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Public Health and Patient Care Aspects in
Pharmacy Education and Pharmacists’ Role in
National Public Health Programs in India

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ACADEMIC DISSERTATION
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ABSTRACT

Pharmacies are convenient for most people to get to and there is no need for an appointment to see pharmacist which makes them natural first port of call healthcare providers in the society. Worldwide, pharmacists are potentially a vital link in healthcare chain. Since public health services do not cater to all the population, pharmacies and private health providers can play a major role in the healthcare system. This also applies to India with a population of over 1.3 billion. Though there is a large presence, pharmacists both in public as well as in private sector remain largely an untapped resource in India.2,3,4

Aims and objectives

The objective of this study was to assess public health and patient care aspects in pharmacy education and the role of pharmacists in national public health programs (NPHPs) in India. The research goal was to find out possibilities and ways of extending pharmacists involvement in national public health programs and how pharmacist education could partly facilitate this shift. The research was divided into four studies which were published as separate original publications. Two of the studies were programmatic studies (I, II) and two cross-sectional surveys (III, IV).

The studies I-IV had the following specific objectives:

- to review pharmacy education system in India from public health and patient care perspective.
- to compare curriculum of different Indian pharmacy programs (DPharm, BPharm, and PharmD) to see overall differences with a focus on the amount of time devoted for pharmaceutical policies and public health, patient care and pharmacy practice aspects in the programs (I).
- to compare Indian pharmacy curriculum at all levels with pharmacy curriculum of USA, Finland and Denmark (II).
to explore acquaintance of final year pharmacy students with 11 major National Public Health Programs and their attitude on pharmacists’ involvement in public health and patient care (III).

to characterize physician perceptions on the role of pharmacists in public health and patient care (IV).

Comparison of curricula (I,II)

The programmatic studies (I, II) were conducted between March 2012 and 2014. The curricula collected from the statutory agencies were used for the comparison to see the overall differences with a focus on the amount of time devoted for pharmaceutical policies and public health, patient care and pharmacy practice aspects in the programs. (I)

Syllabi of courses leading to 1) registered pharmacist title in India (DPharm, BPharm and PharmD), 2) USA (PharmD, curriculum from University of Florida), 3) Finland (Master of Science in Pharmacy program from University of Helsinki), and 4) Denmark (Master of Science in Pharmacy program from University of Copenhagen) were used for comparison. (II)

The results indicate that Indian DPharm and BPharm programs were industry focused, and only PharmD has focus on clinical pharmacy and patient oriented services (I). Indian and US PharmD programs contain most and Indian DPharm and BPharm least public health and patient care aspects (II). DPharm holders are mainstays of pharmacy practice in India but their degree least contains patient care and public health aspects. There is a gap in curriculum, particularly at DPharm level. (I)

Pharmacy Students’ Perceived Knowledge and Attitude on their role in NPHPs (III)

This study was conducted as a classroom survey among final year DPharm, BPharm and PharmD students in India to explore acquaintance with 11 major NPHPs and their attitude on pharmacists’ involvement in public health and patient care (III). A survey instrument was
prepared and distributed in a classroom survey to 326 students from 5 randomly selected pharmacy colleges from Southern part of India. (III)

Students had positive attitudes on pharmacists’ involvement in NPHPs, although their attitudes varied in different student groups, PharmD and DPharm students being most positive towards involvement in NPHPs (III). The study also revealed the need for increasing contents supporting NPHPs to all pharmacy programs, particularly to BPharm program.

**Physician perceptions on the role of pharmacists in NPHPs (IV)**

A cross-sectional survey was designed to a convenience sample of physicians in Southern part of India. This small-scale pilot study was designed to develop a method for characterizing physicians’ perceptions on the role of pharmacists in public health and patient care in India. Six volunteers visited 800 physicians in Southern region in India and collected data in 2014. Survey instrument consisted of 28 structured questions based on NPHPs. The data were collated and extracted and descriptive statistical analysis was conducted by SAS (version 9.3). (IV)

Among 129 responding physicians, 98% were comfortable with pharmacists’ roles in general, 96% comfortable to collaborate and 82% regarded pharmacists as part of health care team (IV). Physicians with shorter professional practice experience were more positive on pharmacists’ involvement in NPHPs than physicians having at least 11 years’ experience. Overall response of accepting pharmacists’ role and involvement in NPHPs was positive, Pulse Polio, HIV/AIDS, Tuberculosis and Tobacco control, and Leprosy eradication programs being the top NPHPs where physicians perceived pharmacists had a role to play.

**Conclusions and recommendations**

Upcoming PharmD graduates with 6 years education (training initiated in 2008) focused mainly towards clinical and patient care aspects should be able to change collaborative practice models and pharmacists’ involvement in patient care and NPHPs. It also would be useful to have an alternative curriculum line focusing on patient care and pharmacy practice aspects in
Indian DPharm and BPharm programs. Practicing pharmacists would benefit from easily accessible continuing education to cover their knowledge gaps in patient care and enhance their contributions to NPHPs.

This study is first of its kind to evaluate pharmacy curriculum contents in India from patient care and public health perspective. It will be helpful to statutory authorities and curriculum reform committees in India and other countries where pharmacists’ role is continuing to evolve towards inclusion of public health and patient care. Further research with a scope of detailed national level analysis to identity pharmacists’ potential in NPHPs is needed.
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My dream with this study started long time ago while I was working for Forum of WHO-FIP’s South East Asian Pharmaceutical Associations. During my work, I was always keen to work on “Why pharmacists in India are not seen as important health care professionals to implement NPHPs?” and I wanted to continue working on this question. When I started discussing with my dearest supervisor Professor Marja Airaksinen about it, she was very much positive that this project would be helpful for the pharmacy profession in India and encouraged me to develop a research protocol. During the last years, this research work took me to different phases where I learnt pharmacy education systems in different parts of the world, communicated with students, volunteers and physicians in various cities in India and abroad.

I owe my deepest gratitude to all the professors, students, physicians, and volunteers, who came forward to take their time. I am sure without their support it would not have been possible to complete this thesis.

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LIST OF ORIGINAL PUBLICATIONS

This thesis is mainly based on the data presented in the following original papers, referred in the text by Roman numerals. The articles are reproduced with kind permission of the copyright holders.


DEFINITIONS OF KEY TERMS

Clinical Pharmacy: is defined as that area of pharmacy concerned with the science and practice of rational medication use.\(^5\)

Curriculum: is a detailed plan of syllabus with subjects in a course including theoretical, practical lessons and academic content to be learnt to complete a program. Specific curriculum shall contain number of hours devoted to each subject for its teaching in theory, practical, tutorial, internship(s) and detailed guidelines for group work and project(s). The curriculum is typically designed to acquire knowledge and skills that are expected to be met by students. To conduct this research, different programs from different countries were used, whose details are given in the subsequent chapters.

Dispensing: interpretation and evaluation of a prescription, selection and manipulation or compounding of a pharmaceutical product, labeling and supply of the product in an appropriate container according to legal and regulatory requirements, and the provision of information and instructions by a pharmacist, or under the supervision of a pharmacist, to ensure the safe and effective use by the patient.\(^6\)

Health promotion: the process of enabling people to increase control over, and to improve, their health.\(^7\)

National Public Health Programs in India: National public health programs (NPHPs) in this study means one or more of 11 NPHPs run by the government of India.\(^8\) The 11 major programs as prioritized by the Ministry of Health and Family Welfare, Government of India, were included in this study are: (1) HIV/ AIDS Control; (2) Revised National Tuberculosis Control (RNTCP); (3) Vector Borne Disease Control (NVBDCP); (4) Leprosy Eradication (NLEP); (5) National Mental Health (NMPH); (6) Prevention and Control of Deafness (NPPCD); (7) Control of Blindness (NPCB); (8) Pulse Polio; (9) Universal Immunization (UIP); (10) Tobacco Control (NTCP); and (11) Health Care of the Elderly (NPHCE).
**Non-communicable disease:** Any disease that can NOT be transmitted from one person to another by direct physical contact, by common handling of an object that has picked up infective micro-organisms, through a disease carrier, or by spread of infected droplets coughed or exhaled into the air.⁹

**Pharmaceutical care:** the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. It is a collaborative process that aims to prevent or identify and solve medicinal product and health-related problems. This is a continuous quality improvement process for the use of medicinal products.¹⁰

**Pharmaceutical practice:** includes the provision of pharmaceutical products, pharmaceutical services and pharmaceutical care and covers all those activities and services provided by pharmacists in the health care system.¹¹

**Pharmaceutical services:** all the services rendered by pharmaceutical staff to support provision of pharmaceutical care. Beyond the supply of pharmaceutical products, pharmaceutical services include information, education and communication to promote public health, the provision of drug information and counseling, regulatory services, education and training of staff.¹²

**Pharmacist:** a person professionally qualified in pharmacy, the branch of health sciences dealing with the preparation, dispensing and use of medicines. The role of the pharmacist has evolved from that of a provider of medicines to that of a provider of patient-centered pharmaceutical care.¹³

**Prevention (preventive measures):** measures which aim to thwart or ward off illness or disease prophylactically.¹⁴

**Public health:** According to World Health Organization, WHO, (2014a) “public health refers to all organized measures (whether public or private) to prevent disease, promote health, prolong life among the population as a whole. Its activities aim to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases”.¹⁵
ABBREVIATIONS

ACPE: Accreditation Council for Pharmacy Education
AICTE: All India Council for Technical Education
AIDS: Acquired Immunodeficiency Syndrome
APPEs: Advanced Pharmacy Practice Experiences
ART: Antiretroviral Therapy
BPharm: Bachelor of Pharmacy
DPharm: Diploma in Pharmacy
FIP: International Pharmaceutical Federation
GPP: Good Pharmacy Practice
HIV: Human Immunodeficiency Virus
IPA: Indian Pharmaceutical Association
MoU: Memorandum of Understanding
MPharm: Master of Pharmacy
MPJE: Multistate Pharmacy Jurisprudence Examination
NAPLEX: North American Pharmacist Licensure Examination
NPHPs: National Public Health Programs
NRHM: National Rural Health Mission
NTCP: National Tobacco Control Program
PCI: Pharmacy Council of India
PCOA: Pharmacy Curriculum Outcomes Assessment
PharmD: Doctor of Pharmacy
RNTCP: Revised National Tuberculosis Control Program (India)
TB: Tuberculosis
WHO: World Health Organization
1 INTRODUCTION

Pharmacies are convenient for most people to get to and there is no need for an appointment to see the pharmacist which makes them natural first port of call\textsuperscript{16} healthcare providers in society. Worldwide pharmacists are potentially a vital link in the healthcare chain. Since the public health services do not cater to all the population, pharmacies and private health providers can play a major role in the healthcare system in India. Having such large presence, unfortunately, pharmacists both in public as well as in private sector remain largely an untapped resource in India.\textsuperscript{17,18,19} One of the glaring examples of this is reflected by the fact that the term pharmacist does not find even a mention in National Health Policy 2002 and National Pharmaceutical Policy of the Ministry of Health, Government of India. Major public health programs are covered under the Ministry of Health and Family Welfare, Government of India, which are: HIV/AIDS prevention and control, Tuberculosis control, Leprosy and Vector Borne Disease control, Mental health, Deafness and Blindness control, Pulse Polio, Universal Immunization, Health Care of Elderly and Tobacco Control programs.\textsuperscript{20} Public health services in this study mean active participation of pharmacists in major health programs run by the government. However, the public health system in India has a shortage of medical and paramedical personnel. Government estimates (based on vacancies in sanctioned posts) indicate that 18% of primary health centers are without a doctor, about 38% are without a laboratory technician, and 16% are without a pharmacist.\textsuperscript{21}

Worldwide, there are differences in pharmacy education and pharmacists’ role in public health and patient care. India has different undergraduate pharmacy education programs with varying contents. In 1994, WHO resolution WHA 47.12 recognized the key role of pharmacists in public health and particularly in the field of medicines which should reflect to curriculum content.\textsuperscript{22} However, little research has focused on assessing how public health and patient care aspects have been taken into account in pharmacy education in India and some other countries where pharmacists actually are more involved in patient care and public health programs.
This thesis is a collation of literature review and scientific research results which is leading to discussion and conclusions. The literature review provides framework and blueprint for the research (Chapter 6) and also provides knowledge about health system (Chapter 2), pharmacists and public health (Chapter 3), pharmacy practice in India (Chapter 4), and pharmacy education in India (Chapter 5).

The research work in this thesis was to assess public health and patient care aspects in pharmacy education and the role of pharmacists in national health care programs in India (I and II). The research goal was to find out possibilities and ways of extending pharmacists involvement in national public health programs and how pharmacist education could partly facilitate this shift. The research also explored: a) final year DPharm, BPharm and PharmD students’ awareness, perceived knowledge and attitude, and acquaintance with 11 major National Public Health Programs (NPHPs); b) their attitude towards pharmacists’ involvement in public health and patient care (III); c) characterized physicians’ perceptions on pharmacists’ role in public health and patient care (IV). This PhD thesis is an attempt to find ways how pharmacy education can facilitate pharmacists’ involvement in public health programs and make them part of health care team.
2  HEALTH SYSTEM IN INDIA

2.1  Health System Prevailing

To understand this research better, it is important to know briefly about the health system prevailing in India.

WHO defines ‘public health’ as the science and art of promoting health, preventing disease and prolonging life through the organized efforts of the society.²³ Public health is a social and political concept aimed at improving health, prolonging life and quality of life among whole populations through health promotion, disease prevention and other forms of health interventions.²⁴

As per the World Health Organization (WHO), a well-functioning health system working in harmony is built on trained and motivated health workers, a well-maintained infrastructure, and a reliable supply of medicines and technologies, backed by adequate funding, strong health plans and evidence-based policies.²⁵ A health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health.²⁶ The overall health systems goal is to improve population health outcomes in an equitable way without overburdening people with health care costs.²⁷

India’s health care system was carefully structured at the time of Independence (1946) to provide primary, preventive, and curative health care within a reasonable distance of the population even in remote, rural areas.²⁸ The health care system in India, at present, has a three-tier structure to provide health care services to its people.²⁹ Networks of health care facilities at the primary, secondary and tertiary level, run mainly by State Governments, provide free or very low cost medical services. There is also an extensive private health care sector, covering the entire spectrum from individual doctors and their clinics, to general hospitals and super specialty hospitals. The three tier structure of health system is shown in Figure 1 below.
2.1.1 Primary Health Care

Primary health care denotes the first level of contact between individuals and families with the health system (Figure 1). According to Alma Ata Declaration of 1978, primary health care was to serve the community; it included maternal and child health care, also family planning; immunization against the major infectious diseases; prevention and control of local endemic diseases; appropriate treatment of common diseases and injuries; and provision of essential drugs, health education, provision of food and nutrition and adequate supply of safe drinking water. In India, primary health care is provided through a network of Sub-centers and primary health centers in rural areas, whereas in urban areas, it is provided through Health posts and Family Welfare Centers (Figure 1). The Sub-center consists of one auxiliary nurse midwife and one multipurpose health worker who serves a population of 5,000 in plains and 3,000 people living in hilly and tribal areas. The Primary Health Centre (PHC), staffed by a Medical Officer and
other paramedical staff serves around 30,000 population in the plains or 20,000 population in hilly, tribal and backward areas. Each PHC is to supervise 6 Sub-centers.

### 2.1.2 Secondary Health Care

Secondary Health Care refers to the second tier of health system, in which patients from primary health care are referred to specialists in higher hospitals for treatment (Figure 1). In India, the health centers for secondary health care include District hospitals and Community Health Centers at block level.

### 2.1.3 Tertiary Health Care

Tertiary Health care refers to the third level of health system, in which specialized consultative care is provided usually on referral from primary and secondary medical care (Figure 1). Specialized Intensive Care Units, advanced diagnostic support services and medical personnel specialization are the key features of tertiary health care. In India, under public health system, tertiary care service is provided by medical colleges and advanced medical research institutes.

### 2.2 Evolution and Development of Public Health System in India

The Bhore committee report is the first health report in India, i.e. the Health Planning and Development Committee's Report, 1946. It was a plan equivalent to Britain's National Health Service (NHS). The Report was based on a countrywide survey in British India. It is the first organized set of health care data for India.

After independence, India embarked on a planned effort to raise standard of living of the people and impetus was given to health care, which was made integral part of socio-economic development. Over the past seven decades (since 1947), public health infrastructure and services have undergone remarkable changes and huge expansion in scale and nature based on recommendations by a number of expert committees. The Alma Ata declaration in 1978 led to the launch of “Health for All by 2000” signed by 137 countries, including India. The strategy for health care development shifted from committee to policy-based approach with the
formulation of National Health Policy 1983. The major goal of this policy was to provide universal and comprehensive primary health services.\textsuperscript{36}

The Alma Ata Declaration on Primary Health Care 1978,\textsuperscript{37} states that “...health is a fundamental human right and that the attainment of the highest possible level of health is the most important worldwide social goal”. In addressing main health problems in the community, Primary Health Care (PHC) must “…provide promotive, preventive, curative and rehabilitative services”. The Declaration states that PHC includes at least “…prevention and control of local endemic diseases, appropriate treatment of common diseases and injuries and the provision of essential drugs”. The Declaration recognized the role played by all health workers and the need for suitable training to enable these people to work as health care team to respond to the expressed needs of the community.

2.3 Major milestones in evolution of Primary Health Care in India\textsuperscript{38}

Over the past seven decades, several governments appointed Committees and Commissions examined issues and challenges which health sector is facing. The purpose of these ad hoc committees formed from time to time is to review the current situation regarding public health status in the country and suggest further course of action in order to accord the best of health care to the people. The Table 1 below highlights the salient findings and recommendations of the various committees since 1946:

Table 1. Salient findings and recommendations of the various committees of the Government of India since 1946

<table>
<thead>
<tr>
<th>1946</th>
<th>Bhore Committee Report on Health Survey and Development\textsuperscript{39}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The recommendations of the Bhore Committee report were:</td>
</tr>
<tr>
<td></td>
<td>• integration of preventive and curative services at all administrative levels</td>
</tr>
<tr>
<td></td>
<td>• short term Primary Health Centre for 40,000 population</td>
</tr>
<tr>
<td></td>
<td>• long term (3 million plan) – Primary Health Centers with 75 beds for each 10,000 – 20,000 population</td>
</tr>
<tr>
<td></td>
<td>• formation of Village Health Committees</td>
</tr>
<tr>
<td></td>
<td>• provision of Social doctor; intersectoral approach to health services development</td>
</tr>
<tr>
<td></td>
<td>• three months training in preventive and social medicine to prepare social physicians for better health status of the citizens</td>
</tr>
</tbody>
</table>
The National Planning Committee (NPC) set up by the Indian National Congress in 1948 under the chairmanship of Colonel S. Sokhey stated that the maintenance of the health of the people was the responsibility of the State, and the integration of preventive and curative functions in a single state agency was emphasized. The Sokhey Committee Report endorsed the recommendations of the Bhore Committee Report and commented that it was “of the utmost significance”.

### 1952 Community Development Programme (CDP)
CDP was envisaged as a multipurpose programme covering health and sanitation (through the establishment of Primary Health Care Centers and Sub-Centers) and other related sectors, including agriculture, education, transport, social welfare and industries. Each Community Development Block (CDB) consists of 100 villages with an approximate total population of 100,000.

### 1962 Mudaliar Committee on Health Survey and Planning
The major recommendation of this committee was to limit the population served by primary health centers to 40,000 with the improvement in the quality of health care provided by these centers. Also provision of one basic health worker per 10,000 population was recommended.

### 1966 Mukherji Committee on Basic Health Service
The committee also worked out the composition and organization of basic health services, which should be provided at the Block level. Also it strongly recommended that importance must be given to due strengthening of the supervisory levels to correspond to the strengthening of the base organization.

### 1967 Jungalwalla Committee on Integration of Health Services
The committee recommended integration from the highest to lowest level in the services, organization and personnel. That is Medical Care and Public Health programs should be put under charge of a single administrator at all levels of hierarchy by adopting - The Unified Cadre, Common Seniority, recognition of extra qualifications, equal pay for equal work, special pay for special work, abolition of private practice by government doctors, improvement in their service conditions.

### 1973 Kartar Singh Committee on Multipurpose Health Workers
The committee recommended the amalgamation of peripheral workers into a single cadre of multipurpose workers. Also it recommended the organizational change with respect to PHCs and SCs - one PHC to be established for every 50,000 population. Each PHC to be divided into 16 SCs each for a population of 3,000–3,500. Each SC to be staffed by a team of one male and one female health worker. The work of 3-4 health workers to be supervised by one Health Assistant.

### 1975 Shrivastav Committee on Medical Education and Support Manpower
The committee recommended:
- Creation of bands of paraprofessional and semi-professional health workers from within the community (like school teachers, post masters etc).
- Establishment of 3 cadres of health workers between community level workers and doctors at PHC.
- Development of “Referral Service Complex” by establishing linkages between the primary health center and higher level referral and service centers like taluka (municipality), district, regional and medical college hospitals.
- Establishment of a Medical and Health Education Commission for planning and implementing the reforms needed in health and medical education on the lines of University Grants Commission.

