

Pharmaceutical Education in India: Past, Present and Future

LJP Tharappel¹, *G Kaur¹ and HS Buttar²

¹ Department of Pharmacology, SPP School of Pharmacy & Technology Management, SVKM's NMIMS, V.L Mehta Road, Vile Parle (W), Mumbai-400056, Maharashtra, India.

² Senior Research Scientist and Assessment Officer, Therapeutic Products Directorate, Health Canada (Retired). Adjunct Professor, Department of Pathology & Laboratory Medicine, Faculty of Medicine, University of Ottawa, Ontario, Canada.

*ginpreet.aneja@gmail.com

Abstract:

Pharmacy as a profession started in India in the early 20th Century. Since then, it has undergone many changes educationally and professionally. Unfortunately, pharmacists in India have been reduced to selling medicines, unlike the West, where the pharmacist is responsible for dispensing medicines prescribed by the physician, and advising patients about their judicious administration. To be at par with their Western counterparts, the Indian educational and pharmacy practicing standards require extensive revision. This change would enhance the profile of pharmacists and enable them to be an integral part of the health care system. In the future, innovations in the discovery and development of newer drugs and dosage forms will be used and personalised pharmacotherapy will be propagated. The future pharmacist has to be aware of these developments to advise the physician and the patient and to be a competent partner in the health care team. Simultaneously, the drug regulatory authorities in India and medical professionals have to recognise the contribution of the pharmacist to society. Only then will the noble pharmacy profession be able to reach the level of greatness it deserves.

Key Words: Contract drug manufacturing, India, patient counselling, pharmaceutical education, and unemployment.

INTRODUCTION:

Pharmacy is the art and science of manufacturing and dispensing of drugs prepared by natural and synthetic sources, and using them for the treatment and prevention of diseases. Pharmacy encompasses various professional skills, such as knowledge for drug synthesis, quality control tests, detection of degradation products and storage of pharmaceutical products as well as dosage form preparation, route of administration, drug-drug and drug-food/herbal interactions [1].

The responsibility of establishing a link between the realms of health sciences and basic pharmaceutical sciences lies in the hands of the pharmacist [2]. Traditionally, the job of a pharmacist was to compound and dispense the required medications for patients. In 1990, Hepler & Strand proposed the idea of "Pharmaceutical Care", but it has taken form recently [2, 3]. This means that the role of a pharmacist has or will significantly shift from its traditional role and now the pharmacist is or will be expected to engage with the patient on a one-to-one basis, and help him/her understand the drug administration and implications of usage better.

In Western countries, the word 'Pharmacist' brings to mind a well trained happy-to-help person, who gladly fills a prescription and offers professional advice to patients regarding the proper use of medications. Unfortunately, the concept of Pharmaceutical Care is hardly a scene that is visible in India. The root cause of this deficiency is lack of co-ordination between the two governing bodies, Pharmacy Council of India (PCI) and All India Council for Technical Education (AICTE)

[http://articles.economictimes.indiatimes.com/2008-02-25/news/28468321_1_pharmacy-colleges-pharmacy-council-aicte

(accessed Mar 17, 2014).

<http://www.thehindu.com/todays-paper/tp-national/tp-otherstates/pci-to-be-the-managing-authority-of-pharmacy-colleges-in-future/article1209151.ece> (accessed Mar 17, 2014). <http://digitalllearning.eletsonline.com/2012/06/aicte-pharmacy-courses-get-pci-disapproval/> (accessed Mar 17, 2014)]. This article gives an overview about the progress of pharmaceutical education in India, a pharmacist's role in delivering healthcare, the employment scenario and the changes in the Indian Pharmaceutical industry.

A LOOK INTO THE PAST:

Pharmacy as a concept was practiced in India from an ancient period. For example, the *Ayurveda* and *Siddha* systems of medicine contain extensive literature on the selection of sources for natural medicines, and compounding and dispensing of those primitive medications, without describing their short- and long-term adverse effects. The origin of modern pharmacy institutions in India dates back to 1899 [4]. At that time, training of pharmacists was mostly conducted at Madras (now called Chennai). The State Medical Faculty of Bengal followed this pharmacy training procedure by starting a similar programme in 1928 [4]. The first undergraduate (UG) course in pharmacy was started at Benaras Hindu University around 1932 by Professor Mahadeva Lal Schroff, fondly called the "Father of Pharmaceutical Education in India". In those days, the curriculum included Pharmaceutical Chemistry, Pharmacy and Analytical Chemistry, which prepared the graduates for working in pharmaceutical industries and not in community pharmacy shops. Subsequently, the other universities in India which followed suit were Andhra University in 1937, Madras University in 1938, Bombay University in 1943, Punjab University in 1944 and L.M. College in 1947 [2].

