Patenting and R&D in Indian Pharmaceutical Industry: Post-TRIPS Scenario

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This paper studies the impact of a restructured patent regime on the R&D expenditure and the patenting activity of Indian pharmaceutical companies. The results indicate that there is an increase in both R&D investment and measured inventive output in the form of patents. The firms, which have paid very little attention to research and innovation in the past, are responding to the restructured IPR regime in novel ways. However, this effect appears to be highly concentrated in the technologically progressive large scale pharmaceuticals while SMEs are yet to develop or acquire resources in order to survive in this competitive era.

Keywords: Pharmaceutical industry, TRIPS, patents, R&D

Patent protection is the cornerstone of a healthy and dynamic research environment of any country. Product patents protect the newly developed products from exploitation without permission of the patent holder in a wholesome manner, whereas, process patents protect the method of production of a product. Patent protection provides incentive and encouragement to the inventor or the company, which is involved in R&D, to develop new and innovative processes and products by providing monopoly rights and making them free from competition. India’s accession to WTO and its obligation to implement the TRIPS Agreement has resulted in a drastic change in the Indian pharmaceutical industry. The Indian Patent Act was revised three times in 1999, 2002 and 2005 to implement various provisions of TRIPS including a product patent regime for chemicals, pharmaceuticals and food products.

Background

The technology for the production of essential drugs was not available to India before independence and India was fully dependent on other nations for the supply of vital drugs. At the time of independence, the Patents and Designs Act, 1911 provided product patents for all the inventions, including foreign inventions, for a period of 16 years from the date of application. The independent government in 1947 emphasized rapid industrialization and invested heavily in pharmaceuticals, yet did not discourage foreign companies from competing in India. In the first decade of independent India i.e. between 1947-1957, 99 per cent of the 1704 drug and pharmaceutical patents in India were held by foreign national enterprises which controlled 80 per cent of the market. The US Senate Committee headed by Kefauver in 1962 had observed that drug prices in India were the highest in the world. During this time, the government took a major step to make the pharmaceutical industry self reliant with the establishment of two giant public sector enterprises, namely the Hindustan Antibiotics Limited in 1954 followed by Indian Drug and Pharmaceuticals Ltd. These two companies played an important role in starting the domestic production of key bulk drugs, although these initiatives taken by the government were not enough to start the local production of pharmaceuticals. Further, two expert committees i.e. the Patent Enquiry Committee (1948-50) and the Ayyangar Committee (1957-59) were established to provide suggestions on the type of patent system that India should implement. The committees suggested that a patent system which focused on the access to resources at lesser prices, fighting back the monopoly in the pharma sector by multinationals and promoting growth in the domestic pharma industry, would be beneficial to India. The Patent Act of 1970, which came into effect in 1972, was finally enacted on the

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recommendations of these committees and only process patents were allowed for pharma products under this Act.

The generic pharma industry in India thrived on the process patent regime and the capacity of domestic pharma steadily advanced in the conducive atmosphere. Well developed chemical infrastructure and process skills enabled Indian companies to develop new and innovative methods by expanding their R&D base, which was later leveraged by them to move up the R&D value chain. Some firms like Ranbaxy, Dr Reddy’s Laboratories (DRL) and Sun Pharma started focusing on novel drug delivery systems, thus adding their own inputs and values to existing products. The products produced this way were better tailored for the Indian market than the drugs manufactured by the MNCs. Pharmaceutical companies like Cipla, Cadila, Lupin, Torrent, Wockhardt and Dabur also established large production facilities in India and started improving their manufacturing efficiency and technology. The negative impact of Indian Patent Act, 1970 was that too many small and medium players entered the pharma industry as there were no intellectual barriers. The TRIPS Agreement provided a transition period till 1 January 2005 for developing countries like India to implement the Agreement and to introduce product patent regime in pharmaceuticals, food and chemicals. The adoption of a product patent regime made survival for SMEs and generic companies, which earlier managed to exist on generic drugs or drugs in high demand manufactured by alternative, non-patented processes, difficult in this competitive market. In view of the above background, the present study was conducted to analyse the effect of TRIPS implementation on the patenting activity and R&D expenditure of Indian pharmaceutical industries.

Effect of TRIPS on the Patenting Activity of Indian Pharmaceutical Industries

The number of patent applications filed and patents granted in a particular research area indicates the level of inventive activity in that particular area. The present analysis was carried out by using databases like Ekaswa (TIFAC) and official websites of the European Patent Office and Indian Patent Office. The results clearly showed that there has been a significant increase in the patent applications filed in India after TRIPS was implemented. The number of patent applications filed has been steadily increasing after TRIPS came into existence in 1995 as pharmaceutical companies realized the need for serious R&D in new drugs and formulations and patenting them.

