, yet this measure makes it easier to see the difference in the degree of productivity of a medical specialty.

DISCUSSION

SCI publication output and its growth

A total of 2,586 papers contributed from Korea were identified from the SCI in 1996, and 3,261 papers in

1997 (Table 1). If limited to original research contributions, the number is reduced to 1,921 and 2,186 respectively. 3,440 (or 1,973 original research) papers were published in 38 clinical medicine specialties, and 2,689 (or 2,379 original) papers were published in 19 biomedical research specialties in two years. An actual total number is a lot less than the sum of papers contributed from each medical specialties, because some interdisciplinary journals are classified into more than one subject category in SCI. The two-year total corresponds to 5,847 (or 4,107 original) papers. This is a great increase from 1,236 (or 1,031 original) papers published in ten years of the 1980s, and from 5,220 papers (or 4,027 original) papers published in the six-year period from 1990 to 1996.

There is no doubt that there has been an absolute growth in the number of SCI papers over the years in the 1990s. Fig. 1 demonstrates the growth of SCI Korean medical papers since 1980. There had been three momentous years over the last 18 years. 1987 was the first leaping point, and the SCI publication output by Korean medical researchers was doubled in a year from 108 papers to 184 papers. Again in 1991, the output was almost doubled in a year from 306 papers to 540 papers. Finally in 1995, the number of papers has increased by thousand from 988 papers to 2,006 papers, and by the growth rate of 103%. This trend continues ever since, yet the annual growth rate is reduced to a modest 25% afterwards.

The explosive growth of SCI Korean medical papers in 1995 has a lot to do with the fact that several Korean medical colleges adopted policy to require medical faculty to publish in SCI journals since 1993 as mentioned in the introduction. It could have taken at least one or two years for that policy took effects: it takes that amount of time for a scientist to publish a research work in a very competitive journal. A rapid increase in 1987 was explained by Lee (14) as the consequence of the sudden increase in the number of English-language Korean medical journals being published around that time. Of the 14 English-language journals published in the early 1990s, six journals began publication after 1985, and four journals were transformed into English-language journals from Korean language journals after 1984.

Another way to look at the growth of Korean medical papers is comparing the average annual outputs for the different periods. It is well illustrated in Table 3 that an average number of papers published each year has increased to a great extent over the years. In the 1980s, the annual average output was 123.6 papers. It has increased 7.0 times to 870.0 in the first part of the 1990s. The annual average output has increased 3.4 times to 2,923.5 during the two-year period of 1996 and 1997.

Table 2. Proportion of Korean medical papers indexed in SCI: 1996-1997, by specialty