After Independence, the pharmacy profession that was prevalent during the British Raj was overhauled and reorganised. There were malpractices abound done by the pharmacists, druggists and chemists. Keeping such negative occurrences in mind, regulations concerning Pharmacy Practice were passed by the Central Government. Modern pharmaceutical training institutions were established and the pharmacy profession itself was regulated by the enactment of the Pharmacy Act in 1948 [5]. The PCI was established in 1949 and the first Education Regulations (ER) framed in 1953, with amendments done in 1972, 1981 and 1991 [2].

THE CURRENT SCENARIO:

Currently, there are more than 1500 institutions offering various pharmacy training programmes across the country. With an annual enrolment of around 100,000 students, the influx of students into pharmacy colleges is at an all time high [4]. The pharmacy degree programs offered in India include: Diploma in Pharmacy (D. Pharm), Bachelor of Pharmacy (B. Pharm), Master of Pharmacy (M. Pharm), Master of Science in Pharmacy [MS (Pharm)] and Master of Technology in Pharmacy [MTech (Pharm)], Doctor of Pharmacy (PharmD), and Doctor of Philosophy in Pharmacy (PhD) [6]. Integration of two courses like B. Pharm + MBA or M. Pharm + MBA has also been initiated by some institutions [7]. Until the early 1980's, only 11 universities and 26 colleges offered pharmacy degree programmes in India [6]. A growth spurt followed, and according to the PCI 2005 calendar, there were 220 recognized degree institutions with an enrolment of 12,506 students and as per AICTE, the total number of degree colleges were 445 with a total admission of 24,672 students [1]. In 2007, the number increased to 854 with an intake of more than 52,000 students and there were also 583 institutions providing Diploma in Pharmacy with a capacity of more than 34,000 students [1, 6]. The majority of these pharmacy institutions are privately funded, and the private sector now accounts for an astounding 91% of all pharmacy students admitted [6].

With such a large number of pharmacy colleges in India, one would expect that the whole country would have somewhat of an equal share of pharmacy training programs, but alas, this is not the case. Disparity reigns and hence an excess of privately funded universities are situated more in the states of Gujarat, Andhra Pradesh, Maharashtra, Tamil Nadu and Karnataka. An increased presence of pharmaceutical companies in the North-Eastern state of Sikkim resulted in pharmacy colleges being started in this state too [1].

There are six National Institutes of Pharmaceutical Education and Research (NIPERs) in India offering MS (Pharm), MTech (Pharm), and doctoral-level degrees [6]. The NIPERs are the prime institutions in the country for pharmaceutical education and research [6].

THE ROAD AHEAD:

The pharmaceutical education imparted to students in India concentrates more on increasing self-employability quotient, and enhancing their entry into academia and the

pharmaceutical industry [2]. This approach has succeeded, and will continue to prove to be an important cog in the wheel for the growth of the pharmaceutical sector. In July 2010, Her Excellency Smt. Pratibha Devisingh Patil, Former President of India, in a speech regarding "Recent Trends in Pharmacy Education and Practice", articulated, "*The Indian pharmaceutical industry has a wide range of capabilities and is ranked amongst one of the foremost industries of the country. It has grown from a meagre turnover of US\$ 0.32 billion in 1980, to about US\$ 21.3 billion in 2009-10, and it is poised to grow at a compounded annual growth rate of 19 percent*" [<http://pci.nic.in/PDF-Files/NSP.pdf> (accessed Mar 18, 2014)]. The growth of the pharmaceutical industry will, of course, depend on the employment of able and competent pharmacists, and this seems to be one of the major reasons for the proliferation of pharmacy colleges in India.

However, apart from the pharmaceutical industry-related employment, practicing pharmacists are also supposed to cater to the needs of general public and patients. But the latter aspect is lacking in the country. Pharmacy stores are handled primarily by diploma holders [8] and patient-pharmacist interaction is seldom present. To bridge this divide, the inclusion of courses designed for Pharmacy Practice is needed in various UG programmes. In addition, the students entering into pharmacy schools have to diversify their horizons and look beyond the tunnel vision of industrial employment to the wider fields of public healthcare. Already, some institutions have started Pharmacy Practice courses but they are nascent. Expansion of training programmes by the teachers and greater acceptance by students is required to cater to the health care needs of patients.

