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3.1 INTRODUCTION

Upliftment in individual, social, professional and economic can be governed through education which will coined the gap in the world of today and tomorrow. The quality concern in education is truly essential in the form education process to the society as a whole, professional body, policy makers, parents and other stakeholders. Moreover, the major change to deeply mark the 21st century has been sifted to from social attitude of independence to in between dependence of individual, societies and organization.

Especially in healthcare, the requirement for professional interdependence has become increasingly apparent, as new priorities in public health and new demographic trends emerge, generating the need for multidisciplinary approaches involving all healthcare providers as well as practitioners and social scientists. Due to wide developments in scientific research and the increasing social demands in terms of healthcare, the pharmacy profession has been forced to undergo a process of evolution with great shifts in its public mission in the last five decades. For an improving pharmacy education, all stakeholders, including students, have a responsibility to encourage and facilitate change and must show leadership in the movement.

The purposes of pharmaceutical education are to provide scientific and technological training relating to standardization, identification, formulation, preparation, quality assurance, distribution, and use of drugs and medicines, disclosing of drug information and management of disease, exploitation of drugs and implementation of laws governing drug exploitation and development of innovative ideas to further strength pharmaceutical services. The pharmacy education system should enable a pharmacy graduate/postgraduate and his/her expertise to fulfill position of responsibility in education. Pharmacy as a profession requires students to be more resourceful, dedicated, disciplined with strong character and interest to serve the society (Checkly, 1997). In order to update, efforts need to be made at the grass-root level so that pharmacy graduates or post-graduates will become competent enough to achieve “Healthcare for humanity through pharmacist”.

3.2 DEVELOPMENT OF PHARMACEUTICAL EDUCATION IN INDIA

Pharmacy education in India has a long history characterized by slow growth between 1842 to 1932. The beginning was made by portages (Goa) in 1842, when the portages government started an institution under the name of ESCOLE MEDICO DE GOA for imparting studies in medicine and for pharmacy. This institution was named as Escola Medico Cirugica de Goa and student’s passing out pharmacy course from this institution were called as “pharmaceutics”. These pharmacists were either engaged in hospital pharmacy or operating their own pharmacies. Portuguese though had set up well-equipped institutions; there were no well-defined laws for controlling the profession of pharmacy. Laws were framed and revised a number of times till finally the Portuguese Government recognizing the role of professionally qualified pharmacists enacted a comprehensive legislation known as “diploma legislative 1952” covering pharmacist and profession of pharmacy. It envisaged that the license to operate pharmacy shall be given only to pharmacists and imposed population criteria for granting license to pharmacist. This legislation was effective even after the liberation of Goa in August 1965 when the drug and pharmacy Act 1940 and pharmacy Act 1948 were gradually extended to Goa. After the liberation of Goa “Escola Medico CirurgicaDe Goa” was upgraded and independent, Medical and pharmacy colleges were set up in 1963 and were affiliated to the Bombay University. The Goa College of pharmacy, which was established in the year 1963, is now recognized by the AICTE and PCI for D. Pharm., B. Pharm., and M. Pharm. courses (Indian Pharma reference guide, 2006).

During the British rule in India, the beginning of pharmacy education was made at the Madras Medical College in 1860. The students were trained in the areas of compounding and dispensing according to pharmacopoeia methods. The courses were not uniform in the absence of a properly framed syllabus. After 1866, students were awarded certificate of qualification to work as chemist and druggist. In 1894, a two-year course after lower secondary was introduced with a syllabus guided by the pharmaceutical society of Great Britain. The course contents included inorganic chemistry, botany, material-medica, practical chemistry and pharmacy for 3 months and one year of practical training in compounding at the general hospital, Madras, Similar courses were also started at Vishakhapatnam, Calcutta, Cuttack, Dacca, Allahabad, Banaras, Luck now, Meerut, Bombay and Nagpur etc. This status of pharmacy education at Diploma level
continued until 1954 when a properly designed Diploma in pharmacy course was started under the pharmacy Act 1948 following the implementation of ER 1953.

