

Report

Japan's Contribution to Research on Infectious Disease

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SUMMARY: We explored the degree of Japan's contribution to research in the field of infectious disease in the last decade. Articles published from 1991-2000 in highly reputed journals on infectious disease were accessed through the MEDLINE database. The number of articles having an affiliation with a Japanese institution was counted in total and for the respective journals. The proportions of randomized controlled trials (RCTs), case-control/cohort studies, and case reports among the articles affiliated with Japan were also calculated, and were compared with the overall proportions of these types of articles for all articles published in these journals. Japan's contribution to research on infectious disease was 3.4% of the total articles and ranked sixth among all countries. The recent trend in contribution was negative, although not statistically significant ($P=0.19$). RCTs in total articles published in these journals were 3.9%, which proportion has been increasing significantly over time. On the other hand, only one RCT (0.2%) was reported from Japan in the last decade. In addition, the proportion of case-control/cohort studies (2.2%) was smaller for articles from Japan than those from other countries. Compared with those of other developed countries, Japan's contribution to research on infectious disease has been unsatisfactory in the last decade. An explanation for this phenomenon should be determined and remedial measures should be taken forthwith.

INTRODUCTION

Infectious diseases collectively pose a tremendous social and economic burden on developing countries. In general, the developed world was moderately free from problems related to infectious disease until the early 80s. The human immunodeficiency virus (HIV) pandemic, however, heavily burdened most developed countries' health care systems, and the field of infectious disease has become an important field of research for both developing and developed countries. Several reports have documented Japan's contribution to different biomedical fields (1). The objectives of this study were to determine Japan's share of articles published in the field of infectious disease in the last decade and to detect any trend in such articles over that period of time.

MATERIALS AND METHODS

Seven journals concerned with infectious disease and having the highest impact factor for the year 2000 were selected from the "Infectious Disease" category set by the Institute for Scientific Information (2) in order to obtain the relevant data. These journals were as follows: AIDS, Journal of Infectious Diseases, Emerging Infectious Diseases, Antiviral Therapy, Infection and Immunity, Microbial Drug Resistance, and Journal of Acquired Immune Deficiency Syndromes. MEDLINE database was searched in the last week of April 2002 to elicit the number of articles (journal articles) originating from Japanese Institutions that had been published from 1991 through 2000. Then the proportion of the articles from Japan was generated for each of the journals and totaled in order to determine the net contribution from Japan to infec-

tious disease journals as a whole. In addition, countries were ranked in descending order according to the proportion of their contribution. Shares of the top 20 ranking countries were also generated for each year (1991-2000) in order to investigate for trends. We also searched the MEDLINE database to elicit the proportion of randomized controlled trials (RCTs), case-control/cohort studies, and case reports for total articles and separately for Japan-affiliated authors.

Nonparametric tests for trends were performed using STATA 7.0 (STATA statistical software version 7 [intercooled], STATA Corp., College Road, Tex., USA) to determine any significant change in each country's contribution over the period of time investigated. Tests of significance were two-tailed, and values of $P \leq 0.05$ were considered to be significant.

RESULTS

In total, 18,668 articles were published in seven journals on infectious disease from 1991 through 2000. Affiliation data were available for 18,537 (99.3%) articles. Japan's contribution consisted of 626 articles (3.4%), and ranged from 0.8% to 5.4% in the respective seven journals (Fig. 1). Japan's share in this field actually decreased over time, from 3.9% in 1991 to 3.1% in 2000, although this negative trend was not statistically significant ($P=0.19$) over the period of time investigated (Fig. 2). Table 1 shows the 20 top-ranking countries in terms of volume and share of total articles. Japan ranked sixth in the world. The United States of America (U.S.) contributed 53.8% of the total articles and was ranked first, followed by the United Kingdom (U.K.) (5.9%), France (4.7%), and Germany (4.0%). Over the period of time investigated, the shares held by the U.S. and Canada went down significantly, from 58.3% in 1991 to 50.7% in 2000 for the U.S. ($P=0.01$), and from 3.6% in 1991 to 3.3% in 2000 for

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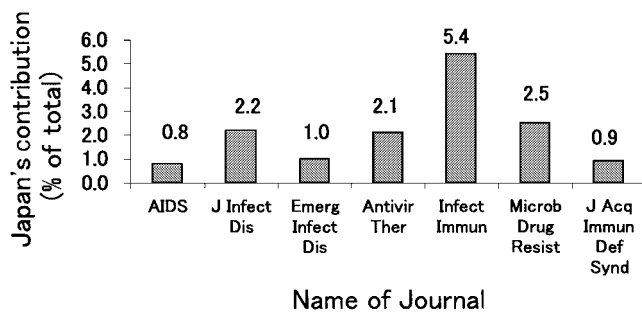


Fig. 1. Japan's contribution to selected seven infectious disease journals from 1991-2000.

