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Genesis, Development and Popularization of Doctor of Pharmacy (PharmD) Education Program at the Global level - A study based on the story from 1955 to 2009.

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Abstract

The concept of clinical pharmacy was introduced in pharmacy profession by the American Hospital pharmacists during the period 1920-1940, though the term 'clinical pharmacy' as such was not coined during those days. Clinical pharmacy as discipline evolved in USA from a combination of factors that contributed for the development and achievements in the area of hospital pharmacy. The introduction of PharmD in the University of California at San Francisco in 1955 contributed for the overall growth and popularization of clinical pharmacy. By 1980s the PharmD became a sought after course in the US. The American Association of College of Pharmacy (AACP) and the Accreditation Council for Pharmaceutical Education adopted PharmD as the essential and basic qualification required for the practice of pharmacy. Along with the regular PharmD, other non-traditional programs like post baccalaureate PharmD were also introduced and PharmD got migrated to other parts of the world. When the Foreign Pharmacy Graduation Equivalency Committee (FPGEC) in the US mandated a 5 year pharmacy graduation program to be eligible to the Foreign Pharmacy Graduation Equivalency Examination (FPGEE), pharmacists from other countries particularly Asian countries including India got upset. All this prompted Indian authorities too to think of introducing PharmD. Finally the PharmD program was initiated in India in 2008 in few selected institutions approved by the Pharmacy Council of India. In spite of the limitations of the Indian PharmD structure and the curriculum, the program will develop to one of the best such programs in the world in the years to come.

Key words: *PharmD, Doctor of Pharmacy, Pharmacy Practice, PharmDr.*

INTRODUCTION

Though public pharmacies started during the 12th century in Italy, France and other parts of the world, the first pharmacy college was established in 1777 in Paris. In 1803 six schools of pharmacy were started in France and private pharmacy education institutions arose in 1808 in Bavaria in Germany. It was in 1821 that the Philadelphia College of Pharmacy admitted the first batch of pharmacy students in America. With the starting of pharmacy institutions like Philadelphia College of Pharmacy, Massachusetts College of Pharmacy (1823) and New York College of Pharmacy (1829) the global focus of pharmacy eduction took an orientation towards America. They could initiate time and again many innovative programs aimed at the future prospects and needs of pharmacists.

The concept of clinical pharmacy was first developed in America. From the period of Jonathan Roberts in 1752 (when he was appointed as the first hospital pharmacist in Pennsylvania hospital in North America) to 1920, hospital pharmacy did not make significant developments or achievements in USA, that warrants special mention. The post-1920 period, particularly the 1940 to 1970s, witnessed many scientific developments and achievements in the area of American Hospital Pharmacy. It was during this golden era of the American Hospital Pharmacy that the clinical pharmacy originated as a superspeciality of hospital pharmacy.In fact, Clinical Pharmacy as a discipline, evolved in America from a combination of factors like innovations in the discipline of hospital pharmacy since 1920s, growth of clinical

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pharmacology since 1940s, formation of the American Society of Hospital Pharmacists(ASHP) in 1942, innovative teaching programs introduced in 1940s and 50s, and the decline of pharmacology instructions in medical schools. The introduction of PharmD program contributed effectively for the development and popularisation of clinical pharmacy as a speciality of pharmaceutical sciences. More over, the distributive aspects of the pharmacy profession was entrusted to the pharmacy technicians (Tse CS 2007).

Genesis of PharmD

Hospital pharmacy attained new status at the University of Michigam under the chief of their hospital pharmacy services Harvey AK Whitney Sr in the late 1920s and early 1930s. In 1942 when he started the ASHP, his vision of pharmacy got percolated into the pharmacy community of USA and other parts of the world (Mc Leod 2006). However, it was a surprise to many pharmacy professionals in various parts of the world, when a pharmacy program of study leading to the professional degree, Doctor of Pharmacy (Pharm.D.), was initiated in the University of California at San Francisco (UCSF), USA in 1955. Though the clinical pharmacy concepts were discussed and debated in the country from 1940s itself, the take-off of the PharmD in UCSF was not smooth and resistance free. The program had to face some unfriendly reactions and resistances from certain corners within the country. But many other universities started to adopt the PharmD in the 1960s. Some other Universities including the University of Kentucky had also taken leading roles in developing Clinical Pharmacy programs in the world. Due to the innovative thinking of people like Paul F Parker, many clinical pharmacy activities were introduced in pharmacy in the 1960s. Inspired from the success of Whitney's experiment of Drug Information center in Michigan University, Paul F Parker opened the first Drug Information Center at a Pharmacy School in 1962. The first hospital wide unit dose distribution program in the country was also initiated at the University of Kentucky in 1965. In 1968, the pharmacy residency program was started that awarded both PharmD degree and residency certificate.