PHARMACISTS' ROLE IN HEALTHCARE DELIVERY:

Throughout the world, a shortage in medical services goes hand-in-hand with a shortage in pharmaceutical services and community pharmacists, which results in a majority of people having limited access to authentic and life-saving drugs. This leads to allocation of work in pharmacies to untrained or non-professional people.

Generally, the supply of medicines to patients is done by private community pharmacies and hospital pharmacies, with the number of the former being higher. Community pharmacists are only involved in selling medicines without any patient interaction [9]. Therefore, there is an urgent call for certified pharmacists to be a part of the broad healthcare system that can fulfil the needs of the patients [10]. Some of the roles that a qualified pharmacist has to fulfil are [<http://pharma.financialexpress.com/20120115/pharmalife01.shtml>]:

1. Providing pharmaceutical care to patients – This means moving away from the traditional role of filling prescriptions to being concerned with the requirements of the patients on an individual basis. In addition, they should monitor the treatment regimen and advise patients for the judicious use of prescribed medicines.
2. Redesigning the medication use system – Quite often, busy doctors fail to gauge the adverse events associated with a medication and this practice causes

either drug-induced adverse immunogenic responses in sensitive patients or iatrogenic effects of prescribed medicaments. The certified pharmacist could tackle these undesirable drug-induced issues by reporting to the doctors and advising patients regarding their prescribed medicines, thus helping to choose a better treatment regimen.

3. Authentic source of pharmaceutical information – The pharmacist must be updated with the latest information concerning the benefits and risks of drugs and their interactions with other xenobiotics. This will help in providing the best pharmacotherapeutic care possible.
4. Adherence to ethics – More and more certified pharmacists are advocating professional ethics. It not only helps to foster a sense of trust among the patients towards pharmacists, but also enables them to treat the patients better with authentic medicines.

A few qualified pharmacists in urban areas are now gradually opening up to this new dimension of pharmaceutical care and are incorporating the above mentioned concerns into their practice. Increased awareness about pharmacotherapy among the people and a sense of integrity among the pharmacists are compelling them towards this approach. But regrettably enough, it's a different state of affairs when we leave the Metros behind. Rural areas still leave a lot to be desired from the pharmacy services. The sale of drugs of abuse in rural pharmacies is rampant mainly in the northern states of India [<http://www.sunday-guardian.com/investigation/delhi-school-kids-fall-prey-to-substance-abuse> (accessed Mar 18, 2014), http://www.nytimes.com/2012/04/19/world/asia/drug-addiction-is-a-growing-problem-in-punjab.html?pagewanted=all&_r=0 (accessed Mar 18, 2014)].

Several barriers exist which prove to be a deterrent for pharmaceutical care in India. For instance, there is a lack of proper education and training of pharmacists, weak implementation of existing drug regulations and laws as well as a lack of recognition of pharmacy as a profession by the other healthcare providers [9]. In order to receive world class pharmaceutical care by well qualified and certified pharmacists, the public and medical professionals will have to support and recognise the pharmacists as an integral part of the health care team. Unfortunately, this phenomenon is still lacking in India!

PHARMACY – DOES IT LAND A JOB?

Pharmacists represent the third largest group of healthcare professionals in the world [11]. In India too, it is a highly sought after professional course. This has resulted in a deluge of pharmacy graduates being produced every year with most of them opting for industry or research. Couple this with the diminishing employment prospects and you've got a horde of educated youth staring at the merciless wall of unemployment.

The statement "Education ensures a better life for children" [http://articles.timesofindia.indiatimes.com/2012-10-11/indore/34386169_1_chief-guest-acropolis-institute-children (accessed Mar 18, 2014)] can be said to capture

the general mindset of the adult Indian population too. A better education helps in obtaining a better job, better pay and a better lifestyle is what has been ingrained since the beginning. But the problem arises when everyone aspires, puts in efforts and gets the fruits of their labour. The industry simply does not require the services of such a large number of candidates, and starts filtering through them to get the best ones, while leaving the others to continue their job hunt [12].