Although certain states of British India attempted to legitimize the practice of pharmacy by restricting the compounding, mixing, preparing, dispensing and selling of drugs to the individuals who received a certificate for recognition as compounder after undergoing this course as different medical colleges and hospitals, there was no uniform legislation to regulate the profession of pharmacy. Considering this lacuna, the government of India appointed the drugs, enquiry committee in August 1930 under the chairperson of Lieut.Col. R.N. Chopra, professor of pharmacology, at the school of tropical medicine, Calcutta to look into the regulation of the profession of pharmacy and restricting it to qualified persons and laying down essential qualifications for them. This committee submitted its report in March 1931, recommended the restriction of pharmacy profession to qualified persons, laid down qualification of diploma and degree in pharmacy, and proposed for a central legislation to control drugs and pharmacy. It also recommended the constitution of central council as the general council of pharmacy and provincial pharmaceutical councils for effective implementation of the proposed central legislation. These recommendations could take a concrete shape only after the country achieved its independence in 1947. The pharmacy act was formulated in 1948 and the pharmacy council of India was constituted in 1949. The state pharmacy councils then gradually came into existence.

### 3.2.1 The diploma programs

After the submission of Chopra Committee recommendations and before the enactment of the pharmacy act of 1948, another committee of Government of India named Health Survey and Development Committee, under the chairmanship of Sir Joseph Bhore, in 1943 pointed out the insufficiency of the existing facilities for pharmaceutical education and recommended that educational facilities be created for diploma pharmacist, graduate pharmacist and pharmaceutical technologist. This committee also recommended the constitution of All India Pharmaceutical Council for maintaining uniform standard. Dr. B. Mukerji who was convener of the subcommittee on pharmaceutical education also framed a detail syllabus of diploma course. Another significant development preceding the independence of India was a symposium on “Ideal Course of Pharmacist” held during the sixth All India Pharmaceutical Conference in January 1946 at Bangalore, which culminated in the constitution of a model course committee
under the governorship of Shri B.V. Patel (Gennaro, Alfonso R. 2001). This committee formulated syllabus for Intermediate Pharmaceutics (I. Pharm.) and Bachelor of Pharmaceutics (B. Pharm.). The recommendations of these committees and the proposed syllabus for diploma course in pharmacy prepared enough ground for the newly constituted Pharmacy Council of India, which in its first meeting on 16th May 1947 constituted a subcommittee to prepare education regulations. The education regulations by the PCI were made for the first time in 1953 and were subsequently revised and updated in 1972, 1981 and 1991. The first institution to be inspected by the pharmacy course according to ER 1953 was the department of pharmacy of Birla Institute at Pilani. Later on, this institution became a leading center of pharmaceutical education in the country providing education up to postgraduate and doctoral in Pharmaceutical Sciences. This department of pharmacy of today’s well-known Birla Institute of Technology and science, which was very carefully nurtured and developed by renowned luminary of pharmaceutical education in our country the late Prof. B.M. Mithal for almost five decades. The other institutions which were granted approval in 1950s by the PCI for diploma in pharmacy course were medical college (Amritsar), L.M. College of pharmacy (Ahmedabad), Madras Medical College (Madras), Christian medical college, (Vellore), Bombay College of pharmacy (Bombay) and pharmacy training centre (Jalpaiguri) (Singh, 1998-b).

3.2.2 The degree programs

The Chopra Committee while recommending the proper organization of pharmacy profession and the education, considered it necessary to train qualified pharmaceutical scientist in an upgraded manner for taking care of manufacturing and standardization of drugs and to man the emerging drug control administration departments. It was recommended the introduction of degree courses in pharmaceutical sciences for this purpose.