It took about two decades for getting PharmD popularised in USA and other parts of the world. In 1973 UCSF started Department of Clinical Pharmacy as an independent unit, which was responsible for the development of the first clinical pharmacy curriculum in the world. Today, the clinical pharmacy residency program of UCSF is the largest in USA.

By 1980s, the authorities in US adopted PharmD as a national professional degree program and by 1992, the AACP and the various pharmacy professional organizations in America took a joint decision to make Pharm D as the minimum requirement for practice of Pharmacy in USA. Since the graduating class of 2006, the BS Pharm degree has been completely replaced by PharmD degree in USA(Carrie 2008). All these developments have positively influenced the pharmacy educational institutions and authorities throughout the world to take proper precautions at their countries.

Influence of American system in other countries.

In 1992, the American Association of Colleges of Pharmacy (AACP) house of delegates voted to support a single entry level educational program at the doctoral level (PharmD). The national organisation that accredits pharmacy degree programs the Accreditation Council for Pharmaceutical Education (ACPE) endorsed the decision of the AACP. However, till 1998, the American Universities and Pharmacy Schools were running programs like B.S (Pharmacy) / B.Pharm and PharmD simultaneously. In 1998, orders were issued to all American Universities to replace their B.S (Pharmacy) and B.Pharm programs with PharmD to make the prospective pharmacists eligible for practice of pharmacy. The adoption of PharmD as the national pharmacy education program to practice pharmacy in USA was the result of the success story of practice oriented, service based and patient focused model of pharmacy practice at the community and hospital levels.

Advantages of PharmD program

PharmD helps to develop abilities and skills required

i) To practice pharmaceutical care, the concept of which is based on sharing the responsibility for the out comes of drug and related therapy.
ii) To effectively communicate with patients and health care professionals.
iii) To scientifically conduct patient interview with the objective of developing patient data base.
iv) To be competent to conduct research studies on drugs and patients in specific areas of interest.
v) To be able to design, implement and evaluate various research projects in health care.
vi) To refine pharmacy practice skills through evidence-based concepts.
vii) To inculcate problem solving skills.
viii) To be able to take up projects and programs in the area of health sciences with special focus on pharmacoeconomics, medication error and pharmacovigilance.
ix) To promote and practice prudent and rational use of medicines aimed at patient care.

PharmD follows a multi-disciplinary curriculum that can produce pharmacists with sufficient mental acuity to differentiate their position from that of the traditional and orthodox role of dispensers of medicines.

Increasing emphasis on improving quality of medication use and enhancing medication safety have dramatically increased the demand for clinical pharmacy and the PharmD program in the US. This is the reason why they had initiated a well planned project in the early 1980s itself for introducing PharmD as the basic qualification for practice by the beginnig of the 21st century. They had given sufficient opportunities and facilities, like introduction of non-traditional PharmD programs, for all the existing pharmacists to get themselves converted as doctors of pharmacy. The Universities framed their own modules with practical approach for part-time and e-learning process of PharmD for existing licensed pharmacists. Many colleges througout USA offered post-baccalaureate PharmD as an additional degree that offered clinical course work and practical training in clinics and hospitals.

PharmD in other countries

The first Canadian PharmD was initiated at the University of British Columbia (U.B.C.) in 1991. The Canadian PharmD program is a post-baccalaureate program of two years (academic period of 20 months) duration. The PharmD programs in Canada are to be accredited by the Canadian Council for the Accreditation of Pharmacy Programs (CCAPP). Students enrolled in the program are required to have graduated from a Canadian Council for Accreditation of Pharmacy Programs (CCAPP) or an American Council of Pharmaceutical Education (ACPE) School with an accredited teaching program. Those who have passed the Pharmacy Examining Board of Canada (PEBC) Evaluating and Qualifying examinations can also join for the Canadian PharmD. In Canada interestingly the PharmD program is offered in both English and French. Pharm D is today very much popular in Europe. In Portugal, Pharmacy studies can be chosen after completing 4 years of basic school, 5 years of preparatory school, and three years of high school education. The process of admission is the same for all degrees from medicine to engineering. The student takes the Master's degree in Pharmaceutical Sciences which is equivalent to the PharmD program in one of the many Pharmacy faculties. The masters program comprises a six year rigorous study. After completing the degree program the students enroll in the regulatory institution for the pharmacist profession in Portugal called, "Pharmacists Order" or in Portuguese "Ordem dos Farmacêuticos". It is equivalent to the residency of Indian programs. After the enrollment the title of Doctor of Pharmacy is issued. Afterwards, Pharmacists can pursue their career in a limitless number of professional areas that range from community pharmacies, drug development, health research, biotechnology to areas such as forensic sciences, food analysis and toxicology. The student can also choose to become a specialist in activities like Pharmaceutical Industry, Pharmaceutical Regulation, Hospital Pharmacy, and Clinical Analysis. Each one of them require an additional 5 year professional study program guided by a tutor in the respective area of knowledge. This specialization is composed of regular evaluations performed by the professional order, which at the end of the 5 years performs an exam. After the success at the exam, the Pharmacist then becomes a specialist, respectively, an Industrial Pharmacist, Regulations Pharmacist, Hospital Pharmacist, and Clinical Analyst.

