



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 09, Issue, 10, pp.8775-8782, October, 2018

RESEARCH ARTICLE

PHARMACY EDUCATION IN INDIA: A CURRENT SCENARIO

*Surya Narayan Das

Gayatri College of Pharmacy, Jamadarpali, Sambalpur, Odisha, India

ARTICLE INFO

Article History:

Received 18th July, 2018
Received in revised form
24th August, 2018
Accepted 20th September, 2018
Published online 30th October, 2018

Key words:

Pharmaceutical Education in India,
Controlling Authority,
Career opportunity,
Pharmaceutical industry.

ABSTRACT

Pharmacy education is the dynamic professional education for the development of country and it is associated with public health protection. Objective of this review article is to motivate the pharmacy professional toward profession through giving thorough knowledge of opportunities in pharmacy field. Although job opportunities for pharmaceutical professionals are with private as well as government sector but in these studies is mainly to point out the career opportunity of pharmaceutical professionals in department wise in private as well as government sector. This study also reflects all requirement for pharmacy professional doing job in different departments. In case of pharmaceutical industry, pharmacy professional may be involved in various activities related to drug discovery, development, action, safety, formulation, production, quality control, quality assurance, packaging, storage, marketing, clinical research, documentation and technology transfer etc. Along with this there is ample scope for research in the pharmacy professional in India and abroad. There is an enormous career opportunity for pharmaceutical professionals in the pharmaceutical industry but only those which are having progressive attitude and confidence and vast knowledge of handling of sophisticated instruments.

Citation: Surya Narayan Das, 2018. "Pharmacy education in India: A current scenario", *Asian Journal of Science and Technology*, 09, (10), 8775-8782.

Copyright © 2018, Surya Narayan Das. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Pharmacy is the branch of science that links the health science with the chemical science, and it is well concerned with the discovery, development, production, and distribution of drugs. The name Pharmacy derive from the Greek word pharmakon, a drug. Drugs are substances used to diagnose, prevent, cure or relieve the symptoms of a disease. They may be collected from plant, animal, marine or chemical origin. Pharmacists are the medication experts on the health care system, offering information and advice to help patients successfully manage their medication therapy with minimum side effects. Pharmacists have the knowledge, skills and expertise to be trusted with a patient's health. Pharmacists are among the most accessible health care professionals (Rakesh, 2010). The enactment of the Pharmacy Act 1948 established the statutory regulation of pharmacy institutions in India. The Pharmacy Council of India was established in 1949 under "Ministry of Health" and the first education regulations (ER) framed in 1953, which were subsequently amended in 1972, 1981, 1991 and 2014. On the other hand, the pharmacy education has never been part of paramedical team and hence, its development has been quite unique and quite different from rest of the world. Pharmacy Council of India and Pharmacy Act were created to establish minimum qualification required to be a pharmacist.

The role of pharmacist in the society was never been given its due place and did not grow due to less paying job compared to job in industry. This would have been the reason for transfer of pharmacy education from PCI to All India Council of Technical Education (AICTE) under the "Ministry of Human Resource Development" (Desale, 2013).

Pharmacy Profession in india: There are over a million pharmacists in India with Around 55% of them in community, 20% in hospital, 10 % in industry & regulatory and 2 % in academia in India, formal pharmacy education leading to a degree began in 1937, with the introduction of a 3 year industry oriented Bachelor of Pharmacy course. To meet the varying needs of the profession at different levels the following pharmacy programs are offered in India today: Diploma in Pharmacy, Bachelor of Pharmacy, Master of Pharmacy, Practice based Doctor of Pharmacy (Pharma D.), and Doctor of Philosophy in Pharmacy (Ph.D.) (Basak, 2010). To practice as a pharmacist in India, one needs at least a diploma in pharmacy, which is awarded after 2 years and 3 months of pharmacy studies & practical training. These diploma-trained pharmacists are currently the mainstay of pharmacy practice in India. Every year nearly 20000 D. Pharma, 30,000 B. Pharma, 6000 M. Pharma and 700 Pharma D. Students graduate in the Country (Dewey, 1944; Dave, 2011). Dave, 2011. Does Bright Future Await Pharmacy. Students? Pharma Times; 43(3):13. Dave, 2011. Does Bright Future Await Pharmacy. Students? Pharma Times; 43(3):13. Dave, 2011. Does Bright Future Await Pharmacy. Students? Pharma Times; 43(3):13. Pharmacy Council of India (PCI) is