These recommendations perhaps motivated then by Vice Chancellor of Banaras Hindu University, Pandit Madan Mohan Malviya, who in addition to being a great Sanskrit scholar, patriot, and forefront freedom fighter was also a farsighted visionary, well aware of the country’s need of scientists and technologists in the years to come. He became the first leading educationist of the country to establish a full-fledged department of pharmaceutics and a degree course in pharmacy at the Banaras Hindu University.
It was during 1930-31 when Pandit Madan Mohan Malviya, who returned to India in 1929 after completing his A.B. Hons. in Chemistry from the Massachusetts Institute of Technology, got involved in the freedom movement, and was imprisoned in 1930 for his participation in the Salt Satyagraha launched by Mahatma Gandhi. Pandit Malviya developed a liking for M.L. Schroff and persuaded him to join the B.H.U. and organize the courses of pharmaceutical sciences. M.L. Schroff joined B.H.U. in 1931 but he had to struggle hard for framing the syllabi and start the course after getting the approval of the faculty. In 1932, pharmaceutical chemistry was introduced as one of the subjects in the B. Sc., the other subjects being chemistry, botany and pharmacognosy. Thereafter an integrated two years B. Sc. course in pharmaceutical chemistry, pharmacy and pharmacognosy. Finally the syllabi were again revised and a full-fledged 3-year B. Pharm. course was introduced in the year 1937, which was apart from pharmaceutical sciences also included as a course of foreign language, German, apart from Prof. M.L. Schroff through and the other faculty members at that stage included Prof. N.K. Basu, Prof. G.P. Shrivastava, Prof. D.N. Majmudar, Prof. D.K. Roy, Prof. A.C. Joshi and Prof. S. Prasad. For his invaluable contribution to the development of pharmacy education, Prof. M.L. Schroff is regarded the father of pharmacy Education in India.

During the next 24 years, 7 more centers were established to impart degree level education in Pharmaceutical Sciences. These includes the university department of pharmacy in Punjab (1947), Andhra (1951), Saugar (1956) Nagpur (1956), and Bombay (1945), an independent L.M. college of pharmacy at Ahmedabad (1947) affiliated to Gujarat University and departments of pharmacy at BITS, Pilani (1950) and the Madras Medical College, Madras (1950).

3.2.3 Master’s & Ph.D. programs

The first M. Pharm. programme of one year was introduced by the B.H.U. in 1940 and Prof. G.P. Shrivastava became the first postgraduate of pharmacy produced by any university in India. Thirty-five candidates qualified for their M. Pharm. from B.H.U. by the year 1952. At that stage, the duration of M. Pharm. course was increased to one and half years with two theory papers and practical work followed by research on a selected problem. In 1951, Punjab University introduced one year M. Pharm. program by research initially with specialization in pharmacognosy. Later on specialization in pharmaceuticals and pharmaceutical chemistry were also introduced of one and half year M. Pharm. course by theory papers, practical and research in
the specializations of pharmaceutical technology, pharmaceutical chemistry, pharmacognosy and pharmacology in 1954. The Andhra University in 1954 started unique one year M. Pharm. programs by research in two special subjects namely analysis of food, water and drugs (branch I) and manufacture of pharmaceuticals and fine chemicals (branch II).

The University of Sagar, now known as Dr. Hari Singh Gaur Vishwavidyalaya, introduced M. Pharm. course with the increased duration of two years in 1957. In due course, this two years pattern was followed by most of the universities in India for more than two decades. At Sagar, a paper on modern techniques and methods of research was made compulsory for all the students and a choice to select second paper in the area of specialization was given to students. The research in second year was also in the field of specialization.

The S.M.S. Medical College, Jaipur was the only centre in the country to introduce and conduct 2 years M. Pharm. in pharmacology programme for a number of years from 1961 to 1969. It also allowed the pharmacy graduates to undertake a three and half years M.Sc. (Medicine) Pharmacology course. This M. Pharm. course at Jaipur was discontinued in 1972. Prof. P.C. Dandiya was responsible for introducing this course during his tenure as Reader and Professor at this Institute. A total of 14 students qualified for their M. Pharm.

In pharmacology under the guidance of Prof. P.C. Dandiya and Prof. V.N. Sharma, many other centers introduced M. Pharm. Course in the conventional four subjects during the last 30 years but some institutions came forward with variations in the specializations. These included quality assurance at SNDT, Mumbai; LMCP, Ahmedabad, COP, New Delhi; industrial pharmacy at Annamalai; pharmaceutical biotechnology at NIPER and Jadavpur; hospital pharmacy at COP, New Delhi; biopharmaceuticals and pharmacokinetics at Karad and pharmacy practice (Clinical Pharmacy) at JSS College of pharmacy, Mysore which is a landmark development towards the introduction of clinical pharmacy in India.