In the Czech Republic, the title is known as PharmDr. (Pharmaciae doctor). The Pharm Dr is in fact a diploma which is different form the Indiana diplomas. The PhD is also a diploma in Czech. The PharmDr. can be obtained by pharmacists who had graduated in pharmacy (Magister, Mgr.) and students have to study for a minimum period of 5 years. Applicants must defend a research or experimental thesis, and pass a rigorous examination. The PharmDr. title is predominantly a prestigious thing.

In France students are admitted to pharmacy education programs (like medicine) through a competitive examination held at the end of the first year. The duration of pharmacy education extends from a minimum of 6 years to 9 years depending upon the options taken. The maximum period of education is for students choosing hospital pharmacy or clinical pharmacy. Students must specialize when entering the 5th year, and choose between dispensing pharmacy, pharmaceutical industry or hospital internship. State diploma for the Doctorate of Pharmacy, PharmD., is granted to pharmacists after they have completed a short thesis (experimental or bibliographic). It is also possible to defend a "real" research thesis for preparing à Ph.D.

In Italy, the course of study leading to the Doctor of Pharmacy (Dottore in farmacia) is of 5 year duration and includes a guided professional apprenticeship in a pharmacy.

The education of pharmacists in the Netherlands requires a minimum of six years of university study. The Dutch consider the educational level of their current (M.Sc.) Degree in Pharmacy to be comparable to the PharmD title in use in the United States. To become a hospital pharmacist,a 4-year residency program has to completed. In the United Kingdom, the PharmD is a relatively new postgraduate program. It is considered as a doctorate degree open to qualified pharmacists. It is offered by the University of Bradford, taking place over 3 years of clinical practice followed by 2 years of research. It is also offered by the University of Portsmouth and the University of Derby.

Iran Universities like the Tehran University, changed the Pharmacy degree from Masters to doctorate (Pharm.D) and the duration of the study was increased to 5 years. Graduates need to present and defend their theses in different fields of pharmacy and this adds another year to their studies and generally after 6 years students can graduate as Doctor in Pharmacy.

In Lebanon, the first Doctor of Pharmacy (Pharm D) degree was awarded by the Lebanese University Faculty of Pharmacy (upon a decree by the Lebanese government) to its graduating class of 19 students in 1992. The program was first established by Dr. Anwar Bikhazi, a Pharmacy graduate of the American University of Beirut with a PhD from the prestigious University of Michigan. The 6-year entry level PharmD program at the Lebanese University adopted the US PharmD curriculum and training. Enrollment into the program is highly competitive with an average admission rate of 20% of applicants. This was the leading PharmD program in the Middle East, which was followed by other mirror copies of similar programs in Lebanon and neighboring countries, such as the ones provided by the University of Saint-Joseph (USJ) in Beirut and the Lebanese American University.

Saudi Arabia started first Pharm D in 2001 at King Abdualziz University (KAU) and later other institutions and Universities like Ibn-Sina University, KFU, Qassim University, KSU College of Pharmacy at Riyadh, College of Pharmacy at Kharj, and Taif University also started PharmD. Pharm D in Saudi is of six years duration including one year clinical rotations. According to the Saudi Commission for Health Specialties (SCFHS), if a student has taken PharmD within a minimum six years period, the graduate has a chance to further develop himself by taking Accredited Residency Training Program for one year duration, making the total duration of the program as seven years.