*Corresponding author: Surya Narayan Das,
Gayatri College of Pharmacy, Jamadarpali, Sambalpur,
Odisha, India.

the statutory body established in 1949, for regulating pharmacy education and practice of pharmacy profession in India. PCI is actively working towards strengthening and upgrading the curriculum to produce competent workforce that is able to meet the growing demands of the industry & community. In 2003, the Pharma Vision 2020 Charter was released by the then President of India, Late Dr. A.P.J. Abdul Kalam, at the 55th Indian Pharmaceutical Congress at Chennai. The Vision 2020 is focused on promoting the highest professional ethical standards of pharmacy, focusing the image of pharmacists and competent healthcare professionals, sensitizing the community, government and others on vital professional issues and supporting pharmaceutical education and sciences in all aspects (Shantanu, 2004).

Career opportunity for pharmacy professional: The pharmacy education provides a good career for employment and also for own business (Somani, 2010; <http://www.employmentnews.gov.in>). (Last cited on 2010 Mar 07)). The pharmacy professionals can work both in central government, state government departments and in private industries (Figure 1), and the government departments include

- Assistant pharmacist in Pharm production, quality control (QC) departments
- MR ib a Pharma company
- Self-employment opportunities by opening own drug store.
- Laboratory technician in pharmacy education institute
- Wholesale pharmacy
- Higher education-direct admission to B.Pharm II year (lateral entry)

Scope for bachelor in pharmacy: Graduate pharmacy candidates having a very good opportunities in the pharmaceutical industry, academia as well as in Government and private sectors with good packages (Knapp, 2002).

Chemist Shop: As pharmacists know about the mode of action, its metabolism and physiological effects of a drugs on the human body in detail, pharmacist play an important role in optimization of a drug treatment for an individual. In a drug store set ups, the pharmacist is mainly involved in processing of prescriptions and sale of medicines and other related jobs such as billing, inventory, etc.



Health Protection Branch, Pest Control Division of Agriculture, Provincial Departments of Environment or Agriculture, etc. In India, pharmacy education is two-tier system after higher secondary passed with PCM or PCB both types of students are eligible for any of the two courses, Diploma in Pharmacy (D.Pharm) and Degree in Pharmacy (B.Pharm). All institutes conducting courses in Pharmacy are regulated by two bodies namely, the All India Council for Technical Education (AICTE) and the Pharmacy Council of India (PCI) (<http://www.employmentnews.gov.in>). (Last cited on 2010 Mar 07)).

Scope for Diploma in Pharmacy

Diploma in Pharmacy candidates can practice pharmacy profession as: (Somani, 2010) <http://www.employmentnews.gov.in>. (Last cited on 2010 Mar 07))

- Drug store pharmacist
- Hospital pharmacist

Now with the changing scenario worldwide, Pharmacist is also expected to provide patient counselling about diseases/drugs and other patient care services as per PCI guideline.