3.2.4 Back to one and half year pattern

Following the implementation of Nayudamma Committee Recommendation in 1980, the duration of all the postgraduate programs in engineering and technology (including pharmaceutical sciences) has been changed to 3 semesters (one and half years), consisting of two semesters of course work and one semester of dissertation work. Further, in order to ensure that
only meritorious and motivated students were admitted to postgraduate programme, the Nayudamma Committee recommended an aptitude test GATE to be held at national level and be designed and administered by appropriate national agency identified for the purpose and the candidates should find a place in the eligibility list to qualify for admission into a postgraduate programs. In 1986, the postgraduate programme in pharmacy also came under the preview of the GATE (later on GPAT) for admission. Currently, the students are required to appear in a single composite paper on pharmaceutical sciences of 3 hours duration for those aspiring for admission to M. Pharm. Course after qualifying GATE are also entitled to scholarship/stipend sanctioned by the AICTE in government and grant-in-aid institutions and the university departments (Singh, 1998-a).

3.2.5 Doctoral studies

Research Programs leading to Ph. D. in different branches of pharmaceutical sciences started in different universities, medical colleges and leading institutions in mid 1950s. It is estimated that by now more than 4000 Ph. D. have been produced in pharmaceutical sciences in the country. The institutions which are very productive in this sphere include the universities of Jadavpur, Banaras, Punjab, Sagar, Nagpur, Bombay, Andhra, Kakatiya, Gujarat, NIPER, etc.

3.2.6 National Institute of Pharmaceutical Education & Research (NIPER)

The move to establish a Central Institute of Pharmacy started in 1950s. The Pharmacy Council of India in 1955 submitted a proposal to the central Government for establishing a Central Institute of Pharmacy. Prof. M. L. Schroff was the president of the Council at that time. Thereafter, the matter was followed by Dr. S. Rohatgi, Prof. Harkishan Singh, Dr. S. B. Rao and Shri K. N. Shabhoughe through the Pharmacy Council of India. The Indian Pharmaceutical Congress Association took up the cause in 1981 and it was due to the constant efforts made by Shri Parvinder Singh, President IPCA, Prof. Harkishan Singh, Dr. S. Rohatgi, Dr. Nityanand and Dr. P. R. Pabrai during the 37th Pharmaceutical congress in 1985 at New Delhi, the then Prime Minister of India Shri Rajiv Gandhi assured to examine the proposal. Ultimately, the Central Government cleared the proposal in December 1990. The National Institute of Pharmaceutical Education and Research (NIPER) situated at Mohali became fully functional with the appointment of Dr. C. L. Kaul as its founder Director on 1st September 1994 built at a cost of Rs.100 crores. NIPER provides excellent facilities for postgraduate studies and research. It has
been accorded the status of deemed university and the first batch of postgraduate came out in 1999 (Kokate, 1999).

3.2.7 Present status of pharmaceutical education in India

The Diploma in Pharmacy course has been designed with the aim of producing pharmacists for managing the community pharmacy services as retail chemists and druggists and for the pharmacy services in hospitals, which are mostly confined to the drug stores and dispensing to outpatient’s drug information and clinical pharmacokinetics. There is urgent need to do away with this course and raise the minimum qualification for registration as pharmacist to the degree level.

At the degree level programs, the syllabi of most of the universities are technology based which produce graduates fit for working mainly in the pharmaceutical industries in the areas of production and quality assurance. The concept of clinical pharmacy practice has still not fully developed in our country through the beginning has now been made in the southern states at Mysore, Velour and Otachmand.

However, a change cannot be brought overnight. It has to be a gradual process. After having serious deliberations on this issue, the AICTE has revised syllabus of B. Pharm. course and without disturbing the technology-based curriculum, introduced the components of the Pathophysiology of important disease and clinical pharmacy in the new syllabus. This syllabus is only going to be a transitory one and in the years to come we will have to divide the degree course in two specialties of technology and clinical pharmacy. In the meantime, our graduates will gain knowledge of clinical pharmacy and will be able to pick up work in the hospitals as professional pharmacists and go for higher studies in clinical pharmacy.