In the Philippines, Pharm D was first started in 2005 at the Centro Escolar University (CEU) as a two year post baccalaureate program open to licensed pharmacists. The CEU had started the College of Pharmacy in 1921. Thailand is one among the few countries that had taken early steps to make their national pharmacy education program ready to adopt the American PharmD program. Thailand signed an MOU with 9 American Universities paying a sum of 15 million US $ in 1984-85 to train their teachers in pharmacy schools in USA. They had sent their pharmacy teachers to the American Universities for getting on the site exposure and experience in running PharmD program including its various components. The first PharmD in Thailand was initiated at Naresuan University in 1992.

In Pakistan, traditionally the bachelor's degree in pharmacy was the first-professional degree for pharmacy practice. In 2003, the Pakistan Pharmacy Council mandated that a doctorate in pharmacy (Pharm D) would be the new first-professional degree. PharmD degree is a professional degree that prepares the graduate for pharmacy practice with a duration of 5 years. Most universities in Pakistan are offering the PharmD program such as Karachi University, Dow College of Pharmacy, Hamdard University, Baqai University, Federal Urdu University, the University of Punjab, the University of Lahore, Gomal University, the Islamia University of Bhawalpur, etc. The qualified institutes are recognized by the Pakistan Pharmacy Council. Provincial Pharmacy councils of Punjab, Sindh, NWFP and Balochistan issue Pharmacist Licenses (RPh). In all the countries where PharmD is in existence, the PharmD curriculum is similar but not identical. However, it is true that certain institutions/ universities give more emphasis to certain subjects, and place less emphasis on others.

Curriculum contents and goals- global scenario.

The PharmD program has three main components. Didactic curriculum, laboratory works based on the theory papers and the clinical rotations including clinical clerkship and residency. The didactic curriculum ensures a strong educational base for the clinical component of the program. Unlike the other pharmacy education programs, the didactic component of PharmD gives emphasis on pharmacotherapeutics, pharmacokinetics and pathophysiology. The laboratory works of the PharmD is very much similar to the traditional B.Pharm program in the case of the general and common subjects.

Throughout the curriculum, students apply what they learn to the practice of pharmacy in the health care of patients. In the first and second years, students master important concepts in science, study mechanisms of drug action and the fate of drugs in the body, and begin to explore the dimensions of pharmacy practice. During the third year, students shift their attention to clinical focused courses and, increasingly, to courses in their chosen pathway and elective courses. The population-based and research-focused course contents of the PharmD provide sufficient emphasis on the principles of health policy, economics, and the application of management techniques. Direct patient care experiences, called advanced pharmacy practice experiences (APPEs), allow students to begin to hone their clinical skills. The fourth year combines APPEs with pathway specific experiences and electives.

The PharmD curriculum helps to produce scientifically and technically competent pharmacists who can apply their education to provide maximum health care services to patients. Students are provided with the opportunity to gain greater experience in patient care in close cooperative relationships with health practitioners. It is the goal of all pharmacy schools to prepare pharmacists who can assume expanded responsibilities in the care of patients and assure the provision of rational drug therapy.

Clerkship, Residency and Clinical rotations.

The first pharmacy scientific residency program in the US was developed by Whitney at University of Michigan hospital in 1927. The ward rounds, clinical postings and clerkship and the residency are the core components of the PharmD program. It is through these, the students get accustomed to real hospital practice situation and get oriented to the evidence based therapy concepts. The clinical rotations provide students the opportunity to apply knowledge acquired in the classroom to the practice of pharmacy in a variety of patient care settings. In addition to refining advanced pharmacy practice skills, students gain confidence in applying evidence-based principles to drug treatment decisions.

Core rotations in adult internal medicine, ambulatory/primary care, cardiology, critical care, emergency medicine etc, are essential for the students. They are also given the options for elective clinical rotations as per their choice in other areas like oncology, nephrology, neurology, pediatrics, infectious diseases, psychiatry, dermatology, endocrinology and urology. The residency programs can be in general pharmacy practice, clinical pharmacy practice, or other speciality areas depending upon the personal interests, preferences and specific career requirements of the students. Completion of a pharmacy residency is sometimes a requirement for employment in hospital pharmacy practice or as clinical faculties at pharmacy schools. Through experiences in a variety of practice settings, students strengthen their clinical skills as active members of a health care team. The program also helps students develop skills required for clinical and basic sciences research.