### 1977 Rural Health Scheme: Community Health Volunteer Scheme-Village Health Guides
According to the Village Health Guide (VHG) scheme, the village community selects a volunteer from the village, mostly women, who was imparted short term training and small incentive for the work. VHG acts as a link between the community and the Government Health System. He/she mainly provides health education and creates awareness of Maternal and Child Health and Family Welfare Services. He/she has to keep a track of communicable diseases and treat minor ailments and provide first aid to the patients.
### Alma Ata Declaration and beyond

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>Alma Ata Declaration – Health For All by 2000^1</td>
<td>The Declaration recommended that primary health care should include at least: education concerning prevailing health problems and methods of identifying, preventing and controlling them; promotion of food supply and proper nutrition, and adequate supply of safe water and basic sanitation; maternal and child health care, including family planning; immunization against major infectious diseases; prevention and control of local endemic diseases; appropriate treatment of common diseases and injuries; promotion of mental health and provision of essential drugs. It emphasized the need for strong first-level care with strong secondary- and tertiary-level care linked to it. In one sense, primary health care reasserted the role and responsibilities of the State, and recognized that health is influenced by a multitude of factors and not just the health services.</td>
</tr>
<tr>
<td>1980</td>
<td>ICSSR and ICMR – “Health for all- An Alternate Strategy”^2</td>
<td>The report also recommended the formulation of a comprehensive national health policy through an intersectoral approach that includes environment, nutrition, education, socio-economic, preventive and curative dimensions.</td>
</tr>
<tr>
<td>1983</td>
<td>Mehta Committee on Medical Education Review^3</td>
<td>The Mehta committee mainly reviewed the medical education in all its aspects and specifically discussed about lack of availability of Health manpower data in India. It also recommended establishment of commission for universities of medical sciences and health education; method for updating manpower data and projections for doctors, nurses and pharmacists.</td>
</tr>
<tr>
<td>1983</td>
<td>First National Health Policy^4</td>
<td>The major goal of this policy was to provide universal, comprehensive primary health services.</td>
</tr>
</tbody>
</table>
| 1987 | Bajaj Committee on health manpower planning, production and management^5 | The major recommendations are:  
- Formulation of national medical and health education policy.  
- Formulation of national health manpower policy.  
- Establishment of an Educational Commission for Health Sciences (ECHS) on the lines of UGC.  
- Establishment of health science universities in various states and union territories.  
- Establishment of health manpower cells at center and in all states.  
- Vocationalization of education at 10+2 levels for health related fields with appropriate incentives, so that good quality paramedical personnel may be available in adequate numbers.  
- Carrying out a realistic health manpower survey. |
| 1996 | Bajaj Committee on Public Health Systems^6                           | Key recommendations are policy initiatives with respect to review National Health Policy, Establishment of health impact assessment cell, surveillance of critically polluted areas, search for alternative strategy / strengthening of health services / system research, uniform adoption of public health Act by the local health authorities, establishing national notification system / national health regulations, joint council of health, family welfare and ISM and homeopathy, establishing an apex technical advisory body, constitution of Indian medical and health services, administrative restructuring of department of health and family welfare and Director General of Health Services (DGHS), strong health manpower planning division under DGHS, opening of regional schools of public health along with the emphasis on implementation of committee recommendations of manpower planning, production and management of 1987. |
| 2000 | National Population Policy (NPP)^7                                   | The immediate objective of NPP was to address the unmet needs of contraception, health care infrastructure and health personnel and to provide integrated delivery for basic reproductive and |
childcare services. It envisaged development of one-stop integrated and coordinated service delivery at the village level for basic reproductive and child health services through a partnership of the government with voluntary and non-governmental organizations.

<table>
<thead>
<tr>
<th>2002</th>
<th>Second National Health Policy&lt;sup&gt;58&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The major goals set by this policy are:</td>
</tr>
<tr>
<td></td>
<td>● Eradication of Polio and Yaws by 2005</td>
</tr>
<tr>
<td></td>
<td>● Elimination Leprosy by 2005</td>
</tr>
<tr>
<td></td>
<td>● Elimination Kala Azar by 2010</td>
</tr>
<tr>
<td></td>
<td>● Elimination Lymphatic Filariasis by 2015</td>
</tr>
<tr>
<td></td>
<td>● Achievement of zero level growth of HIV/AIDS by 2007</td>
</tr>
<tr>
<td></td>
<td>● Reduction of Mortality by 50% on account of TB Malaria, other vector and water borne diseases by 2010</td>
</tr>
<tr>
<td></td>
<td>● Reduction of IMR to 30/100 and MMR to 100 per 100,000 by 2010</td>
</tr>
<tr>
<td></td>
<td>● Increase the utilization of public health facilities from &lt;20% to &gt;75% by 2010</td>
</tr>
<tr>
<td></td>
<td>● Increase health expenditure by Government as a %GDP from existing 0.9% to 2% by 2010</td>
</tr>
<tr>
<td></td>
<td>● Establish an integrated system of surveillance, National Health Accounts and Health Statistics by 2005</td>
</tr>
<tr>
<td></td>
<td>● Increase share of central grants to constitute at least 25% of total health spending by 2010</td>
</tr>
<tr>
<td></td>
<td>● Increase state sector health spending from 5.5% to 7% of budget by 2005 and further increase to 8% by 2010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2005</th>
<th>National Rural Health Mission (NRHM)&lt;sup&gt;59&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The National Rural Health Mission aims to restructure the health delivery systems towards providing universal access to equitable, affordable and quality health care responsive to the health needs of the community. Human resource requirement under NRHM has stepped up drastically, in view of renewed commitment to universal coverage. The challenges involved in training, recruitment, placement and motivation of health workers across the country cannot be neglected, if universal coverage is to be attained.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2015</th>
<th>Pharmacy Practice Regulations, 2015&lt;sup&gt;60&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Some of the salient features of the regulations are below.</td>
</tr>
<tr>
<td></td>
<td>● It is mandatory to display owner’s name at or near the entrance of pharmacy</td>
</tr>
<tr>
<td></td>
<td>● It is mandatory to display the name, registration number, qualification, and photograph of Registered pharmacist in dispensing area.</td>
</tr>
<tr>
<td></td>
<td>● Registered pharmacist must dress formally and wear a clean white overall (coat/apron) with a badge displaying the name and registration number.</td>
</tr>
<tr>
<td></td>
<td>● Registered pharmacist must attend minimum 2 refresher courses of minimum of 1 day duration each in a span of 5 years for renewal of the registration as pharmacist.</td>
</tr>
<tr>
<td></td>
<td>● The regulations have in detail the duties of the registered pharmacists, as well as their duties to their patients, to each other, to the public and to the profession.</td>
</tr>
<tr>
<td></td>
<td>● The regulations have listed a list of acts of commission or omission which if committed by a Registered Pharmacists amount to professional misconduct, thus rendering him/her liable for disciplinary action.</td>
</tr>
<tr>
<td></td>
<td>● The regulations also list out the details of position title, job responsibilities, knowledge and skills of various cadres of pharmacists at hospital practice site, at a community pharmacy, and of drug information pharmacists.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2015</th>
<th>National Health Policy (draft under progress)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The main goal of the Policy is:</td>
</tr>
<tr>
<td></td>
<td>The attainment of highest possible level of good health and well-being, through a preventive and promotive health care orientation in all developmental policies, and universal access to good quality health care services without anyone having to face financial hardship as a consequence.</td>
</tr>
<tr>
<td></td>
<td>The objectives of the policy are:</td>
</tr>
</tbody>
</table>
Improve population health status through concerted policy action in all sectors and expand preventive, promotive, curative, palliative and rehabilitative services provided by the public health sector.

Achieve a significant reduction in out of pocket expenditure due to health care costs and reduction in proportion of households experiencing catastrophic health expenditures and consequent impoverishment.

Assure universal availability of free, comprehensive primary health care services, as an entitlement, for all aspects of reproductive, maternal, child and adolescent health and for the most prevalent communicable and non-communicable diseases in the population.

Enable universal access to free essential drugs, diagnostics, emergency ambulance services, and emergency medical and surgical care services in public health facilities, so as to enhance the financial protection role of public facilities for all sections of the population.

Ensure improved access and affordability of secondary and tertiary care services through a combination of public hospitals and strategic purchasing of services from the private health sector.

Influence the growth of the private health care industry and medical technologies to ensure alignment with public health goals, and enable contribution to making health care systems more effective, efficient, rational, safe, affordable and ethical.

2.4 Health Indicators in India

Spending on health care in India was an estimated five percent of gross domestic product (GDP) in 2013. It is expected to remain at that level through 2016 and the total health care spending in local-currency terms is projected to rise at an annual rate of over 12%, from an estimated $96.3 billion in 2013 to $195.7 billion in 2018. The government’s low spending on health care places much of the burden on patients and their families, as evidenced by the country’s out-of-pocket (OOP) spending rate, one of the world’s highest. According to the World Health Organization (WHO), just 33% of Indian health care expenditures in 2012 came from government sources. Of the remaining private spending, around 86% was OOP. India still spends only around 4.2% of its national GDP towards health care goods and services (compared to 18% by the US). Key Health Indicators in India are shown in Table 2 below.
### Table 2. Key Health Indicators of India (Source: World Health Organization Country Office, India)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Statistics</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1,300,000,000</td>
<td>2015</td>
</tr>
<tr>
<td>Population aged under 15 years (%)</td>
<td>29</td>
<td>2013</td>
</tr>
<tr>
<td>Population aged over 60 years (%)</td>
<td>8</td>
<td>2013</td>
</tr>
<tr>
<td>Median age (years)</td>
<td>26</td>
<td>2013</td>
</tr>
<tr>
<td>Population living in urban areas (%)</td>
<td>32</td>
<td>2013</td>
</tr>
<tr>
<td>Total infertility rate (per woman)</td>
<td>2.5</td>
<td>2013</td>
</tr>
<tr>
<td>Number of live births per year (thousands)</td>
<td>25595.2</td>
<td>2013</td>
</tr>
<tr>
<td>Number of deaths per year (thousands)</td>
<td>9944.9</td>
<td>2013</td>
</tr>
<tr>
<td>Birth registration coverage (%)</td>
<td>84</td>
<td>2011</td>
</tr>
<tr>
<td>Cause of death registration coverage (%)</td>
<td>8</td>
<td>2007</td>
</tr>
<tr>
<td>Life expectancy at birth (years)</td>
<td>68.3</td>
<td>2016</td>
</tr>
<tr>
<td>Gross national income per capita (PPP int $)</td>
<td>5350</td>
<td>2013</td>
</tr>
<tr>
<td>Total expenditure on health per capita (Intl $)</td>
<td>215</td>
<td>2013</td>
</tr>
<tr>
<td>Total expenditure on health as % of GDP</td>
<td>4</td>
<td>2013</td>
</tr>
</tbody>
</table>

GDP = Gross Domestic Product

### 2.5 India in Comparison to International Ranking

World Health Organization recognizes health as a human right and a common denominator for ensuring social well-being. With the World Health Organization’s 2000 World Health Report ranking India’s health care system was at 112 out of 190 countries.

Comparison of health expenditure across various countries internationally is presented in Table 3. India’s per capita health expenditure was $146 PPP in 2011. Share of government expenditure in total health expenditure of India is just over 30%, which is the lowest among these 16 countries.
Table 3. International comparison of health expenditure, 2011 (World Health Organization 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Per Capita Government expenditure (PPP$)</th>
<th>Per capita Total Expenditure (PPP$)</th>
<th>Share of Government Expenditure in Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>4,047</td>
<td>8,467</td>
<td>47.8</td>
</tr>
<tr>
<td>Germany</td>
<td>3,420</td>
<td>4,474</td>
<td>76.4</td>
</tr>
<tr>
<td>France</td>
<td>3,169</td>
<td>4,128</td>
<td>76.6</td>
</tr>
<tr>
<td>Canada</td>
<td>3,197</td>
<td>4,541</td>
<td>70.4</td>
</tr>
<tr>
<td>U.K</td>
<td>2,728</td>
<td>3,364</td>
<td>81.1</td>
</tr>
<tr>
<td>Brazil</td>
<td>474</td>
<td>1,035</td>
<td>45.8</td>
</tr>
<tr>
<td>Mexico</td>
<td>505</td>
<td>1,004</td>
<td>50.3</td>
</tr>
<tr>
<td>China</td>
<td>236</td>
<td>423</td>
<td>55.8</td>
</tr>
<tr>
<td>Malaysia</td>
<td>341</td>
<td>619</td>
<td>55.1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>50</td>
<td>132</td>
<td>37.9</td>
</tr>
<tr>
<td>Thailand</td>
<td>289</td>
<td>372</td>
<td>77.7</td>
</tr>
<tr>
<td>Pakistan</td>
<td>26</td>
<td>83</td>
<td>31.3</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>77</td>
<td>183</td>
<td>42.1</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>26</td>
<td>67</td>
<td>38.8</td>
</tr>
<tr>
<td>Nepal</td>
<td>39</td>
<td>85</td>
<td>45.9</td>
</tr>
<tr>
<td>India</td>
<td>44</td>
<td>146</td>
<td>30.1</td>
</tr>
</tbody>
</table>

PPP= purchasing power parity

2.6 Human Resources in Health Care

Human Resources Management (HRM) is a vital management task in the field of health care and other services sectors. In these sectors, because of staff performance customer is facing challenges and experiences in quality of performance (Howard et al., 2006). Human resource management in these sectors plays pivotal role in the success of the reform of health sector.66

There are strong linkages between population, health and development. India’s health challenges are not only huge in magnitude due to its large population but they are complex due to its diversity and the chronic poverty and inequality. There are extreme interstate variations, caused by not only the cultural diversity but because the states are at different stages of demographic transition, epidemiological transition and socioeconomic development.67

Effectively functioning health systems depend on human resource, which range from medical, Ayush and dental graduates and specialists, graduate, auxiliary nurses and pharmacists to other allied health professionals. Despite considerable improvement in health personnel in position (ANM 27%, nurses 119%, doctors 16%, specialists 36%, pharmacists 38%), gap between staff in position and staff required...
at the end of the plan was 52% for ANM and nurses, 76% for doctors, 88% for specialists and 58% for pharmacists. These shortages are attributed to delays in recruitment and to postings not being based on workload or sanctions. Public health cadre as envisioned in the Eleventh Plan to manage NRHM is not yet in place. Similarly, lack of sound human resource management policies result in irrational distribution of available human resource and suboptimal motivation.

The scarcity of skilled human resources has been one of the major bottlenecks in achieving the progress towards Millennium Development Goals (MDG’s). The proportion of skilled health providers stands very low at 100 per 100,000 populations as against the international minimum norm of 228 per 100,000 populations to deliver basic maternal and child health services. Added to this, is the issue of skewed distribution of health workers towards the urban areas, which is evident from the fact that 60% of the health workforce in the urban areas, where only 28% percent of the country’s population reside (Census India 2001). As per World Health Statistics 2013, physicians 6.5, 10, 0.8, and 5.4 pharmacists per 10,000 population in India 2005 – 2012 whereas, maximum 26.3 pharmacists per 10,000 population.

2.7 Health Workforce in India

“India has a severe shortage of human resources for health. India’s health workforce is made up of a range of health workers who offer health-care services in different specialties of medicine. These personnel consists of allopathic doctors (31%), with bachelor degree or specialists; practitioners of ayurveda, yoga, naturopathy, unani, siddha, and homoeopathy (9%), with university degree or specializations; nurses and midwives (30%); pharmacists (11%) with diploma, bachelor, masters and PharmD (doctorate) degrees; and others (9%) which comprises of technicians and allied health workers; community health workers includes health educators and health assistants; accredited social health activists; registered medical practitioners with little or no formal training and traditional medicine practitioners and faith healers. A comprehensive national policy for human resources is needed to achieve universal health care in India.” Public health system has a shortage of medical and paramedical personnel. Government estimates (based on vacancies in sanctioned posts) indicate that 18% of primary health centers are without a doctor, about 38% are without a laboratory technician, and 16% are without a pharmacist, which shows existing shortages of laboratory technicians and pharmacists. In cross-country comparisons, the total number of allopathic doctors, nurses, and midwives (11.9 per 10,000 people) is about half the WHO benchmark of 25.4 workers per 10,000 population.
2.8 Pharma Vision 2020

In December 2002, the Planning Commission of India setting the scene on health care, enshrined the India Vision 2020 for “...improving access to health services to meet the health care needs...”.

The vision of the Pharmacy Council of India is enumerated below:

- In the year 2020, pharmacists and pharmaceutical scientists working within various disciplines of pharmacy will be established and recognized as the medicines experts and experts in health promotion and disease prevention.
- The pharmacists will interact with other professionals as the preferred source of information and advice on prescribing and medicine management of disease.
- The pharmacists will develop their pharmaceutical expertise and facilities in order to deliver high-tech and individually tailored medicines in the primary care setting.
- The pharmacists will be actively involved in the National Health Programs like promotion of essential medicines, primary health care, HIV/AIDS, TB, malaria, tobacco use or family planning.
- The pharmacists will become knowledgeable to participate in medication management and outcome monitoring, including the ability to alter doses and change medicines with agreed therapeutic protocols.
3 PHARMACISTS AND PUBLIC HEALTH IN INDIA

In general, major health programs (communicable and non-communicable) are derived from the national health policy which need human resources for implementation. This chapter is focused on national health policy and existing programs in India, current status, opportunities and barriers for pharmacists in implementing or taking active part in these programs. Existing initiatives of pharmacy organizations in India in promoting role of pharmacists in NPHPs is presented. Furthermore, statements and policies of international organizations such as WHO and International Pharmaceutical Federation (FIP) and examples of worldwide organizations promoting role of pharmacists in public health are discussed.

3.1 National Health Policy in India

In the national health policy 2002, the word pharmacist is not mentioned. Also historically, pharmacists have not been mentioned in Indian government's health and pharmaceutical policies, perhaps due to lack of clarity of their role and their potential beyond supply of pharmaceutical products. Policy makers should exploit potential of pharmacists in community, hospital and government settings for improving pharmaceutical services and health and thus relieve the doctors, dentists and nurses of unnecessary load of work. Policy makers usually see pharmacies as commercial enterprises and pharmacists as business people. Policy makers should view pharmacies as part of the health care sector and pharmacists as health care professionals providing health care services and focus on them as they do with other health care professionals.

The new draft National Health Policy 2015, which is under final phase of preparation, addresses the urgent need to improve performance of health systems in India. Given the two-way linkage between economic growth and health status, this National Health Policy is a declaration of the determination of the Government to leverage economic growth to achieve health outcomes and an explicit acknowledgement that better health contributes immensely to improved productivity as well as to equity.
The primary aim of the new National Health Policy 2015,\textsuperscript{81} is to inform, clarify, strengthen and prioritize the role of the government in shaping health systems in all its dimensions: investment in health, organization and financing of healthcare services, \textbf{prevention of diseases and promotion of good health through cross sectoral action}, access to technologies, \textbf{developing human resources}, encouraging medical pluralism, building the knowledge base required for better health, financial protection strategies, regulation and legislation for health.

A policy is only as good as its implementation. Past policies, have faced innumerable constraints in implementation. The National Health Policy therefore envisages that an implementation framework be put in place to deliver these policy commitments. However, the implementation framework and policy are yet to be finalized.

The most positive observation for the profession is that in the new draft national health policy 2015, pharmacists are identified as human resources for health among doctors, nurses and dental health professionals.\textsuperscript{82} The draft policy also mentions the need of further expansion of the pharmacy education and the need to ensure the outputs of these institutions (including pharmacy) to meet the needs of the nation. The draft policy has also mentioned pharmacists as available complementary human resource options to develop expansion of primary care. This will not only improve availability of manpower with appropriate skills in public health system in remote areas but will also provide additional promotional avenues to many cadres and attract them to work in remote areas. As per the draft policy, the last ten years have seen a major expansion of medical, nursing and technical education, including pharmacy education. The policy mentions that there is greater opportunity to make use of these resources to provide local employment without compromising quality. The policy emphasizes enforcement of quality professional education or professional ethics and good practices to be implemented by professional councils; including Pharmacy Council of India. The policy calls for a major reform and strengthening of these bodies and their accountability.
3.2 National Public Health Programs in India

The government of India runs several national public health programs for the citizens of India. The major programs\textsuperscript{83} are to cover both communicable and non-communicable diseases, the main objectives of these programs are given in Table 4 below.
Table 4. National Health Programs and Their Objectives

<table>
<thead>
<tr>
<th>Program title</th>
<th>Objective(s)</th>
</tr>
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<tbody>
<tr>
<td><strong>Communicable diseases</strong></td>
<td></td>
</tr>
<tr>
<td>National HIV/AIDS Control Program</td>
<td>The main objective of this program in India is that every person living with HIV has access to quality care and is treated with dignity. Effective prevention, care and support for HIV/AIDS is possible in an environment where human rights are respected and where those infected or affected by HIV/AIDS live a life without stigma and discrimination.</td>
</tr>
<tr>
<td>Revised National Tuberculosis Control Program (RNTCP)</td>
<td>TB control program is to achieve and maintain cure rate of at least 85% in new sputum positive pulmonary TB patients and detection of at least 70% of such cases. Directly Observed Treatment is highlight of this program.</td>
</tr>
<tr>
<td>National Vector Borne Disease Control Program (NVBDCP)</td>
<td>The objectives of the program is to prevent and control Malaria, Dengue, Lymphatic Filariasis, Kala-azar, Japanese Encephalitis and Chikungunya in India.</td>
</tr>
<tr>
<td>National Leprosy Eradication Program (NLEP)</td>
<td>Early detection &amp; complete treatment of new leprosy cases. Carrying out house hold contact survey in detection. Early diagnosis and prompt multi drug therapy (MDT), through routine and special efforts. Information, Education &amp; Communication (IEC) activities in the community to improve self reporting to Primary Health Centre (PHC) and reduction of stigma. Intensive monitoring and supervision at Primary Health Centre/ Community Health Centre.</td>
</tr>
<tr>
<td><strong>Non-communicable diseases</strong></td>
<td></td>
</tr>
<tr>
<td>National Mental Health Program (NMHP)</td>
<td>1) To ensure the availability and accessibility of minimum mental healthcare for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of the population; 2) To encourage the application of mental health knowledge in general healthcare and in social development; and 3) To promote community participation in the mental health service development and to stimulate efforts towards self-help in the community.</td>
</tr>
<tr>
<td>National Program for Prevention and Control of Deafness (NPPCD)</td>
<td>1) To prevent the avoidable hearing loss on account of disease or injury; 2) Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness; and 3) To strengthen the existing intersectoral linkages for continuity of the rehabilitation program, for persons with deafness.</td>
</tr>
<tr>
<td>National Program for Control of Blindness (NPCB)</td>
<td>1) To reduce the backlog of blindness through identification and treatment of blind at primary, secondary and tertiary levels; 2) Prevention of visual impairment; through provision of comprehensive eye care services and quality service delivery; 3) To enhance community awareness on eye care and lay stress on preventive measures; and 4) To secure participation of Voluntary organizations/Private Practitioners in eye care.</td>
</tr>
<tr>
<td>Pulse Polio program</td>
<td>Children in the age group of 0-5 years administered Polio drops during the national and sub-nationals immunization rounds. About 172 million children are immunized during each National Immunization Day.</td>
</tr>
<tr>
<td>Universal Immunization Program (UIP)</td>
<td>Protection of children from life threatening conditions by providing vaccination. Vaccines provided under UIP are BCG (Bacillus Calmette Guerin), DPT (Diphtheria, Pertussis and Tetanus Toxoid), OPV (Oral Polio Vaccine), Measles, Hepatitis and TT (Tetanus Toxoid).</td>
</tr>
<tr>
<td>National Tobacco Control Program (NTCP)</td>
<td>1) To bring about greater awareness about the harmful effects of tobacco use and about the Tobacco control Laws; and 2) To facilitate effective implementation of the Tobacco Control Laws.</td>
</tr>
<tr>
<td>National Program for Health Care of the Elderly (NPHCE)</td>
<td>To provide separate, specialized and comprehensive health care to the senior citizen at various level of State health care delivery system including outreach services.</td>
</tr>
</tbody>
</table>
3.3 Current Stand and Opportunities for Indian Pharmacists in Public Health

Though there is a large number of pharmacists working both in public and private sectors still remain largely an untapped resource in India.\textsuperscript{85,86,87} One of the glaring examples of this is reflected by the fact that the pharmacists do not find even a mention in National Health Policy 2002\textsuperscript{88} and National Pharmaceutical Policy.\textsuperscript{89} Nine out of eleven National Public Health Programs (NPHPs) run by the government of India, namely leprosy and vector borne disease control, mental health, deafness and blindness control, pulse polio, universal immunization, health care of elderly and tobacco control programs.\textsuperscript{90} Pharmacists’ involvement in HIV/AIDS prevention and control; and tuberculosis control programs that have been recently rolled out.\textsuperscript{14}

However, for decades the health and pharmaceutical policies of India have overseen human resources readily available in pharmacy profession. The Indian public health standards formulated by the National Rural Health Mission (NRHM) do not place much emphasis on the role of pharmacists as compared to other categories of health care personnel, such as nurses and laboratory technicians.\textsuperscript{91}

These large numbers of pharmacists available are being used by health authorities to show improved and better statistics of health and medical personnel, but not being used in policies and patient care practice settings. In the worldwide scenario, pharmacists offer public health interventions more conveniently than other paramedics, since they are easily accessible and recognized as experts in matters of health\textsuperscript{92} and medicine, which should be adopted by Indian pharmacy profession. The huge workforce that is readily available is not officially a part of health care team. If this workforce is motivated and properly trained, they can become tremendous potential for improving public health in India.