Apart from the conventional subjects, the specializations in the areas of hospital and clinical pharmacy have to be able to take responsibilities in leading hospitals and work as members of the health care team.

As per AICTE, the number of students in pharma education from 2007 to 2012 is shown in the table given below. (www.aicte-india.org).

Table 3.1 Current scenario in pharmaceutical education status in India
<table>
<thead>
<tr>
<th>Pharmacy courses</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>23897</td>
<td>25248</td>
<td>25420</td>
<td>26414</td>
<td>26474</td>
</tr>
<tr>
<td>Ph. D</td>
<td>28</td>
<td>38</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Fellowship</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Post-Doctoral</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Post Graduate</td>
<td>4497</td>
<td>5809</td>
<td>7572</td>
<td>15848</td>
<td>21996</td>
</tr>
<tr>
<td>UG2\textsuperscript{nd} Year Direct</td>
<td>231</td>
<td>223</td>
<td>223</td>
<td>295</td>
<td>295</td>
</tr>
<tr>
<td>Under Graduate</td>
<td>37135</td>
<td>42171</td>
<td>45638</td>
<td>52912</td>
<td>53265</td>
</tr>
<tr>
<td>Total</td>
<td>65788</td>
<td>73489</td>
<td>78891</td>
<td>95517</td>
<td>102078</td>
</tr>
</tbody>
</table>

**Figure 3.1: Current scenario in pharmaceutical education status in India**

Looking to the pharma professions from 2007 to 2012, the progress of pharmacy courses in different degrees found to be gradually increasing. The detail of courses and numbers of vacancy are described in table No. 3.2.

3.2.8 The International outline

The Profession of pharmacy vis-a-vis the educational profiles of pharmacists has now been clearly bifurcated in two streams as tabulated below.
The professional pharmacists have the aim of making sure that their patients use medication safely and effectively with proper advice, whether they practice in hospitals or community pharmacies, perform research or work at pharmaceutical companies and relevant areas. As a most trusted profession worldwide, pharmacy involves drug preparation, patient counseling, disease state management, and research. The necessity for pharmacists has increased due to advances in awareness about diseases, medications, and factors that enhance or diminish the safety and effectiveness of drugs.

### 3.2.9 B.V. Patel PERD centre, Ahmedabad

The B.V. Patel Pharmaceutical Education & Research centre is India's first multidisciplinary postgraduate research institute dedicated to the pursuit of brilliance in the pharmaceutical sciences setup with the latest and best R & D facilities, highly qualified scientific & technical personnel & regular education, training and developmental activities. Today, it is an internationally recognized research institute providing the pharmaceutical industry and academia people for the opportunity and resources to commence the latest in research and development.

Advantageously placed in western India where 80% of the drug manufacturing takes place, the PERD Centre acts as a vehicle & supportive partner to the pharmaceutical industry and academia by actively promoting continuing education, industry-academia interaction and research in pharmaceutical and allied sciences.

### Table: 3.2 International scenarios

<table>
<thead>
<tr>
<th>The clinical pharmacist</th>
<th>The pharmaceutical scientist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient care</td>
<td>Drug discovery / development</td>
</tr>
<tr>
<td>Prepare design</td>
<td>Test</td>
</tr>
<tr>
<td>Dispense</td>
<td>Counsel Formulate</td>
</tr>
<tr>
<td>Clinical studies</td>
<td>Administration</td>
</tr>
<tr>
<td>Investigate test</td>
<td>Market sell</td>
</tr>
</tbody>
</table>
3.3 DEVELOPMENT OF PHARMACEUTICAL INDUSTRY IN INDIA

The establishment of modern Indian Pharmaceutical Industry was laid in the beginning of the present century when a small factory known as “Bengal Chemical & Pharmaceutical Works” was established in Calcutta.

Pharmaceutical business in the first decade after independence was dominated by international or foreign companies. During this period, the Indian sector hardly had 10% of the market share. Currently Indian pharmaceutical companies contribute more than 60% of country’s production. Medicines for the NHP are supplied by the national sector confessional rates up to 40% lower than the market rate (Lalla, 1998).

