

Historical Background and Development of Profession of Pharmacy



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HISTORICAL BACKGROUND OF PHARMACY



Doctor and pharmacist, illustration from *Medicinarius* (1505) by Hieronymus Brunschwig.

- Practised even in the ancient days but in a preliminary form.
- **“Sushruta samhitha”** an ayurvedic monograph of medical substances compiled in 6th century BC.
- Charaka Muni(Charaka Sanhitha)
- Sharngadara Muni(Sharngadara Sanhitha)

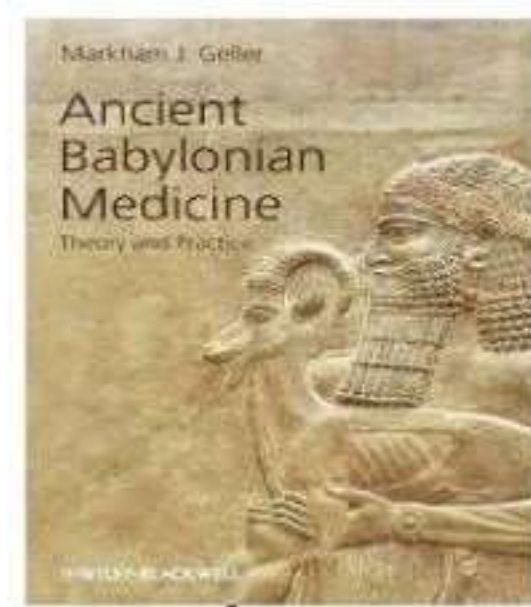




- 6th millennium BC to early 2nd millennium BC
Sumerians used “Cuneiform clay tablets” to note the instructions given for the use of medicines.
- Engraving tablet an official monograph took birth before 500BC.
- 1st known trademark was ‘Terra Sigillata’



- **Babylonians** were single handedly and very efficiently performed the duties of physician, pharmacist & priest.
- Medical texts of this era were inscribed on clay tablets- Record for approach towards the treatment of a particular disease.
- Identification, symptoms of disease, prescribing suitable drug regimen and treatment, instructions for compounding the prescription and finally appealing to god for recovery.



- **Theophrastus**, a Greek philosopher around 300 BC studied plants, herbs shrubs etc.. Regarded as “**Father of Botany**”.
- **Mithridates VI** contributed to Toxicology. Used to test toxins and their antidotes on himself and his prisoners. Came up with formula for universal antidote “**Mithridatum**”
- Egyptian medical document **Papyrus Ebers** and **Papyrus Edwin Smith** were written in 1550 BC and 16th century BC respectively.



- The word pharmacy derived from Greek word **“Pharmacon”** means medicine or drug.
- Greeks are 1st promoters of profession of pharmacy.
- Greek physician called **Pedanius Dioscorides** wrote a book of 5 volumes on medicine & pharmacy book is translated in Latin entitled **De Materia Medica** it served as foundation for other books of medical profession





- Numerous contributions and additions to the work of **Dioscorides** were made during the **Islamic golden age** by several scientists of the middle east



- Oldest Chinese literature work included a script named “**Recipes for 52 Ailments**” found in **Mawangui tomb** sealed in 168 BC.



- In China during the Han Dynasty in the 1st century AD, a manuscript entitled **Shennong Bencao Jing (Divine Farmer)** dealing with medicinal substance was compiled. By **Shennong**.
- He analysed bark, herb, root and their properties etc. Authorised the book **Pen T Sao** consisting about 365 drugs of natural and mineral sources.
- He considered as the **Father of Chinese medicine**.

- **Galen (130-200 BC)** was one of the greatest instructor and practitioners of medicine and pharmacy of his era in Rome.



