

# Modern Pharmaceutical Education and Its Root in India

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## ABSTRACT

I am not afraid of weapons but I fear pens and its action said by Napoleon the Great validates the worth of education. But the perspectives of education have undergone morphing with times and needs. Pharmacy education had also taken up the roads that no navigator took. Since human life began, nature was an open textbook for all curious ones. Though the word, "pharmacy" originated in India during the British reign, Indian land always had tales of medicinal preparations to say from ancestry. But the dawn of modern pharmacy began in the late nineteenth century. Since then, the field has undergone morphological as well as technological advancements. Even mars wasn't the limit for the growth seen in pharmacy education during the last century. From its initial step as a pharmaceutical shop in 1811 to the establishment of diploma programs in the late nineteenth century in madras medical college and its rise as a university, where the department of Pharmaceutical Engineering Institute of Technology, Banaras Hindu University, Varanasi holds its prime position being the first pharmaceutical university to be launched in India in 1937. Now it spreads like the vascular system to different realms of a healthy society.

But, just like each cell in our body has oncogenes for growth and tumor suppressor genes for retardation, every efficient system needs to be timely regulated, which is seen through the rules brought into the table as the pharmacy act in 1948 and the amendments made later by the regulatory bodies like PCI, which was formed in 1953. A new calling was also

made into pharmacy education with the starting of Pharm.D by PCI and the Government of India in 2008. Being on the shore of Pharmacy education, a boat full of opportunities waiting for the updated Pharmacy scholars.

Since its origin to this day, the pharmaceutical education system had evolved and is still evolving to reach the peak of excellence and it is a daily goal that can be achieved only if proper regulations and the use of advanced technologies go hand in hand with the growing needs of the health care. As an individual, let each pharmacy graduate make this an agenda to go forward and grow upward with the wings given by pharmacy education.

**Keywords:** Pharmaceutical Education, Pharmacy Colleges, B. Pharm, M. Pharm, MBA in Pharmacy, Ph.D. in Pharmacy.

## INTRODUCTION

India is the best incarnation of the west and the east culture has got the privilege to step out as a unique contribution. Adding its flavors of intellect, traditions, and science on a global level has caught the attention of royal dynasties from time immemorial.

Not to say much, India had lost its purity with every empire, that controlled her. The antiquity of Vedas along with the traditional knowledge passed on by our ancestors had been stolen from the right hands. Still, the Indian mud which provided its lap for the legendary ARYABHATTA, the greatest astronomer of the classical age (1), and Sushruta, the Father of plastic surgery (2)

has never lost its inborn worth and continues to shine in a midst of the darkest eras it faced.

India's legacy of disciplinary education under sages was well-known for ages. Ayurveda and Siddha took their roots from this mainland. The vast knowledge of medicine from the herbs and shrubs was thus always an experimental area of interest for medical expertise.

**THE GENESIS OF MODERN PHARMACY EDUCATION IN INDIA**

Bathgate in Kolkata saw the cornerstone for the arise of the pharmacy field in 1811 by Scotch. Over time, the late nineteenth

century transmogrified itself to provide degree programs for producing eligible and competent professional candidates. In 1870, a diploma program was offered for the first time at Madras Medical College, which was initially started as a training program for chemists. The base of pharmaceutical education in India took place in 1884 when 1-year training course was started for dispensing medicines. In 1899, the dawn of Modern Pharmaceutical Education began in the hub of cultural and economic centers of south India - The CHENNAI. (3) The below table gives a glance at events that planted seeds for the current pharmacy field.