A strong base was created by selling up simultaneous ancillary industries & petrochemical projects. This resulted in the growth of pharmaceutical industry. India’s dependence on imports started failing once the production of bulk drugs started in country itself. Few Indian companies also started R & D work. In the beginning of 80’s India started exporting bulk drugs too many countries in the world, industry became a foreign exchange earner. Indian Industry has achieved this goal due to the top quality & competitive pricing of products offered to the world market. Today 80% of the total bulk drugs exported from the country is by the Indian sector.

Indian pharmaceutical industry has grown tremendously in the field of formulation also. They are sold at the cheap rates anywhere in the world. The credit of the present status of the pharmaceutical industry can be given to two major events namely the setup of the Pharmaceutical enquiry committee & the Hathi committee. The year 1953-54 was a landmark in the history and development of pharmaceutical industry in India. The major event that took place was the setting up of a committee known as “Pharmaceutical enquiry committee” (Lalla, 1998).

The following were specific conditions of reference of this committee:

Work of the existing Pharmaceutical manufacturing companies in India with particular reference to,

a. The demand for the drugs produced & their essentially
b. The quality of the drugs
c. The cost of production
d. The efficiency of the process employed
e. Either the production is made from imported intermediates and penultimate products, or from basic raw materials and chemicals

Based on the advice by the pharmaceutical enquiry committee, Govt. of India and the planning committee evolved a ground policy framework, for the development of the industry that best suited the country’s needs. The result of all these can well be seen today. There has been phenomenal growth both in basic and formulations. The next landmark was the appointment of a committee known as “Hathi Committee”. The Hathi Committee was appointed in February 1974 and consisted of 15 members with Shri Jalsukhlal Hathi as the chairman (Singh, 1998-a).

The specific terms and references of this committee were:

1. To enquire into the progress made by the industry and the status achieved by it.
2. To recommend measures necessary for ensuring that the public sector attains a leadership role in the manufacture of basic drugs, formulations and Research- Development.
3. To make recommendations for promoting the rapid growth of the drugs industry and particularly, of the Indian and small-scale industries sector.
4. To recommend measures for effective quality control to drugs and for rendering assistance to small units in this regard.
5. To examine the measure taken so far to reduce the prices of drugs for the consumer, and to recommend such further measures as may be necessary to rationalize the prices of basis drugs and formulations.
6. To recommend measures taken for providing essential drugs and common house-hold remedies to the general public, especially in the rural areas.
7. To recommend institutional and other arrangements to ensure equitable distribution of basic drugs and raw materials especially to the small scale sectors.

The committee started regular setting and in the first setting itself, if felt the need for appointment of a subcommittee, to examine the question of issue of permission. No objection letters and COB licenses. As usual sub-committee submitted its report to the committee. This sub-committee consisted of 6 members. Following this decision, a sub-committee had recommended, “To recommend measures for effective quality control of drugs and rendering assistance to the small scale units in this regard”.

50
3.3.1 Glimpses of the Indian pharmaceutical industry

The Indian pharmaceutical industry stands fourth in volume terms and thirteen in value terms worldwide. It contributed 0.2% of the worldwide share in 2005, which is valued approximately at 5.2 billion. The imports are of the order of 4% of the total value of the industry. Per capita annual drug consumption in India is as low as 3 billion, which when multiplied by one billion populations, roughly corresponds to the profit made by Novartis Inc.2000 (Indian Pharma reference guide, (2004c)).

According to IDMA, the expected numbers of pharma firms in India are more than 28,000. From these, only 400 are in organized sector and account for the manufacture of almost 70% of the produce. India recorded almost 1000% growth in the number of manufacturers since 1970. Opening from the early 1990’s, the formulation market in India overshadowed the bulk drug sector. There are almost 8,500 brands in 107 major therapeutic areas being sold in India presently. India’s pharma export have risen from Rs. 9.5 crore in 1970–71 to Rs. 12,850 crore in 2004–05, which is 7.1% of India’s total export in all merchandise.