Internationally, there is an under use of pharmacists for patient care and public health efforts. A coordinated and multifaceted effort to advance workforce planning, training, and education is needed in order to prepare an adequate number of well-trained pharmacists for such roles.\textsuperscript{93} In 2011, International Pharmaceutical Federation (FIP) in conjunction with WHO has come up
with a new version of Good Pharmacy Practice guidelines. The expected roles of the pharmacists are:

i) prepare, obtain, store, secure, distribute, dispense, administer and disposal medical products;

ii) provide effective drug therapy management;

iii) maintain and improve professional performance; and

iv) contribute to improve effectiveness of the health-care system and public health.

3.4 Pharmacists as Human Resources for Public Health Programs in India

Manpower for health services has been described as ‘the heart of the health system in any country’. World health workforce is facing significant challenges. With an estimated shortage of more than four million health workers worldwide, the global health workforce crisis is possibly the greatest health system constraint in countries seeking to meet their 2015 Millennium Development goals (MDGs). As identified by the World Health report 2006, India is 1 of 57 countries facing shortage of Human Resources for Health. In India, the latest advances in medicine are available to people who can pay, but the vast underclass of 800 million people or more, have little or no access to healthcare. The public health system in India has a shortage of medical and paramedical personnel. As of March 2013, the total number of registered doctors in the country was 885,233. Government estimates, based on vacancies in sanctioned posts, indicate that 18% of primary health centers are without a doctor, about 38% are without a laboratory technician, and 16% are without a pharmacist.

Physicians are opinion leaders in health care policy making, and thus, in key position for building up strategies for pharmacists’ involvement in national public health programs. Creating evidence on physicians’ perceptions on the role of pharmacists in public health and patient care could guide pharmacists in preparing to take active part in national public health programs (NPHPs) and to appear on national health and pharmaceutical policies. Pharmacists’ involvement in NPHPs means active participation in one or more of 11 NPHPs run by the government of India.
3.5 Public Health Programs – Pharmacists’ Involvement and Barriers

Appropriate training and support is needed in order to increase pharmacists’ confidence in providing public health services.\(^{106}\) Apart from community pharmacy, the pharmacists do have an important role in public health.\(^{107}\) Pharmacists are well positioned to also serve the mission of public health, both in their individual pharmacist–patient relationships and in their population-based activities and collaborations with public health agencies. The areas and the role of pharmacists are as follows:\(^{108}\)

- Immunization programs: administration and promotion of immunization
- Disaster preparedness and response, e.g., natural disaster: Education of public, planning of emergency response, surveillance of noticeable syndromic conditions, communication with public, provision of mass medications, etc.
- Contraceptive services: Distribution of contraceptive measures and education about their use
- Prevention and control of disease and injury: Promotion of healthy lifestyles, reduce hospitalizations.

3.6 Existing Interventions of Pharmacists in Public Health in India

There is no official accumulated database on existing interventions of Indian pharmacists in public health. However, various sources like journals databases and association reports, very few interventions of pharmacists’ initiatives in public health are collated below.

“A systemic review\(^{109}\) concluded that most pharmacists viewed public health services as important and part of their role but secondary to medicine related roles. The majority of pharmacists in the review were positive about providing public health services and felt that this was an important role. This suggests that the changing role of community pharmacy from traditional dispensing activities to greater involvement in health improvement is largely accepted, and the importance of providing these services is understood. Pharmacists’ confidence in providing public health services was on the whole average to low. Time was consistently identified as a barrier to providing public health services. Lack of an adequate counseling space, lack of demand and expectation of a negative reaction from customers were also reported by some pharmacists as barriers. Appropriate training and support is needed in
order to increase pharmacists’ confidence in providing public health services. A need for further training was identified in relation to a number of public health services.”

Raj Vaidya et al. (2012) described in an article “The role of the Pharmacist in the various national health programs (National Vector Borne Disease Program, Cancer Control Program, School Health program, Blindness Control Program, National AIDS Control Program, AYUSH, Prevention and control of Non Communicable Diseases, National Tobacco Control Program, etc.) has never been envisaged or documented, and pharmacists have never made attempts to do the same. However, this needs to be done on a priority basis. For the profession to develop, major initiatives should be established by setting practice standards, qualification and registration of pharmacists at all levels and quality assurance standards for practice of pharmacy in the National Health Programs.”

The pharmacy profession in India has been full of contrast. One side to the coin of pharmacy profession in India is the industry sector which is successful and at par with the world in all aspects; on the other side, pharmacy practice which remained much behind time. Pharmacists are still not regarded or performing as true health care professionals. The retail pharmacy has been dominated by the business attitude rather than a professional approach and therefore, community pharmacist has failed to provide patient oriented services. However, slowly as professional pharmacy advances in other parts of the world, and globalization sets in, it is realized by retail chemists association and other national pharmacists associations and regulatory authorities that there is immediate need to change. They are coming together on a common platform to work towards this distinct goal. This is best exemplified by collaboration of the Drugs Controller General of India office with the Indian Pharmaceutical Association (IPA) and the WHO to develop Good Pharmacy Practices for the Indian community pharmacies. As part of this process, pharmacy educationists realized that there is a need to bring in changes in pharmacy curriculum to produce future generation of competent pharmacists from public health perspectives. Due to emphasis given by visionary leaders and increasing expectations of educated consumers, the pharmacists themselves are realizing the need of patient focused
services. Thus the background work for the journey of the traders towards the transformation to health professionals has begun. The new generation pharmacists in India; with PharmD program started in 2008; are gearing up for a change and are willing to absorb new ideas. The following are example of such initiatives taken by the pharmacy profession:

3.6.1 Pharmacists Fight against HIV/AIDS in India
The Indian National Health Policy was reformulated on the basis of realistic considerations of capacity.113 As per UNAIDS Gap Report 2016, there are 2.1 million people living with HIV and 86,000 new HIV infections in 2015 of which 43% of adults were on antiretroviral therapy.114 In this context, proper role and involvement of pharmacists in medicine management and overall health care program becomes crucial.

The WHO has signed a joint declaration in 1997 with FIP on the role of the pharmacists in the fight against HIV/AIDS pandemic.115 The IPA in its countrywide initiative undertook sensitization of pharmacists and their role during National Pharmacy Week campaign in 2000. FIP Community Pharmacy Section (CPS) appointed an observer from India for the term 2000-2004 with a specific aim of developing Guiding Principle for pharmacists to deal with HIV/AIDS in India. The efforts were supported by the CPS and FIP Foundation for Education and Research. The guiding principles document was prepared with the help of working group and they were used for training the trainers and in-service pharmacists. More than 400 pharmacists from New Delhi, 250 from Mysore and 25 pharmacists from Kolkata were trained in 2004.116

The training objectives were to:

- motivate pharmacists to disseminate information to the society on protection against HIV/AIDS;
- explain about the safe use of disposable needles and condoms;
- inform the HIV/AIDS patients about proper usage of drugs, diet and lifestyle changes;
- encourage and counsel the kith and kin of the AIDS patients;
- offer moral support to lead a smooth life.
The training modules also dealt with role of pharmacists in prevention and information, pathophysiology, mode of transmission and therapeutics of AIDS, safe blood and blood products, diagnostic screening tests and perils of injectable drug use.

Due to the vast demography and huge number of pharmacists, it is desirable to intensify the training process by joining the consortium of like-minded organizations for global funding and unleashing proper use of anti-retrovirals. However, since then the IPA has included training modules in their regular training programs.

3.6.2 Pharmacists for Future Free of Tobacco

India is the second largest consumer and third largest producer of tobacco in the world. A majority (86%) of tobacco sale in India consists of bidi, chewing tobacco and gutkha. There are 240 million smokers in India, out of which 194 million are men and 45 million are women. India reports 5 million child smokers with 55,000 children starting regular tobacco use every year.

The Indian Pharmaceutical Association has identified the need of pharmacists’ participation in smoking cessation by conducting a survey in 2003 on role of pharmacists in future free of tobacco. The survey included pharmacy students, community pharmacists and pharmacists working in other facets like industry, regulatory, academics and hospitals. The survey results showed that 95% participating pharmacists felt that they have a role to play in fight for the future free of tobacco. After this, several Associations both at national and local levels have started organizing campaigns during National Pharmacist Week celebrations and World Tobacco Day to promote the role of pharmacists in Tobacco free future. During these campaigns, pharmacists disseminated the information in local languages. Pharmacists gained confidence about their role in the society and politicians who were willing to work and support pharmacists have reached on one platform to work together. Though there was lot of momentum during 2003 and 2004, recently there are no specific activities registered. It is important that the associations and other professional bodies continue the good work for the benefit of the society.
3.6.3 TB Fact Card Project

The participation of pharmacists in TB fact card project (an initiative of Indian Pharmaceutical Association, Commonwealth Pharmaceutical Association and International Pharmaceutical Students Federation) indicates the beginning of a new era in the history of Indian pharmacy practice. The counseling offered treatment monitoring and creation of awareness about TB among the community by dissemination of information, and encompasses all the aspects of pharmaceutical care by the pharmacists. There is a healthy partnership which is getting established with physicians through such work. This has became a milestone project leading to put the pharmacists on national programs. In recent years, pharmacists and professional associations have actively promoted the pharmacist’s role in public health. There are examples of pharmacists taking initiatives to be a part of national health programs such as the Revised National Tuberculosis Control Program (RNTCP). For the first time 2014, the RNTCP guidelines mentioned the word “pharmacist” as specialists with expertise in managing Multi-Drug-Resistant Tuberculosis (MDR-TB)\textsuperscript{120} which is a step forward.

In 2012, a Memorandum of Understanding (MoU) between Central TB Division and IPA, PCI, AIOCD and FIP-WHO SEARO Forum of National Pharmaceutical Associations with an objective to engage pharmacists in RNTCP for TB care and control in India.\textsuperscript{121} This MoU was valid for one year and is extended till 2017.\textsuperscript{122}

3.7 Barriers for Pharmacists’ Involvement in Public Health

Community pharmacies have both the opportunity and potential to play an important role in public health. Earlier research has shown that despite their potential, community pharmacies have been underutilized in the provision of public healthcare services.\textsuperscript{123} A systematic review on community pharmacy and emerging public health initiatives in developing South East Asian countries recognized that attempts have been made by countries to expand scope of community pharmacy practice through piloting the introduction of new services in both pharmacy and public health practice.\textsuperscript{124} However, the pace of such expansion has been relatively slow and is not supported by a strong evidence base for pharmacist involvement in
Several notable barriers internally and externally to the pharmacy environment such as lack of knowledge, lack of confidence, poor recognition from the general public and lack of supportive policies have constrained progress.\textsuperscript{125}

The following three are some of the most important barriers that cover major challenges for pharmacists in taking an active role in public health and national public health programs.

- Education needed for healthcare services provision in community pharmacies

The healthcare services in community pharmacies are currently insignificant and therefore, must undergo reforms to meet the changing needs of modern medicines users. The pharmacist's role in patient care is expected to grow, as professional and educational standards develop. Although pharmacists' contributions to health care are yet to be recognized, there is every reason to be optimistic toward making patient care in community pharmacy setting a success. For this, the educational system for pharmacists has to be adapted.\textsuperscript{126} Efforts should be expanded to increase coverage of public health topics within pharmacy curriculum and vice versa. Public health mainly focuses on preventative care and the population’s perspective.\textsuperscript{127}

The issue is globally important for the pharmacy profession and the FIP has recognized it and created a global platform for discussions, leadership, shared challenges and success. Recognizing the need to support and strengthen pharmacy education worldwide, in November 2007, FIP, in collaboration with WHO and United Nations Educational, Scientific and Cultural Organization (UNESCO), formed the Pharmacy Education Taskforce. The purpose of the Taskforce is to oversee the implementation of the Pharmacy Education Taskforce Work Plan. The Action Plan aims to enable the sustainability of a pharmacy workforce that is relevant to local needs. The Action Plan is dedicated to five domains of action: quality assurance, academic and institutional capacity, pharmacy support workforce, leadership, and competency and vision for pharmacy education. In many countries
worldwide have already influenced the training as they have shifted towards PharmD programs with more clinical pharmacy preparing for patient care oriented practice.

A study conducted among community pharmacists in Malaysia recommends that undergraduate pharmacy education be redesigned to include public health training to ensure graduating pharmacists are competent in performing a public health role.\(^{128}\)

- **Under utilization of pharmacists in public health**
  The potential for pharmacists to effect dramatic improvements in public health remains largely untapped.\(^{129}\) Today, public health services are in demand. An opportunity exists for the integration of pharmacy and public health shifting the pharmacy profession toward a promising future. Evidence suggests that utilizing pharmacists in public health settings helps to improve health outcomes, decrease costs, prevent diseases, minimize adverse drug events and maintain good patient health.\(^{130}\)

- **Lack of supporting policies and regulations**
  Both at local and national level, pharmacists needs proper policy back up and strict regulations in supporting their role in active participation in national and public health programs.

3.8 **Statements and Recommendations of Various International Organizations on the Role of Pharmacists in Public Health**

Health promotion, disease prevention and lifestyle modification are activities at community level that have a public health focus. Worldwide, pharmacists can offer public health interventions more conveniently than other groups since they are easily accessible and recognized as experts in matters of health. Globally, pharmacists are a trusted source of information and advice on health and medicines. However, they cannot operate in isolation and must accept joint responsibility with all health professionals to serve community and public health goals. In this context, various international organizations have charted out several
recommendations, policies and statements on how the pharmacists can take important role in health care system and public health programs. Highlights of these recommendations, policies are described below.

3.8.1 WHO Recommendations to Involve Pharmacists in Health Care System

The recognition of the role of pharmacist in various facets and improvement of pharmacy quality of services began under the WHO’s revised drug strategy in WHA 1986. WHO convened two Consultative Group meetings in New Delhi, India in 1988 and Tokyo, Japan in 1993 on the role of pharmacists in health care system.\textsuperscript{131} The important recommendations in relation to the pharmacy education and on the role of pharmacists in health care system are:

- Pharmacists should communicate and cooperate effectively with the other members of the health care team
- The undergraduate pharmacy course should adequately cover the principles of national health and drug policies
- Pharmacists should be members of health care teams and their roles in the team should be recognized
- The curriculum should be properly balanced with contents of basic sciences, pharmaceutical sciences, biomedical and clinical sciences, socio-economic and behavioral sciences and practice experience

The WHO WHA 47.12 resolution from 1994, emphasized pharmacists’ responsibility to provide advice on medicines and their use, to promote the concept of pharmaceutical care, and to actively participate in illness prevention and health promotion.

Subsequently WHO organized two more meetings on the role of the pharmacist, in Vancouver, Canada in 1997 and in The Hague, The Netherlands in 1998. These meetings reinforced the need for pharmacy curricular reform.\textsuperscript{132}
3.8.2  FIP Policies and Statements on Pharmacy Education and Pharmacist Role in Healthcare

The following are few of International Pharmaceutical Federation’s guidelines, statements, policies related to GPP and pharmacy education to promote pharmacists’ role in public health.

- In response to the WHO’s recommendations, FIP in 1992 has developed standards for pharmacy services under the heading “Good pharmacy practice in community and hospital pharmacy settings”. Following the recommendations of the WHO Expert Committee and the endorsement of the FIP Council in 1997, the FIP/WHO joint document on good pharmacy practice (GPP) was published in 1999 in the thirty-fifth report of the WHO Expert Committee on Specifications for Pharmaceutical Preparations.133

- In 2000, FIP Council has adopted a statement of policy on Good Pharmacy Education Practice providing a conceptual framework for the design, implementation and assessment of contemporary education programs for pharmacists throughout the world.134

- In 2002, FIP adopted a Statement of professional standards continuing professional development.

- FIP Statement of policy on quality assurance of pharmacy education, 2009. This statement is intended as a companion piece to FIP’s Statement of Policy on Good Pharmacy Education Practice.

- The 2011 FIP’s GPP document underlines the requirements of Good Pharmacy Practice and how to set standards required for GPP, (which also imply a quality management framework and a strategic plan for developing services). GPP is organized around 4 major roles for pharmacists. “Contribute to improve effectiveness of the health-care system and public health” is one among them.

- FIP has also issued statements on professional standards for continuing professional development, good pharmacy education practice135 and pharmaceutical care.136

A joint document, “Developing pharmacy practice: a focus on patient care” by International Pharmaceutical Federation (FIP) and WHO emphasize that pharmacists should engage in preventive care activities that promote public health and prevent diseases.137
3.8.3 Examples of Other Organizations Promoting Role of Pharmacists in Public Health

Internationally, there is an increased focus on the promotion of pharmacists’ role in public health area. There are several examples where international organizations are working hard to make progress in this focused area. The following few highlighted examples shown in Table 5.