Specialty	Korea*	Total SCI†	Ratio‡	% Contribution from Korea
Clinical Medicine				
1. Allergy	44 (0.75%)	7,580 (0.83%)	0.90	0.580%
2. Andrology	1 (0.02%)	546 (0.06%)	0.29	0.183%
3. Anesthesiology	24 (0.41%)	13,426 (1.47%)	0.28	0.179%
4. Cardiac & Cardiovascul Sys	74 (1.27%)	36,598 (4.02%)	0.31	0.202%
5. Clinical Neurology	119 (2.04%)	39,047 (4.29%)	0.47	0.305%
6. Dermatol & Venereal Dis	165 (2.82%)	14,592 (1.60%)	1.76	1.131%
7. Emerg Med & Critical Care	7 (0.12%)	8,105 (0.89%)	0.13	0.086%
8. Endocrinology & Metabolism	136 (2.33%)	30,129 (3.31%)	0.70	0.451%
9. Gastroenterology & Hepatology	317 (5.42%)	34,997 (3.84%)	1.41	0.906%
10. Geriatrics & Gerontology	6 (0.10%)	4,222 (0.46%)	0.22	0.142%
11. Hematology	95 (1.62%)	43,631 (4.79%)	0.34	0.218%
12. Immunology	37 (0.63%)	13,537 (1.49%)	0.43	0.273%
13. Infectious Disease	234 (4.00%)	42,166 (4.63%)	0.86	0.555%
14. Med, General & Internal	25 (0.43%)	67,068 (7.37%)	0.06	0.037%
15. Med, Legal	4 (0.07%)	1,883 (0.21%)	0.33	0.212%
16. Med, Miscellaneous	3 (0.05%)	674 (0.07%)	0.69	0.445%
17. Neurosciences	192 (3.28%)	54,388 (5.97%)	0.55	0.353%
18. Obstetrics & Gynecology	77 (1.32%)	16,148 (1.77%)	0.74	0.477%
19. Oncology	172 (2.94%)	37,340 (4.10%)	0.72	0.461%
20. Ophthalmology	184 (3.15%)	23,490 (2.58%)	1.22	0.783%
21. Orthopedics	53 (0.91%)	10,483 (1.15%)	0.79	0.506%
22. Otorhinolaryngology	35 (0.60%)	7,183 (0.79%)	0.76	0.487%
23. Pathology	94 (1.61%)	18,874 (2.07%)	0.78	0.498%
24. Pediatrics	73 (1.25%)	23,191 (2.55%)	0.49	0.315%
25. Peripheral Vascular Disease	66 (1.13%)	23,180 (2.55%)	0.44	0.285%
26. Pharmacology & Pharmacy	352 (6.02%)	51,409 (5.65%)	1.07	0.685%
27. Psychiatry	21 (0.36%)	19,558 (2.15%)	0.17	0.107%
28. Public, Environ & Occup Health	48 (0.82%)	17,400 (1.91%)	0.43	0.276%
29. Radiol, Nucl Med & Med Imag	290 (4.96%)	31,949 (3.51%)	1.41	0.908%
30. Rehabilitation	6 (0.10%)	2,183 (0.24%)	0.43	0.275%
31. Respiratory System	23 (0.39%)	8,904 (0.98%)	0.40	0.258%
32. Rheumatology	50 (0.86%)	9,190 (1.01%)	0.85	0.544%
33. Substance Abuse	4 (0.07%)	2,463 (0.27%)	0.25	0.162%
34. Surgery	551 (9.42%)	69,159 (7.60%)	1.24	0.797%
35. Toxicology	43 (0.74%)	11,870 (1.30%)	0.56	0.362%
36. Transplantation	74 (1.27%)	8,564 (0.94%)	1.35	0.864%
37. Tropical Medicine	5 (0.09%)	2,699 (0.30%)	0.29	0.185%
38. Urology & Nephrology	428 (7.32%)	24,544 (2.70%)	2.72	1.744%
Subtotal§	3,440 (58.83%)	673,137 (73.94%)	0.80	0.511%
Biomedical Research				
39. Anatomy & Morphology	7 (0.12%)	2,323 (0.26%)	0.47	0.301%
40. Biochem & Molec Biol	1,457 (24.92%)	124,537 (13.68%)	1.82	1.170%
41. Biomethods	25 (0.43%)	4,495 (0.49%)	0.87	0.556%
42. Biophysics	183 (3.13%)	25,106 (2.76%)	1.13	0.729%
43. Biotechnol & Appl Microbiol	616 (10.54%)	25,207 (2.77%)	3.81	2.444%
44. Cell Biology	250 (4.28%)	42,564 (4.68%)	0.91	0.587%
45. Developmental Biology	29 (0.50%)	6,780 (0.74%)	0.67	0.428%
46. Engineering, Biomedical	49 (0.84%)	7,228 (0.79%)	1.06	0.678%
47. Genetics & Heredity	206 (3.52%)	29,021 (3.19%)	1.11	0.710%
48. Health Care Sci & Services	0 (0.00%)	263 (0.03%)	—	0.000%
49. Medical Informatics	7 (0.12%)	3,406 (0.37%)	0.32	0.206%
50. Med Lab Technol	18 (0.31%)	5,446 (0.60%)	0.51	0.331%
51. Med, Research & Experimental	123 (2.10%)	21,255 (2.33%)	0.90	0.579%
52. Microbiology	210 (3.59%)	19,311 (2.12%)	1.69	1.087%
53. Microscopy	5 (0.09%)	1,748 (0.19%)	0.45	0.286%
54. Nutrition & Dietetics	24 (0.41%)	10,094 (1.11%)	0.37	0.238%
55. Parasitology	10 (0.17%)	4,251 (0.47%)	0.37	0.235%
56. Physiology	70 (1.20%)	23,853 (2.62%)	0.46	0.293%
57. Virology	43 (0.74%)	7,389 (0.81%)	0.91	0.582%
Subtotal§	2,689 (45.99%)	293,696 (32.26%)	1.43	0.916%
Total§	5,847 (100.00%)	910,405 (100.00%)	—	0.642%

The no. of meeting abstracts, editorials, corrections, and news items are included.