Higher Studies: After competing B.Pharm degree, student goes for higher studies for better job opportunities. Some of the higher study options in the field of pharmacy are as follows: (Singh, 2009)

- Master of Pharmacy
- Master of Pharmacy in Clinical Pharmacy
- Master of Business Management in Pharm.tech
- Master of Pharmacy in Biotechnology
- Master of Pharmacy in Pharmaceutical Analysis
- Master of Pharmacy in Pharmaceutical Management and Marketing
- Master of Pharmacy in Pharmaceutical Technology
- Master of Pharmacy in Pharmacology
- Master of Pharmacy in Quality Assurance (QA)
- Master of pharmacy in bulk drug

- Master of Pharmacy in Medicinal Chemistry
- Master of Pharmacy in Drug Regulatory Affair
- Master of Pharmacy in Industrial Pharmacy
- Master of Pharmacy in Pharmaceutics
- Master of Pharmacy in Bio-Pharmaceutics
- Master of Pharmacy in Pharmacognosy
- Master of Pharmacy in Photochemistry
- Master of Pharmacy in Medicinal Natural Products
- Master of Pharmacy in Pharmaceutical Administration
- Master of Pharmacy in Pharmacy Practices
- Master of Pharmacy in Phyto-pharmaceutical and Natural Products
- Master of Pharmacy in Drug Discovery and Drug Development
- MS in Pharmacy
- MBA in Pharmaceutical Management
- MBA in Operation Management
- MBA in Production Management
- MBA in Pharmaceutical Marketing Management
- MBA in Health Care System
- MSc. in Analytical Chemistry
- MSc. in Medicinal Chemistry
- MSc. in Pharmaceutical Chemistry
- MSc. in Pharmacology
- MSc. in clinical research
- M.Pharm + MBA duration: 3 years (dual degree programmed)
- Pharm D
- Ph.D. in Pharmacy

Research Organization: In India various Contract Research Organisations are established and these CRO provide research on development and Discovery of new drug molecule, P and D, Formulation and Development (F and D) and Clinical Research for various Pharmaceutical companies. Hence job opportunities for the Pharmacy professionals in this area (Dimachkie *et al.*, 2012; Drabu, 2010; Shtilman, 2009) http://www.contractpharma.com/issues/2006-05/view_features/croindustry-update/. (Last accessed on 2014 Aug 20))

Production Management: A pharmacy professional works in the production of bulk drugs (API) and intermediates and formulation as:

- Production Chemist
- Production Officer
- Production Executive
- Production Planner
- Production Manager
- Vice President - Production.

Quality Control: A pharmacy professional holds various posts in QC department such as:

- QC Chemist
- QC Executive
- Technical Manager – QC
- QC Manager.

Quality assurance: Quality Management System needed for building the confidence that manufactured products are of standard quality with minimum risk of rejection and maximum

customer satisfaction. Pharmacy professionals working on various positions in QA department such as: (World Health Organization. Quality Assurance of Pharmaceuticals, 1997; Nandhakumar, 2011; Nash, 1993)

- QA Inspector
- QA Executive
- Document Controller
- QMS - coordinator
- Validation - coordinator
- QA Manager.

Research And Development: Research and Development is the mind of the pharmaceutical industry, as it is the key to growth and nourishment of the industry. In R&D Pharmacy professional works in the following areas: (Spilker, 2008)

- New Drug Discovery Research
- P and D of API-development of viable processes for the manufacture of drugs and intermediates for their commercial production
- F and D of Conventional and Novel Drug Delivery Systems.
- Pharmacy professional give their services on various position such as:
- R&D Chemist
- R&D Executive
- Research Scientist
- Research Associates
- Group Leader - R&D
- Head - R&D
- Vice President - R&D

Clinical Research: Clinical research determine the safety and effectiveness of medications, devices, diagnostic products and treatment regimens intended for human use. These may be used for prevention, treatment, diagnosis or for relieving symptoms of a disease. Clinical Research is different from clinical practice. In clinical practice, one uses established treatments while in clinical research evidence is collected to establish a treatment (Anderson, 2010). Pharmacy professionals have high job opportunity in the following area of clinical research (Loan *et al.*, 2012).

- Clinical trials
- Bioequivalence study
- Pharmacokinetics study and
- Toxicological studies.