The characteristic feature of the PharmD is its components of clinical postings, ward rounds, clerkship and residency. Hospital pharmacists in France have initiated medical rounds with physicians since 1815. After the internship in hospital pharmacy was introduced in 1815, the municipal hospital of Paris had become more effective than it had been, and the pharmacy interns were directed to make hospital rounds with physicians and surgeons. By 1829, the responsibility of the pharmacist-intern to make hospital rounds with physicians and surgeons was explicitly stipulated in the Regulations of Paris hospitals. Kenneth Fitch, a former Editor of the Journal, ***'Mondial de Pharmacie',*** and a contemporary and an associate of William Martindale, went to the hospital to examine patients with amoebic dysentery and to note the effects of drugs, synthesised by Martindale, against the disease.

Length of Study

In USA, the Pharm.D degree program requires at least 2-years of specific pre-professional or pre-pharmacy undergraduate coursework followed by 4-academic years (to the extend of 3 calendar years) of professional study. Pharmacy colleges and schools accept students directly from high school for both the pre-pharmacy and pharmacy curriculum, or after completion of the college course prerequisites. Majority of students enter a pharmacy program with 3 or more years of college experience. College graduates who enroll in a pharmacy program shall have to complete the full 4-academic years of professional study to earn the Pharm.D degree. The AACP does not track the availability of accelerated programs of study for individuals with a baccalaureate degree in a related health career or science field.

Though the duration of PharmD is 4 academic years (three years) in USA after two years of pre-professional program at the University level, in other countries, it varies from 5 to 6 or even more years. In most of the countries, the PharmD is a 5 year program.

Arab countries like Egypt, Syria, Jordan, Saudi Arabia were intuitively conducting 5yr degree course (B.Pharm) since early 1990s and some of their pharmacy colleges just changed the name of the course from B.Pharm to PharmD. Pakistan very smartly took the inadvisable shortcut by upgrading their degree to new nomenclature of Pharm.D and increased 4 year to 5 year duration. In some countries, including Pakistan the post-baccalaureate PharmD is of only one year duration and in most other countries, it is a two year program.

Genesis of Pharm D in India.

The pharmacy education in India is not much old. It was initiated in Banaras Hindu University in 1932 by a thirty year old youth, Mahadeva Lal Schroff popularly known as M.L. Schroff. He could start pharmacy education in the country just because of the encouragement and support he got from Pandit Madan Mohan Malaviya, a national figure and Vice chancellor of the Banaras Hindu University.

In 1940, April the first M.Pharm course was started in the Banaras Hindu University (BHU). Later, Schroff worked as Principal of Birla College, Pilani during (1949- 52) and was the Professor of pharmacy at Saugar University (1958-60). In 1964, based on the invitation from Dr. Triguna Sen he organized the department of pharmacy at Jadavpur University, Calcutta. However, the growth of pharmacy education was in the 'bonsai style' in the beginning. Even at the time of independence there were only five pharmacy colleges in the country and it increased to 16 by 1967. During the period 2000-2008 hundreds of new pharmacy degree colleges started in the country. The number of degree colleges increased to around 900 by 2009. Only about 15 percent of the Indian Pharmacy Colleges are situated in the health care campus attached to the hospitals or medical colleges.

In India, the post graduate pharmacists working in the hospital pharmacies were engaged in different teaching positions in the department of pharmacology of various medical colleges. They were well respected and accepted by the medical students. Some academicians in India, like Dr.P.C.Dandiya, Professors Gode and Gambir (Department of Pharmacology, Institute of Medical Sciences, BHU), Prof. R.D. Kulkarni (Department of Pharmacology, Grant Medical College, Bombay) and Dr.B.D.Miglani (Delhi University) tried to bring this evolution of clinical pharmacy in the West, into the Indian pharmacy profession in the 1970s and early 1980s. However, clinical pharmacy could make an impact in the pharmacy profession and the practice in India only in the 1990s. In the beginning, clinical pharmacy was restricted to hospitals in India, but later spread to community settings. Today, Indian clinical pharmacy also addresses industry-based issues like drug information, clinical trials, pharmacy journalism and pharmacovigilance activities.

The area of pharmaceutical sciences in India is developing day by day and the role of pharmacist is also undergoing major changes. The pharmaceutical industry in India has attained tremendous growth and development during the last three or four decades. With growing internationalization of the pharma industry and the globilization of the pharmacy education program, the standards of pharmacy education need to be world class and the country is no doubt moving in that direction. The first effort in introducing PharmD in India was initiated in Trivandrum Government Medical College in the 1990s itself and in 1999 Dr.Revikumar K.G., Head of Hospital and Clinical Pharmacy, framed a curriculum for starting PharmD in the University of Kerala, Trivandrum with the help of some some American Universities (Fig1) and took it ahead. Though the Board of Studies and the Faculty of Medicine cleared the proposal, it could not materialise due to some reasons at that time.