*, Percentage share of a specialty out of the total number of papers published by Korean researchers is provided in ().

†, Percentage share of a specialty out of the total number of papers published by world's researchers is provided in ().

‡, Ratio is the percentage share of Korea divided by the percentage share of total SCI.

§, A column total is less than the sum of each cell in the column because some records are coded more than once in different subjects.

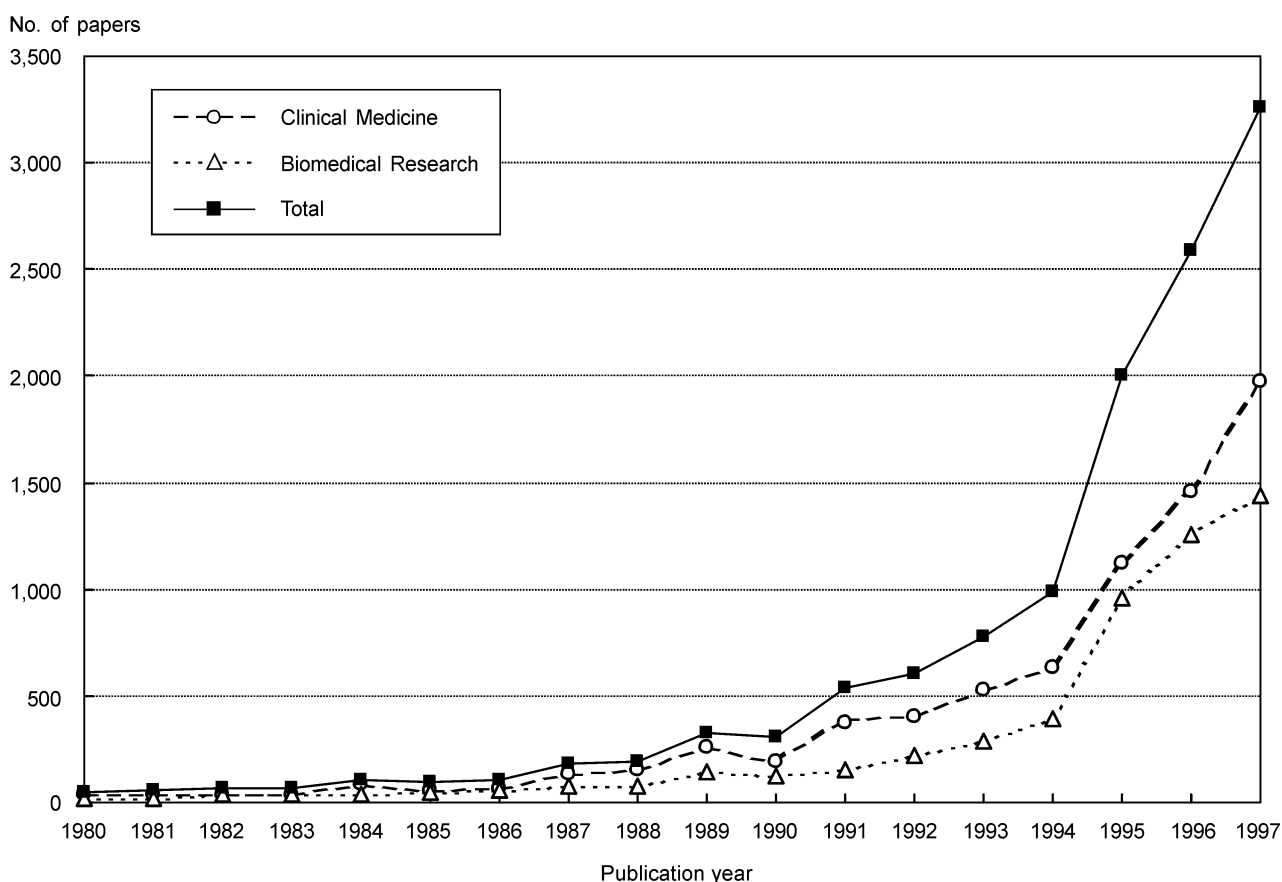


Fig. 1. Growth of SCI Korean Medical Papers: 1980-1997.