- 1st formulated cold cream by him resembles present modernized product.
- His methods followed about 1500 years. Today also they serves as basis for preparing many medicaments.
- 1st to extract therapeutic constituents from plants. (Galenicals)

- In Japan pharmacists' respect and status were higher than other health professionals.
- Evident in **asuka** (538- 710) and **nara** (710-794)
- Their positions well illustrated in **TAIHO CODE** (701) and re-described in **YORO CODE** (718)

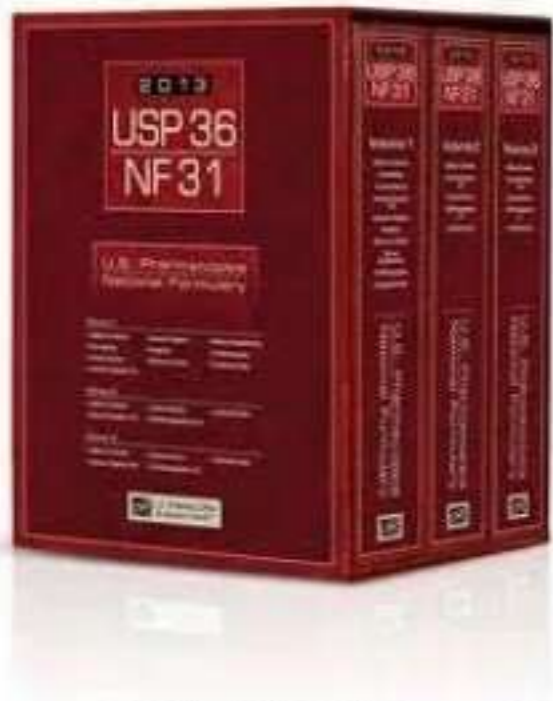
- Practice of pharmacy was also prevalent among the monks in 7th century. They used to impart their disciples with the knowledge of medicine.

- During Islamic golden age in 754 pharmacy (Drug store) were set up 1st time in **Baghdad**, under the rule of **Caliph Abbasid**
- By 9th century pharmacy profession started. Regulated by state Govt. in Baghdad.
- In the medieval Islamic period which followed the Islamic golden age, Growth of knowledge in chemistry & Botanical science paved the way for evaluation of pharmacology.
- **Mohd. Ibn Zakariya** (865-915) strived to upgrade the benefits of medicinal substances.

- **Abu al- Qasim- Zahrawi (936-1013)** innovated distillation and sublimation process. His manuscript named as **'Liber Servitoris'**
- **Sabur Ibn Sahi (689)** has compiled 1st Pharmacopoeia.
- Kitab al-Saydalah, the book on drugs is one of the most definite, specific best illustrated book on drug pharmacology by **Al-Biruni (9973-1050)** (described drug properties, role of pharmacy & pharmacists)
- Book **'Canon of Medicine'** by **Ibn Sina**. Explained pharmacology of 700 medicinal preparations.

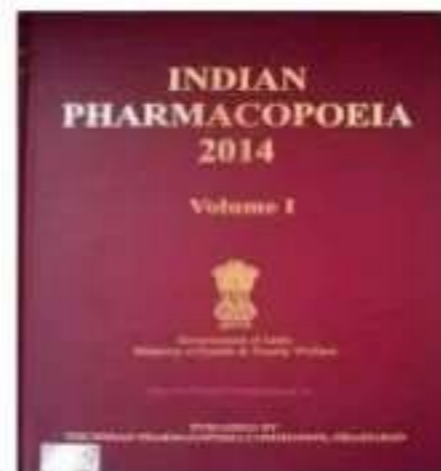
- In 10th century, in a book titled “The foundations of the true properties of remedies” by Al-Muwaffaq explained the distillation process of sea water so as to make it potable.
- Also gave information about properties of arsenious oxide combination with silicic acid.
- Informed about noxious characteristics of copper and lead compounds.

- The 12th century in Europe marked the setting up of drug stores.
- In the year 1240 **King Frederick II** passed an order according to which pharmacy profession was distinguished as a separate profession.
- In 1241 pharmacies were established in Germany
- 1800 and early 1900's witnessed the rapid development in pharmacy field.



- 1st USP- 1820
- 1st pharmacy school- 1821 in Philadelphia (US)
- American pharmacy association- 1852 by **William Proctor**. Regarded as father of pharmacy
- National Formulary-1888

- The year 1870 marked the birth of pharmacy in Madras state of India. Medical students use to practice.
- 1881 in Bengal institutes were started to train compounders.
- Banaras Hindu university started B.Pharmacy course in the year 1937 (Mahadeva Lal schroff)
- Punjab university in 1944
- 1st Indian pharmacopoeia- 1955



Mahadeva Lal Schroff (1902-1971)



**Bengal Chemicals &
Pharmaceuticals Ltd.**
(A Government of India Enterprise)

- The beginning of the Modern Pharmaceutical Industry can be traced back to the early part of the 20th century with the starting of the 1st Indian owned drug firm.
- The “**Bengal Chemical and Pharmaceutical Works**” in **kolkata** in **1901** by **Proff. P.C Ray**.