**Table1) Origin of Pharmacy educational events in India**

YEAR	Educational development seen
1811	Pharmaceutical shop got installed by Scotch at Bathgate in Kolkata
1870	Madras medical college started a diploma programme for chemists
1884	1-year course got introduced in madras medical college for pharmacy practice in dispensing

**HEADWAY OF MODERN PHARMACY EDUCATION IN INDIA**

The twentieth century had not just given a breath of freedom to its children in India but it also gave birth to an era, where the basic rights of education could be enjoyed by every child despite the inequalities present. The medical faculty of Bengal 1928 started training programs for pharmacists but the well-established university-oriented pharmaceutical education was instigated on the blackboards of Banaras Hindu University under the guidance of Professor. Mahadeva Lal Schroff, father of

pharmaceutical education in India (3,4,5). The addition of pharmaceutical chemistry to the BSc degree in 1932 donated enormous faith in the faculty about investing in Indian students to reform them into skilled pharmacy professionals. This led to the initiation of the present-day bachelor's degree in pharmacy which was a three-year program in 1935 and the progress within the next three years introduced a master's curriculum to the field. The following are the 10 Pharmacy education-providing colleges that were started initially in India.

**Table 2) Initial colleges in India with the year of establishment.**

Year of inception	Colleges/Universities
1937	Department of Pharmaceutical Engineering, Institute of Technology, Banaras Hindu University, Varanasi
1944	University Institute of Pharmaceutical Sciences, Punjab University, Chandigarh
1947	L. M. College of Pharmacy, Ahmadabad
1950	Department of Pharmacy, Madras Medical College, Chennai
1950	Birla Institute of Science and Technology, Pilani
1951	College of Pharmaceutical Sciences, Andhra University, Visakhapatnam
1952	Department of Pharmaceutical Sciences, Dr. H.S. Gour University, Sagaur
1956	Department of Pharmaceutical Sciences, Nagpur University, Nagpur
1958	Pharmaceutical Department, University Institute of Chemical Technology, Mumbai University, Mumbai
1963	Department of Pharmaceutical Technology, Jadavpur University, Kolkata

Despite the advanced syllabus seen today, Pharmacognosy, Pharmaceutical Chemistry, German, and Pharmacoeconomics were the initial subjects. At this point, it would be

interesting to spare some space to know the initial pharmacy graduates. In 1940, Mr. Subhadra Kumar Patni and in 1943 Mr. Gorath Prasad Shrivastav were the first

pupils who graduated B.Pharm and M.Pharm respectively. The story took another turn in Indian history within another 10 years when the University of Patna acknowledged Shevohari Lal as the first Ph.D. holder in 1953. (3)

### **REVITALIZATION OF PHARMACEUTICAL EDUCATION**

Just like the judiciary checks upon the legislature and executive departments for the efficient running of a democratic government, the necessity of statutory bodies came into the picture in the early twentieth century when malpractices exceed in the pharmacy field. In 1948, the pharmacy act was passed to regulate the pharmaceutical institutions of India. The next year saw the establishment of the pharmacy council of India by the ministry of health and in 1953; the first education regulation was framed. It didn't stop there as well. To meet up the needs of the upcoming decades in providing efficient and skilled labor in pharmacy practice, subsequent amendments were made in 1972, 1981, and 1991. Hereby, these regulatory bodies came up with minimum qualification requirements for being a registered pharmacist. (3)(4). Today PCI (Pharmacy Council of India) and AICTE (All India Council for Technical Education) acts as an anchor for the sailing Pharmacy ship. (11)

### **RENOVATION IN PHARMACY EDUCATION**

Yes, the pharmacy had spread its wings in sectors of education, industry, retail, and research. But somewhere it lacked in providing patient-oriented services. Worldwide redrafting of pharmacy education occurred; being influenced by the global change, Dr. BD Miglani, acknowledged as India's father of hospital pharmacy introduced a post-graduate program with a specialization in hospital and clinical pharmacy in 1984. This trend was later taken up by CMC Vellore in 1996 and JSS College of Hospital and Clinical Pharmacy in 1997 by introducing post-