These are some of the areas of clinical research, which are in high demand as they are involved in the systematic evaluation of potential drug substances prior to getting them approved by the regulatory authorities. Pharmacy professionals have job potential in the Clinical Research in the following position:

- Clinical Training Analyst
- Clinical Research Monitor
- Clinical Research Associate
- Clinical Affairs - Project Manager
- Clinical Trials Manager
- Clinical Research Coordinator
- Clinical Research Manager
- Patient Recruiter
- QC Manager

- QA Manager
- Manager Clinical Operation.

Regulatory Affairs And Intellectual Property Rights: In order to enter into trade with the foreign countries, it is mandatory to get the necessary approvals and sanctions as per the formats given by local regulatory authorities such as approvals to be obtained from US FDA for USA, Therapeutic Goods Administration (TGA). for Australia, MCA and MCM for UK and European countries and ICH guidelines going to be uniform for international levels (Saigal, 2009; Kumar, 2013). At National level, the FDA (Foods and Drugs Control Administration) is the main regulatory body governing and implementing the rules and regulations for the Drug and Pharma industry. The job opportunities for Pharmacy graduates are excellent and range from the levels of a Drug Inspector (DI), Sr. DI, Deputy Drug Controller, Asst. Drug Controller, Drug Controller and finally Drug Controller of India. Providing information and expertise in the latest changes in the regulatory requirements of national GMP, WHO - GMP, US FDA, TGA, ICH guidelines

These professionals will find employment in industry as

- RA Assistants
- RA Associates
- Documentation Administrators and Medical Information Associates
- RA Consultants for Pharm/Biotechnology Industry
- Regulatory Food Safety Scientist
- Pharmaco-vigilance Manager
- Drug Safety Specialist.

Sales And Marketing: Medical sales representatives are a key link between pharmaceutical companies and medical and healthcare professionals. They work strategically to increase the awareness and usages of a company's pharmaceutical and medical products. They also promote products to the different organizations and government department.(24) Based on a specific geographical location, and they usually specialize in a particular product such as Cardiovascular Division, Diabetes Division, Gynaecological Division, Psychiatric Division, Ayurveda Division, Neuro Division, Dermatological Division, etc. They may also make presentations and organize group events for healthcare professionals. The Pharma sales and marketing are highly technical field and offers excellent opportunities for the pharmacy graduates. Pharmacy professional starts their career in sales and marketing career as MR and go up to the levels of (Kotler *et al.*, 2001).

- Sales Officer
- Area Sales Manager
- Regional Sales Manager
- Zonal Sales Manager
- General Marketing Manager
- Manager - International Marketing and Exports.

Product Management: Degree in Pharmacy with MBA (marketing) after few years of experience in sales and marketing can work as a member of the Product Management Team. Their responsibilities are:

- Market research
- Benchmarking

- Strategizing and positioning of product
- Give lead to next products to be developed at R&D
- Promotional activities, etc.
- Launching and withdrawal of product in market.

Bioinformatics

Bioinformatics is the application of information technology to the field of molecular biology. The primary goal of bioinformatics is to increase our understanding of biological processes. Major research efforts in the field include:

- Sequence alignment
- Genetic finding, genome assembly
- Protein structure alignment
- Protein structure prediction
- Prediction of gene expressions
- Protein-protein interactions
- Modeling of evolution.

Pharmacy professional with knowledge of computer application and software has job potential in the bioinformatics in the following position:

- Bioinformatics trainee
- Bioinformatics analyst
- Scientist/senior scientist – Bioinformatics
- Team leader – Bioinformatics
- Bioinformatics – Trainer
- Bioinformatics – Lecturer to professor.