- ‘Alembic Chemical works’ was set up in 1907 in Baroda.
- Other big units during early part of century were Sarabhai Chemical works, The Bengal Immunity Laboratory and few Govt. laboratories for the manufacture of vaccines and sera.

- Modern drug research in India started in **1920** when **Sri Ram Nath Chopra** set up active centre of research on Indian medicinal plants at the **school of Tropical Medicine, Kolkata**.
- **Dr. Upendranath Brahmachari** at the **Campbell Medical school, Kolkata** introduced Urea Stibamine in **1922** for the treatment of Kala-azar.



- **World War-I:** Simple cough syrups, tablets, capsules.
- Quinine- By Govt. in Darjeeling and Nilgiris.
- By 1930- sera, vaccines, anaesthetics like ether, chloroform, few simple drugs based on coal-tar distillation products began in the country.



- **World war-II:** Plant based synthetic drugs and biologics.
- Manufacture of anti dysentery drugs like Iodochlor, Chemotherapeutic drugs like Arsenical, Anti Leprotic drugs, colloidal preparations of calcium, silver Iodine etc. was started during this period.
- Production of biologics like Liver extracts, pituitary extracts, Adrenaline solution was taken up.

- “Council of Scientific and Industrial Research” was registered in March 12, 1942 to coordinate various activities of Industrial research and development.
- Today **C.S.I.R** is premier research organization with 39 laboratories and 101 extension centres.
- When India became independence total production was worth of Rs.10 crores.



Post Independence development:

- Realising the crucial role of the pharmaceutical industry, the Govt. of India paid a special attention to the needs of this industry.
- In 1948, a survey was undertaken of the country's industrial potential in all the sectors and a programme of development was undertaken in the first 5 years, subsequently followed every 5 years.





- In order to reduce the dependency on imports and increase the production of Abs (specially penicillin and streptomycin) **‘Hindustan Antibiotic Limited’** set up in 1954 at Pimpri near Pune.
- Private enterprises were encouraged to enter into production of sulpha drugs.





- In the early 1960's, the indigenisation of the industry started with R&D collaboration b/n the industry and National Laboratories and academia.
- **Indian Drug and Pharmaceutical Limited** was set up by Govt. in 1964 to provide a boost to the production of bulk drugs and formulations.



- The 1970's saw an upsurge of **R&D** within the industry because of the encouragement provided by the Govt. to establish **R&D** units within the industry in the form of liberal tariff and tax concessions and financial incentives.
- Special provision given in **Patent act-1970** to exclude the product patent for drugs and medicines, food and chemicals provided the right climate for innovation in the development of alternative routes for the synthesis of existing drugs.

- The 1980's and 1990's saw setup of number of manufacturing units.
- Near self-reliance was achieved in the production of bulk drugs and formulations.



Present Scenario:

- The Indian Pharmaceutical Industry, today is one of the largest and most advanced among the developing countries.
- Indian Pharmaceutical Industry today has the capability to manufacture all the needed formulations and 70% of its bulk drugs requirements.



- The Pharmaceutical industry in India is the world's third-largest in terms of volume and stands 14th in terms of value.
- According to Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers, the total turnover of India's pharmaceuticals industry is US\$21.04 billion.
- Mumbai, Hyderabad and Ahmedabad are the major pharmaceutical hubs of India.

- Except some Anti-cancer drugs and few antibiotics all the products are currently manufactured in India for the domestic market as well as for export.
- The value of Indian pharmaceutical market for formulation today is around 14,000 crores and is growing steadily at the rate of 13-15% /A.
- Pharmaceutical export have risen from Rs. 46 crores in 1980 to Rs. 5000 crores.

Indian Pharmaceutical Industry in the 21st Century:

- To provide healthcare for all at an affordable cost, Indian pharmaceutical industry has the obligation to discover, develop, produce and distribute new drugs for which no therapy is currently available.
- Industry has also to develop better diagnostic tools as well as prophylactics for diseases which are preventable.