A comparison of the top eleven large pharma companies in 2010, on the basis of their turnover between 1999 and 2009 indicates that Ranbaxy has the largest contribution and the maximum number of patent applications filed followed by Glaxo Smithkline (GSK), Cadila and Dr Reddy’s Labs (Fig. 1). More number of applications is related to inventions in the field of new or improved processes for products than for the products themselves. The product related applications are concerned with intermediates and formulations with maximum contribution in modified release dosage forms. It was also observed in the present study that more firms have marked their presence in patent filed and granted in the post-TRIPS era.

As can be seen from Fig. 2, there has been an increase in the product patent applications filed by large pharma companies especially after 2005. The number of patent applications filed by Indian majors
i.e. Ranbaxy, DRL and Cipla are quite consistent since 1995. There was no significant change in filing of patent applications in case of these companies because by 2005 they had already initiated measures like increased patent filing to encounter the post-TRIPS competition. There was a significant increase in filing of patent applications by other pharma companies e.g. Cadila, Nicholas Piramal, Sun Pharma and Lupin Limited which reflects the increased importance these companies attached to product patents. A large number of product patents by large scale pharmaceuticals have also been approved (Fig. 3). Mankind Pharma, though ranking five on the basis of its turnover in 2010, has not filed any patent, but has started investing in R&D recently.

Many applicants among the top companies (except Alkem) had started using the PCT route for filing of applications in multi-countries after India joined the Patent Cooperation Treaty in 1999 (Fig. 4).

Similar findings were also reported by various researchers. Kiran and Mishra deduced that prior to 1995, except Ranbaxy, a majority of the Indian pharmaceutical firms did not have US patents. However, in the post-TRIPS period, especially after 2000, a larger number of firms marked their presence. Chaudhuri, in his working paper emphasized that patenting by major Indian pharmaceutical R&D spenders started in US in 1990 when Ranbaxy obtained two patents. Since then, particularly after the late 1990s, there has been increasing trend in patent application filing. Before 1995, only seven patents were obtained and all of them were by Ranbaxy. As India revised its Patent Act in 1999, 2002 and 2005, patent applications by Indian as well as foreign companies increased significantly. However, as compared to large pharma companies, the number of patent applications filed by SMEs were found to be negligible. The reason was possibly the limited knowledge of the intellectual property system and limited access to the expert advice on patent filing. SMEs also have limited resources unlike large scale pharmaceutical industries and relative inability to absorb the cost and risk associated with enforcement and infringement issues. SMEs prefer to use alternate means of protection like trade secrets, etc.

R&D in Indian Pharmaceutical Industries: Effect of TRIPS

Research and development is the key to the future of the pharmaceutical industry. The considerable improvement in the life expectancy and health all over the world can be attributed to a steady increase in research investment. The strength of Indian R&D comes from the abundance of excellent scientific talent in combinatorial chemistry, in developing new synthetic molecules and plant derived candidates for drugs. The R&D conducted by Indian pharmaceutical industries has different objectives e.g. development of new chemical entities (NCEs), modification of existing chemical entities to develop new dosage forms (incrementally modified drugs), development of processes for manufacturing active pharmaceutical ingredients (APIs) and development of formulations for regulatory requirements and quality. Traditionally, the majority of India’s pharmaceutical spending was concentrated on reverse engineering and adaptation of patented foreign drugs to the Indian market. The Indian pharmaceutical industry spent very little on innovative R&D and most of the industry’s funding went into incremental improvement in established
processes rather than new drug discovery and development. In the early 1990s, the Indian pharma industry set aside less than 2 per cent of its annual turnover to R&D compared to the 15-30 per cent allocated by western innovative counterparts.\textsuperscript{15} Even Indian majors e.g. Ranbaxy and Dr Reddy’s spent only 2.35 per cent of their sales on R&D in 1992-93 (ref. 16). However with the implementation of TRIPS, the R&D profile of the Indian pharmaceutical firms has undergone major changes. The period after 1995 has seen all round consolidation of the leading firms in Indian industry. India’s leading drug companies recognized that they could not survive as global players without significant R&D capabilities.

In the present studies, the expenditure on R&D by the firms has been taken as an indicator of their activeness in new research and development. The expenditure data has been taken from the annual reports of respective companies for different years. The data has been presented in Fig. 5. The two largest among the Indian pharmaceutical firms are Ranbaxy and Dr Reddy’s Labs. Ranbaxy was the largest R&D spender in the Indian pharma industry and spent Rs 36 crores (4.61 per cent of its sales) on R&D in 1994-95, the year when TRIPS came into effect.\textsuperscript{13} There was a moderate increase in the R&D expenditure in early 2000 but it shot to Rs 486 crores in 2005 and Rs 498 crores in 2010 which is the highest expenditure among the top 11 firms in 2010 (Fig. 5). For Dr Reddy’s Labs, the second largest R&D spender, expenditure increased sharply from Rs 13.27 crores (4.78 per cent of total turnover) in 1999 to the highest ever Rs 437 crores (12.91 per cent of total turnover) in 2008 and Rs 389 crores in 2010 (Fig. 6). Among the other major consistent spenders, expenditure between 1999 and 2010 has increased for Sun Pharma from Rs 18 crores to Rs 225 crores and from Rs 21.27 crores to Rs 215 crores for Cadila.