graduation diplomas and post-graduation masters in hospital and clinical pharmacy respectively. Numerous other colleges in India showed the green flag to the above proposal. (7) And that lead to the revision of the pharmacy act in 2008 by PCI and the Government of India, heading towards the formation of a 6-year course Pharm.D, otherwise termed Doctor of Pharmacy. (3) The Syllabus for a Doctor of Pharmacy varied quietly from the contemporaneous syllabus of B.Pharm and M.Pharm. Along with the B. Pharm syllabus, other clinical-oriented subjects like therapeutics, clinical research, pharmacoepidemiology, clerkship, clinical pharmacokinetics, and therapeutic monitoring were included during the second half of the 6 years program. It also involves an internship in the final year with the practice of residency in general medicine for 3 months and other 3 specialties for the rest of the year. This also opened the way for Indian students to be competent enough at the international level. (6). JSS College Of Pharmacy in Mysore became the stepping stone as the first college to introduce Pharm.D in India's history. (3)

### **PHARMACEUTICAL EDUCATION AND THE PRESENT**

There are almost 3393 Pharmacy colleges in India (8) and Uttar Pradesh stands at the top by having 585 institutions, followed by 509 and 204 pharmacy institutions in Maharashtra and Madhya Pradesh respectively. (9) Her Excellency Smt. Pratibha Devisingh Patil, Former President of India, in July 2010, while addressing "Recent Trends in Pharmacy Education and Practice", quoted, "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 meager 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". Her words manifested the clear impact of Pharma on the GDP growth of the nation and passed a supreme mission to the

pharmacy educational department in fostering skilled graduates as potential ones. (4)

Currently, the main Pharmacy courses available include a Diploma in Pharmacy, Bachelor of Pharmacy, Master of Pharmacy, Doctor of Pharmacy, Master of Science in Pharmacy, Master of Technology in Pharmacy, Master of business administration in Pharmacy, and Doctor of Philosophy in Pharmacy. (10)(11)(12) There are almost 434 Government pharmacy colleges and Maharashtra tops the list with 48 government Pharmacy Colleges. (11) Also, there are 7 national institutes of pharmaceutical education and research. (12) The basic eligibility criteria to enter into a pharmacy course as per PCI include:

**Diploma in Pharmacy (2-year program):**

- 1) Intermediate examination in Science
- 2) The first year of the three-year degree course in Science
- 3) 10+2 examination (academic stream) in Science
- 4) Pre-degree examination
- 5) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations. (13)

**Bachelor of Pharmacy (4-year programs):**

- 1) Students who have passed the 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to the 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually.
- 2) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.
- 3) B. Pharm lateral entry (to the third semester): A pass in the D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act (14)

**Master of Pharmacy (2-year programs):**

- 1) Students should have a minimum of 50% in Bachelor of Pharmacy(B.Pharm) from a PCI/AICTE-approved college or university.
- 2) Students should qualify for GPAT or any other national & state level M.Pharm entrance test with a valid score. (15)

**Doctor of Pharmacy (6-year programs):**

**For Pharm.D:**

- 1) A pass in the 10+2 examination with Physics and Chemistry as compulsory subjects along with one of the following subjects: Mathematics or Biology.
- 2) 2)A pass in the D.Pharm course from an institution approved by the Pharmacy council of India under section 12 of The Pharmacy Act.

**For Pharm.D (Post Baccalaureate):**

- 1) A pass in B.Pharm from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act. (16)

**Master of Science in Pharmacy (2-year programs):**

- 1) B.Pharm degree from PCI and AICTE recognized institute with at least 60% marks in graduation.
- 2) MBBS, BAMS, and BDS professionals can apply too.
- 3) Those with M.Sc. in Life Sciences are also eligible.
- 4) Admission to the program is through entrance tests and merit of marks obtained in graduation. GPAT/GATE/NET qualified candidates are given preference. (17)

**Master of Technology in Pharmacy (2-year program):**

- 1) The basic qualification required for pursuing M.Tech in Pharmaceutical Technology is a Graduation degree in (B.E / B.Tech / B.Pharma from a recognized college or university.