1. New Drug Discovery:

- Indian pharmaceutical industries have to gear themselves to the new patent regime specially with regard to new drug discovery since India has GATT.
- As per the TRIPS, India has amended its Patent Law to provide strong product patents in the field of drugs and pharmaceuticals.



- Indian drug industry should identify and concentrate on areas of special relevance to developing countries including infectious diseases like Malaria, Filariasis, HIV, TB etc. since research in USA and Europe are primarily directed to diseases of relevance to the developed world.
- Other areas of relevance could be chronic diseases like arthritis, liver disease, lipid disorders, memory disorder, neuronal regeneration etc.

2. Process development and Drug

Synthesis:

- Indian drug industries started concentrate on non infringed **new chemical entities** because of product patents.
- Production of **generic drugs** and drug **intermediates** because of capability and experience of Indian scientists in developing the alternative and cheaper routs of drug synthesis.



- Hence concentrated on upgradation of infrastructure with world class scale-up and manufacturing facilities (GMP).



3 . Formulations:

- A lot need to be focused on NDDS like site specific or TDDS.
- NDDS like SR, Transdermal, Ocular etc. can be developed using existing drugs.
- R&D should be focus on development of NDDS for diseases such as TB, Leprosy, Filariasis etc.
- Requirement of upgradation of existing facilities even for Conventional dosage forms to meet Int. Standards.

4. Biotechnology products:

- Molecular biology and Genetic engineering offers great opportunities to the Pharmaceutical Industries for the development of new generation of immunodiagnosics, vaccines and therapeutic agents.
- Fermentation, Improved microbial strains, Tissue culture etc. are the areas which has great potential for the industry here since raw materials are all indigenously available.



5. Indigenous systems of medicine:

- Indian pharmaceutical industry should take advantage of the rich traditional heritage and knowledge that this country possesses.



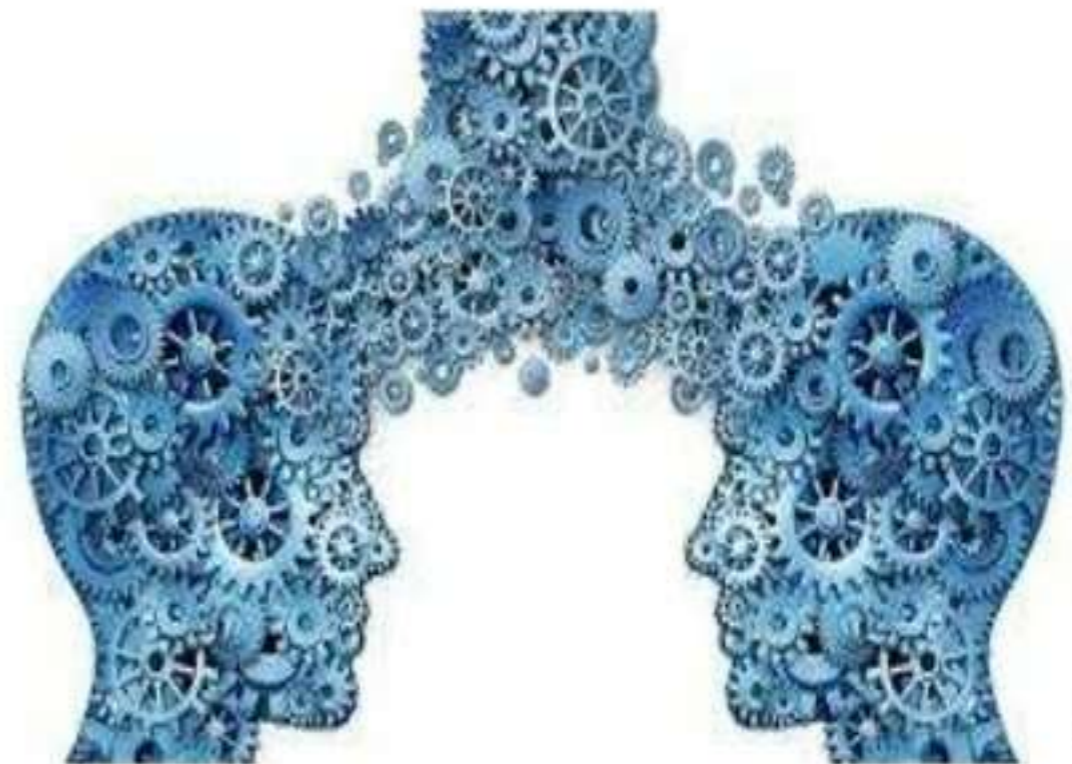
6. Clinical research:

- To discover new indications for existing drugs.
- Eg: Metronidazole which was originally developed as an anti-amoebic later on indications as anti-trichomonal and anti-anaerobic found.



