



REVIEW ARTICLE

A Bibliometric Study on Second-generation Antipsychotic Drugs in the Asia–Pacific Region



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In this review, we analyzed the status and changes in the research on second-generation (atypical) antipsychotic drugs in the Asia–Pacific region (i.e., Japan, South Korea, Taiwan, Hong Kong, Singapore, and Australia). We also performed a bibliometric study of the literature in this region on atypical antipsychotic drugs (e.g., clozapine, risperidone, olanzapine, ziprasidone, quetiapine, sertindole, aripiprazole, paliperidone, amisulpride, zotepine, asenapine, iloperidone, lurasidone, perospirone, and blonanserin). We applied bibliometric indicators of production and dispersion (i.e., Price's law on the increase of scientific literature and Bradford's law, respectively). We also calculated the participation index of different countries. The data were also correlated with relevant social and health data from the Asia–Pacific region (e.g., the per capita gross domestic product and total per capita expenditure on health and gross domestic expenditure on research and development). All data are discussed together. We also analyzed the different aspects among the six countries in the region.

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1. Introduction

The advances in antipsychotic drugs in the past 20 years are important because of the clinical introduction of many second-generation (atypical) antipsychotic drugs (SGAs) such as risperidone, olanzapine, quetiapine, ziprasidone, and aripiprazole. These agents have improved the quality of life of psychotic patients and have contributed to weakening the stigmatization of psychiatric diseases. The acceptance of SGAs has resulted from their improved therapeutic efficacy and patients' adherence to therapy, which

reduces relapses.¹ Since 2003, the approved indication of SGAs for the treatment of bipolar disorder (BD) has considerably advanced the research related to these drugs. Research in the countries of the Asia–Pacific region—some consolidated countries (e.g., Japan and Australia) and others emerging countries (e.g., South Korea, Taiwan, Hong Kong, and Singapore)—is not an exception at this point because they have powerful economies. The four countries, South Korea, Taiwan, Hong Kong, and Singapore, called “the Asian Tigers” or “Asian Dragons”, have exceptionally high growth rates (>7% per year). South Korea is one of the great 20–50 class economic powers of East Asia, and is the most industrialized member country of the Organization for Economic and Co-operative Development (OECD). Hong Kong is a special administrative region of China and, as one of the world's leading international financial centers, has a reputable capitalist economy. However, Singapore is an emergent country with a highly developed market-based economy, but it has a short psychiatric history. Taiwan adds a consolidated psychiatric tradition to its strong economic growth. In Japan, political, social, and

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economic conditions have greatly influenced the development of psychiatry during the past 3 decades. In Australia, mental health reforms have been occurring in parallel with similar developments in other Western nations. In this review, we analyze jointly and comparatively the published results of the bibliometric studies in Japan,² South Korea,³ Taiwan,⁴ Hong Kong,⁵ Singapore,⁶ and Australia.⁷

2. A brief description of methods in the bibliometric SGA studies in the Asia–Pacific region

We used EMBASE Biomedical Answer web (Elsevier B.V., Amsterdam, The Netherlands), which consists of MEDLINE (*Index Medicus*, United States National Library of Medicine, Bethesda, MD, USA), and *Excerpta Medica* (Elsevier Science Publishers, Amsterdam, The Netherlands). The bibliometric method used in the previously listed article has been described elsewhere.^{2,3,4,5,6,7} In brief, we included documents that contained in the author address section the descriptors “Japan”, “South Korea”, “Taiwan”, “Hong Kong”, “Singapore”, or “Australia”; and in the title section, the descriptors “atypic* (atypical*)”, “antipsychotic*”, “second-generation antipsychotic*”, “clozapine”, “risperidone”, “olanzapine”, “ziprasidone”, “quetiapine”, “sertindole”, “aripiprazole”, “paliperidone”, “amisulpride”, “zotepine”, “asenapine”, “iloperidone”, “lurasidone”, “perospirone”, and “blonanserin”. We confined the year of publication until 2011. We considered all original articles, reviews, editorials, and letters to the editor. Duplicated documents were deleted.

2.1. Bibliometric indicators

Price's law was used to analyze productivity by fitting exponential growth models.⁸ To assess the dispersion of scientific information, we applied Bradford's law. Bradford proposed a model of concentric zones of productivity with decreasing density of information.⁹ This model permits the identification of the journals most widely used or with the greatest weight in a given field of scientific production. We also used the impact factor (IF) for 2011. Another indicator included in these analyses is the national participation index (PI) of different countries for overall scientific production (i.e., the ratio of the number of documents generated by a specific country and the total number of documents on this topic). The PI has also been compared to the global PI in the biomedical and health sciences (and in particular in the psychiatry and neurology field). The PI has likewise been correlated with some health data such as the per capita gross domestic product, total per capita expenditure on health, and gross domestic expenditure on research and development (R&D). The health data were obtained from the 2011 OECD Health Division and 2011 World Health Organization Department of Health Statistics and Informatics. Other data were obtained from different sources such as the Statistics Office of Department of Health of Taiwan (2009) Taipei, Taiwan or the Census and Statistical Department and Department of Health of Hong Kong (Hong Kong, 2011).