- 2) The Graduation has to be completed in any of the Chemical Engineering / Organic Chemistry or a related discipline.
- 3) A minimum aggregate score of 60% (55% for SC / ST candidates) is required at the level of Graduation and for the admission process.
- 4) Some institutes conduct an entrance examination for admission to their postgraduate pharmaceutical technology course.
- 5) Preferably, a minimum of 24 months of work experience is required as many reputed institutes of the country prefer students with professional experience in the subject. (18)

### Master of Business Administration in Pharmacy (2 years):

- 1) The student should have graduated B.Pharm from a recognized PCI-approved college

- 2) The B.Pharm aggregate score must be between 45 to 50%. Courses like part-time MBA and Executive MBA need work experience of nearly 5 years sometimes.
- 3) Students need to pass the MBA entrance exams and exams vary for different colleges but general MBA exams include GMAT, CAT, MAT, CMAT, XAT, etc. (19)

### Doctor of Philosophy in Pharmacy (3 YEARS):

- 1) The student must complete a Master's degree in Pharmaceutics or any of its equivalent subjects.
- 2) Students must get a minimum of 55% of the aggregate marks from any recognized university.
- 3) Clearing cut-off marks in the entrance examination are the prime requirement for getting admission to this course.
- 4) The students also have to do well in the Personal Interview round. (20)

Table 3) Here are the top pharmacy colleges in India in 2022 and their year of establishment. (21)

Year of establishment	Colleges/Institutions
1972 (22)	Jamia Hamdard Pharmaceutical Sciences, New Delhi
1944 (23)	Punjab University of Pharmaceutical Sciences, Chandigarh
1964 (24)	BITS Pilani - Birla Institute of Technology and Science Phamaceutical Sciences
1998 (25)	NIPER Mohali - National Institute of Pharmaceutical Education and Research SAS Nagar
1933 (26)	ICT Mumbai - Institute of Chemical Technology
2007 (27)	NIPER Hyderabad - National Institute of Pharmaceutical Education and Research
1980 (28)	JSS College of Pharmacy, Ooty
1963 (29)	MCOPS - Manipal College of Pharmaceutical Sciences
1993 (30)	JSS College of Pharmacy, Mysore
2007 (31)	NIPER Ahmedabad - National Institute of Pharmaceutical Education and Research

### SCOPE OF PHARMACY EDUCATION IN THE CURRENT ERA

The horizon waiting for Pharmacy graduates is immense. Writing down a few could explain the radius of the Pharma field. Let's have a glance at the territories encompassed by Pharmacy graduates. A graduate with a diploma in pharmacy, their domain can be defined as a Drug store pharmacist, a hospital pharmacist, an Assistant pharmacist in Pharm production, quality control (QC) departments, a medical representative in a Pharma company, Self-employment opportunities by opening their drug store, Laboratory technician in pharmacy education institute, Wholesale pharmacy.

Higher graduation as a bachelor in pharmacy further opens a greater number of fields and this includes being in a Chemist shop, Higher studies including Master of pharmacy, MS in Pharmacy, MBA in pharmacy, Pharm.D, Research Organization, Production Management, Quality Control, Quality assurance, Research And Development, Clinical Research, Regulatory Affairs, And Intellectual Property Right, Sales And Marketing, Product Management, Bioinformatics, Medical Transcription, Academics, Community Pharmacy, Hospital Pharmacy, Pharmaceutical Packaging Technology, Formulation Development,



Government Sector, Entrepreneur, Forensic Pharmacy and the list still goes on. Amongst the listed sectors, higher positions are garnished by masters, MS, MBA, Ph.D., and Pharm.D graduates. Pharm.D graduates have the additional benefit of being able to participate in Ward Rounds, Pharmaceutical Care Services, Medication History Interviews, Prescription Order Review/Medication Chart Review, Poisons Information Service, Medication Error Monitoring, and Therapeutic Drug monitoring. (6) Pharmacy, therefore, can be visualized as an ocean and pharmacy graduates as sails man and it depends upon each graduate, how far they can sail and dive and come out with valuable pearls that the world had never seen. This was the case when the mRNA stole the light of the world at the beginning of this decade. In one line, a pharmacy graduate with a dream and passion can be like Navinchandra Jamnadas (the richest pharmacist in the world) with an annual worth of \$15.7 million i.e Indian currency worth of Rs.1,190,838,720 or a small pharmacy shop owner with an income of minimum \$276/month(32) i.e Indian currency worth of Rs. 20,934.49.