When the Foreign Pharmacy Graduation Equivalency Committee (FPGEC) in US mandated a 5 year pharmacy graduation programme to be eligible to take the Foreign Pharmacy Graduation Equivalency Examination (FPGEE), quite naturally pharmacists from South Asian countries including India have got upset. Many Indian Bachelor of Pharmacy graduates who had undergone the 4year B.Pharm course and went to US for a job since 2003 were put in quandary. All this prompted Indian authorities to think seriously about the introduction of PharmD in India.

The Indian authorities could introduce the six year regular PharmD and the three year post baccalaureate PharmD in 2008 in the country. The Gazette of Government of India, dated 16th May 2008 notified the norms for PharmD program. The current syllabus of the PharmD include regular Pharmacy subjects and specific subjects like therapeutics and clinical pharmacy. Orientation and exposure in clinical, hospital and community pharmacy practices is also incorporated.

Table1. Pharmacy Colleges approved by PCI for starting regular PharmD in 2008

Sl.No	Name of College	University
1.	Department of Pharmacy Practice, Annamalai University , T.N.	Annamalai University, Annamalai Nagar Chidambaram, Tamil Nadu.
2.	Visveswarapura Institute of Pharmaceutical Sciences, Bangalore	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
3.	J.S.S College of Pharmacy, Mysore	J.S.S University, Mysore, Karnataka
4.	K.L.E College of Pharmacy, Belgaum	K.L.E University, Belgaum, Karnataka
5.	M.S Ramaiah College of Pharmacy, Bangalore	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
6.	Navodaya Education Trust's N.E.T Pharmacy college ,Raichur	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
7.	Hyderabad Karnataka Education Society's College of Pharmacy,Gulbarga	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
8.	Sri.Jagadguru Mallikarjuna Murugharajendra College of Pharmacy,Chitradurga	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
9.	B.V.V Sangha's Hanagal Shri Kumareshwar College of Pharmacy, Bagalkot	Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka
10.	J.S.S College of Pharmacy,Ootacamud	J.S.S University, Mysore, Karnataka
11.	Sri Ramachandra College of Pharmacy,Chennai	Sri Ramachandra University,Chennai, Tamil Nadu
12.	Sri.Ramakrishna Institute of Paramedical Sciences,Coimbatore	The Tamil Nadu Dr.MGR Medical University, Chennai,Tamil Nadu
13.	Manipal College of Pharmaceutical Sciences, Manipal	Manipal University, Manipal, Karnataka.
14.	Smt.Sarojini Ramulamma College of Pharmacy, Mahabubnagar	Osmania University, Hyderabad, Andhra Pradesh
15.	Raghavendra Institute of Pharmaceutical Education & Research,Anantapur	Jawaharlal Nehru Technological Kukatpally,Hyderabad, Andhra Pradesh
16.	Deccan School of Pharmacy, Hyderabad	Osmania University, Hyderabad, Andhra Pradesh
17.	Talla Padmavathi College of Pharmacy, Warangal	Kakatiya University, Andhra Pradesh
18.	Bharat Institute of Technology, RangaReddy(Disst.)	Jawaharlal Nehru Technological Kukatpally,Hyderabad, Andhra Pradesh
19.	St.Peter's Institute of Pharmaceutical Sciences,Vidyanagar	Kakatiya University, Andhra Pradesh
20.	Sri.Venkateshwara College of Pharmacy, Hyderabad	Osmania University,Hyderabad, Andhra Pradesh
21.	GIET School of Pharmacy,Rajahmundry	Andhra University, Visakhapatnam, Andhra Pradesh
22.	Malla Reddy College of Pharmacy, Secunderabad	Osmania University,Hyderabad, Andhra Pradesh
23.	Shri Vishnu College of Pharmacy,West	Andhra University, Visakhapatnam, Andhra Pradesh
24.	Vaagdevi College of Pharmacy,Warangal	Kakatiya University, Andhra Pradesh
25.	P.Rami Reddy Memorial College of Pharmacy,Kadapa	Jawaharlal Nehru Technological Kukatpally,Hyderabad, Andhra Pradesh
26.	Shri.Ramnath Singh Institute of Pharmaceutical Sciences & Technology,Gwalior	Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, Madhya pradesh
27.	Poona College of Pharmacy, Pune	Bhari Vidyapeeth University,Maharashtra

Hospital rounds, clinical postings, training in 4th and 5th year and the one complete year residency in the hospital during the last year of the course (sixth year) can help the PharmD students get familiar with actual hospital and clinical practice set-ups. However the curriculum for the PharmD course as finalized by the Pharmacy Council of India (PCI) require drastic changes taking into consideration the global and national scenario to make it more effective and result oriented.