Table 5. International examples where pharmacists’ role in public health area is in focus

<table>
<thead>
<tr>
<th>Country</th>
<th>Organization</th>
<th>Promotion of pharmacists’ role in public health</th>
</tr>
</thead>
</table>
| USA     | American Public Health Association (APHA) | In 2006, American Public Health Association (APHA) has rolled out a policy statement on the Role of pharmacists in Public Health. In order to facilitate the development in this area, APHA recommended the following desired actions\textsuperscript{138}:
  a. Supports greater inclusion of public health concepts in the curricula of schools of pharmacy, as well as the development of more joint PharmD/MPH programs;
  b. Reiterates the need for increased awareness of the role of pharmacists in public health through the dissemination of information among schools of public health, professional societies, policy-makers and other health care employers;
  c. Encourages the transdisciplinary collaborations of health planning agencies, schools of public health, schools of pharmacy, public health agencies, policy-makers and pharmacy and public health professionals to develop legislation and advocate for plans that address health care needs spanning from local to worldwide;
  d. Supports the influx of more pharmacists trained in public health, in response to the pharmacist and public health worker shortages;
  e. Urges Congress to charge CMS to recognize pharmacists as health care providers within its programs (e.g., under Medicare) to function in public health capacities and to be eligible for proper reimbursement in such capacities. As is the case with all licensed providers, this should be restricted to services provided within the terms of the state pharmacy licensure regulations; and
  f. Encourages participation of pharmacists and other public health professionals in transdisciplinary research. |
|         | American Society of Health-System Pharmacists (ASHP) | In 2008, American Society of Health-System Pharmacists (ASHP) rolled out a statement on the role of Health-System Pharmacists in Public Health\textsuperscript{139}. The statement identified following examples of activities that health-system pharmacists can engage in to promote public health:
  a. Providing population-based care;
  b. Developing disease prevention and control programs (including medication safety programs) in their institutions and communities;
  c. Developing health-education policies and programs within their institutions that address the needs of patients, other health care professionals, community leaders, and the public;
  d. Collaborating with state and local authorities, including health departments and boards of health, to address local and regional health care needs (including environmental hazard and emergency preparedness programs);
  e. Advocating for sound legislation, regulations, and public policy regarding disease prevention and management; and
  f. Engaging in population-based research and initiating campaigns to disseminate new knowledge. |
Example from AACPs study

More examples of recent milestones, events and important documents finding in USA (in AACPs study)\textsuperscript{140} are given below:

- a. CAPE included public health as a focus of pharmacy education; continued in CAPE 2013 and ACPE 2016 Standards\textsuperscript{141}
- b. APHA Statement: Role of the Pharmacist in Public Health Awareness (2005)\textsuperscript{142}
- c. U.S. Public Health Service: Improving Patient and Health System Outcomes through Advanced Pharmacy Practice (2011)\textsuperscript{143}
- d. Centers for Disease Control and Prevention: A Program Guide for Public Health: Partnering with Pharmacists in the Prevention and Control of Chronic Diseases (2012)\textsuperscript{144}
- e. National Association of County and City Health Officials: Building and Sustaining Strong Partnerships between Pharmacies and Health Departments at State and Local Levels (2013)\textsuperscript{145}
- f. CDC Public Health Grand Rounds: How Pharmacists Can Improve our Nation’s Health (2014)\textsuperscript{146}
- g. APHA approved Pharmacy Special Primary Interest Group (SPIG) (2014)\textsuperscript{147}
- h. Academic Pharmacy Now article highlighting the Public Health SIG (2015)\textsuperscript{148}

<table>
<thead>
<tr>
<th>Australia</th>
<th>Pharmaceutical Society of Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A report from Australia “Building upon pharmacists’ practice in Australia - a vision for the profession pharmacists” stated that Australia’s pharmacists realize the vision by undertaking several functions and one of them is “providing preventive and public health services” by:</td>
</tr>
<tr>
<td></td>
<td>a. facilitating public health campaigns in local communities including health promotion, pandemic response, immunization and monitoring;</td>
</tr>
<tr>
<td></td>
<td>b. providing access to screening and health checks to detect risk factors; providing healthy lifestyle advice and monitoring; and providing community education on medicines and health.\textsuperscript{149}</td>
</tr>
<tr>
<td>UK</td>
<td>Royal Pharmaceutical Society of Great Britain</td>
</tr>
<tr>
<td></td>
<td>RPSGB) went a step ahead and prepared Professional Standards for Public Health Practice for Pharmacy, for pharmacists and pharmacy teams working in England and Wales. These standards provide a framework to support pharmacists and their teams to improve public health services, and shape future services and pharmacy roles to deliver quality patient care and improve health outcomes.\textsuperscript{150}</td>
</tr>
<tr>
<td>Denmark</td>
<td>National efforts</td>
</tr>
<tr>
<td></td>
<td>Health promotion in community pharmacy Denmark’s country report\textsuperscript{151} from 2000 described five initiatives where pharmacies took initiative in improving public health. These initiative are: pharmacy-based smoking cessation, weight reduction, pharmacy services for the elderly, quality improvement of drug therapy for asthma patients, diabetes year-2000. These programs are still in practice in Denmark.</td>
</tr>
<tr>
<td>EU</td>
<td>European Pharmacists Forum (EPF)</td>
</tr>
<tr>
<td></td>
<td>In March 2015, the European Pharmacists Forum (EPF) prepared a white paper and call to action on the role of pharmacy in supporting public health.\textsuperscript{152} The EPF called upon national governments, payers and insurers, manufacturers to work collaboratively with pharmacy and pharmacists’ associations to develop pharmacy’s role in improving public health and patient outcomes.</td>
</tr>
</tbody>
</table>

The above mentioned are few examples where pharmacists are taking active part in various public health programs in their respective countries. Different parts of the world are taking different initiatives based on their population needs and opportunities to improve citizens’ health. This study is focusing on mainly on how the Indian pharmacists can be best utilized to make them part of health care system and to involve in public health programs.
4 PHARMACY PRACTICE IN INDIA

This chapter will brief on history of pharmacy practice and pharmacy practice regulations, pharmacy ownership, types of community pharmacies, pharmacist work areas, how community pharmacy works including supply chain and distribution system in India. Furthermore, a brief on current status and future of pharmacy practice in India and vision are discussed.

4.1 History of Pharmacy Practice in India

Early Indian (Hindu) medicine is divided into two periods. The first continuing from the earliest beginning until about 800 B.C. (Vedic period) and the second roughly from 800 B.C. to 1000 A.D. (Brahmanic period). After 1000 A.D. largest parts of India came under Islamic rule and Arab doctors took over the medical practice in the country. In ancient India, students learnt the art of preparing flower juices, extracting liquors, concocting different herbal combinations, making new compounds of minerals and extracting alkalies out of minerals. Students were also trained in planting, grafting, general care of plants, as also identifying different herbs and when and how to cultivate and preserve them.153

4.2 Pharmacy Regulations in India

4.2.1 History and Development of Pharmacy Regulations in India154,155

The history of pharmacy profession or regulations in India started with Opium act in 1878. The profession went through several changes under evolution process from compounders to chemists to pharmacists with bachelor and masters and PharmD. Today, pharmacy profession is striving hard to realize its vision and mission to achieve best practices and to provide better pharmaceutical care services to the patients. In this process, the regulatory authorizes are doing their best to implement Pharmacy Practice Regulations (2015) to harmonize the practice of pharmacy throughout the country. Table 6 below gives an overview of the Acts or Regulations that came into force in India concerning drugs and pharmaceuticals since 1878 till 2015.
Table 6. An overview of Acts or Regulations of India concerning drugs and pharmaceuticals

<table>
<thead>
<tr>
<th>Year</th>
<th>Act or Regulation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1878</td>
<td>Opium Act</td>
<td>Dealt with cultivation of poppy and the manufacture, transport, export, import and sale of opium.</td>
</tr>
<tr>
<td>1889</td>
<td>Indian Merchandise Act</td>
<td>Misbranding of goods in general.</td>
</tr>
<tr>
<td>1894</td>
<td>Indian Tariff Act</td>
<td>Levy of customs duty on goods including foods, drinks, drugs, chemicals and medicines imported or exported.</td>
</tr>
<tr>
<td>1898</td>
<td>Sea Customs Act</td>
<td>Goods with ‘false trade description’ were prevented from importing under this act.</td>
</tr>
<tr>
<td>1919</td>
<td>Poisons Act</td>
<td>Regulated the import, possession and sale of poisons.</td>
</tr>
<tr>
<td>1937</td>
<td>Import of Drugs Bill</td>
<td>Later it was withdrawn.</td>
</tr>
<tr>
<td>1940</td>
<td>Drugs Bill</td>
<td>To regulate the import, manufacture, sale and distribution of drugs in British India. This Bill was finally adopted as ‘Drugs Act of 1940’.</td>
</tr>
<tr>
<td>1941</td>
<td>Drugs Act of 1940</td>
<td>The first Drugs Technical Advisory Board (D.T.A.B.) under Drugs Act of 1940 was constituted.</td>
</tr>
<tr>
<td>1941</td>
<td>Central Drugs Laboratory</td>
<td>National statutory laboratory of the Government of India for quality control of Drug and Cosmetics</td>
</tr>
<tr>
<td>1945</td>
<td>Drugs Rule</td>
<td>The Drugs Act has been modified from time to time and at present the provisions of the Act cover Cosmetics and Ayurvedic, Unani and Homeopathic medicines in some respects.</td>
</tr>
<tr>
<td>1945</td>
<td>Pharmacy Bill</td>
<td>Pharmacy Bill to standardize the Pharmacy Education in India.</td>
</tr>
<tr>
<td>1946</td>
<td>Indian Pharmacopoeial List</td>
<td>It contains lists of drugs in use in India at that time which were not included in British Pharmacopoeia.</td>
</tr>
<tr>
<td>1948</td>
<td>Pharmacy Act 1948</td>
<td>An Act to regulate the profession of pharmacy.</td>
</tr>
<tr>
<td>1948</td>
<td>Indian Pharmacopoeial Committee</td>
<td>Constituted for publication of Indian Pharmacopoeia.</td>
</tr>
<tr>
<td>1949</td>
<td>Pharmacy Council of India</td>
<td>Established under Pharmacy Act 1948.</td>
</tr>
<tr>
<td>1954</td>
<td>Education Regulation</td>
<td>Education Regulation have come in force in some states but other states lagged behind.</td>
</tr>
<tr>
<td>1954</td>
<td>Drugs and Magic Remedies Act</td>
<td>To stop misleading advertisements.</td>
</tr>
<tr>
<td>1954</td>
<td>Prevention of Food Adulteration Act</td>
<td>To maintain standards in usage of additives, preservatives, antioxidants, flavoring agents, chelating agents as permitted in the Indian Pharmacopoeia</td>
</tr>
<tr>
<td>1955</td>
<td>Medicinal and Toilet Preparations Act</td>
<td>Introduced to enforce uniform duty for all states for alcohol products.</td>
</tr>
<tr>
<td>1955</td>
<td>Indian Pharmacopoeial Commission</td>
<td>First Edition of Indian Pharmacopoeia was published.</td>
</tr>
<tr>
<td>1985</td>
<td>Narcotic and Psychotropic Substances Act</td>
<td>To protect society from the dangers of addictive drugs.</td>
</tr>
<tr>
<td>1995</td>
<td>Drugs (Price Control) Order</td>
<td>Controls the price of drugs in India and this Order changed from time to time.</td>
</tr>
<tr>
<td>2002</td>
<td>Patents (Amendment) Act</td>
<td>To bring India’s patent regime into compliance with the WTO TRIPs Agreement.</td>
</tr>
<tr>
<td>2008</td>
<td>PharmD regulations</td>
<td>Regulations for PharmD education in India.</td>
</tr>
<tr>
<td>2014</td>
<td>Minimum Qualification for Teachers in Pharmacy Institutions Regulations</td>
<td>To maintain the minimum standards of teaching in various departments of a pharmacy college or institution imparting diploma, graduate and post-graduate education shall be as prescribed there under.</td>
</tr>
<tr>
<td>2015</td>
<td>Pharmacy Practice Regulations</td>
<td>To ensure best practices to implement Code of pharmacy ethics, duties, responsibilities of pharmacist, inspection of pharmacies, maintain GPP, CEP and implementing other laws related to D&amp;C Act</td>
</tr>
</tbody>
</table>
Pharmacists working in the community practice setting are either diploma pharmacists or graduate pharmacists with BPharm degrees. Their presence is legally required during the dispensing of prescription medicines and selling of OTC medicines according to Rule 65(15) of the Drugs and Cosmetics Rules 1945.

Pharmacists represent the third largest health care professional group in the world after nurses and doctors/physicians. Public health deals with improving health or preventing illness in a population, and public health programs are usually coordinated by the government or a group/body accountable to a community. Improving public health in any country requires intersectoral action and combined efforts of people from various professions and disciplinary backgrounds.

4.2.2 Regulation of Pharmacies in India
Pharmacy practice in India is governed by the Drugs & Cosmetics Act 1940 and the Drugs & Cosmetics Rules 1945 formed under the Act, which stipulated manufacturing, distribution and sale of drugs, where the regulations to acquire a license to run a pharmacy are prescribed under “Part VI - sale of drugs other than homoeopathic medicines”. The State Governments appoint the licensing authorities, i.e., State Drug Control Offices for this purpose. Though the practice of homoeopathic medicine is common in India, a separate license is required to sell such medicines. The regulatory officers with titles drug inspectors or drug controllers appointed under the Act regulate the licensing and running of pharmacies (also called medical stores, chemists and druggists).

4.2.3 Regulation of Pharmacist Registration in India
In 1948, the Pharmacy Act was enacted as the India’s first minimum standard of educational qualification for pharmacy practice to regulate the practice, education, and profession of pharmacy. Minimum qualification for registration and practice of pharmacy in India is a pass in one or more of the following:
i) DPharm, a 2 year program from an institution approved under Section 12 of the Pharmacy Act, followed by 500 hours of practical training in one or more of the following institutions namely, (a) Hospitals/dispensaries run by Central/State Government; (b) a pharmacy, chemist and druggist licensed under the Drugs and Cosmetics Rules, 1945 made under the Drugs and Cosmetics Act, 1940; (c) Drugs manufacturing unit licensed under the Drugs and Cosmetics Act, 1940 and Rules made there under.

ii) BPharm a 4 year degree program from an institution approved by the PCI under section 12 of the Pharmacy Act. BPharm is a 4 years degree program.

iii) PharmD a 6 year full time doctorate program as per the PharmD Regulations 2008, framed under section 10 of the Pharmacy Act 1948.

4.2.4 The New Pharmacy Practice Regulations (2015)

In exercise of the powers conferred by Section 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government made Pharmacy Practice regulations, 2015. These regulations are made to ensure the best practices to implement Code of Pharmacy Ethics, rolled out the duties and responsibilities of registered pharmacist in general, inspection of pharmacies by the inspectors to inspect pharmacies, maintaining Good Pharmacy Practices and Continuing Education Programs and making sure of implementing other laws related to Drugs and Cosmetics Act. Practice regulations, 2015 rolled out duties of registered pharmacists to their patients and also described pharmacist responsibilities in connection to dispensing and/or supply of drugs, promotion of rational use of drugs and patient counseling. Duties of registered pharmacist to the public and to the profession, misconduct and punishments and disciplinary action were also described in these regulations. These regulations will help to change the face of pharmacy practice in India. Provisions of patient counseling and the provision of those acts or services necessary to provide pharmaceutical care in all areas of patient care including primary care. The professional regulations (Pharmacy Practice regulations, 2015) ensure the minimum practice standards in the society. These regulations are new hope to the profession. Various duties of pharmacists as described the new regulations are reproduced below:
Duties of registered pharmacists to their patients

Obligations to the Sick:

(a) Though a registered pharmacist is not bound to attend each and every person asking his services, he shall not only be ever ready to respond to the calls of the sick and the injured, but shall be mindful of the high character of his mission and the responsibility he discharges in the course of his professional duties. Pharmacists shall never forget that the health and the lives of those entrusted to his care depend on his skill and attention.

(b) Registered pharmacist having any incapacity detrimental to the patient or which can affect his performance vis-à-vis the patient, shall not be permitted to practice his profession.

(c) Pharmaceutical care (in addition to the provisions of Drugs and Cosmetics Rules 1945 and Schedule N of the said Rules) the following provisions shall be included. No person other than a Registered Pharmacist shall compound, prepare, mix, dispense or supply of any medicine on the prescription of a Registered Medical Practitioner (Schedule H & X drugs). A Registered Pharmacist shall review the patient record and each prescription presented for supply for the purpose of promoting therapeutic appropriateness by indentifying:

i) Over utilization or under utilization

ii) Therapeutic duplication

iii) Drug-disease interactions

iv) Drug-drug interactions

v) Incorrect drug dosage or duration of drug treatment

vi) Drug-allergy interactions

vii) Correlation of availability of drugs (to avoid artificial shortage of drugs)

viii) Clinical abuse/misuse.

Patience, Delicacy and Secrecy

Patience and delicacy shall characterize the registered pharmacist. Confidences concerning individual or domestic life entrusted by patients to a registered pharmacist and defects in the disposition or character of patients observed during medical attendance shall never be revealed.
unless their revelation is required by the laws of the State. Sometimes, however, a registered pharmacist shall determine whether his duty to society requires him to employ knowledge, obtained through confidence as a registered pharmacist, to protect a healthy person against a communicable disease to which he is about to be exposed. In such instance, the registered pharmacist shall act as he would wish another to act toward one of his own family in like circumstances.

**Duties of registered pharmacist**

**Dispensing/supply of Drugs:**

a. The various activities of dispensing (prescription assembly) like removal of drugs from the packing, filling the prescription etc. may be performed under the super-vision of a registered pharmacist by any person who has been trained to perform these activities. However, the actual dispensing of drugs to patients shall only be performed by the Registered pharmacist after due verification of the prescription filled by others.

b. A Registered pharmacist shall undertake a pharmaceutical assessment of every prescription presented for dispensing. For the purpose of the act, pharmaceutical assessment is defined as the point at which Registered pharmacist applies his knowledge to establish the safety, quality, efficacy and rational use of drugs treatments specified by a prescriber.

c. Patient confidentiality shall be maintained at all times.

d. Appropriate information shall be provided to the patient or the care giver and, where possible, understanding of this information should be checked.

e. For all prescriptions handled by the pharmacy:

   (i) Patient details shall be checked and confirmed;

   (ii) Pharmaceutical assessment shall be made;

   (iii) Proper documentation shall be maintained.

f. Assessment of the prescription should include but not be limited to assessment of whether:

   (i) The prescription is legally valid.

   (ii) The prescription includes an appropriate dosage form and appropriate route of administration.

   (iii) Prescription is appropriate to the patient’s condition.
(iv) Duration of treatment is correct.
(v) Prescription is appropriate according to patient’s parameters (age, weight etc.) and previous medication.
(vi) Prescription is compatible with other medications.
(vii) Prescription is consistent with formulary and guidelines, if any.
(viii) Possibility of side effects and adverse drug reactions exist.
(ix) Contra-indicated.
(x) Potential for misuse and inappropriate use of the medicines in prescription by patient exists.
(xi) Prescription is complying with labeling requirements.

g. Compounding, dispensing and labeling of required drug products should ensure that:
   (i) The drug product matches the prescription.
   (ii) The drug product has not expired.
   (iii) The drug product is appropriately compounded (if necessary), packed and labeled appropriately.
   (iv) The accuracy of dispensing is checked by Registered Pharmacist.
   (v) Proper documentation is made.

h. Delivery of the drug product to the patient/carer is done in such a way as to ensure that:
   (i) The Registered pharmacist hands over the drug to the patient/carer.
   (ii) Appropriate information on drugs is provided to the patient/carer.

Pharmacist for promotion of rational drug use

To promote rational use of drugs, the pharmacist shall involve himself in activities such as:
(i) Preparation of formularies both at the hospital level and at state/national levels.
(ii) Critical assessment of promotional materials prepared by the drug companies.
(iii) Dissemination of evaluated information through authorized sources.
(iv) Updating the knowledge of drugs through continuing education programs and also to organize educational programs for health professionals.
(v) Preparation and dissemination of patient information leaflets.
**Patient counseling**

Upon receipt of a prescription (prescription drug order) and following a review of the patient’s record, a Registered Pharmacist shall personally initiate discussion of matters that will enhance or optimize drug therapy with each patient or care given of such patient. Such discussion shall be in person, whenever practicable or by telephone and shall include appropriate elements of patient counseling. Such elements may include the following:

(i) Name and description of the drugs;
(ii) The dosage form, dose, route of administration, and duration of drug therapy;
(iii) Intended use of the drug and expected action;
(iv) Special directions and precautions for the drug;
(v) Common severe side effects or adverse effects or interactions and therapeutic contraindications that may be encountered, including their avoidance, and the action required if they occur;
(vi) Techniques for self monitoring drug therapy;
(vii) Proper storage of the drugs;
(viii) Prescription refill information;
(ix) Action to be taken in the event of a missed dose;
(x) To ensure rational use of drugs.

**Pharmacies providing patient counseling shall have regard to the following:**

- Only Registered pharmacists are involved in counseling.
- Facilities are provided for confidential conversation and patient confidentiality is maintained.
- Patient information leaflets are provided.
- Proper documentation is made.
- Unnecessary counseling should be avoided.
- Counseling for Patient’s Benefit: In every consultation, the benefit to the patient is of foremost importance. All registered pharmacists engaged in the case should be frank with the patient and his attendants.
Punctuality in counseling: Utmost punctuality should be observed by a registered pharmacist in making themselves available for counseling.

The pharmacist shall maintain the records pertaining to drugs administered to the patients (drug card) that may be utilized for the evaluation of the drug therapy.

The pharmacist is authorized (as a Health care professional) to undertake process and outcome research, health promotion and education and provide health information. Also to undertake the pharmacoepidemiological studies.

**Duties of registered pharmacist to the public and to the profession**

**Registered pharmacists as Citizens:** Registered pharmacists, as good citizens, possessed of special training shall disseminate advice on public health issues. They should play their part in enforcing the laws of the community and in sustaining the institutions that advance the interests of humanity. They shall particularly co-operate with the authorities in the administration of sanitary/public health laws and regulations.

**Physician/Nurses:** Registered pharmacists shall seek cooperation from physicians, dentists and nurses wherever required.

**Public and Community Health:** Registered pharmacists, especially those engaged in public health work, shall enlighten the public concerning quarantine regulations and measures for the prevention of epidemic and communicable diseases. At all times the registered pharmacist shall notify the constituted public health authorities of every case of communicable disease under his care, in accordance with the laws, rules and regulations of the health authorities. When an epidemic occurs a registered pharmacist shall not abandon his duty for fear of contacting the disease for himself.
4.3 Ownership of Community Pharmacies in India

It is mandatory to get a license to run a pharmacy in India.\textsuperscript{164} The community/retail pharmacy sector is the prime source of medicines for both ambulatory and hospitalized patients (minimum stock in many hospitals). The medicines manufactured by pharmaceutical companies are made available to the community pharmacy level through their distributor or clearing and forwarding agent.\textsuperscript{165} Pharmacy licensing is controlled by the Food and Drug Administration of India which awards a license only to a qualified pharmacist to operate.\textsuperscript{166}

In India, ownership of a pharmacy is not an exclusive domain of the pharmacist alone, as in many European nations. This has resulted in anyone without proper education or qualification or background or experience to start a pharmacy. Pharmacists own few pharmacies, but a large majority are owned by non-pharmacists.\textsuperscript{167} Individuals pharmacists and partnerships or corporate owned must have a supervising pharmacist.\textsuperscript{168} As per the Indian Brand Equity Foundation (IBEF), pharmacy is one of the top five key players in Indian retail industry.

Figure 2. Flow diagram showing the process of setting up a new pharmacy in India
4.4 Types of Community Pharmacies in India

Pharmacy chains are expanding operations using different store formats. Primarily, community pharmacies are to serve the people of India in the following different formats as shown in Table 7.