Why has unemployment risen?

Unemployment has and always will be present, but the situation for Pharmacists is grimmer than for others. Some of the reasons for the increase in unemployment are [12-14]:

1. The number of industries be it pharmaceutical (small, medium or large MNC's) or herbal, are negligible compared to the number of pharmacy colleges springing up across the country.
2. Mandatory regulation and licensing of colleges is not done by the Government or the concerned authorities.
3. Competition with Bachelor of Science (BSc) and Master of Science (MSc) graduates, *Ayurvedic* doctors and Botanists and Doctor of Medicine (MD) Pharmacology graduates for a position in the Chemistry and Analysis, Pharmacognosy or Herbal and Clinical Research departments of industries respectively.
4. Non – pharmacy products cannot be marketed by Pharmacists due to rigid syllabi.
5. Lack of quality teachers resulting in poor understanding by students.
6. Vast difference between the syllabus taught and the requirements of the industry.
7. Students lack basic communication and language skills which are integral for recruitment.

Steps to be taken to combat unemployment:

The PCI has recently addressed the issue of unemployed pharmacists

[<http://pharmabiz.com/NewsDetails.aspx?aid=68384&sid=1> (accessed Mar 18, 2014)]. Dr. Hemant Koshia raised this issue with the other PCI members. He said that jobs for pharmacy graduates are declining and that the Government should take some steps to solve this problem. These steps are [13, 15, <http://pharmabiz.com/NewsDetails.aspx?aid=68384&sid=1> (accessed Mar 18, 2014)]:

1. Amending the Drugs & Cosmetics (D&C) Rules, 1945 which state that a B.Pharm or B.Sc graduate can work as an Analytical or Manufacturing Chemist. Only Pharmacy graduates should be allowed to work in this area after proper evaluation of their existing skills.
2. Restricting the number of seats in Pharmacy colleges.
3. Implementing strict quality standards in existing Pharmacy colleges to ensure high overall education quality.
4. Enhancing written and verbal communication skills of the students.

5. Updating the syllabus taught and removal of obsolete topics, focussing more on the procedures which are widely used in the industry.
6. Providing internship to students for a period of at least three months, so as to expose them to the industrial way of life.

PHARMACISTS' ROLE IN THE INDIAN INDUSTRY:

Three Hundred patented drugs that generated around US\$ 400 billion in 2010 sales are expected to go off patent between 2011 and 2016 [<http://greaterpacificcapital.com/article/china-drug-distribution/> (accessed Mar 18, 2014)]. This will trigger a war of sorts among generic manufacturers to file Abbreviated New Drug Applications (ANDA's). India being a generic hub will also be party to this. In 2013 itself, India had submitted 112 ANDA's to the Food & Drug Administration (FDA) [http://www.process-worldwide.com/management/markets_industries/articles/415275/ (accessed Mar 18, 2014)] and Indian generic exports have an annual growth rate of 27% [http://www.process-worldwide.com/management/markets_industries/articles/415275/index2.html (accessed Mar 18, 2014)]. These figures itself lend credibility to the belief that Asia's Diamond will continue to be a strong generic player.

Although known for its generic prowess, a few Indian pharmaceutical companies have tasted success in the fields of manufacturing innovative drugs with Ranbaxy's Synriam [<http://www.ranbaxy.com/business-operations/research-and-development/> (accessed Mar 18, 2014)] being the first New Chemical Entity (NCE) to emerge from India.

Such breakthroughs in manufacturing both API's and formulations can be attributed to the tenacity of the pharmacists working in the industry. But as the industrial demand for competency is constantly increasing, the educational domain will have to undergo changes to match the industrial requirements.

CONCLUSION:

The treatment of a patient lies in the hands of medical and paramedical professionals. Pharmacists being one among them have to try and live up to their professional capabilities. This will only be possible if the pharmacists obtain proper knowledge about the safety and efficacy of medicines and patient counselling during their studies, which unfortunately, is not currently the case in India. An improved educational system will enable pharmacy

graduates to satisfy the requirements of the Pharmaceutical Industry, which currently is missing. In addition, a knowledgeable and competent pharmacist can help the Indian Pharmaceutical Industry to move away from being a Generic Titan to a R&D hub. In short, an educational revamp is required, which will not only benefit the patients, but also the nation as a whole.

CONFLICT OF INTEREST:

No conflict of interest has been declared by the authors.

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