Medical Transcription: MT is an allied health profession, which deals in the process of transcription, or converting voice-recorded reports as read out by physicians and/or other healthcare professionals, into electronic format. A medical transcriptionist is the person responsible for converting the patient's medical records into electronic format.(4,5)Due to the increasing demand to document medical records, countries particularly USA started to outsource the services of medical transcription. Since India is several hours ahead of America and Europe, Indian medical transcription industries can offer the natural advantage of quicker turnaround time. That is why India is chosen as the one of the best source of outsourcing in MT. In Typical MT firm, the pharmacy professional gives their services on various posts (Basak, 2010)

- Trained medical transcriptionist
- Senior medical transcriptionist
- Proof readers
- Sub editors
- Editors
- Supervisor

Opportunities In Abroad: Pharmacy graduate of India may consider higher studies outside India to make their carrier even more interesting. One can enroll for master as well as Ph.D. in desired field of studies after obtaining Graduate Degree of Pharmacy in India.

Detail Information regarding get admission to pharmacy colleges in different countries are easily available on their respective websites. At a time of admission foreign countries colleges asking about some qualifying exam that's why firstly pharmacy graduates qualify one or more of the following exam (Bawa *et al.*, 2010).

- Graduate Record Exam
- Test of English as a Foreign Language

Academics: Excellent opportunities for the pharmacy professionals are available in teaching profession. As per the AICTE norms the minimum entry-level qualification as Assistant Professor is M.Pharm. This is a profession associated with job satisfaction and social status as teaching is considered to be noble profession. The higher posts in the hierarchy are Associate Professor, Professor, Principal, etc. The emoluments are satisfactory (Basak, 2014; Dewey, 1944) After 6th pay scale and AICTE rules and regulation, most of the postgraduate candidates are choosing academic field as profession because of job satisfaction, facility for higher education and research, social status and comfort. Promotion scheme in academia is well defined by the regulatory bodies.

Community Pharmacy: This concept, which is already very old in developed Western countries, is rapidly catching up the Healthcare service in our country. Through the services of community pharmacy, a Pharmacist becomes a vital link between the patients and the products that is, drugs. The pharmacist also serves a vital link between the patients and other healthcare professionals, especially the medical experts (Basak, 2010).

Hospital Pharmacy: This is a very sought after professional especially in countries like the USA and Canada (Dave, 2011). The trend is already set in many hospitals in the country. This is a key position, and the Pharmacist plays an important role from preparing prescription to the patient's medical history after the Medical doctor has diagnosed the disease. The Pharmacist is the best informed qualified drug expert whose advice is sought by everybody regarding the dosage, incompatibilities and side effects of drugs (Bawa *et al.*, 2010).

Pharmaceutical Packaging Technology: The pharmaceutical packaging market is constantly advancing and has experienced annual growth of at least 5% per annum in the past few years (Saigal *et al.*, 2009). The market is now reckoned to be worth over \$20 billion a year. As with most other packaged goods, pharmaceuticals need reliable and speedy packaging solutions that deliver a combination of product protection, quality, tamper evidence, patient comfort and security needs (Lockhart *et al.*, 2012). Constant innovations in the pharmaceuticals themselves such as blow fill seal vials, anti-counterfeit measures, plasma impulse chemical vapor deposition coating technology, snap off ampoules, unit dose vials, two-in-one prefilled vial design, prefilled syringes and child-resistant packs have a direct impact on the packaging (Bunn *et al.*, 2016). The review details several of the recent pharmaceutical packaging trends that are impacting packaging industry and offers some predictions for the future (<http://www.pharmatutor.org/content/march-2014/job-for-diploma-pharmacy-pharmacist-in-all-india-institute-medical-sciences-government-job/> Web page accessed on 4 June 2014).

Formulation Development: Pharmaceutical formulation is the development of a bioavailable, stable and optimal dosage form for a specific administration route. Formulation department goal is to assist its clients in identifying the best form of delivery and the most viable manufacturing strategy for their lead candidate. To lead and oversee the formulation department to conduct R&D for drug formulation, to make

technical innovations in the field of formulation and to provide technical support to manufacturing, to manage department employees and work closely with other departments to advance product development within the organization. There is lot of possibilities for pharmacy professionals at various levels as:

- Manager
- Assistant Manager
- Project Assistant
- Research Scientist
- Formulation development ANDA-emerging market scientific manager
- Junior Research Scientist
- Packing Development Scientist
- Analytical Method Development Scientist
- Associate Pharmacist - Drug Delivery Research Laboratory
- Documentation Officer.