Table 7. Types of community pharmacies in India

<table>
<thead>
<tr>
<th>Type of pharmacy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital pharmacies</td>
<td>• are usually set-up in hospitals and dispense a limited number of medicines.</td>
</tr>
<tr>
<td></td>
<td>• cater mainly to the requirements of patients admitted in hospitals.</td>
</tr>
<tr>
<td>Independent / standalone</td>
<td>• located in or near residential areas</td>
</tr>
<tr>
<td>pharmacies</td>
<td>• some offer home delivery</td>
</tr>
<tr>
<td></td>
<td>• target customers from middle and upper class households</td>
</tr>
<tr>
<td>Malls/ shop-in-shops</td>
<td>• located in supermarkets, malls or departmental stores</td>
</tr>
<tr>
<td></td>
<td>• Spenser has tie-up with LifeKen Medicines for its daily stores in south India</td>
</tr>
<tr>
<td>Townships</td>
<td>• located in supermarkets, malls or departmental stores</td>
</tr>
</tbody>
</table>

Apart from the above pharmacy types, the Government of India under the Aegis of Department of Pharmaceutical, Jan Aushadhi initiative was taken in 2008 to make quality drugs available at affordable prices through dedicated stores selling generic medicines which are available at lesser prices but are equivalent in quality and efficacy as expensive branded drugs. These pharmacies stock only generic medicine approved and listed by the Bureau of Pharma Public sector undertakings of India (BPPI). These are called Jan Aushadhi stores and are currently 137 such pharmacies in India.

4.5 Types of Pharmacist Work Areas in India

Apart from Industry, regulatory agencies, marketing, academics, research, pharmacists practice in the various settings. “Pharmacy Practitioner” means an individual with valid license/registration or otherwise authorized under the Act to counsel or otherwise and administer drugs in the course of professional practice, these individuals may be practicing as Community/Hospital/Clinical/Drug information-pharmacist.
Community pharmacist is an individual currently registered and who works according to legal and ethical guidelines to ensure the correct and safe supply of medical products to the general public. They are involved in maintaining and improving people's health by providing advice and information as well as supplying prescription medicines.

The area of government practice for pharmacists covers Rural Medical Dispensary (RMD); Primary Health Centre (PHC); Community Health Centre (CHC); Urban Health Centre (UHC); district, Sub-divisional and Rural hospitals; large tertiary care and teaching hospitals and other public hospitals including Railways, ESIS, Coal India, CGHS, MPT, Airlines, Armed Forces, Jail hospitals, etc.

Hospital pharmacists is an individual currently registered and working in a hospital pharmacy service, primarily within the public / private sector. They are responsible for ensuring the safe, appropriate and cost-effective use of medicines. Hospital pharmacists use their specialist knowledge to dispense drugs and advice patients about the medicines which have been prescribed. They work collaboratively with other health care professionals to devise the most appropriate drug treatment for patients. Some pharmacists are also involved in manufacturing required drug treatments.

Drug Information Pharmacist is an individual currently registered who works in a community pharmacy/hospital Pharmacy/teaching hospital/ other health care settings and provides information and advice regarding drug interactions, side effects, dosage and proper medication storage to patients/physicians/dentists/other health care professionals.

Clinical Pharmacist is an individual currently registered and who provides patient care that optimizes the use of medication and promotes health, wellness and disease prevention. Clinical pharmacists care for patients in all health care settings. Clinical pharmacists often collaborate with physicians and other healthcare professionals.
The workflow of a community pharmacy is simple like in any other country doing direct dispensing. In India, generally there is no prescription drop off system. Usually the patient comes directly from the physicians, clinics or hospitals with prescriptions expecting the pharmacy to dispense or fill or refill the prescription. Depending on the size of the pharmacy, there are one or more pharmacists and shop assistants, who receive the patients and find medicine. The pharmacist checks medicine, counsel the patients after which the patient will go to cash counter and pay. This is only a common concept, however, in small pharmacies there is only one pharmacist managing all the functions. In some pharmacies pharmacist and assistant divide the functions. Figure 3 below illustrates common workflow of a community pharmacy in India.

Pharmacies attached to the GP’s office usually know the products that the physicians would prescribe. Hence, they maintain reasonable stocks as they do not want to lose business to the neighboring competing pharmacy. On medicine purchases in private pharmacies in India, there
is no co-pay settlement from the private insurance companies or from the government insurance system. Community pharmacies are not tied up with private insurance companies if a patient has insurance which reimburses his/her medicine, reimbursement will be processed directly between the patient and insurance company. Therefore, pharmacy has lesser administration work and pharmacies do not need to wait for settlement of reimbursements, which means, the patients pay for their medicine from the pocket. Usually, sales medical representatives from pharma industry visit both physicians and the pharmacies, where they brief the products and also offer promotions to push the products. Pharmacies order the medicine via sales representatives or through the wholesalers, depending on the size of manufacturing company and there are different policies that the companies follow.

4.7 Medicines Information Resources for Community Pharmacists in India

Indian pharmacists have available several medicines information sources to serve their customers. Official sources of drug information are Central Drug Research Institute (CDRI) and National Formulary of India (NFI) and the several drug information centers run in collaboration with state pharmacy councils, WHO country office, Universities, hospitals and other autonomous bodies. Chauhan et al.\textsuperscript{170} has presented an overview of drug information source centers available in India which is given below:

**National Information Centre on Drug and Pharmaceuticals (NICDAP)**

National Information Centre on Drug and Pharmaceuticals (NICDAP) which uses the library resources of Central Drug Research Institute; Government of India a constituent laboratory of Council of Scientific and Industrial Research. R&D activities in CDRI are supported by a modern knowledge Resource Center which comprises a fully computerized library with a rich collection of relevant books and periodicals, on-line subscription of a large number of databases and periodicals and an Information Center which provides many services as well as on-line response to queries.
**National Formulary of India (NFI)**
NFI is a guidance document for healthcare professionals and contains clinically oriented summaries about drugs. NFI is an official tool for pharmacists in India which is prepared by the Indian Pharmacopoeia Commission, under the Ministry of Health, Government of India. The drugs contained in NFI have been chosen for rational and economic prescribing. It helps in selection of drugs from a wide range of available drugs in the market. NFI is the drug formal information resource in India.

Apart from these, there are also several drug information centers established in collaboration with state pharmacy councils, WHO Country Office, universities, hospitals and other autonomous bodies. These centers are funded independently by State Pharmacy Councils or in collaboration with any other governmental, private or non-profitable organizations. It is free for pharmacists and/or patients to contact the DCIs to obtain any information related to medicines. These drug information centers receive queries/questions both from health professionals and patients over telephone, direct access and during the ward rounds; if DCI is located in a hospital. The following are some of the DCIs.

**List of Drug Information Centers Run at State Pharmacy Councils in India (Regional)**
- Drug Information Center, Maharashtra State Pharmacy Council, Maharashtra
- Andhra Pradesh state pharmacy council, Andhra Pradesh
- Drug information center, Jaipur, Rajasthan
- Drug information center, Raipur, Chhattisgarh
- Karnataka state pharmacy council (KSPC), Bangalore, Karnataka

**DIC's Set Up By Karnataka State Pharmacy Council, CDSCO, and Who India Country Office**
- Drug information center, Jaipur, Rajasthan
- Drug information center, Raipur, Chhattisgarh
- Drug information center, Panaji, Goa
- Drug information center, Dibrugarh, Assam

**Other Drug, Poison or Alcohol Information Centers in India**
- Alcohol and drug information center (ADIC), Trivandrum, Kerala
- Bowring and Lady Curzon hospital, Bangalore, Karnataka
- Bulletin on drug and health information (BIDI), Kolkata, West Bengal
- CDMU documentation center, Calcutta, West Bengal
- Christian medical college hospital Vellore, Tamil Nadu
4.8 Complex Supply Chain or Distribution System in India

The distribution of medicines and cosmetics is governed by various drug laws like the Drugs and Cosmetics Act and Rules, Narcotic Drugs and Psychotropic Substances Act.

Drug distribution in India has witnessed a paradigm shift. Before 1990, pharmaceutical companies used a different distribution system, in which they established their own depots and warehouses that now have been replaced by clearing and forwarding agents (CFAs). These organizations are primarily responsible for maintaining storage (stock) of the company’s products and forwarding SKUs to the stockist on request. Most companies keep 1–3 CFAs in
each Indian state. On an average, a company may work with a total of 25–35 CFAs. Unlike a CFA that can handle the stock of one company, a stockist (distributor) can simultaneously handle more than one company (usually, 5–15 depending on the city area), and may go up to even 30–50 different manufacturers. The stockist, in turn, after 30–45 days (a typical credit or time limit) pays for the products directly in the name of the pharmaceutical company. The CFAs are paid by the company yearly, once or twice, on a basis of the percentage of total turnover of products.172,173

- **CFAs**: These organizations are primarily responsible for maintaining storage (stock) of the company’s products and forwarding SKUs to the stockist on request. Most companies keep 1–3 CFAs in each Indian state. On an average, a company may work with a total of 25–35 CFAs. The CFAs are paid by the company yearly, once or twice, on a basis of the percentage of total turnover of products.

- **Stockist**: is the distributor, who can simultaneously handle more than one company (usually, 5–15 depending on the city area), and may go up to even 30–50 different manufacturers. They pay for the products directly in the name of the pharmaceutical company after 30 to 45 days.

- **The retail pharmacy** obtains products from the stockist or substockist through whom it finally reaches the consumers (patients).

Unlike in the West, where a manufacturer can directly supply goods at the retail level, products in India move through a chain of intermediaries. The manufacturer supplies goods to the first layer comprising a clearing and forwarding agent, a super stockist or a company-owned depot. These, in turn, supply to stockist from whose premises goods are routed to wholesalers, medical institutions, hospitals and retailers. The retailer dispenses the drugs to final consumers. Manufacturers can directly supply to institutions and hospitals, but never to a retailer.174 Drug distribution in India is layered and regulated, which is showed in the flow diagram in Figure 4 below.
4.9 Duties of Pharmacist

Like in another country, the pharmacists in India have several roles. They have several responsibilities like dispensing prescription medicine, provide required medicine information and counsel the patients to obtain optimal therapeutic outcomes, maintain medication records, health promotion and prevention of diseases, advice on self-care, pharmacovigilance, professional guidance to patients and other health care workers, and disposal of unused medicines. The pharmacists are also responsible for procurement, inventory and storage management. In 2011, The Pharmacy Council of India adopted WHO Good Pharmacy Practice (GPP) guidelines in community and hospital pharmacy settings\textsuperscript{175} and in 2015 the Pharmacy Practice regulations came into force. The GPP guidelines will help improving pharmacists professional contribution among other health professional and also in the society.
4.10 Pharmacy Profession - Future of Pharmacy Practice in India

In 2003, the Pharma Vision 2020 Charter was released by the then President of India, 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. Indian Pharmaceutical Association once again, with the support of the leaders of the pharmacy profession presented the road map to Pharma Vision 2020 at the 58th Indian Pharmaceutical Congress held in December 2006 at Mumbai. The themes of the subsequent Congresses have been centered on Pharma Vision 2020. In the year 2020, pharmacist and pharmaceutical scientist working within various disciplines of pharmacy will be well established and recognized as medicine expert and will be an expert in health promotion and disease prevention. The Vision 2020 theme is being carry forwarded through the National Pharmacy Week every year and also Indian Pharmaceutical Congress. This year the theme of the Indian Pharmaceutical Congress is "Pharma Vision 2020-Pharmacists for a Healthy India" with a tag line, 'Quality Pharmaceuticals and Patient Welfare'.

4.11 The Vision 2020 of Indian Pharmacy Profession

According to Pharma Vision 2020 Charter, in the year 2020, pharmacists and pharmaceutical scientists working within various disciplines of pharmacy will be established and recognized as the medicines experts and experts in health promotion and disease prevention.

- The pharmacists will interact with other professionals as the preferred source of information and advice on prescribing and medicine management of disease.
- Pharmacists will develop their pharmaceutical expertise and facilities in order to deliver high-tech and individually-tailored medicines in the primary care setting.
- Pharmacists will actively involve in national health program like promotion of essential medicines, primary health care, HIV/AIDS, TB, Malaria, tobacco use or family planning.
Pharmacists will become knowledgeable to participate in medication management and outcome monitoring, including the ability to alter doses and change medicines with agreed therapeutic protocols.

Indian pharmacist will be actively involved in national health program and perform individualized therapy. Finally a pharmacist should be patient oriented rather than product-oriented, so that he can be a total healthcare provider.

4.12 Future of Pharmacy Profession and Challenges

The number of individuals in India having lifestyle diseases, such as diabetes, hypertension, coronary heart diseases and cancer are steadily rising. Pharmacists thus have the potential to help the nation in facing these challenges. Pharmacists with their knowledge and expertise can help in production, distribution, storage and dispensing of quality medicines, promoting rational medicine use, health promotion, medicines management, providing patient counseling to improve adherence of therapy, assisting patients in making effective self-medication choices and decisions for their health and much more.

India has a vast and growing pharmaceutical industry. With the implementation of the WTO (World Trade Organization) proposals on intellectual property rights, the Indian pharmaceutical industry will quickly have to increase its focus and invest more in terms of money, infrastructure and manpower on research and development of new medicines, both for tropical diseases as well as lifestyle/chronic diseases.

All these factors indicate that Indian healthcare industry has a long way to go and pharmacists have to play a vital role in it. In rural areas, where often availability of doctors is a serious problem, pharmacists can take up active roles in providing basic health care and advice on medicine use, health promotion, and self medication. Pharmacists can also look upon new
avenues in immunizations, tobacco cessation, home visits for medication review and care, counseling services, etc.

In the coming years, there will be an increasing demand for qualified pharmacists in all sectors, namely research, regulatory affairs, manufacturing, marketing, clinical, community, academics, etc. both in our country as well as across the world.

Pharmacy is a rewarding career, in terms of personal satisfaction and financial compensation, as well as service to the people. So start planning from today. As the old Chinese saying goes “A journey of a thousand miles begins with one small step”.
5 \hspace{1em} PHARMACY EDUCATION IN INDIA

This chapter covers history of pharmacy profession in India and how pharmacy education evolved, pharmacy education programs including admission requirements, production overview and education regulations and quality of pharmacy education. There is also brief description on pharmacy education in previously selected other countries, namely USA, Denmark and Finland.

5.1 \hspace{1em} History of Pharmacy Education in India

India is made up of 29 States and 6 Union Territories with a population of over 1.3 billion residents.\(^{180}\) India has the second largest education system in the world.\(^{181}\) Its higher education system is also one of the largest in the world, and has been witnessing healthy growth in its number of institutions and enrollment in last few decades. While professional courses account for a third of enrolment, the fee for such courses is significantly higher than general courses (upwards of 10 times), resulting in majority spending towards such courses.\(^{182,183}\) Such professional courses are medical and dental doctor, law, engineering and pharmacy.

The colonial period (1750–1947) brought the new western system of medicine and paved the way to emerge pharmacy houses in India. Though pharmacy was practiced since ages in India, it is recognized as a profession only from 18\(^{th}\) century.\(^{184,185}\) Pharmacy education in India, at the certificate level, was started in 1842 in Goa by the Portuguese\(^{186}\) and as a university level program at the Banaras Hindu University as BPharm course in 1937.\(^{187}\) The courses were provided for studies in pharmaceutical chemistry, pharmacy, pharmacognosy, and pharmaceutical economics which prepared graduates to work as specialists in quality control and standardization of drugs for pharmaceutical companies,\(^{188,189}\) but not for patient care in pharmacy practice.\(^{10}\) As per the report of the health survey and planning committee of Government of India, 1961, the course for the graduate pharmacists (BPharm) was designed to train the smaller number who will be engaged in manufacturing concerns, analytical laboratories, and educational medical institutions,\(^{190}\) which continued to have the same contents.
The pharmacy practice scenario and especially community pharmacy practice during pre-independence era was highly unregulated and there were no restrictions on the practice of pharmacy in India. After the Indian independence in 1947, the Pharmacy Act 1948 was enacted for the regulation of the profession and practice of pharmacy in India.

The Pharmacy Council of India (PCI), a statutory body governed, was constituted under section 3 of the Pharmacy Act, 1948 to regulate the pharmacy education and profession in India. Important functions and duties of the PCI are:

i) to prescribe minimum standard of education required for qualifying as a pharmacist,

ii) to ensure uniform implementation of the educational standards throughout the country,

iii) framing of Education Regulations prescribing the conditions to be fulfilled by the institutions seeking approval of the PCI for imparting education in pharmacy,

iv) inspection of pharmacy institutions seeking approval under the Pharmacy Act to verify availability of the prescribed norms,

v) to approve the course of study and examination for pharmacists,

vi) to maintain Central Register of Pharmacists and

vii) to approve qualifications granted outside the territories to which the Pharmacy Act extends i.e. the approval of foreign qualification.

During past decade, the pharmacy profession has expanded significantly in implementation of need-based educational programs and professional practice. However, future of pharmacy profession rests on (1) developing well-qualified, knowledgeable, skilled, and competent human resources; (2) providing high-quality pharmaceutical care services in health care system; and (3) fulfilling other professional obligations/responsibilities on the basis of societal need. These are achievable only through changes in the legislative framework that improve and maintain high standards of the pharmacy profession in both educational and practice settings.
5.2 Pharmacy Education Programs and Admission Requirements in India

To meet varying needs of the profession in India at different levels, several pharmacy programs offered, which are diploma in pharmacy (DPharm) a 2 year full time program; bachelor of pharmacy (BPharm), a 4 year full-time program; master of pharmacy (MPharm), a 2 year program – with specialization in biotechnology, pharmaceutical chemistry, quality assurance, pharmaceutics, pharmacognosy, pharmacology, pharmacy practice; master of science in pharmacy [MS (Pharm)], master of technology in pharmacy [MTech (Pharm)], doctor of pharmacy (PharmD), a 6 year program and doctor of philosophy (PhD) in pharmacy. However, DPharm, BPharm and PharmD are the only recognized programs to become registered pharmacist in India. There are over 1,700 institutions that offer different pharmacy programs in India with an intake of over 100,000 students per academic year. Pharmacy education system in India with entry level requirements to various programs is illustrated in Figure 5. Upon successful completion of one or more programs shown within the dots can practice pharmacy as registered pharmacists in India.

5.2.1 Admission Requirements for the Enrolment of Pharmacy Programs

Available pharmacy programs, duration and eligibility requirements to enter different programs are also explained below.

5.2.2 Diploma in Pharmacy (DPharm)

Admission to DPharm program as per Education Regulations 1991, pass in any of the following examinations with Physics, Chemistry and Biology or Mathematics:

i) intermediate examination in Science; (higher secondary examination);

ii) first year of the three year degree course in science;

iii) 10 year of secondary education (high school) + 2 years higher secondary examination (academic stream) in science;

iv) pre-degree examination;

v) any other qualification approved by PCI as equivalent to any of the above examination.
5.2.3 Bachelor of Pharmacy (BPharm)
Admission to the first-year BPharm program is made directly from higher secondary school (10+2 with physics, chemistry, biology or mathematics) plus on the basis of marks obtained in the higher secondary examination and/or on the basis of a merit list rank prepared based on scores on an entrance examination administered by a state or individual institution.12

5.2.4 Master of Pharmacy (MPharm)
The criterion for entry to an MPharm program is academic performance in the BPharm or an entrance test or both. Currently, there is more demand for the MPharm programs than the availability of places in the country.12 An important criterion, a high Graduate Pharmacy Aptitude Test (GPAT) score, qualifies a student to receive government scholarship during the period of their MPharm study. This criterion is optional for admission to the first-year MPharm program. However, all the public institutions require both past academic performance and GPAT score for application to the MPharm program.12, 197

5.2.5 Doctor of Pharmacy (PharmD)
A six academic years (five years of study and one year of internship/residency) full time program. Minimum qualification for admission to PharmD is a pass in:

i) 10+2 examination with physics and chemistry as compulsory subjects along with mathematics or biology or

ii) DPharm course from an institution approved by PCI or

iii) any other qualification approved by PCI as equivalent to any of the above examinations.198
Figure 5. Pharmacy education system in India. Up on successful completion of one or more programs shown within the dots can practice pharmacy as registered pharmacists in India.

* To pursue PharmD (Post Baccalaureate) which is three years full-time program (2 years of study and 1 year residency), pass in BPharm from an institution approved by the PCI is minimum criteria for admission.

5.3 Production Overview

An overview on types of pharmacy programs and number of colleges offering pharmacy programs and approved student intake per year is described in Table 8. India has provision for over 100,000 pharmacy admissions each year, which includes DPharm, BPharm and PharmD.

There are about one million registered pharmacists in India working in various positions, applying their unique knowledge and skills, contributing to the health of the nation.
Table 8. Pharmacy programs, regulatory bodies and number of colleges and admissions in India

<table>
<thead>
<tr>
<th>Academic program</th>
<th>Duration of program</th>
<th>Duration of internship*</th>
<th>Regulation authority</th>
<th>Number of colleges</th>
<th>Number of admissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPharm</td>
<td>2 years</td>
<td>3 months</td>
<td>PCI + AICTE</td>
<td>708</td>
<td>42,062</td>
</tr>
<tr>
<td>BPharm</td>
<td>4 years</td>
<td>3 months</td>
<td>PCI + AICTE</td>
<td>919</td>
<td>59,844</td>
</tr>
<tr>
<td>PharmD</td>
<td>5 years</td>
<td>12 months</td>
<td>PCI</td>
<td>142</td>
<td>4,270</td>
</tr>
<tr>
<td>PharmD (Post Baccalaureate)</td>
<td>3 years</td>
<td>12 months</td>
<td>PCI</td>
<td>57</td>
<td>570</td>
</tr>
</tbody>
</table>

*Internship program = practical training in hospitals/ dispensaries and/or in a pharmacy and/or drugs manufacturing unit

PCI = Pharmacy Council of India
AICTE = All India Council for Technical Education

5.4 Regulation of Pharmacy Education in India

Pharmacy education in India is regulated by 2 statutory bodies: PCI and AICTE. AICTE was established under the AICTE Act 1987. The AICTE is primarily responsible for planning, formulating, maintaining norms and standards in technical education, which includes pharmacy. Pharmacy education at all levels excluding PharmD is regulated by AICTE. All institutions running DPharm, BPharm and MPharm must have an approval from AICTE to run the courses.