The PCI in July 2008 invited applications for starting PharmD in India. Though it was done in a comparatively hasty manner giving only minimum period to apply, they had received about 50 applications from states like Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Maharashtra, Madhya Pradesh and Orissa and conducted the inspection in August. In September 2008, the PCI approved about twenty pharmacy institutions from states like Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra and Kerala for starting PharmD course from the academic year 2008- 09**.** Subsequently few more institutions were approved for starting the program. Some of these were given the permission to start both PharmD and PharmD post baccalaureate (See Table 1 and II).

The pharmacy colleges have to fulfill the requirements as fixed by the PCI like sufficient number of qualified faculty, class rooms laboratories etc. Along with hospital facility (300 bed hospital) for starting the PharmD. In 2008, the University Grants Commission (UGC) has sanctioned Rs.50 lakh to Annamalai University in Tamil Nadu to start PharmD program. They are the first to launch the PharmD in India. Immediately after starting the PharmD, the Annamalai University initiated steps for having a tie-up with some American Universities. In 2009 February Dr.James Scott from Western Universtity, California visited Annamalai University to study the situation and the facilities available at the University for running the program. In that connection, Dr. Scott has visited and studied the facilities in some other centers in south India like Amrita School of Pharmacy (Amrita University, Kochi, Kerala), Alshifa College of Pharmacy (Calicut University, Kerala), KLE College of Pharmacy (KLE University, Belgaum) and Sri Ramachandra University, Chennai. In the years to come, the PharmD program in India will develop to one of the best such programs in the world as the country has the potential and facility for the same.