### **DORMANCY IN PHARMACY EDUCATION**

Though widely established, the retarding force created by delayed updates does not allow the pharmacy field to excel up to its potential.

Lack of industrial exposure to the students in the pharmacy curriculum has denied them the privilege of finding industry-oriented jobs as skilled candidates.

The commercialization of education gives chances for non-meritorious students to be graduates, thus reducing the quality of labor in the pharmacy field.

Narrow research fields with no curriculum provide space for undergraduate students to do research in industries or laboratories.

Low practical knowledge leaves the students with failed memory of theoretical knowledge in establishing it.

Lack of technical knowledge and software information providing curriculum keeping the students lag at a global level

The subjects and the syllabus need to be updated by the industrial procedures.

Providing internships for the students with a stipend motivates them to choose their area of interest and makes them capable and confident candidates for the pharmacy manpower requirement.

The course of Pharm.D was supposed to be instigated by the MCI as announced to the lower parliament by the Union health minister Mr. J.P Nadda but now this field is handled by academicians from animal pharmacology, hospital pharmacy, pharmaceuticals, and so on. This lack of infrastructure has created low self-esteem in the students to undertake the tasks, which they are supposed to do.

In many developed countries like the USA, and France, Pharm.D is an undergraduate program that provides a residency of 3 years, which enables the students to be competent and confident candidates for clinical pharmacy programs. So, extending the residency period for Pharm.D programs could boost the confidence of Pharmacy graduates to an immense level. (4,5,6)

### **PROPOSALS FOR PROSPERING PHARMACY EDUCATION**

Designing the curriculum so that the first two years could give pharmacy basic knowledge and the next two years could give the students an option to choose their specialization. The students need to be provided with the flexibility of attending his/her interested class; say a student who is passionate about marketing needs to be given that training instead of forcing him to attend analytical chemistry e. t. c. (5)

Regular up gradation of the syllabus to generate graduates competent enough to work with experienced ones as potential employable.

Establish collaborations with industries to get pre-exposure and practical training.

Technical skills need to be added to the students by providing opportunities for training in the given programs.

Technological and software operational training needs to be added to the curriculum to improve the area of work for the students as professionals.

Improving verbal and written communication skills to add up their interference while dealing with patient care in the hospital.

Improve the Pharmacy curriculum to involve the students in training in proper healthcare delivery system.

Restrain the colleges on commercializing pharmacy education and keep strict criteria, to generate quality pharmacy graduates who are meritorious and capable enough.

Faculties providing training for clinical-oriented programs should be updated on the daily growing requirements of pharmacy graduates.

Research-oriented courses should be given more interest than the outdated syllabus, to bring out the highest caliber of students. (3,4,6)

## CONCLUSION

The road travelled since centuries ago is still not unravelled fully. Each day is a progress sheet in the history of pharmacy education. Before we learned under sages and now, we are learning under professionals, tomorrow we will learn under robots and technologies. Yes, we need to grow as the world grows. Today's pharmacy educational system is growing in an arithmetic way but the needs of the world with pharmacy graduates are growing exponentially and this has to be balanced. It's better to recall the words of Elon musk at this point, "we may be working hard but some others might be working harder". This applies to every field, if pharmacy graduates are not updated as per the world's requirements, then robots and technologies could replace us. So, let's get updated and not outdated to emerge as radiating light in the dark.

## Abbreviations

PCI: Pharmacy Council of India

AICTE: All India Council for Technical Education

SC: Scheduled Caste

ST: Scheduled tribe

GMAT: Graduate Management Admission Test

CAT: Common Admission Test

MAT: Management Aptitude Test

CMAT: Common Management Admission Test

XAT: Xavier Aptitude Test

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