5.5 Quality of Pharmacy Education India

National Board of Accreditation (NBA) is established under the All India Council for Technical Education Act, 1987, to access and accredit the colleges and/or institutions of technical and professional education. NBA is to promote and recognize excellence in technical education in colleges and universities - at both the undergraduate and post-graduate levels. NBA accredits pharmacy programs at diploma (DPharm), degree (BPharm) and Postgraduate (MPharm) levels. NBA accredits programs and not colleges/ institutions/ departments.
PCI is in process to establish National Taskforce for Quality Assurance in Pharmacy Education (NTF QAPE) to oversee the implementation of PCI’s initiative for quality assurance in pharmacy education. The initiative aims to enable the sustainability of a pharmacy workforce that is relevant to local needs and also align with global expectations. The PCI envisages that by the year 2020, NTF QAPE will help overcome weaknesses in the education system and help produce appropriately trained pharmacists with the competencies to not only meet the demands of the country, but also be a part of a global competent health care workforce.

Some premium institutions from India are also applying for the USA’s Accreditation Council for Pharmacy Education’s (ACPE) accreditation program under ACPE’s International Services Program, which provides the confidence in the quality of education that the institutions are providing.

5.5.1 Quality of Pharmacy Teaching in India
The Pharmacy Council of India, through an Extraordinary Gazette approved by the central government of India on 12, November 2014, made new regulations to maintain the minimum standards of teaching in various departments of a pharmacy college or institution imparting diploma, graduate and post-graduate education shall be as prescribed there under.

5.5.2 Bachelor of Pharmacy (Practice) Regulations, 2014
Bachelor of Pharmacy (Practice) consists of a degree certificate of having completed the course of study and passed examination as prescribed in these regulations for the purpose of additional qualification to be entered in the register of pharmacists. These new regulations will help upgrading the qualification of practicing pharmacists with Diploma in Pharmacy.

In global pharmacy and pharmaceutical education initiatives, the call for circular reform has been raised by International Pharmaceutical Federation (FIP). In developed countries, patient-centered curricula and public health pharmacy are focused on tackling ever-changing health environments. If the full potential of pharmacists is to realize in India, their expertise
in medicine management should be utilized to make them part of national health and pharmaceutical policies, the curriculum of different Indian pharmacy education programs needs to ensure that pharmacists are able to take their role in patient-centered activities and national public health programs. For this purpose, it is important to assess curriculum for public health and patient care aspects and compare with other countries where there is more emphasis and exposure on these aspects.

5.6 Pharmacy Education in Other Countries

5.6.1 Pharmacy Education Programs in USA

USA has PharmD as the only program to practice the pharmacy in the country as a pharmacist (Table 1). PharmD programs at all US universities must be accredited by the Accreditation Council for Pharmacy Education (ACPE), the national agency for accreditation of professional degree programs in pharmacy and providers of continuing pharmacy education. Schools of Pharmacy offering the traditional Master of Science in Pharmacy (MSc Pharm) and PhD programs prepare students for teaching and research careers. In USA, after successful completion of PharmD, one cannot directly register as pharmacist and start practicing pharmacy. The graduates with PharmD, willing to practice pharmacy must also:

i) complete internship, whose length vary for each state,

ii) pass North American Pharmacist Licensure Examination (NAPLEX), and

iii) Multistate Pharmacy Jurisprudence Examination (MPJE) state law examination which is conducted by State Pharmacy Boards.

Moreover, proof of completing continuing education programs, approved by Accreditation Council for Pharmacy Education (ACPE), is required for the renewal of pharmacist license.

5.6.2 Pharmacy Education Programs in Denmark

To become registered pharmacist and/or to own a pharmacy in Denmark, minimum qualification required is MSc degree in pharmacy (Table 1). MSc degree from Danish University of Pharmaceutical Sciences is the oldest program in Denmark. University of Southern Denmark is also offering both BSc and MSc in pharmacy programs duly recognized to register as a pharmacist which is accredited by ACE Denmark, the Danish Accreditation Institute.
Denmark, upon successful completion of MSc(Pharm) degree with 6 months internship (altogether 5 years), there are no additional exams required to be completed for becoming registered pharmacist and to practice pharmacy.

5.6.3 Pharmacy Education Programs in Finland

Finland has adopted a 2-tier university undergraduate training program for pharmacists consisting of BSc and MSc degrees, which is in line with the Bologna Declaration harmonizing structures of the European university degrees.\textsuperscript{214,215} The BSc degree consists of 180 ECTS credits and it takes 3 years to complete. The MSc degree takes an additional 2 years to complete (total 300 ECTS credits).\textsuperscript{216} MSc level pharmacists mostly work in managerial and leadership positions and in positions requiring advanced pharmaceutical expertise. A majority of BSc pharmacists work in community pharmacies being responsible for dispensing, patient counselling and customer service. A pharmacy can be owned only by a MSc pharmacist.\textsuperscript{217}

In addition to the minimum requirements specified in Directive 2005/36/EC of the European Union and of the Council for Pharmaceutical Education, students pursuing the BSc(Pharm) and MSc(Pharm) degree must obtain professional and practical competencies in areas determined nationally important for pharmacists to acquire during their basic education. An essential part of BSc(Pharm) curriculum in Finland is an obligatory internship of 6 months (30 ECTS credits), which is integrated with professional study at the university.\textsuperscript{218} The internship can be taken in a community pharmacy which is open to the public (minimum 3 months/15 ECTS credits), or in a hospital under supervision of that hospital’s pharmaceutical department (maximum 3 months/15 credits).\textsuperscript{219,220,221}

Finnish BSc and MSc degrees are designed to prepare students for professional practice. The curriculum has elective courses both in the bachelor's and master’s degree. The master's degree aims at developing further the students' scientific skills and includes an obligatory 6-month research project (Master’s thesis, 40 ECTS credits).\textsuperscript{222} In Finland, both BSc (3 years) and MSc (5 years) of pharmacy can register and practice as pharmacist, however, only pharmacists
with a MSc degree may own a community pharmacy. Both the bachelors and masters programs have personal study plan which is approved by the professor or other nominated senior instructor. The personal study plan gives flexibility to the students to choose their area of interest. Students interested in community pharmacy practice, and social and clinical pharmacy can plan their studies and become experts. In Finland, graduates with bachelor’s (BSc) and master’s (MSc) degree in pharmacy do not need additional exams to become registered pharmacist and practice pharmacy.
6 CONCLUSION OF THE LITERATURE REVIEW

India has shortage of medical and paramedical workforce and the pharmacists’ role in public health is not recognized by the policy makers and is not enrolled. There is evidence on expansion of the role of pharmacists in public health programs through pilot projects, but at a relatively slow pace. The barriers for pharmacists could be internal and external to the pharmacy environment such as knowledge, confidence levels, and recognition in general public and supportive policies. The pharmacists in India are not actively involved in public health programs while there is a great potential and opportunity to play an important role. To make this happen, it is important to examine and understand pharmacy curriculum, pharmacists’, physicians’ and public perceptions on pharmacist knowledge in public health programs and perceptions on pharmacist role in public health.
7 OBJECTIVES OF THE STUDY

This study consists of 4 parts that were conducted during 2012 – 2014. The objective of this study was to assess public health and patient care aspects in pharmacy education and the role of pharmacists in national health care programs in India. The research goal was to find out possibilities and ways of extending pharmacists involvement in national public health programs and how pharmacist education could partly facilitate this shift.

The following are detailed objectives by sub-studies:

- to review pharmacy education system in India (I, II)
- to compare the Indian pharmacy curricula of Diploma in Pharmacy (DPharm), Bachelor of Pharmacy (BPharm), and Doctor of Pharmacy (PharmD) to see the overall differences with a focus on the amount of time devoted for pharmaceutical policies and public health, patient care, and pharmacy practice aspects in the programs. (I).
- to compare Indian pharmacy curriculum of Diploma in Pharmacy (DPharm), Bachelor of Pharmacy (BPharm) and Doctor of Pharmacy (PharmD) with Pharmacy curriculum of USA, Finland and Denmark to see overall differences with a focus on the amount of time devoted in the programs for pharmaceutical policies and public health, patient care and pharmacy practice aspects. (II)
- to explore final year DPharm, BPharm and PharmD students’ awareness, perceived knowledge and attitude, and acquaintance with 11 major National Public Health Programs (NPHPs) and their attitude towards pharmacists’ involvement in public health and patient care. (III)
- to characterize physician perceptions on the role of pharmacists in public health and patient care. (IV)
8 METHODS

A triangulation process was used in this study by combining quantitative and qualitative methods (Figure 6, Table 9). The chosen methods were a comparative programmatic research (I, II) and cross-sectional surveys (III, IV).

![Diagram of study outline]

**Figure 6. The outline of the study**
Table 9. Overview of research plan by substudies I-IV

<table>
<thead>
<tr>
<th>Study</th>
<th>Aim of the study</th>
<th>Study design and method</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>To compare Indian pharmacy curriculum of DPharm, BPharm, and PharmD programs to see overall differences with a focus on the amount of time devoted for public health, patient care, and pharmacy practice aspects.</td>
<td>Programmatic research</td>
<td>The curriculum contents were divided into four core areas. The duration of time spent on each core subject area was given in number of hours, which were used for comparison.</td>
</tr>
<tr>
<td>II</td>
<td>To compare Indian pharmacy curricula with Pharmacy curriculum of USA, Finland and Denmark to assess differences with a focus on pharmaceutical policies and public health, patient care and pharmacy practice aspects.</td>
<td>Programmatic research</td>
<td>The curriculum contents were divided into four core areas and number of hours were collated and analyzed.</td>
</tr>
<tr>
<td>III</td>
<td>To explore awareness, perceived knowledge and attitude of Indian pharmacy students on National Public Health Programs (NPHPs).</td>
<td>A cross-sectional classroom survey to a convenient sample of final year pharmacy students in five pharmacy schools (n=326, response rate 100%)</td>
<td>Descriptive statistics (means, standard deviations, Chi-square tests)</td>
</tr>
<tr>
<td>IV</td>
<td>To characterizing physicians’ perceptions on the role of pharmacists in public health and patient care in India.</td>
<td>A cross-sectional survey to a convenience sample of physicians in Southern region in India (n=800, response rate 16%)</td>
<td>Descriptive statistics (means, standard deviations, Chi-square tests)</td>
</tr>
</tbody>
</table>

The current research was divided into the following four studies, each of them being published as a separate original publication (I-IV). Two studies were programmatic studies (I, II), while the remaining two were cross-sectional surveys (III, IV).

**8.1 Pharmacy Curricula Comparison**

A comparison of pharmacy curriculum to see the overall differences with a focus on the amount of time devoted for pharmaceutical policies and public health, patient care and pharmacy practice aspects was conducted. To do so, the curricula were analyzed and the work was divided into two parts.
8.1.1 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison between DPharm, BPharm and PharmD Programs (I)

The first part of the research compared the Indian pharmacy curriculum of Diploma in Pharmacy (DPharm), Bachelor of Pharmacy (BPharm), and Doctor of Pharmacy (PharmD) to see the overall differences with a focus on the amount of time devoted for pharmaceutical policies and public health, patient care and pharmacy practice aspects in the programs.

This was a programmatic research conducted between March 2012 and January 2013. The curricula were collected from the statutory bodies, not from the individual universities as the universities follow the standard curriculum provided by these statutory bodies, namely Pharmacy Council of India (PCI) and All India Council for Technical Education (AICTE).

Syllabus of Indian Pharmacy courses leading to become a registered pharmacist, DPharm, BPharm and PharmD were collected. The syllabus for DPharm and PharmD programs are uniform throughout the nation with same subjects, chapters and number of teaching hours per year as prescribed under the PCI Education Regulations 1991 and PharmD Regulations 2008, respectively, which were used for the comparison. It is mandatory for all the colleges conducting DPharm and PharmD to follow the syllabus prescribed by PCI under the relevant Acts. As per the Clause 10(i) of the AICTE Act 1987, it is mandatory for all the AICTE approved BPharm programs to maintain the uniformity in accordance with model curriculum. In fulfillment of this Clause, a Model curriculum for BPharm is prescribed by the AICTE in 2011, which was used for the comparison in this study.

Syllabus of Indian Pharmacy courses leading to become a registered pharmacist, DPharm, BPharm and PharmD was collected. The curriculum content from each program were divided into four core areas named as: Area 1: Basic Biomedical Sciences; Area 2: Pharmaceutical Sciences; Area 3: Social/Behavioral/Administrative Sciences; and Area 4: Clinical Sciences; as outlined in Appendix-B of Accreditation Council of Pharmacy Education’s (ACPE) accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of
pharmacy degree, 2011 version. The core curriculum comparison results were analyzed from each pharmacy program and compared with special focus on Social/Behavioral/Administrative Sciences and Clinical Sciences areas.

From each test curriculum that was collated, the number of hours of each core area was separated as described in ACPE’s accreditation standards and guidelines and the National Association of Boards of Pharmacies’s (NABP) Pharmacy Curriculum Outcomes Assessment (PCOA) guidelines. Subjects from each program are divided into theory lectures and practical hours in the laboratory. Theory hours are defined as the class-room teaching on chapters from curriculum by the lecturers/professors. The practical hours are defined as hours spent in laboratory or in a practical setting. The duration of time spent on each subject is given in number of hours, which is used for comparison.

8.1.2 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison with USA, Finland and Denmark (II)

The aim of this study was to compare Indian pharmacy curriculum of Diploma in Pharmacy (DPharm), Bachelor of Pharmacy (BPharm) and Doctor of Pharmacy (PharmD) with Pharmacy curriculum of USA, Finland and Denmark to see overall differences with a focus on the amount of time devoted to pharmaceutical policies and public health, patient care and pharmacy practice aspects in the programs.

8.1.2.1 Methodology

To achieve the objective of the study, this programmatic research was designed to compare curriculum of Indian pharmacy education programs (DPharm, BPharm and PharmD) with the pharmacy curriculum of Denmark, Finland and USA, where pharmacy is being practiced with patient care in focus. The study was conducted between March 2013 and August 2014.
8.1.2.1.1 Selection of Countries

WHO has grouped its Member States into six regions: African Region, Region of the Americas, Eastern Mediterranean Region, European Region, South East Asia Region (SEAR) and Western Pacific Region (WPR). India covers the largest part in SEAR, USA is an important member of Region of America, and Finland and Denmark are from Europe Region. Though countries like Australia from WPR also demonstrate patient focused pharmacy practice, but the comparison was limited to the USA, Denmark and Finland. This is because most remarkable professional philosophies guiding patient focused and clinical based pharmacy practice originate from the USA. Pharmacists in Northern Europe seem to be best positioned in health care chain to detect, prevent, and solve drug-related problems.

8.1.2.1.2 Selection of Curricula

Syllabus of Indian Pharmacy courses leading to registered pharmacist title, DPharm, BPharm and PharmD were collected. The syllabus for DPharm and PharmD programs are uniform throughout the nation with the same subjects, chapters and number of teaching hours per year as prescribed under the PCI Education Regulations 1991 and PharmD Regulations 2008 (India), respectively, which were used for the comparison. It is mandatory for all the colleges conducting DPharm and PharmD programs to follow the syllabus prescribed by PCI under the relevant Acts. As per the Clause 10(i) of the AICTE Act 1987, it is mandatory for all the AICTE approved BPharm programs to maintain the uniformity in accordance with the Model Curriculum. In fulfillment of this Clause, a Model Curriculum for BPharm is prescribed by the AICTE in 2011, which was used for comparison in this study. This curriculum is a guideline for the universities, and hence, BPharm curriculum from randomly selected two different universities is tested to see if they are in-line with the Model Curriculum of AICTE. Both these universities have approximately the same amounts of core subject areas (2-5 percent variation).
USA PharmD curriculum was randomly selected from the University of Florida. Master of Science in Pharmacy program from both the University of Helsinki, Finland, and the University of Copenhagen, Denmark were used for comparison (curriculum valid in 2012 – 2013 academic year).

8.1.2.1.3 Conversion of Credits into Hours
Selected Indian curricula were available in number of hours. However, other selected curriculums were available in number of credits. The University of Florida curriculum is defined in credits, where each credit is equivalent to 17 hours. One ECTS credit (European Credit Transfer System) of Finnish and Danish curriculum is equivalent to 27 hours of student work. Using these conversion references, all curriculums included in this study were converted into number of hours-format to make them comparable.

8.1.2.1.4 Division of Core Curriculum Content and Comparison
This study applied the same method as was used in a previous study which defined the curriculum content and compared existing pharmacy curricula in India in terms of public health and patient care aspects.

The curriculum content from each study curriculum was divided into the following four core areas: area 1: Basic Biomedical Sciences; area 2: Pharmaceutical Sciences; area 3: Social/Behavioral/Administrative Sciences; and area 4: Clinical Sciences; as outlined in Appendix-B of ACPE “Accreditation standards and guidelines for the professional program in pharmacy leading to the doctor of pharmacy degree, 2011 version”. The core curriculum areas from each program were tabulated and the results were analyzed and compared with a focus on area 3 and area 4.

In Core area 3: health and pharmaceutical policies, practice management, pharmaco economics, pharmaco-epidemiology, pharmacy law, regulatory affairs, ethics, professional
communication, social and behavioral aspects of practice both in community and hospital pharmacy practice were collated.

In Core area 4: pharmacotherapy, drug information, medication safety and literature evaluation and research design aspects were collated. Special focus was made to see if there was emphasis on patient care (for example efforts to improve therapeutic outcomes by counseling, disease and medicine management, maintaining patient profiles), health and pharmaceutical policies and public health programs (for example, knowledge and preparation to take part in national health programs, such as HIV/AIDS Control, Tuberculosis Control, Vector Borne Disease Control, Leprosy Eradication, Pulse Polio, Universal Vaccination and Tobacco Control programs\(^{241}\) in the curriculum. From each curriculum collated number of hours from each core area was separated as described in ACPE’s accreditation standards and guidelines and the National Association of Boards of Pharmacies’s (NABP) Pharmacy Curriculum Outcomes Assessment (PCOA) guidelines.\(^{242}\) Subjects from each program were divided into theory lectures and practical hours in the laboratory. Theory hours are defined as the class-room teaching on chapters from curriculum by the lecturers/professors. The practical hours are defined as hours spent in laboratory or in a practical setting.

### 8.2 Role of Pharmacists in National Public Health Programs in India: A Survey on Pharmacy Students’ Perceived Knowledge and Attitude (III)

The objective of this study was to explore final year DPharm, BPharm and PharmD students’ awareness, perceived knowledge, attitude, and acquaintance with 11 major National Public Health Programs (NPHPs) in India, and their attitude towards pharmacists’ involvement in public health and patient care.

#### 8.2.1 Study Design

The study was conducted as a cross-sectional classroom survey in 2014. A survey instrument with 27 items was formulated by taking “A Survey Exploring Knowledge and Perceptions of
8.2.2 Survey Instrument

The survey instrument (Annexure 1) assessed pharmacy students in:

i) perceived knowledge and attitude on National Public Health Programs in general; and

ii) perceived knowledge on individual National Public Health Programs.

iii) The students were asked to give their top two preferences of work area (job discipline) after completion of their pharmacy education.

The following 11 major programs as prioritized by the Ministry of Health and Family Welfare, Government of India, were included in the survey instrument245: (1) HIV/AIDS Control; (2) Revised National Tuberculosis Control (RNTCP); (3) Vector Borne Disease Control (NVBDCP); (4) Leprosy Eradication (NLEP); (5) National Mental Health (NMPH); (6) Prevention and Control of Deafness (NPPCD); (7) Control of Blindness (NPCB); (8) Pulse Polio; (9) Universal Immunization (UIP); (10) Tobacco Control (NTCP); and (11) Health Care of the Elderly (NPHCE).

8.2.3 Method

The questionnaire was initially validated by two professors, two pharmacists and 6 students for contents before data collection. The survey instrument was distributed to students from 5 randomly selected pharmacy colleges from Southern part of India. A brief introduction on NPHPs and objectives of the study were provided to students. The survey was conducted among DPharm (2nd year), BPharm (4th year) and PharmD (6th year) students. This was a classroom survey, students independently responded to the questionnaire in classrooms. The data were collated and analyzed by using SAS (version 9.3). Chi-square tests were used to determine any statistical differences in responses between various student groups with p value of <0.5 deemed as significant. The study did not need Ethical Committee approval as per the University of Helsinki Ethical guidelines. However, all the students in-principle agreed to
complete the survey tool. The anonymity of the responding students was assured in all phases of the study.

8.3  Pharmacists in National Public Health Programs in India: A Pilot Study Highlighting Physicians’ Perceptions (IV)

8.3.1  Study Design
This was a cross-sectional survey to a convenience sample of physicians in Southern region in India.

8.3.2  Survey Instrument
The method of this cross-sectional small-scale pilot study was designed using the following three studies as baseline references: “Physician perceptions of pharmacist roles in a primary care setting in Qatar”,246 “Professional training and roles of community pharmacists in Malaysia: views from general medical practitioners”247 and “Extending the roles of community pharmacists: views from general medical practitioners”.248

A survey tool was developed with 28 structured questions divided into three sections: (i) physicians’ experiences of interaction and cooperation with pharmacists; (ii) physicians’ general opinion on pharmacists’ involvement in NPHPs; (iii) Physicians’ opinion on pharmacists’ role in 11 major individual NPHPs. The questionnaire was initially validated by two professors, two pharmacists and two physicians for content before data collection. Their views and comments were considered and incorporated, as perceived appropriate, into the final questionnaire (Annexure 2).