3.3.1.1 Indian pharmaceutical industry (Indian pharma ref. guide, (2004-a)).

- **Annual turnover**: 226 Billion; Growth 5.1%
- **Exports**: 141 Billion – Over 65 countries
- **Imports**: 40 Billion
- **Outsourcing opportunities**: Excellent outsourcing opportunities for clinical trials, R & D, custom synthesis, technical services, e.g. Bioinformatics, etc.
- **Future market size**: McKinney projection 2010 – U.S.$ 25 billion
- **Bulk drugs production**: Rs. 78 Billion. Over 400 Bulk drugs manufactured
- **Manufacturing facilities**: Largest number of U.S. FDA approved manufacturing facilities outside U.S.A.
- **No. of DMFs (Drug Master Files) field with U.S. FDA**: 126, higher than Spain, Italy, China and Israel
- **Per capita drug expenditure**: Rs.220 per year
- **Share of world pharma market**: 1.0% in value, 8% in volume terms
- **Global ranking**: in Volume terms – 4th, Value terms – 13th
• **Number of generic brands**: Over 60,000 in 60 therapeutic categories

• **Capital investment**: Rs.45 Billion

• **R&D expenditure**: Rs.6.6 billion, about 2% of sales (However, some research based companies are spending over 6% of sales on R & D)

• **Ancillary industry**: Extremely well developed. All manufacturing equipment and machineries locally available.

• **Number of units**: About 10,000, out of which around 300 units in the organized sector

• **Intellectual capital**: Third largest English speaking scientific and technical manpower in the world (highest intellectual capital per dollar)

• **Employment**: Direct – 5, 00,000 Indirect – 24, 00, 000

3.3.1.2 **Gujarat pharmaceutical industry** (Indian Pharma Ref. guide, (2004-b)).

• **Annual turnover**: Rs.6,500 Crore; Growth 15%

• **Exports**: Rs.1,500 Crore (30% of India’s total production)

• **Share of Indian pharma market**: 40%

• **Global ranking**: in volume Terms – 1st, Value Terms – 1st

• **Number of units**: About 3,122

• **Number of units (Bulk drugs)**: 100

• **Number of active formulation units**: 1,500

• **Number of units turn over more than 10 Crore**: 80

• **Area wise scope (Production)**:
  - Ahmedabad – 30% to 35%
  - Baroda – 18% to 20%
  - Bharuch and Vapi – 25% to 30%

3.4 **CHALLENGES IN PHARMA EDUCATION**

Today pharma education is facing numbers of problems in the development and restructuring the old pharma education. Increase in the numbers of pharmacist with the low quality is the burning number of question for the pharma graduates dilute the field opportunities and the quality of the work affected by the low quality of the graduates. To make the pharma education effective a number of the constituted bodies like PCI (Pharmacy Council of India), AICTE (All India Council for Technical Education) are working to watch the facilities and the quality of education.
Lack of adequate industry-institute interaction, minimum or less computer aided pharmacy education, no proper teaching and minimum institutes and distance education etc. are some other problems (Patel & Prajapati, 2012).

3.5 LIBRARY SYSTEM IN PHARMACY COLLEGES

The concept of ‘college library’ has been used successful. Library is one of the largest and most expensive educational resources of any academic institution (Kumar, Krishan 1989). In the Indian context, many students do not have a proper place to read at home. Therefore, it is essential that a college library should provide modern facilities for comfortable reading. Today more than 900 pharmacy colleges are functioning in India, with an annual intake of about twenty five thousand students and quite a few of them have good library facilities to foster wide reading and love for books among the students (Bajaj, Mohan C. 1997). Most of library is expected to support the purposes of the pharmacy college and should have specialized works like encyclopedia, yearbooks, directories, serials, non-book materials and collection of standard treatises on various branches of pharmacy education. The reader does not get benefit of most important services like selective dissemination of information, Current awareness service, Indexing and Abstracting (Shiva et al., 1999).

Modernization of libraries is essential for research activities in the field of pharmacy. Library facilities should have been developed as a part of total programs of a college. It should provide latest development in the specific area of their interest. It is to be noted that more than 20,000 scientific and technical articles are published worldwide in one day. As such; it becomes inevitable for the pharmacy professionals to search mass of information rapidly for the satisfaction of a specific information need (Kumbargoudar, 1999).