Table 3. Changes in the productivity of SCI Korean medical papers

Period	No. of years	Productivity			
		Absolute (no. of papers)			Relative (% contribution)
		Total	Average/yr	m,e,c,n*	
1980-1989	10	1,236	123.6	205 (16.6%)	0.051% [†]
1990-1995	6	5,220	870.0	1,193 (22.9%)	0.245%
1996-1997	2	5,847	2,923.5	1,740 (29.8%)	0.642%

Data for the 1980-1989 period is excerpted from Lee CS, Medical Papers Published by Korean Scientists During the 1980s: A Comparison with Chemistry [dissertation]. Chicago: Univ Chicago, 1994. Data for the 1990-1995 period is excerpted from Lee CS. Publication output and contribution rate of SCI Korean medical papers: 1990-1995. J Korean Soc Info Manag 1999; 16: 137-56.

*, No. of meeting abstract (m), editorials (e), corrections (c), and news items (n), which are not considered as original research papers. Percentage in () is the proportion of these out of the total no. of SCI Korean medical papers.

[†], Percentage contribution for the period 1980-1990 rather than 1980-1989.

The overall publication output of each specialty for the 1996 and 1997 period is 51.3 papers per year. This is more than 15 times of the 1980s in which a mere number of 3.16 papers per year for each specialty is published in SCI journals. To put it in more direct terms, the output of a specialty for one year of the late 1990s is almost a double size of the ten-year output of an average medical specialty of the 1980s.

Of all the 57 medical specialties, biochemistry & mol-

ecular biology has produced the most number (1,240 papers in two years) of SCI Korean papers, followed by the Biotechnology and applied microbiology with 608 papers (Table 1). Both Biochemistry & molecular biology and Biotechnology and applied microbiology have always been the two most productive areas in Korean medicine as far as the SCI publications are concerned. Pharmacology and pharmacy has produced the most number of SCI Korean papers among clinical medicine specialties. There

have not been much changes in the rankings of medical specialties by the number of papers produced since 1980s. In addition to the medical specialties mentioned above, Dermatology & venereal disease, Neurosciences, Radiology, nuclear medicine & medical imaging, Surgery have been in the top ranks of clinical medicine specialties. Biophysics, Cell biology, and Genetics & heredity also have been in the top of biomedical research specialties.

Proportion of meeting abstracts

One point to be made here is that papers presented at international congresses (ar even domestic, as in urology & nephrology) are captured in the SCI database, if abstracts of the meetings are published in relevant SCI journals. Meeting abstract comprise the second largest group of documents in SCI records. Other groups of a particular document type not considered as original research contribution, are of negligible size. There were a few Korean medical specialties which seemed to produce a good number of papers in international journals due to these meeting abstracts. 252 out of 317 gastroenterology & hepatology papers were meeting abstracts and there were two corrections. They consist 80.1% of Korean papers in that medical specialty. Urology and nephrology is another medical specialty with a high proportion (77.6% in the present survey) of meeting abstracts covered in SCI. There were 19 medical specialties in which more than 20%, and eight medical specialties in which more than 50%, of the SCI records were meeting abstracts and so on. 42.7% of clinical medicine and 11.6% of biomedical research papers are of these document types not considered as original research papers. Altogether, 29.8% of SCI Korean medical papers are of these document types. The proportion of Korean meeting abstracts is a bit higher than the proportion of meeting abstracts found throughout SCI which ranges 15% to 20% of total SCI records (19). The rate of 29.8% is a quite extensive increase from 22.9% of the first half of the 1990s and from 16.6% of the 1980s (Table 3).

Thus, although presenting papers at international congresses should be encouraged as international promotion of research conducted in Korea, we should not be misled by the inflated SCI publication counts which include the meeting abstracts.