8.3.3  Method
Six volunteers personally visited 800 physicians working in private hospitals and as independent practitioners in Southern region in India and collected data during the period of March to November 2014. Well in advance, the volunteers were briefed about the importance of the
study and process of collecting data. The volunteers made two visits: the first visit was to explain and deliver the print version of the survey tool, then the second visit to collect the data. To document the consent of physicians and to maintain authenticity of the study, participating physicians were requested to fill the questionnaire personally and sign and stamp it at the end of the survey form.

To maintain anonymity of the respondents, data forms were numbered and the numbers were used as IDs during the data entry in University of Helsinki’s E-lomake online survey portal. The data were collated, extracted and descriptive statistical analysis was conducted by SAS (version 9.3). Results are presented as frequencies and percentages. The physicians’ perceptions of pharmacists’ role in NPHPs were reflected according to length of their medical practice. Chi-square tests were used to determine if there were any statistical differences in the responses in this respect. For this purpose, the survey respondents were segregated into the following 4 groups based on the number of years of professional practice: Group A with less than 5 years of professional practice (43%, n=55); Group B with 5-10 years of practice (26%, n=33), Group C with 11-15 years of practice (12%, n=15) and Group D with more than 15 years of practice (20%, n=26).
9 RESULTS

This chapter focuses on describing key findings of the original studies I-IV, summarized below.

**Key findings from curriculum comparison studies**

**Comparison among Indian pharmacy programs (I):**
- Less emphasis on social/behavioral/administrative and clinical sciences from DPharm and BPharm programs to support pharmacists' role in patient care and public health.
- DPharm and BPharm curriculum focused more on industry and less on patient care.
- PharmD is focused on clinical pharmacy and patient-oriented services.
- DPharm and BPharm curriculums are not preparing pharmacists to take part in public health, patient and pharmaceutical care services.
- There is a gap in curriculum, particularly at DPharm level.
- Indian pharmacy programs do not have the same length and knowledge levels, but the graduates obtain the same title (pharmacist).

**Curriculum comparison between India, USA, Finland and Denmark's pharmacy programs (II):**
- The proportions of 4 core areas remarkably varied between the curricula assessed.
- Unlike in USA, graduates from India, Denmark and Finland does not need to take any additional assessment examinations to practice pharmacy.
- Need for introduction of community service in DPharm and BPharm programs were identified.
- Indian programs were covering more basic and biomedical sciences when compared to programs in USA, Finland and Denmark.
- POCA recommends 22% of social/behavioral/administrative sciences in curricula, but none of the programs were fulfilling it.
- Finnish and Danish curricula have more electives than Indian or US curricula.
- Pharmaceutical policy and public health topics were least allocated in all the programs studied.

**Key findings from student and physician surveys**

**Pharmacy Students’ perceived knowledge and attitude on role of pharmacists in NPHPs (III):**
- 83% of participating students (n=326) opined that it was very important/important to include NPHPs in normal pharmacists’ training programs.
- DPharm and PharmD students indicated higher interest in NPHPs than BPharm students.
- Only 21% of students believed that their current knowledge was very much sufficient/sufficient to become active part of NPHPs. Need for knowledge improvement is identified.
- 81% students felt that they have very important/important role to play in NPHPs.
- 96% were willing to take up a professional role and want to learn more about NPHPs.
- Pulse polio, HIV/AIDS, Tuberculosis-, Tobacco-, Blindness -control and universal vaccination programs

**Physicians’ perceptions on pharmacists in NPHPs in India: a pilot study highlighting (IV):**
- 98% of participating physicians (n=129) were comfortable with current pharmacists’ roles in general.
- 96% were comfortable or somewhat comfortable to collaborate with pharmacists.
- 82% regarded pharmacists as part of health care team.
- Young physicians with shorter professional practice were more positive on pharmacists’ involvement in NPHPs than senior physicians with an experience of over 10 years.
- Overall response of accepting pharmacists’ role and involvement in NPHPs was positive.
- Pulse Polio, HIV/AIDS, Tuberculosis, Tobacco control and Leprosy eradication programs being top NPHPs where physicians perceived pharmacists had an important role to play.

Figure 7. Summary of key findings (I-IV).
POCA = Pharmacy Curriculum Outcomes Assessment Guidelines of National Association of Boards of Pharmacy, USA. NPHPs = National Public Health Programs
9.1 Pharmacy Curricula Comparison

9.1.1 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison between DPharm, BPharm, and PharmD Programs (I)

The curriculum blueprint for each program is shown in Table 10 (DPharm), Table 11 (BPharm), and Table 12 (PharmD), which is divided into theory and practical hours in four core areas.

Table 10 shows that DPharm program has only 1500 hours, of which 850 hours (57%) are of theory and 650 hours (43%) are of practical work. Under area 3, social/behavioral/administrative pharmacy sciences, DPharm has 175 hours (12%), and under area 4, clinical sciences has a total 125 hours of which 75 hours are of theory and 50 hours of practice.

Table 10. DPharm curriculum blueprint which is divided into core areas according to teaching hours (1500 teaching hours in total)

<table>
<thead>
<tr>
<th>Core area and subject</th>
<th>T hrs*</th>
<th>P hrs*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area 1 Basic and Biomedical sciences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Anatomy and Physiology</td>
<td>75</td>
<td>50</td>
<td>125</td>
</tr>
<tr>
<td>Biochemistry and Clinical Pathology</td>
<td>50</td>
<td>75</td>
<td>125</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>125</td>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>8</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td><strong>Area 2 Pharmaceutical Sciences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Chemistry-I</td>
<td>75</td>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td>Pharmaceutical Chemistry-II</td>
<td>100</td>
<td>75</td>
<td>175</td>
</tr>
<tr>
<td>Pharmaceutics-I</td>
<td>75</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Pharmaceutics-II</td>
<td>75</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Pharmacology and Toxicology</td>
<td>75</td>
<td>50</td>
<td>125</td>
</tr>
<tr>
<td>Pharmacognosy</td>
<td>75</td>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>475</td>
<td>475</td>
<td>950</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>32</td>
<td>32</td>
<td>63</td>
</tr>
<tr>
<td><strong>Area 3 Social/Behavioral/Administrative Pharmacy Sciences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Education and Community Pharmacy</td>
<td>50</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Drug Store and Business Management</td>
<td>75</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Pharmaceutical Jurisprudence</td>
<td>50</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>175</td>
<td>0</td>
<td>175</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td><strong>Area 4 Clinical Sciences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
From Table 11, it is observed that “Model curriculum for BPharm” is covering 1155 hours (31%) of basic and biomedical sciences and 2190 hours (58%) of pharmaceutical sciences, totaling 3750 hours of the curriculum, which means 89% of total time is being spent learning basic, biomedical, and pharmaceutical sciences. Of the total time, 1740 hours (46%) are dedicated to traditional practical lab work. The focus areas related to practice and public health is not as significantly emphasized. The core area 3, social/behavioral/administrative pharmacy sciences, covers 315 hours (8%) and core area 4, clinical sciences, covers only 90 hours (2%).

Table 11. BPharm curriculum blueprint which is divided into core areas (3750 teaching hours in total)
Table 12 shows that PharmD curriculum comprises 1056 hours (18%) of basic and biomedical sciences and 2112 hours (37%) of pharmaceutical sciences. However, PharmD covers 561 hours (10%) of social/behavioral/administrative sciences and 1980 hours (36%) of clinical sciences. Apart from this, it is also mandatory for the graduates to undergo one year of internship during the sixth year involving specialty units in hospitals. The duration of the internship is divided as six months in general medicine department in a hospital and six months in specialty departments (two months each in three specialty departments). It is a phase of training where if a student is exposed to actual pharmacy practice or clinical pharmacy services and acquires skills under supervision so that he or she may become capable of functioning independently.249
Table 12. PharmD curriculum blueprint which is divided into core areas (6709 teaching hours in total)

<table>
<thead>
<tr>
<th>Core area and subject</th>
<th>T hrs*</th>
<th>P hrs*</th>
<th>Tutorial hrs*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area 1 Basic and Biomedical sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remedial Mathematics/ Biology</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Human Anatomy and Physiology</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pathophysiology</td>
<td>99</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Microbiology</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Medicinal Biochemistry</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>495</td>
<td>396</td>
<td>165</td>
<td>1056</td>
</tr>
<tr>
<td>%</td>
<td>9</td>
<td>7</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td><strong>Area 2 Pharmaceutical Sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Organic Chemistry</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Inorganic Chemistry</td>
<td>66</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Analysis</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Medicinal Chemistry</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutics</td>
<td>66</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Formulations</td>
<td>66</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Biopharmaceutics and Pharmacokinetics</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacology-I</td>
<td>99</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacology-II</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacognosy and phytopharmaceuticals</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>Total hours</strong></td>
<td>891</td>
<td>891</td>
<td>330</td>
<td>2112</td>
</tr>
<tr>
<td>%</td>
<td>16</td>
<td>16</td>
<td>6</td>
<td>37</td>
</tr>
<tr>
<td><strong>Area 3 Social/Behavioral/Administrative Pharmacy Sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Pharmacy</td>
<td>66</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Hospital Pharmacy</td>
<td>66</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacoepidemiology and Pharmacoeconomics</td>
<td>99</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Biostatistics and Research Methodology</td>
<td>66</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Jurisprudence</td>
<td>66</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total hours</strong></td>
<td>330</td>
<td>99</td>
<td>132</td>
<td>561</td>
</tr>
<tr>
<td>%</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td><strong>Area 4 Clinical Sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Toxicology</td>
<td>66</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Clinical Research</td>
<td>99</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Clinical Pharmacy</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacotherapeutics-I</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacotherapeutics-II</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Pharmacotherapeutics-III</td>
<td>99</td>
<td>99</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Clinical Pharmacokinetics and Pharmacotherapeutic Drug Monitoring</td>
<td>66</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Clerkship (Ward rounds on daily basis)</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Project work (Six Months)</td>
<td>0</td>
<td>660</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total hours</td>
<td>%</td>
<td>Grand total hours</td>
<td>%</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------</td>
<td>----</td>
<td>-------------------</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>660</td>
<td>12</td>
<td>2376</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>1056</td>
<td>18</td>
<td>2442</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>264</td>
<td>5</td>
<td>891</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td>35</td>
<td>5709</td>
<td></td>
</tr>
</tbody>
</table>

\* T hrs = Theory classes in hours, P hrs = Practical classes in hours and Tutorial hours: After 2-3 hours of theory class, students are divided into small groups, where they discuss and debate for an hour on what was learnt in Theory classes under the guidance and supervision of lecturer or professor.

A comparison of number of hours from each core subject area of all three different programs is illustrated in Figure 8. This shows much less emphasis on social/behavioral/administrative and clinical sciences from DPharm and BPharm programs to support pharmacists’ role in patient care and public health. Figure 8 is a 2D-bar graph with two vertical x-axis values. X-axis on the left shows the percentage, and x-axis on the right shows duration of the program in years.

![Figure 8. Comparison of hours of core areas in curriculums of different programs.](image)

Out of two years of education in DPharm program, 63% of the time is being spent on pharmaceutical sciences, and 43% of the curriculum is filled with compounding practical exposure in the labs without focus on health policies, public health, pharmacy practice areas like medication management and review of patient profiles, etc. It is also lacking course work in health care policy, patient care, patient counseling, and communication aspects.
9.1.2 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison with USA, Finland and Denmark (II)

Table 13 shows an overview of pharmacy programs available in four selected countries, length of each pharmacy program, regulatory body responsible for pharmacist registration and additional assessment examinations required to pass to obtain pharmacist registration.

<table>
<thead>
<tr>
<th>Country</th>
<th>Academic qualification</th>
<th>Duration of program</th>
<th>Duration of internship</th>
<th>Regulatory authority</th>
<th>Additional requirements to practice pharmacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>DPharm</td>
<td>2 years</td>
<td>3 months</td>
<td>PCI + AICTE</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>BPharm</td>
<td>4 years</td>
<td>3 months</td>
<td>PCI + AICTE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MPharm</td>
<td>2 years (1 year dissertation)</td>
<td>None</td>
<td>AICTE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PharmD</td>
<td>5 years</td>
<td>12 months</td>
<td>PCI</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>PharmD</td>
<td>4 + (2-3 years pre-pharmacy studies)</td>
<td>Varies from state to state (1200-1500 hours)</td>
<td>NABP/ State Boards of Pharmacy</td>
<td>NAPLEX + MPJE</td>
</tr>
<tr>
<td>Finland</td>
<td>BSc (Pharm)</td>
<td>2.5 years</td>
<td>6 months</td>
<td>National Supervisory Authority for Welfare and Health (Valvira)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>MSc (Pharm)</td>
<td>4.5 years</td>
<td>6 months</td>
<td>Danish Health and Medicines Agency</td>
<td>None</td>
</tr>
<tr>
<td>Denmark</td>
<td>MSc (Pharm)</td>
<td>4.5 years</td>
<td>6 months</td>
<td>Danish Health and Medicines Agency</td>
<td>None</td>
</tr>
</tbody>
</table>

*Internship program = practical training in hospitals/dispensaries and/or in a community pharmacy and/or drugs manufacturing unit.

1According to European Union regulations, minimum 3 months of the 6-months internship must be done in a community pharmacy. The remaining 3 months can be done in a hospital or community pharmacy.

PCI = Pharmacy Council of India; AICTE = All India Council for Technical Education; NAPLEX = North American Pharmacist Licensure Examination; MPJE = Multistate Pharmacy Jurisprudence Examination.

9.1.2.1 Pharmacy Education in India

Minimum qualification for registration and practice of pharmacy in India is a pass in either of DPharm or BPharm or PharmD programs from PCI approved institution with 3 months
internship for DPharm and BPharm and 12 months internship for PharmD (Table 13). Pharmacy education in India is regulated by 2 statutory bodies: Pharmacy Council of India and All India Council for Technical Education. Indian pharmacy graduate does not need to take any additional assessment examinations to practice pharmacy.

9.1.2.2 Pharmacy Education in USA

USA has PharmD as the only program to practice the pharmacy in the country as a pharmacist (Table 13). PharmD programs at all US universities must be accredited by the Accreditation Council for Pharmacy Education (ACPE), the national agency for accreditation of professional degree programs in pharmacy and providers of continuing pharmacy education. Schools of Pharmacy offering the traditional Master of Science in Pharmacy (MSc Pharm) and PhD programs prepare students for teaching and research careers. In USA, after successful completion of PharmD, one cannot directly register as pharmacist and start practicing pharmacy. The graduates with PharmD, willing to practice pharmacy must also: i) complete internship, whose length vary for each state, ii) pass North American Pharmacist Licensure Examination (NAPLEX), and iii) Multistate Pharmacy Jurisprudence Examination (MPJE) state law examination which is conducted by State Pharmacy Boards. Moreover, proof of completing continuing education in programs approved by the Accreditation Council for Pharmacy Education (ACPE) is required for renewal of pharmacist license.

9.1.2.3 Pharmacy Education in Denmark

To become registered pharmacist and/or to own a pharmacy in Denmark, minimum qualification required is MSc degree in pharmacy (Table 13). MSc degree from Danish University of Pharmaceutical Sciences is the oldest program in Denmark. University of Southern Denmark is also offering both BSc and MSc in pharmacy programs duly recognized to register as a pharmacist which is accredited by the Danish Accreditation Institute (ACE Denmark). In Denmark, upon successful completions of MSc (Pharm) degree with 6 months internship (altogether 5 years), there are no additional exams required to be completed for becoming registered pharmacist and to practice pharmacy.
9.1.2.4 Pharmacy Education in Finland

Finland has adopted a 2-tier university training program for pharmacists consisting of BSc and MSc degrees, which is in line with the Bologna Declaration harmonizing structures of the European university degrees\textsuperscript{253,254} (Table 13). The BSc degree consists of 180 ECTS credits and it takes 3 years to complete. The MSc degree takes an additional 2 years to complete (total 300 ECTS credits).\textsuperscript{255} MSc level pharmacists mostly work in managerial and leadership positions and in positions requiring advanced pharmaceutical expertise. A majority of BSc pharmacists work in community pharmacies being responsible for dispensing, patient counseling and customer service. Only MSc pharmacists can own a pharmacy.\textsuperscript{256}

In addition to the minimum requirements specified in Directive 2005/36/EC of the European Union and of the Council for Pharmaceutical Education, students pursuing the BSc(Pharm) and MSc(Pharm) degree must obtain professional and practical competencies in areas determined nationally important for pharmacists to acquire during their basic education. An essential part of BSc(Pharm) curriculum in Finland is an obligatory internship of 6 months (30 ECTS credits), which is integrated with professional study at the university.\textsuperscript{257} The internship can be taken in a community pharmacy which is open to the public (minimum 3 months/15 ECTS credits), or in a hospital under supervision of that hospital’s pharmaceutical department (maximum 3 months/15 credits).\textsuperscript{258,259,260}

Finnish BSc and MSc degrees are designed to prepare students for professional practice. The curriculum has elective courses both in the bachelor's and master's degree. The master's degree aims at developing further the students’ scientific skills and includes an obligatory 6-month research project (Master's thesis, 40 ECTS credits).\textsuperscript{261} In Finland, both BSc (3 years) and MSc (5 years) of pharmacy can register and practice as pharmacist, however, only pharmacists with a MSc degree may own a community pharmacy.\textsuperscript{262} Both the bachelors and masters programs have personal study plan which is approved by the professor or other nominated senior instructor. The personal study plan gives flexibility to the students to choose their area of interest. Students interested in community pharmacy practice, and social and clinical pharmacy
can plan their studies and become experts. In Finland, graduates with bachelor’s (BSc) and master’s (MSc) degree in pharmacy do not need additional exams to become registered pharmacist and practice pharmacy.

### 9.1.2.5 Comparison of Total Time Spent in Each Core Content Area

The curricula from all four countries were divided into theory and practical hours in four core areas. The results of Comparison of total time spent in each core content area, in number of hours, from India, USA, Denmark and Finland is described below.

Table 14. Comparison of total time spent in each core content area, in number of hours, in each study program in India, USA, Denmark and Finland.

<table>
<thead>
<tr>
<th>Core Area</th>
<th>DPharm India: Total hours 1500</th>
<th>BPharm India: Total hours 3750</th>
<th>PharmD India: Total hours 5709</th>
<th>MSc Pharm Finland: Total hours 8100*</th>
<th>MSc Pharm Denmark: Total hours 8400**</th>
<th>PharmD USA: Total hours 2482</th>
<th>PCOA***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Hours</td>
<td>% Hours</td>
<td>% Hours</td>
<td>% Hours</td>
<td>% Hours</td>
<td>% Hours</td>
<td>% Hours</td>
</tr>
<tr>
<td>Basic and Biomedical sciences</td>
<td>17 250</td>
<td>31 1155</td>
<td>18 1056</td>
<td>10 783</td>
<td>12 980</td>
<td>12 306</td>
<td>16</td>
</tr>
<tr>
<td>Pharmaceutical Sciences</td>
<td>63 950</td>
<td>58 2190</td>
<td>37 2112</td>
<td>28 2241</td>
<td>40 3374</td>
<td>13 323</td>
<td>30</td>
</tr>
<tr>
<td>Social/behavioral/administrative</td>
<td>12 175</td>
<td>8 315</td>
<td>8 462</td>
<td>15 1188</td>
<td>7 560</td>
<td>8 204</td>
<td>22</td>
</tr>
<tr>
<td>Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Sciences</td>
<td>8 125</td>
<td>2 90</td>
<td>36 2079</td>
<td>14 1107</td>
<td>16 1386</td>
<td>66 1649</td>
<td>32</td>
</tr>
</tbody>
</table>

* Finnish MSc (Pharm) curriculum has electives 2781 hours (34%) of the curriculum

** Danish MSc (Pharm) curriculum has electives 2100 hours (25%) of the curriculum

*** Pharmacy Curriculum Outcomes Assessment Guidelines of National Association of Boards of Pharmacy, USA

**Core area 1: basic and biomedical sciences**

Indian pharmacy programs are covering more basic and biomedical sciences compared to Denmark, Finland and USA (Table 14). This applies particularly to Indian BPharm program, of which 31% of the total hours are related to basic and biomedical sciences. The corresponding proportions in Indian DPharm and PharmD programs are 17% and 18%, respectively. In other countries of the study, the proportion is 10-12%.  

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Core Area 2: pharmaceutical sciences
The proportion of pharmaceutical sciences in pharmacy programs varies a lot between countries and degrees (Table 14). Both DPharm and BPharm programs in India are allocating about 60% of total time to pharmaceutical sciences. Indian PharmD curriculum is covering 2112 hours of pharmaceutical sciences, which is higher than suggested PCOA percent (37% vs. 30%, respectively).

Core Area 3: Social/behavioral/administrative sciences
Social/behavioral/administrative sciences can be considered as the backbone subjects to public health oriented pharmacy practice. PCOA is recommending 22% of the curriculum to be devoted to social/behavioral/administrative sciences, but none of the test programs are covering recommended amount of time. DPharm curriculum in India is covering 12% (175 hours), BPharm and PharmD are covering 8% (315 hours and 462 hours, respectively). Finnish MSc (Pharm) has 15% (1188 hours) which is highest among all. Indian programs are lacking course work in behavioral and social sciences, health care policy, patient counseling and communication aspects.263

Core Area 4: clinical sciences
This core area gives proper knowledge to practicing pharmacists to provide patient care that optimizes the use of medication and promotes health, wellness, and disease prevention.264 By spending more number of hours in clinical sciences, pharmacists can acquire knowledge to offer better patient care to enhance therapeutic outcomes. PCOA recommends devoting 32% of the time for clinical sciences. However, Indian DPharm and BPharm are covering 8% (125 hours) and 2% (90 hours) of clinical sciences, respectively. PharmD curriculum is covering 36% of clinical sciences which is at par with the PCOA recommendation (32%). The US-PharmD program has 66% (1649 hours) of clinical sciences which is more than 2-fold compared to the PCOA recommendation.
9.2 Role of Pharmacists in National Public Health Programs in India: A Survey on Pharmacy Students’ Perceived Knowledge and Attitude (III)

Among a total of 326 responding students, 159 (49%) were male and 167 (51%) female students from final year D Pharm (n=101), BPharm (n=109); and Pharm D (n=116) program in India (Table 15).