3. Important findings of bibliometric studies on SGAs in the Asia–Pacific region

3.1. Growth of scientific literature on SGA drugs

After studying the analyzed database, we obtained 669 original documents that dealt with different aspects of SGAs in Japan during the period 1982–2011.² For the period 1993–2011, we obtained 438 original papers from Australia,⁷ 359 papers from Taiwan,⁴ 326 papers from South Korea,³ 51 papers from Singapore,⁶ and 44 papers

from Hong Kong.⁵ On performing a joint analysis of the evolution of scientific production on SGAs in the period 1993–2011 ($n = 1857$), we found a markedly increased number of documents generated over the past 20 years, without evidence (until the end of the period studied), of the process of saturation postulated by Price⁸ in his theory of expansion of scientific literature. To assess whether the growth of scientific production in SGAs follows Price's law, we made a linear adjustment of the data, based on the equation $y = 13.43x - 39.351$; and we made another adjustment to the exponential curve, based on the equation $y = 10.729e^{0.1763x}$. As Figure 1 shows, the mathematical adjustment to the exponential curve permitted us to obtain a correlation coefficient of $r = 0.8978$, which indicates that 4.91% of variance is unexplained by this fitting. By contrast, the linear adjustment of the measured values provides a correlation coefficient of $r = 0.8149$, and therefore 18.17% of unexplained variance. With these data, we can conclude that the analyzed database was more in keeping with an exponential fitting than a linear fitting and that the postulates of Price's law were fulfilled.

This phenomenon is extensive to the individual analysis of Japan,² South Korea,³ and Taiwan.⁴ However, the repertoire of Australia,⁷ Hong Kong,⁵ and Singapore⁶ did not meet the postulates of Price's law; in the latter two countries, this may be because of the small sample of publications. In Hong Kong, we speculated that, although 15 SGAs were included in the current literature search, only nine SGAs—amisulpride, aripiprazole, clozapine, olanzapine, paliperidone, quetiapine, risperidone, sertindole, and ziprasidone—had been licensed and were available in Hong Kong during the study period. In the Australian case, this discrepant finding may be because this country has more of an interest in doing post-marketing studies because regulatory clinical trials tend to be performed in European-based or United States-based countries. Regulatory agencies in Taiwan, South Korea, and Japan all demand that the data demonstrate the same efficacy for their citizens that is as good as the efficacy demonstrated in the original Caucasian population in the United States of America and the United Kingdom. This may be the reason psychiatrists in Taiwan⁴ and South Korea³ have more of an interest in doing efficacy-related studies, compared to psychiatrists in Australia⁷; however, all three countries do not have any pharmaceutical drug companies on their soil.

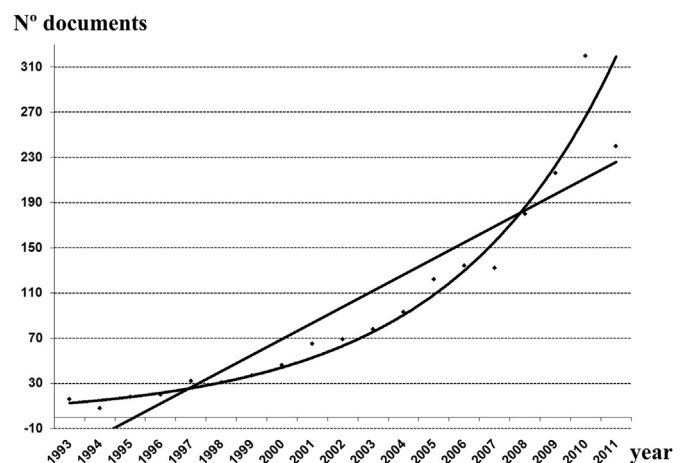


Figure 1 Growth of scientific production on SGAs in the Asia–Pacific region. A linear adjustment of the data and a fitting to an exponential curve were performed to check whether production follows Price's law of exponential growth. Linear adjustment: $y = 13.43x - 39.351$ ($r^2 = 0.8183$). Exponential adjustment: $y = 10.729e^{0.1763x}$ ($r^2 = 0.9509$). SGAs = second-generation antipsychotics.

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