7. Collaborative Research:

- The R&D units of India can take up contract R&D for many foreign companies. It is mutually beneficial for both partners.
- Collaboration with the national laboratories, research institutions and universities can also be fruitful.



Top 10 Publicly Listed pharmaceutical companies in India by Market Capitalization as of July 2015

Rank	Company	Market Capitalization 2015 (INR crores)
1	<u>Sun Pharmaceutical</u>	2,17,636
2	<u>Lupin Ltd</u>	84,193
3	<u>Dr. Reddy's Laboratories</u>	63,779
4	<u>Cipla</u>	52,081
5	<u>Aurobindo Pharma</u>	42,454
6	<u>Cadila Healthcare</u>	38,677
7	<u>Glenmark Pharmaceuticals</u>	29,047
8	<u>GlaxoSmithKline Pharmaceuticals Ltd</u>	28,587
9	Divis Laboratories	24,847
10	<u>Torrent Pharmaceuticals</u>	22,320

Top 20 Biotechnology companies in India,

Rank	Company
1	<u>Serum Institute of India</u>
2	<u>Biocon</u>
3	<u>Nuziveedu Seeds Private Limited</u>
4	<u>Novo Nordisk</u>
5	<u>Syngene International</u>
6	<u>Reliance Life Sciences</u>
7	<u>Eli Lilly and Company</u>
8	<u>Bharat Serums</u>
9	<u>Biological E. Limited</u>
10	<u>Fortis Clinical Research</u>

Rank	Company
11	<u>Novozymes South Asia</u>
12	<u>Ankur Seeds</u>
14	<u>Indian Immunologicals Limited</u>
15	<u>GlaxoSmithKline Pharmaceuticals Ltd</u>
13	<u>Bharat Biotech International</u>
16	<u>Tulip Group</u>
17	<u>Hafkine Biopharmaceutical</u>
18	<u>Mahyco</u>
19	<u>Advanced Enzymes</u>
20	<u>Raasi Seeds</u>

Scope of Pharmacy





Production & Manufacturing

A B. Pharm graduate has a lucrative career in the production of pharmaceutical products



Formulation Development

A B. Pharm graduate plays a significant role in the formulation of an accurate dosage form

Quality assurance & Quality Control

The success of any Pharmaceutical industry is in the quality of its products which lies in the hands of a B.Pharm graduate



Drug Regulatory Affairs

A B.Pharm graduate is the minimum eligibility for governing the laws and regulations such as the Federal Food Drug and Cosmetics Act, Patents, Trademarks and Intellectual Property Rights of the pharmaceutical industry



Pharmaceutical Packaging technology

Life of any pharmaceutical product depends upon its packing



Research & Development

Discovering a new drug has assumed prime importance in the pharmaceutical industry



Hospital Pharmacy

The Pharmacist is the qualified drug expert whose advice is sought by everybody regarding the dosage, incompatibilities & side effects of drugs

Community Pharmacy

The pharmacist serves a vital link between the patients and other healthcare professionals, especially the medical experts

Academics

As per the AICTE norms the minimum qualification for D.Pharm colleges as lecturer is B. Pharm



Marketing

Pharmaceutical production unit is incomplete without marketing & sales, anything produced has to be sold



- Drug Inspector
- Drug Controller
- Scientist in CSIR, ICMR
- Govt. Analyst

Govt. Jobs

Regulatory Bodies

Members of PCI, AICTE

Chemist Shop



Entrepreneurship

Establishment of a new pharmaceutical industry is another challenging area



Opportunities abroad

Golden opportunities galore for qualified Pharmacy professionals in various countries



Higher Studies

A B. Pharm candidate can opt for M. Pharm, MBA, MS-NIPER, Clinical Research



Nuclear pharmacy

Pharmacotherapy

Forensic Pharmacy

Armed Services

Pharma Consultancy

Medical Transcription

Other Opportunities

THE PHARMA TREE