The increase in R&D activity can be attributed to global changes in IP system in various countries, especially in India and changes in the domestic policies. The increased expenditure can also be related to Indian Drug Policy Control Order under which the production and development of innovative drugs and processes were exempted from price control for five years while new drugs were exempted for 10 years.

Dhar and Gopakumar have observed that R&D spending by pharmaceutical industry in India was significantly higher than that recorded by other industries i.e. food and beverages, machinery and textile.\textsuperscript{16} They also emphasized that pharma industry was the only one among the leading industries to have consistently improved its R&D spending. Though more money is being pumped into R&D after signing of the TRIPS Agreement, this investment is still meager when compared to the spending of established global firms. Indian firms have the potential to extract discernible output even with a relatively low level of R&D spending because of the lower costs of development in India; yet they face other problems such as lack of necessary expertise in basic areas and new tools to smoothly switch over from reverse engineering. Reverse engineering and generics R&D requires less communication across the disciplines or therapeutic areas as compared to innovative R&D.\textsuperscript{17} Product development research, on the contrary is time consuming, requires huge funds as well as out of the box thinking. Industry estimates reveal that most of

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\caption{R&D expenditure of leading pharmaceuticals}
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\caption{R & D spending as a percentage of total turnover}
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the R&D budget of the major companies is invested in the different stages of clinical evaluation of new products; still only two-thirds of the drugs that enter phase III are ultimately marketed. This suggests that attrition rate is very high in earlier research stages. Similar results came out from a study conducted by the consulting firm Oliver Wyman, which looked at 450 new chemical entities approved by USFDA between 1996 and 2010 (ref. 19). The report refers to 1996-2004 as an ‘era of abundance’ and 2005-2010 as an ‘era of scarcity’ where very few drugs (22 NMEs) were approved as compared to 36 NMEs in the era of abundance. In spite of this decline, the R&D expenditure almost doubled over the study period and most of the pharma companies continued to maintain strong net income levels. In such an environment, drug firms opt to orient their R&D towards preparing and producing generic copies rather than developing or discovering NCEs. Therefore, the short term focus of an Indian firm with expertise in reverse engineering is likely to be on improved dosage forms of the drugs and combination drugs. It has also been emphasized that though Indian pharmaceutical companies like Ranbaxy, DRL and Lupin began investing in R&D for NCEs when TRIPS came into effect, none of these companies is engaged in the entire process of drug development because they are not ready for a start-to-finish model in NCEs research and do not have the skills and funds required for development and marketing of a drug. The model adopted by Indian companies is to develop new molecule up to a certain stage and then license it out to partners from developed countries, primarily to MNCs.

As far as the R&D intensity of smaller pharmaceutical firms is concerned, these lag behind their larger counterparts in undertaking innovative activities. A study by Pradhan also suggested that a large number of SMEs do not engage in any R&D activity and a majority of those engaged spend only a very small proportion of their turnover on it. The low and declining R&D intensity seems to suggest that small firms are falling behind larger companies in upgradation of technological capabilities, since the larger ones are consistently increasing their R&D investments. SMEs require strong technology support because they do not have huge resources for upgradation and expansion of their internal R&D facilities. However this drawback can be countered by linking the innovative activities of SMEs with resources of research institutions and universities.

Conclusion
Patent graph activity of any pharmaceutical firm indicates the intensity of their innovative activities in R&D. There has been a growth in patent activities in India after TRIPS came into existence. Most of the patenting activity is carried out by large pharmaceutical companies in India and abroad, and further, a greater number of applications is related to new or improved processes for products rather than products themselves. The product related applications are concerned with intermediates and formulations with maximum contribution in modified-release dosage forms. Research and development is the key to the success of any pharmaceutical industry, however, very few companies were involved in innovative R&D in India till 1995 due to lack of product patent regime. The period after 1995 has seen all round development of the leading firms in Indian pharmaceutical industry. India’s leading drug companies recognized that they could not survive as global players without significant R&D capabilities. Hence, considerable improvement in the research investment has been observed after the implementation of TRIPS in the pharmaceutical industry. The present studies has established that there is a growth in the patent applications filed in India after TRIPS came into existence in 1995 because of the fact that pharmaceutical companies have realized the need for outcome based R&D and legal protection of output. However, R&D intensity of SME pharmaceutical firms is too insignificant in comparison to large firms because of lack of technology support and resources for upgradation and expansion of their internal R&D facilities. Thus, there is an urgent need for SMEs to develop a collaborative research culture with public and privately funded research organizations for their survival.

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