AIDS: AIDS.
 J Infect Dis: Journal of Infectious Diseases.
 Emerg Infect Dis: Emerging Infectious Diseases.
 Antivir Ther: Antiviral Therapy.
 Infect Immun: Infection and Immunity.
 Microb Drug Resist: Microbial Drug Resistance.
 J Acq Immun Def Synd: Journal of Acquired Immune Deficiency Syndromes.

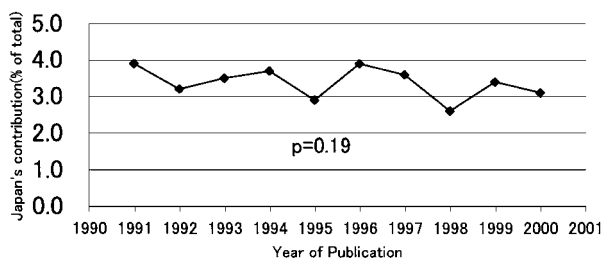


Fig. 2. Overall trend of Japan's contribution to major infectious disease journals.

P value of test trend.

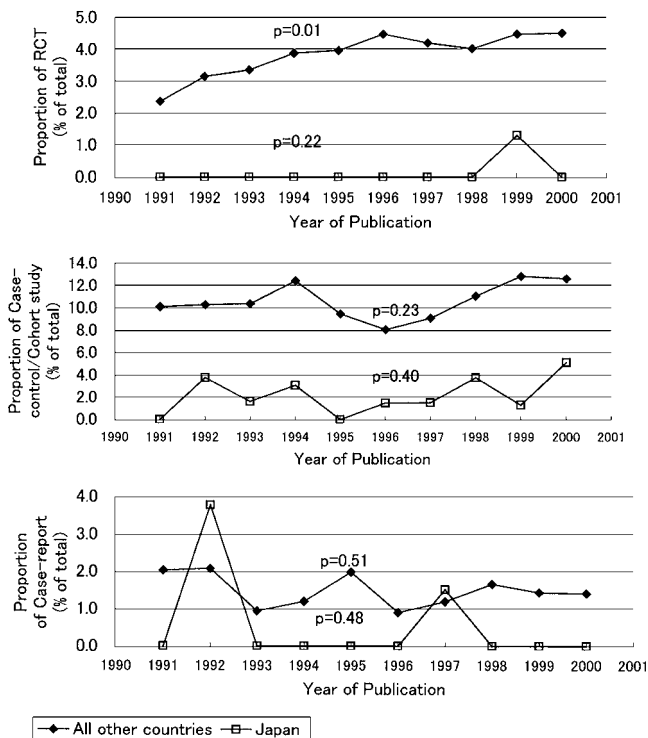


Fig. 3. Japan's contribution in terms of research design, RCTs, Case-control/Cohort studies, and Case reports.

RCT: Randomized controlled trial, P value of test for trend.

Table 1. Share of articles on infectious disease for the 20 top-ranking countries

Country	Number of articles published (% of total)		
	1991-2000 ($n=18,668$)	1991 ($n=1,584$)	2000 ($n=2,523$)
USA ↓	10,042 (53.8)	923 (58.3)	1,280 (50.7)
UK	1,103 (5.9)	94 (5.9)	155 (6.1)
France	881 (4.7)	57 (3.6)	139 (5.5)
Germany	737 (4.0)	61 (3.9)	112 (4.4)
Canada ↓	697 (3.7)	57 (3.6)	82 (3.3)
Japan	626 (3.4)	60 (3.8)	78 (3.1)
Netherlands	616 (3.3)	34 (2.2)	90 (3.6)
Italy ↑	565 (3.0)	32 (2.0)	94 (3.7)
Australia	459 (2.5)	39 (2.5)	65 (2.6)
Sweden	403 (2.2)	39 (2.5)	45 (1.8)
Spain ↑	236 (1.3)	9 (0.6)	50 (2.0)
Switzerland	232 (1.2)	24 (1.5)	27 (1.1)
Denmark	170 (0.9)	11 (0.7)	22 (0.9)
Belgium	161 (0.9)	19 (1.2)	18 (0.7)
Brazil ↑	153 (0.8)	5 (0.3)	33 (1.3)
Finland	121 (0.7)	8 (0.5)	17 (0.7)
India	91 (0.5)	4 (0.3)	13 (0.5)
Norway	85 (0.5)	1 (0.1)	8 (0.3)
Thailand	83 (0.4)	5 (0.3)	18 (0.7)
Israel	69 (0.4)	6 (0.4)	9 (0.4)

Ranking based on total number of articles published from 1991-2000.