Government Sector: The government sector is providing the more job opportunities for all the education completed candidates. So the candidates who have completed B.Pharm can also apply for various jobs in Government sector. Before applying for any government job, you must get minimum of 60% in your B. Pharm, registered in PCI, and your age limit is between 21 and 30 years. In government sector Pharmacy professional work as (Bawa *et al.*, 2010; Bunn *et al.*, 2006)

- Army Pharmacist, drug squad of the Police Department, UPSC, IBPS, RRB, SSC, etc.
- State Drug Testing and Research Laboratory, Hospital Pharmacist, Railway Pharmacist
- Assistant Chemical Engineers in Prohibition and Excise subordinate service
- Government Indian Medicine Pharmacy
- Government Ayurvedic Pharmacy, Research Institute in Indian System of Medicine
- Drug Analyst
- Food Inspector
- Assistant DI
- DI
- Assistant Drug Controller
- Drug Controller
- Scientist in CSIR/ICMR etc

Regulatory Bodies: In the present scenario, pharmaceuticals are considered as the most highly regulated industries worldwide. The regulatory body ensures compliances in various legal and regulatory aspects of a drug.(22,24) Every country has its own regulatory authority, which is responsible to enforce the rules and regulations and issue the guidelines to regulate drug development process, licensing, registration, manufacturing, marketing and labeling of pharmaceutical products. Some of the international or national regulatory agencies and organizations which also play essential role in all aspects of pharmaceutical regulations related to drug product registration, manufacturing, distribution; price control, marketing, R&D, and intellectual property protection are as follows (Sharma, 2006; Guide to Good Storage Practices for Pharmaceuticals, 2003)

- National Bodies

- Central Drug Standard Control Organization
- Government of India Directory of Health and Family Welfare
- Indian Council of Medical Research
- Minister of Health and Family Welfare
- PCI
- AICTE.
- International Bodies
- ICH
- United Nation Health Care Organization
- World Health Organization
- World Trade Organization.

Entrepreneurships: Individual in this world has two options to earn his bread and butter; one to have his own enterprise and provide employment(32) and to be an employee of existing enterprises. It is left to the individual to decide whether he would only earn his bread and butter by being an employee of an enterprise or would provide employment to others to earn their bread and butter by establishing an enterprise. Entrepreneur is the one who has initiated a business and owns an enterprise. Who can forget Bill Gates, one of the best-known entrepreneurs of the personal computer revolution? However, there are just a few entrepreneurs who made a big name in Pharma business. Some notable entrepreneurs include, to name a few, Acharya Prafulla Chandra Ray, Bengal Chemicals and Pharmaceutical Works (1901), Khwaja Abdul Hamied, Cipla (1935), Ranbir Singh and Gurbax Singh, Ranbaxy (1937) later bought by Bhai Mohan Singh in 1952, Ramanbhai B. Patel, Zyudus (1952), Dr. Desh Bandhu Gupta, Lupin (1968), Kiran Mazumdar Shah, Biocon (1978), Dilip S. Sanghvi (He won Ernst and Young Entrepreneur of the year 2010 award), Sun Pharmaceuticals (1983), Dr. Kallam Anji Reddy, Dr. Reddy's (1984), Jagadish Saxena, Elder Pharmaceuticals (1987), K Raghavendra Rao, Orchid (1992) (Available at www.homeoffice.gov.uk/agencies-publicbodies/fsr/ Web page accessed on 15 marches 2014).