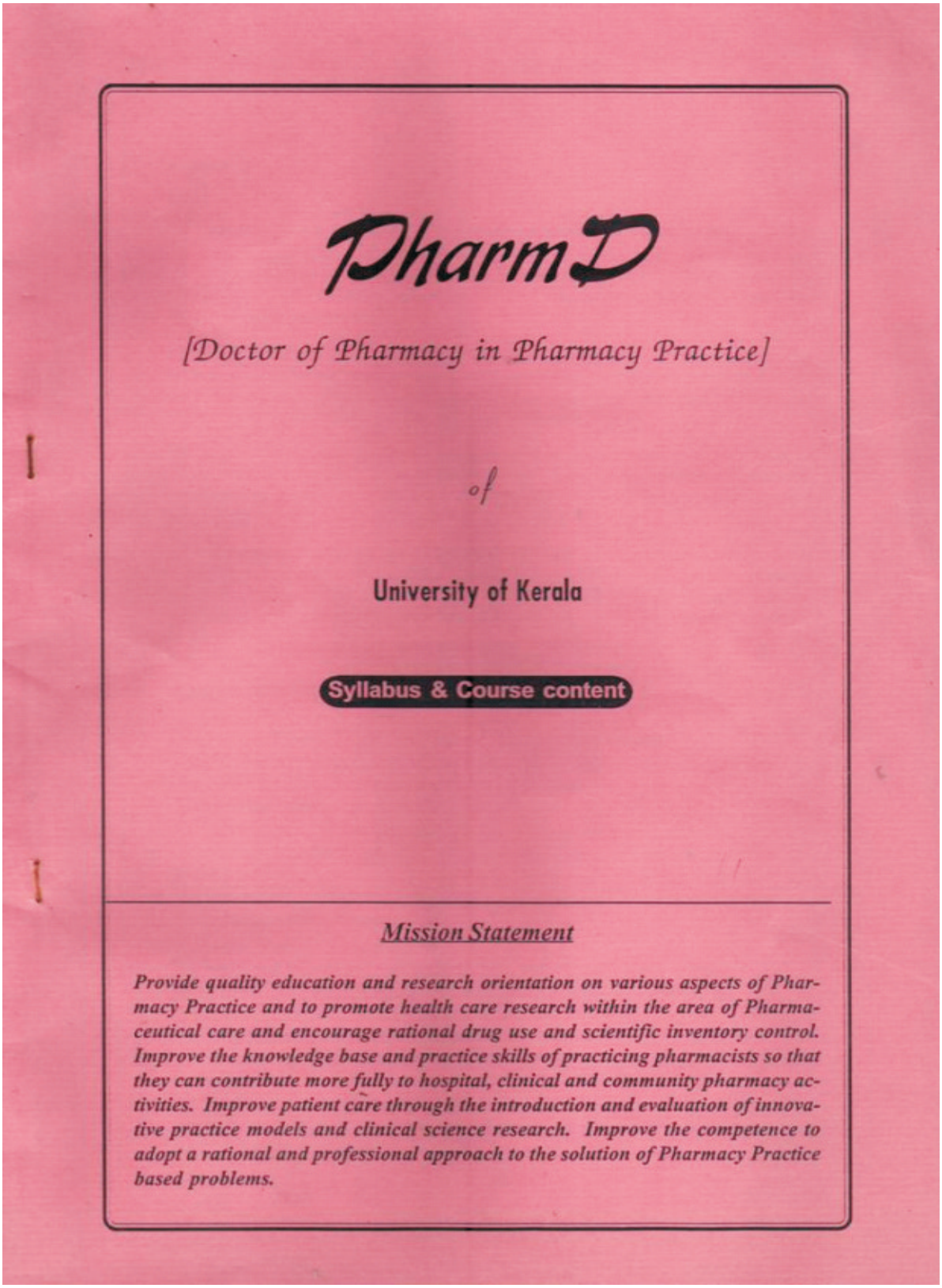
PharmD Tuition Fee

The tuition fee for PharmD varies from country to country, state to state, university to university and institution to institution. The tuition fee is highest in countries like USA. In Idaho State University (ISU) it is $12000 (about Rs 6 lakhs) per semester for non-residents and 5000$ for Idaho residents. In Pakistan the fee is almost uniform and is about Rs. 50000 per semester. In India the tuition fee on average rupees one lakh per year in private sector. However, depending upon the facilities, infrastructure and other amenities the fee may increase or decrease. In government institutions the fee is very less. Unfortunately, very few government institutions have taken steps to start PharmD in India.

Table.2. Pharmacy Colleges approved by PCI for starting Pharm.D (post baccalaureate) program.

Sl.No	Name of College	University
1.	Dept. of Pharmacy Practice, Annamalai University T.N.	Annamalai University, Chidambaram,Tamil Nadu
2.	Visveswarapura Institute of Pharmaceutical Sciences,Bangalore	Rajiv Gandi University of Health Sciences, Bangalore, Karnataka
3.	J.S.S College of Pharmacy, Mysore	J.S.S University, Mysore, Karnataka
4.	K.L.E College of Pharmacy, Belgaum	K.L.E University, Belgaum, Karnataka
5.	J.S.S College of Pharmacy, Ootacamud	J.S.S University,Mysore,Karnataka
6.	Sri Ramachandra College of Pharmacy,Chennai	Sri Ramachandra University,Channai,Tamil Nadu
7.	Sri. Ramakrishna Institute of Paramedical Sciences, Coimbatore	The Tamil Nadu Medical University, Chennai, Tamil Nadu
8.	Manipal College of Pharmaceutical Sciences, Manipal	Manipal University, Manipal, Karnataka

Fig1. PharmD syllabus of University of Kerala framed in 1999 for starting the program in Trivandrum Medical College in 2000


PharmD

[Doctor of Pharmacy in Pharmacy Practice]

of

University of Kerala

Syllabus & Course content

Mission Statement

Provide quality education and research orientation on various aspects of Pharmacy Practice and to promote health care research within the area of Pharmaceutical care and encourage rational drug use and scientific inventory control. Improve the knowledge base and practice skills of practicing pharmacists so that they can contribute more fully to hospital, clinical and community pharmacy activities. Improve patient care through the introduction and evaluation of innovative practice models and clinical science research. Improve the competence to adopt a rational and professional approach to the solution of Pharmacy Practice based problems.

Future prospects.

ASHP in 2003 issued a vision statement for pharmacy practice in American hospitals and health systems. It prescribes 6 goals and 31 objectives to be attained by 2015. It motivates the ASHP members to advance the profession to higher levels. In 2004, another visionary statement was launched by the Joint Commission of Pharmacy Practitioners(JCPP). It ensures that pharmacists will be the health care professionals responsible for providing patient care that ensures optimal medication therapy outcomes by 2015. Both these position statements envisage that all clinical pharmacists and practicing pharmacists will have completed at least one year of residency training by the year 2020. The Indian PharmD has to be planned and developed as a program giving sufficient opportunities for residency and other hospital and clinical postings promoting evidence based practice culture. The practice and education have to move ahead in tandem. It is essential to provide sufficient opportunities for carrying out real and innovative practice experiences in the PharmD program. Experiences and lessons form other countries show that prospects for the PharmD are much better in India.

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