↑ Share of articles went up significantly over time.

↓ Share of articles went down significantly over time.

Data did not total 100% because shares of other countries are not included.

Canada ($P = 0.05$). On the other hand, those of Italy ($P = 0.02$), Spain ($P = 0.01$), and Brazil ($P = 0.02$) showed significantly positive trends.

Over the last decade, the proportion of RCTs among the infectious disease articles in these journals was 3.8%, showing an upward trend in the last decade ($P = 0.01$). On the other hand, only one RCT (0.2%) was reported from Japan (Fig. 3) in this time. In addition, the proportions of case-control/cohort studies, and of case reports were 2.2% and 0.5% among the articles from Japanese institutions, and were 10.8% and 1.5% from all the countries as a whole (Fig. 3). These trends were not statistically significant.

DISCUSSION

Japan's share of articles in this field (3.4%) is higher than that in general medicine (0.7% of total, 14th in the world) (3,4), and is comparable to that in high quality basic science (3.1%) (3), but much lower than that in nuclear medicine (11.4% of total, second in the world) (5) and orthopedics (8.3% of total, third in the world) (6). Small proportions of RCTs and case-control/cohort studies among articles from Japan reveal the fact that the number of high quality clinical investigations conducted in Japan is small in this field. In fact, recent studies also documented that Japan lags behind other developed countries in conducting high quality clinical research (7). The main bulk of research conducted in this field in Japan seems to be basic research on infectious diseases. Since there was no way to retrieve data from MEDLINE using MeSH (medical subject headings) or publication type, we could not quantify what portion of this 3.4% was comprised of basic science articles.

There are some barriers to conducting clinical research on infectious diseases in Japan. First, there are few specialists in infectious disease even at academic hospitals in Japan, although the importance of this clinical field has been increasing in Japan (i.e., due to HIV and to drug-resistant strains of bacteria). Second, Japan's research in medical science has been basic science-oriented since the introduction of Western medicine in the late 1800s, and physicians' attitudes remain inclined towards it. Third, lack of training in 'clinical research methodology' among clinicians seems to be an obstacle in promoting clinical research in Japan. Japan's 14th-place ranking in general medicine (4) and ninth place in conducting clinical trials (7) reflect the current Japanese situation vis-à-vis clinical research.

The following strategy would be helpful to promote high quality clinical research in Japan. First, clinical division of specialists in infectious disease should be set up in academic hospitals in Japan. Second, reasonable funding should be directed to clinical departments for the purpose of conducting patient-oriented research on infectious disease. Finally, appropriate research methodology should be imparted to medical students, residents, and postgraduate students through a well-designed curriculum. Clinical research should be promoted at all possible levels in Japan, but not at the expense of basic research. The overall objectives of this promotional effort would be to elevate the quality and quantity of clinical research in Japan to the level of that of other industrialized countries.

There are some limitations of this study. First, the data on the number of publications in these journals represents only a gross estimate of the proportion of Japan's contribution to articles on infectious disease. The absolute number of high quality journal articles originating from Japan is certainly different from that in our findings because there are a multitude of journals other than the seven dealt with in this

study. Second, some studies were conducted as joint collaborations of mixed teams of local and international researchers, and the communicating other authors' affiliations were recorded as the origin of research in the MEDLINE database. Thus, current data here very likely underestimate the contribution of Japanese researchers. However, the proportion of contribution obtained here, relative to those of other countries, is likely to reflect the real situation.

In conclusion, Japan's share of research on infectious disease was unsatisfactory in comparison to that by other developed countries in the last decade. Remedial measures should be taken forthwith to promote high quality clinical research in this field.

REFERENCES

1. Fukui, T. (1998): Procedure in evidence-based medicine. *J. Jpn. Soc. Intern. Med.*, 87, 2122-2134 (in Japanese).
2. Institute for Scientific Information (2000): *Journal Citation Reports 2000*. Institute for Scientific Information, Philadelphia.
3. Fukui, T. and Rahman, M. (2002): Contribution of research in basic and clinical sciences in Japan. *Intern. Med.*, 41, 626-628.
4. Rahman, M. and Fukui, T.: A decline in the United States share of research articles. *N. Engl. J. Med.* (in press).
5. Rahman, M., Sakamoto, J. and Fukui, T. (2002): Japan's contribution to nuclear medicine research. *Ann. Nucl. Med.*, 16, 383-385.
6. Rahman, M., Sakamoto, J. and Fukui, T.: Japan's share of articles in orthopedics. *J. Orthopedic Sci.* (in press).
7. Rahman, M., Sekimoto, M., Morimoto, T. and Fukui, T. (2001): Randomized controlled trials conducted in Japan as a comparison with top-ranking countries. *J. Epidemiol.*, 11, 46-47.