Forensic Pharmacy: Forensic pharmacists are pharmacists who specialize in legal cases. They combine the science of pharmaceutical drug research with criminal justice and legal practice. They may be called upon to testify about the side effects of a drug, or they may perform research to determine the effect that a drug had in a person's death. Most forensic pharmacists work full-time in regular pharmacy jobs and provide legal consultancy or expert witness services on a part-time basis. A forensic pharmacist might also testify about a medication error made by a hospital and how it contributed to a person's injury. Forensic pharmacists can work for the defendant or the plaintiff (Bhowmik *et al.*, 2010).

Conclusion

The main extract of the above discussion is that in India there are a lot of opportunities for skilled and well-educated pharmacy professional. Many private as well as government registered pharmaceutical industry or many government departments those regulate the pharmaceutical industry in India are providing great opportunity for capable pharmacy professional. One English idiom (where there's a will there's a way) best fit in pharmacy field which means if you truly want to get good job, you will find a way to get good job inspite of obstacles because there is no scope for incompetent or

downhearted pharmacy professional. At a time, there are surplus job opportunities, carrier advancement and job securities for pharmacy professionals in pharmaceutical industry in India because global recession has no impact on pharmaceutical industry in comparison to other industries (IT Industry).

REFERENCES

- Anderson JR. 2010. Career Opportunities in Clinical Drug Research. 1st ed. New York: Cold Spring Harbor Laboratory Press. p. 2000-19.
- Basak, S.C. and Sathyanarayana, D. 2011. Pharmacy education in India. *American journal of pharmaceutical education*. 74(4): p. 68.
- Bawa S., Tonk RK., Tonk JA., Kumar S., Singla S. 2010. Career opportunities in pharmacy profession: An informative note. *Chron Young Sci.*, 1:7-11.
- Bhowmik D., Chandira M., Chiranjib B. 2010. Emerging trends of scope and opportunities clinical trials in India. *Int J Pharm Pharm Sci.*, 2:7-20.
- Brooks K. 2006. CRO Industry Update: Growth, Expansion & New Opportunities; Available from: http://www.contractpharma.com/issues/2006-05/view_features/croindustry-update/. (Last accessed on 2014 Aug 20).
- Bunn G., Nally JD. 2006. Good manufacturing practices for pharmaceuticals. In: Swarbrick J, editor. *Drugs and the Pharmaceutical Sciences*. 6th ed. New York, London: Informa Healthcare; p. 121-4.42. Carus A, Grant C, Wattie R, Pridham MS. Development and validation of a technique to measure and compare the opening characteristics of tamper-evident bottle closures. *Packag Technol Sci* 2006;19:105-18.
- Central Drugs Standards Control Organization. Available from: <http://cdsco.nic.in/forms/contentpage1.aspx?lid=952/> Web page accessed on 15 July 2014.
- Dave, J.B. 2011. Does Bright Future Await Pharmacy Students? *Pharma Times*; 43(3):1
- Desale P. 2013. An Overview about Pharmacy Education in India. *Indian Journal of Research in Pharmacy and Biotechnology*, 1(3): 329-332.
- Dewey, John 1944. *Democracy and Education*. The Free Press ISBN 0-684-83631-9:1-4. 2.
- Dimachkie M., Ramirez B., Popescu C., Reggie E. 2012. Contract Research Organizations: An Industry Analysis. *Int J Pharm Healthc Mark.*, 6:336-50.
- Drabu S., Gupta A., Bhadauria A. 2010. Emerging trends in contract research industry in India. *Contemp Clin Trials.*, 31:419-22.
- Guide to Good Storage Practices for Pharmaceuticals. WHO Expert Committee on Specifications for Pharmaceutical Preparations. 37th Report. Geneva: World Health Organization; 2003 (WHO Technical Report Series, No. 908, Annex 9).
- Inegbenebor AU. 2007. Pharmacists as entrepreneurs or employees: The role of locus of control. *Trop J Pharm Res.*, 6:747-54.
- Kevin H, Neil C. 2002. Can Applied Entrepreneurship education enhance job satisfaction and financial performance? An empirical investigation in the Australian pharmacy profession. *JSBM*;40:162-7.
- Knapp DA. Professionally determined need for pharmacy services in 2020. *Am J Pharm Educ* 2002;66:421-9.