Effect of Korean SCI journals

The effect of Korean journals which are SCI journals in the increase in the number of SCI Korean papers is of noteworthy. A total of 484 papers was published in Korean SCI journals in 1996, and 481 papers in 1997. They consist 18.7% and 14.9% of all SCI Korean papers

published in each year. Although the proportion of Korean SCI journal papers exceeded 15%, only 6 Korean medical journals were indexed in SCI in 1996 and 1997. These journals were found in a few medical specialties of biomedical research. Four of them were Biochemistry & molecular biology journals, producing 360 papers in 1996 and 370 in 1997. Since 670 Korean papers were indexed in SCI in 1996 and 787 papers in 1997, they consist almost 50% of the SCI papers published by Korean scientists in the field. The other two journals were Biotechnology & applied microbiology journals, producing 124 out of 308 SCI Korean papers of the specialty in 1996 and 111 out of 308 papers in 1997. It is about 40% of the SCI papers produced by the Korean scientists in the field. The Experimental & Molecular Medicine is indexed in two subject categories: Biochemistry & molecular biology, and Medicine, research & experimental. The journal papers also consist more than 50% of Korean papers published in the SCI journals of the Medicine, research & experimental field.

SCI contribution rate

During the two-year period of 1996 and 1997, percentage contribution from Korea was the highest, by far, in Biotechnology & applied microbiology with 2.444% (Table 2). Its productivity ratio, the percentage share by Korean scientists in relation to that by world's scientists, is 3.81. Urology & nephrology was the next highest with 1.744%. However, as it is known, almost 80% of the papers of the specialty are meeting abstracts. Therefore, it may be fair to say that the percentage contribution from Korea was the highest in Biochemistry & molecular biology with 1.170%. The next highest was Dermatology & venereal diseases with 1.131%. Simple figures such as the absolute number of papers is higher for Biotechnology & applied microbiology than Biochemistry & molecular biology. However, if productivity ratio or percentage contribution rate is compared, a somewhat different result is produced.

No Korean medical specialties contributed one percent or more to the world literature of that specialty during the 1980s. However, it is found in the present study that three medical specialties mentioned above contributed one percent or more to the world literature of that specialty in 1996 and 1997. In the early part of the 1990s, two medical specialties (Biotechnology & applied microbiology, and Urology & nephrology) contributed one percent or more to the world literature of that specialty.

There is a great difference between the percentage contribution rates in clinical medicine (0.511%) and biomedical research (0.916%). It is much higher in biomedical research. It is to be noted that biomedical research

includes four specialties with six Korean journals whereas clinical medicine has not a single Korean journal indexed in SCI.

The overall percentage contribution from Korea to SCI for medicine is 0.642% for the 1996 and 1997 period, whereas it was 0.245% in the early 1990s and 0.051% in the 1980s (Table 3). It has tripled in the 1996 and 1997 period compared to the first half of the 1990s, and it has increased in the magnitude of ten times compared to the 1980s. Yet, the overall contribution from Korea to SCI in medicine has not reached to 1% of total SCI records. The percentage contribution of Korean medicine to SCI is not as promising as other scientific fields in Korea. It is reported that Korea contributed 7,295 papers to SCI in 1996 and they consist 1.02% of total SCI records. In 1997, a total of 9,124 papers were contributed to SCI from Korea, and they consist 0.91% of total SCI records (20).

In conclusion, this study shows that the absolute productivity of SCI Korean medical papers as measured by the number of SCI Korean papers for the period of 1996 and 1997 has increased in the order of ten times compared to the early period of the 1990s. However, the relative productivity of SCI Korean medical papers as measured by the percentage contribution from Korea to SCI and by its corresponding productivity ratio has not increased at the same rate. It has increased about three times. What this implies is that although the number of SCI Korean medical papers has grown enormously, the growth in the contribution rate of Korean medical papers to the SCI is not as impressive as the growth of the number of papers published. This study also indicates that the relative productivity of SCI Korean medical publication output is not as great as the SCI Korean publication output of all sciences combined. Inclusion of six Korean journals in SCI since 1995 in the area of medicine has resulted in the increase of more than 15% of SCI Korean publication output.

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