- Kotler P., Armstrong G. 2001. Principles of Marketing. 9th ed. New Delhi: Prentice Hall of India Private Limited; p. 80-8.
- Kumar S., Panwar R., Singh U. 2013. A review on "Regulatory affairs in the pharmacy curriculum". *Int J Res Dev Pharm Sci.*, 2:690-8.
- Loan GM, Wafai ZA, Qadrie ZL, Zargar SA. 2012. A review on "Therapeutic drug monitoring in psychiatry: An important step in clinical practice". *Int J Res Dev Pharm Life Sci.*, 1:176-82.
- Lockhart H, Paine FA. 2012. Packaging of Pharmaceuticals and Healthcare Products. Springer Science & Business Media. p. 1, 98-9, 173-8, 187.
- Nandhakumar L, Dharmamoorthy G, Rameshkumar S, Chandrasekaran S. 2011. An overview of pharmaceutical validation: Quality assurance view point. *IJRPC.*, 1:1003-14.
- Nash RA, Berry IR. Pharmaceutical Process Validation. 2nd ed. New York: Marcel Dekker; 1993. p. 167-88, 200-5.
- Oparah AC., Eferakeya AE. 2005. Attitudes of Nigerian pharmacists towards pharmaceutical care. *Pharm World Sci.*, 27:208-14.
- Rakesh R. Somani, 2010. Extending frontiers of pharmacy profession opportunities, by carrier article in Employment News, employmentnews.gov.in, cited on 4th march.
- Saigal N, Baboot S, Ahuja A, Ali J. USFDA generic approval process. *IJPER* 2009;43:232-40.
- Shantanu, K. 2004. Pharmacy education: current problems and suggested solutions. *Indian J Pharm Educ.*, 38:15.
- Sharma AK. 2010. Carrier in Pharmacy, Carrier Article in Employment News. Available from: <http://www.employmentnews.gov.in>. (Last cited on Mar 07).
- Sharma PP. 2006. How to practice GMPs. 5th ed. New Delhi: Vandana Publication Pvt. Ltd. p. 169-234.
- Sheeja VS, Naveen MV, Prasad NR, Sathibabu T, Krishna RM. 2011. Role of e-marketing in pharmaceutical business. *Pharmanest Int J Adv Pharm Sci.*, 2:84-9.
- Shtilman Y. 2009. Pharmaceutical drug testing in the former Soviet Union: Contract research organizations as broker and dealers in an emerging testing ground for America's big pharma. *Boston Coll Third World Law J.*, 29:425-54.
- Silverman B. Research and Development in forensic science; a review. *Forensic Sci Regulat* 2011:1-24./Available at www.homeoffice.gov.uk/agencies-publicbodies/fsr/ Web page accessed on 15 march 2014.
- Singh B, Katare OP. 2009. Need of quality education for changing Pharma world. *IJPER*;43:203-18.
- Somani RR. 2010. Extending Frontiers of Pharmacy Profession Opportunity, Carrier Article in Employment News. Available from: <http://www.employmentnews.gov.in>. (Last cited on Mar 04).
- Spilker B. 2008. Guide to Drug Development: A Comprehensive Review & Assessment. 1st ed. Wolter Kluwer: Lippincott Williams & Wilkins. p. 1215.
- World Health Organization. 1997. Quality Assurance of Pharmaceuticals. A Compendium of Guidelines and Related Materials. 1st ed. Geneva: *World Health Organization*. p. 18-30.
- Available from: <http://www.pharmatutor.org/content/march-2014/job-for-diploma-pharmacy-pharmacist-in-all-india-institute-medical-sciences-government-job>/Web page accessed on 4 June 2014.