Table 15. Demographic characteristics of student respondents (n=326) according to pharmacy program

<table>
<thead>
<tr>
<th>Variable</th>
<th>DPharm (n=101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>Total (n=326)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, n(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.032</td>
</tr>
<tr>
<td>Male</td>
<td>57 (56)</td>
<td>56 (51)</td>
<td>46 (39)</td>
<td>159 (49)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>44 (44)</td>
<td>53 (49)</td>
<td>70 (61)</td>
<td>167 (51)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>20.9 (1.9)</td>
<td>21.1 (1.2)</td>
<td>22.8 (1.5)</td>
<td>21.6 (1.8)</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>21</td>
<td>21</td>
<td>23</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Min;max</td>
<td>18;27</td>
<td>20;29</td>
<td>20;29</td>
<td>18;29</td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
*p = < 0.05 was considered significant

Their top 3 ‘first preferences of work area’ after completion of education were: hospital (23% of the respondents prioritizing this as the first preference of work area), drug manufacturing industry (22%) and community pharmacy (20%) (Table 16).

Table 16. Student preferences of work area after completing education according to pharmacy program (% of the respondents, n=326)

<table>
<thead>
<tr>
<th>Question</th>
<th>Total (n=326)</th>
<th>DPharm (n=101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where do you plan to work after graduation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Pharmacy</td>
<td>64 (20)</td>
<td>40 (12)</td>
<td>8 (8)</td>
<td>14 (14)</td>
</tr>
<tr>
<td>Hospital Pharmacy</td>
<td>76 (23)</td>
<td>50 (15)</td>
<td>31 (31)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Drug Manufacturing Industry</td>
<td>71 (22)</td>
<td>34 (10)</td>
<td>28 (28)</td>
<td>10 (10)</td>
</tr>
<tr>
<td>Research and Development</td>
<td>20 (6)</td>
<td>19 (6)</td>
<td>8 (8)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Clinical Research</td>
<td>33 (10)</td>
<td>40 (12)</td>
<td>2 (2)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Regulatory affairs in industry</td>
<td>10 (3)</td>
<td>19 (6)</td>
<td>2 (2)</td>
<td>9 (9)</td>
</tr>
<tr>
<td>Regulatory officer in government</td>
<td>8 (2)</td>
<td>21 (6)</td>
<td>1 (1)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Higher studies</td>
<td>26 (8)</td>
<td>38 (12)</td>
<td>15 (15)</td>
<td>14 (14)</td>
</tr>
<tr>
<td>Marketing</td>
<td>10 (3)</td>
<td>24 (7)</td>
<td>0 (0)</td>
<td>15 (15)</td>
</tr>
<tr>
<td>Teaching</td>
<td>3 (1)</td>
<td>34 (10)</td>
<td>2 (2)</td>
<td>10 (10)</td>
</tr>
<tr>
<td>Any other, please specify</td>
<td>5 (2)</td>
<td>7 (12)</td>
<td>4 (4)</td>
<td>7 (7)</td>
</tr>
</tbody>
</table>
Table 17 shows students’ perceptions on their knowledge in national public health programs (NPHPs). There was 100% agreement on the necessity for the pharmacists to know about NPHPs. Most (69%) of the students reported having studied about disease prevention and dissemination of information, but only 28% felt that the amount of time devoted to learn public health aspects in basic pharmacy studies was sufficient. Sixty-seven percent of the students had not studied National Health Policy and 60% had not studied pharmaceutical policy in pharmacy curriculum. Most typically, training was through some lectures during the basic studies (36% of the respondents) or self-study (21%). A small proportion of the students (4%) had received at least one course on NPHPs in continuing education. Out of total of 326 respondents, 58% reported that they had adequate knowledge to take part in NPHPs. The proportion of students reporting adequate knowledge to take part in NPHPs was highest among Pharm D (66%) and D Pharm (62%) students and lowest among BPharm students (45%, p < 0.001). The same trend was found in assessing students knowing about NPHPs in India: 41% of Pharm D students reported knowing NPHPs well, but only 17% and 10% of D Pharm and BPharm students, respectively (p < 0.001).

Table 17. Pharmacy students’ (n=326) perceived knowledge in NPHPs stratified by pharmacy program

<table>
<thead>
<tr>
<th>Question</th>
<th>Response, n (%)</th>
<th>Total (n= 326)</th>
<th>DPharm (n = 101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you studied about National Health Policy in your pharmacy curriculum?</td>
<td>Yes</td>
<td>96 (30)</td>
<td>25 (25)</td>
<td>13 (12)</td>
<td>58 (50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>220 (67)</td>
<td>72 (71)</td>
<td>94 (86)</td>
<td>54 (47)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not know</td>
<td>7 (2)</td>
<td>2 (2)</td>
<td>1 (1)</td>
<td>4 (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not remember</td>
<td>3 (1)</td>
<td>2 (2)</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Have you studied pharmaceutical policy in your pharmacy curriculum?</td>
<td>Yes</td>
<td>111 (34)</td>
<td>31 (31)</td>
<td>19 (17)</td>
<td>61 (52)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>197 (60)</td>
<td>67 (66)</td>
<td>84 (77)</td>
<td>46 (40)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not know</td>
<td>10 (3)</td>
<td>0 (0)</td>
<td>3 (3)</td>
<td>7 (6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not remember</td>
<td>8 (3)</td>
<td>3 (3)</td>
<td>3 (3)</td>
<td>2(2)</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Yes, I know well</td>
<td>Yes, I know to some extent</td>
<td>Yes, I have heard, but do not know contents</td>
<td>No, I have never heard about them</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------</td>
<td>---------------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Do you know the national public health programs in India?</td>
<td>100 (31)</td>
<td>114 (35)</td>
<td>36 (11)</td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Have you received lectures or completed any courses that provided information on national public health programs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, I have received lectures during my basic studies</td>
<td>117 (36)</td>
<td>25 (25)</td>
<td>21 (19)</td>
<td>71 (61)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Yes, I have received at least 1 course in continuing education</td>
<td>13 (4)</td>
<td>2 (2)</td>
<td>5 (5)</td>
<td>6 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, I have studied about NHPs as self-study</td>
<td>69 (21)</td>
<td>16 (16)</td>
<td>39 (36)</td>
<td>14 (12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have not received any training on national health programs</td>
<td>127 (39)</td>
<td>58 (57)</td>
<td>44 (40)</td>
<td>25 (22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the amount of time devoted to learn public health aspects sufficient?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.012</td>
<td></td>
</tr>
<tr>
<td>Yes, it is sufficient</td>
<td>90 (28)</td>
<td>27 (27)</td>
<td>36 (33)</td>
<td>27 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, not sufficient</td>
<td>166 (51)</td>
<td>45 (44)</td>
<td>48 (44)</td>
<td>73 (63)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No opinion</td>
<td>70 (21)</td>
<td>29 (29)</td>
<td>25 (23)</td>
<td>16 (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Based on your pharmacy education, do you have adequate knowledge to take part in national public health programs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>188 (58)</td>
<td>63 (62)</td>
<td>49 (45)</td>
<td>76 (66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>73 (22)</td>
<td>23 (23)</td>
<td>21 (19)</td>
<td>29 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No opinion</td>
<td>59 (18)</td>
<td>14 (14)</td>
<td>34 (31)</td>
<td>11 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not necessary for pharmacists</td>
<td>6 (2)</td>
<td>1 (1)</td>
<td>5 (5)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you studied about disease prevention and dissemination of information in National Public Health Programs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.539</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>225 (69)</td>
<td>69 (68)</td>
<td>70 (64)</td>
<td>86 (74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>91 (28)</td>
<td>28 (28)</td>
<td>36 (33)</td>
<td>27 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not know</td>
<td>10 (3)</td>
<td>4 (4)</td>
<td>3 (3)</td>
<td>3 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is it necessary for the pharmacists to know about national public health programs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>326 (100)</td>
<td>101 (100)</td>
<td>109 (100)</td>
<td>116 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
*p = < 0.05 was considered significant.

Of all respondents, 83% (91% of Pharm D, 90% of D Pharm and 69% of BPharm students; p= < 0.001) had the opinion that it was very important or important to include NPHPs in normal training programs for pharmacists (Table 18). Only 21% (p=0.001) of the students believed that their current knowledge about NPHPs was very much sufficient or sufficient to become active part of NPHPs. However, 81% students felt that they have very important or important role to play in NPHPs. Almost all, 96% were willing to take up professional role in NPHPs and 81%
wanted to learn more on NPHPs. The proportion of students having been ever involved in any NPHPs during their pharmacy education program was highest for Pharm D students (73%) and lowest for BPharm students (28%). The trend was the same concerning internships (51% vs. 23%, respectively).

Table 18. Pharmacy students’ (n=326) attitude on NPHPs - stratified by pharmacy program

<table>
<thead>
<tr>
<th>Question</th>
<th>Response, n (%)</th>
<th>Total (n= 326)</th>
<th>DPharm (n = 101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think that it is important to include National Public Health Programs in normal training program for pharmacists?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very important</td>
<td>186 (57)</td>
<td>70 (69)</td>
<td>50 (46)</td>
<td>66 (57)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Important</td>
<td>86 (26)</td>
<td>21 (21)</td>
<td>25 (23)</td>
<td>40 (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately</td>
<td>45 (14)</td>
<td>6 (6)</td>
<td>32 (29)</td>
<td>7 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of little importance</td>
<td>7 (2)</td>
<td>4 (4)</td>
<td>2 (2)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unimportant</td>
<td>2 (1)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>2 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you feel that your current knowledge about public health programs in the country is sufficient?</td>
<td></td>
<td>14 (4)</td>
<td>3 (3)</td>
<td>4 (4)</td>
<td>7 (6)</td>
<td>0.001</td>
</tr>
<tr>
<td>Very much sufficient</td>
<td>56 (17)</td>
<td>22 (22)</td>
<td>13 (12)</td>
<td>21 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>64 (20)</td>
<td>31 (31)</td>
<td>12 (11)</td>
<td>21 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>175 (54)</td>
<td>39 (39)</td>
<td>72 (66)</td>
<td>64 (55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not sufficient</td>
<td>17 (5)</td>
<td>6 (6)</td>
<td>8 (7)</td>
<td>3 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you feel you have an important role to play in public health programs?</td>
<td></td>
<td>176 (54)</td>
<td>60 (59)</td>
<td>42 (38)</td>
<td>77 (66)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Very important</td>
<td>89 (27)</td>
<td>28 (28)</td>
<td>29 (27)</td>
<td>32 (28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Important</td>
<td>24 (8)</td>
<td>10 (10)</td>
<td>8 (7)</td>
<td>6 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately</td>
<td>34 (11)</td>
<td>3 (3)</td>
<td>30 (28)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of little importance</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During your pharmacy education program, have you ever been involved in any public health program(s)?</td>
<td></td>
<td>156 (48)</td>
<td>41 (41)</td>
<td>30 (28)</td>
<td>85 (73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>170 (52)</td>
<td>60 (59)</td>
<td>79 (72)</td>
<td>31 (27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>134 (41)</td>
<td>50 (49)</td>
<td>25 (23)</td>
<td>59 (51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you ever involved in any public health program(s) during your internship?</td>
<td></td>
<td>252 (77)</td>
<td>86 (85)</td>
<td>71 (65)</td>
<td>95 (82)</td>
<td>0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>60 (19)</td>
<td>11 (11)</td>
<td>34 (31)</td>
<td>15 (13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14 (4)</td>
<td>4 (4)</td>
<td>4 (4)</td>
<td>6 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you willing to take up a professional role in public health program?</td>
<td></td>
<td>263 (81)</td>
<td>91 (90)</td>
<td>68 (62)</td>
<td>104 (90)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>49 (15)</td>
<td>6 (6)</td>
<td>35 (32)</td>
<td>8 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14 (4)</td>
<td>4 (4)</td>
<td>6 (6)</td>
<td>4 (3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
*p = < 0.05 was considered significant.
9.2.2 Perceived Knowledge in Major National Public Health Programs in Communicable Diseases

Of communicable diseases, most willingly students would take part in HIV/AIDS control (83% of all respondents), Tuberculosis control (75%), leprosy eradication programs and National Vector Borne Disease Control program (NVBDCP) (64% of each) (Table 19).

Table 19. Perceived knowledge in major NPHPs in communicable diseases - stratified by pharmacy program (n=326)

<table>
<thead>
<tr>
<th>Question</th>
<th>Total (n=326)</th>
<th>DPharm (n = 101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS control program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>293 (90)</td>
<td>86 (85)</td>
<td>101 (93)</td>
<td>106 (91)</td>
</tr>
<tr>
<td>No</td>
<td>33 (10)</td>
<td>15 (15)</td>
<td>8 (7)</td>
<td>10 (9)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>245 (75)</td>
<td>62 (61)</td>
<td>81 (74)</td>
<td>102 (88)</td>
</tr>
<tr>
<td>No</td>
<td>81 (25)</td>
<td>39 (39)</td>
<td>28 (26)</td>
<td>14 (12)</td>
<td></td>
</tr>
<tr>
<td>Are you willing to take part?</td>
<td>Yes</td>
<td>269 (83)</td>
<td>73 (72)</td>
<td>100 (92)</td>
<td>96 (83)</td>
</tr>
<tr>
<td>No</td>
<td>57 (17)</td>
<td>28 (28)</td>
<td>9 (8)</td>
<td>20 (17)</td>
<td></td>
</tr>
<tr>
<td>Revised National Tuberculosis Control Program (RNTCP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>255 (78)</td>
<td>71 (70)</td>
<td>82 (75)</td>
<td>102 (88)</td>
</tr>
<tr>
<td>No</td>
<td>71 (22)</td>
<td>30 (30)</td>
<td>27 (25)</td>
<td>14 (12)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>221 (68)</td>
<td>59 (58)</td>
<td>64 (59)</td>
<td>98 (88)</td>
</tr>
<tr>
<td>No</td>
<td>105 (32)</td>
<td>42 (42)</td>
<td>45 (41)</td>
<td>18 (16)</td>
<td></td>
</tr>
<tr>
<td>Are you willing to take part?</td>
<td>Yes</td>
<td>244 (75)</td>
<td>72 (71)</td>
<td>77 (71)</td>
<td>95 (82)</td>
</tr>
<tr>
<td>No</td>
<td>82 (25)</td>
<td>29 (29)</td>
<td>32 (29)</td>
<td>21 (18)</td>
<td></td>
</tr>
<tr>
<td>National Vector Borne Disease Control program (NVBDCP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>211 (65)</td>
<td>66 (65)</td>
<td>63 (58)</td>
<td>82 (71)</td>
</tr>
<tr>
<td>No</td>
<td>115 (35)</td>
<td>35 (35)</td>
<td>46 (42)</td>
<td>34 (29)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>186 (57)</td>
<td>52 (51)</td>
<td>53 (49)</td>
<td>81 (70)</td>
</tr>
<tr>
<td>No</td>
<td>140 (43)</td>
<td>49 (49)</td>
<td>56 (51)</td>
<td>35 (30)</td>
<td></td>
</tr>
<tr>
<td>Are you willing to take part?</td>
<td>Yes</td>
<td>210 (64)</td>
<td>68 (67)</td>
<td>62 (57)</td>
<td>80 (69)</td>
</tr>
<tr>
<td>No</td>
<td>116 (36)</td>
<td>33 (33)</td>
<td>47 (43)</td>
<td>36 (31)</td>
<td></td>
</tr>
<tr>
<td>National Leprosy Eradication Program (NLEP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highlights of the program: Early detection &amp; complete treatment of new leprosy cases. Carrying out house hold contact survey in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
detection. Early diagnosis & prompt MDT, through routine and special efforts. Information, Education & Communication (IEC) activities in the community to improve self reporting to Primary Health Centre (PHC) and reduction of stigma. Intensive monitoring and supervision at Primary Health Centre/Community Health Centre.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response, n (%)</th>
<th>Total (n=326)</th>
<th>DPharm (n=101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>226 (69)</td>
<td>70 (69)</td>
<td>66 (61)</td>
<td>90 (78)</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>100 (31)</td>
<td>31 (31)</td>
<td>43 (39)</td>
<td>26 (22)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>203 (62)</td>
<td>54 (53)</td>
<td>57 (52)</td>
<td>92 (79)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>123 (38)</td>
<td>47 (47)</td>
<td>52 (48)</td>
<td>24 (21)</td>
<td></td>
</tr>
<tr>
<td>Are you willing to take part?</td>
<td>Yes</td>
<td>209 (64)</td>
<td>64 (63)</td>
<td>59 (54)</td>
<td>86 (74)</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>117 (36)</td>
<td>37 (37)</td>
<td>50 (46)</td>
<td>30 (26)</td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
*p = < 0.05 was considered significant.

Of non-communicable diseases, 72% of the students were willing to take part in Blindness control, 76% pulse polio programs and 67% in Universal Vaccination Program (Table 20). Under other programs prioritized as NPHPs (Table 6) 90% of the respondents were willing to take part in National Tobacco Control program and 60% Program for Health Care of the Elderly.

Table 20. Perceived knowledge in major NPHPs in non-communicable diseases and other areas - stratified by pharmacy program (n=326)

National Mental Health Program (NMHP)
Objectives: 1. To ensure the availability and accessibility of minimum mental healthcare for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of the population; 2. To encourage the application of mental health knowledge in general healthcare and in social development; and 3. To promote community participation in the mental health service development and to stimulate efforts towards self-help in the community.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response, n (%)</th>
<th>Total (n=326)</th>
<th>DPharm (n=101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>213 (65)</td>
<td>66 (65)</td>
<td>61 (56)</td>
<td>86 (74)</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>113 (35)</td>
<td>35 (35)</td>
<td>48 (44)</td>
<td>30 (26)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>178 (55)</td>
<td>55 (54)</td>
<td>49 (45)</td>
<td>74 (64)</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>148 (45)</td>
<td>46 (46)</td>
<td>60 (55)</td>
<td>42 (36)</td>
<td></td>
</tr>
<tr>
<td>Are you willing to take part?</td>
<td>Yes</td>
<td>217 (67)</td>
<td>68 (67)</td>
<td>61 (56)</td>
<td>88 (76)</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>109 (33)</td>
<td>33 (33)</td>
<td>48 (44)</td>
<td>28 (24)</td>
<td></td>
</tr>
</tbody>
</table>

National Program for Prevention and Control of Deafness (NPPCD)
Highlights: 1. To prevent the avoidable hearing loss on account of disease or injury, 2. Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness, 3. To strengthen the existing inter-sectoral linkages for continuity of the rehabilitation programme, for persons with deafness.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response, n (%)</th>
<th>Total (n=326)</th>
<th>DPharm (n=101)</th>
<th>BPharm (n=109)</th>
<th>PharmD (n=116)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you know about the program?</td>
<td>Yes</td>
<td>181 (56)</td>
<td>53 (52)</td>
<td>55 (50)</td>
<td>73 (63)</td>
<td>0.129</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>145 (44)</td>
<td>48 (48)</td>
<td>54 (50)</td>
<td>43 (37)</td>
<td></td>
</tr>
<tr>
<td>Do you have a role to play?</td>
<td>Yes</td>
<td>169 (52)</td>
<td>53 (52)</td>
<td>39 (36)</td>
<td>77 (66)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

109
Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>157 (48)</td>
<td>48 (48)</td>
</tr>
<tr>
<td>Yes</td>
<td>189 (58)</td>
<td>51 (47)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80 (69)</td>
</tr>
</tbody>
</table>

National Program for Control of Blindness (NPCB)

Highlights:
1. To reduce the backlog of blindness through identification and treatment of blind at primary, secondary and tertiary levels.
2. Prevention of visual impairment; through provision of comprehensive eye care services and quality service delivery.
3. To enhance community awareness on eye care and lay stress on preventive measures;
4. To secure participation of Voluntary Organizations/Private Practitioners in eye Care.

Do you know about the program?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>238 (73)</td>
<td>75 (74)</td>
</tr>
<tr>
<td>Yes</td>
<td>88 (27)</td>
<td>26 (26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>86 (80)</td>
</tr>
</tbody>
</table>

Do you have a role to play?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>213 (65)</td>
<td>65 (64)</td>
</tr>
<tr>
<td>Yes</td>
<td>113 (35)</td>
<td>36 (36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>71 (65)</td>
</tr>
</tbody>
</table>

Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>234 (72)</td>
<td>69 (68)</td>
</tr>
<tr>
<td>Yes</td>
<td>92 (28)</td>
<td>32 (32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>87 (80)</td>
</tr>
</tbody>
</table>

Pulse Polio program

Objectives: Children in the age group of 0-5 years administered Polio drops during the national and sub-nationals immunization rounds. About 172 million children are immunized during each National Immunization Day.

Do you know about the program?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>260 (80)</td>
<td>70 (69)</td>
</tr>
<tr>
<td>Yes</td>
<td>66 (20)</td>
<td>31 (31)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>92 (84)</td>
</tr>
</tbody>
</table>

Do you have a role to play?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>229 (70)</td>
<td>56 (55)</td>
</tr>
<tr>
<td>Yes</td>
<td>97 (30)</td>
<td>45 (45)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76 (70)</td>
</tr>
</tbody>
</table>

Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>248 (76)</td>
<td>65 (64)</td>
</tr>
<tr>
<td>Yes</td>
<td>78 (24)</td>
<td>36 (36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>87 (80)</td>
</tr>
</tbody>
</table>

Universal Immunization Program (UIP)

Objective: Protection of children from life threatening conditions by providing vaccination. Under UIP, following vaccines are provided: 1. BCG, 2. DPT, 3. OPV (Oral Polio Vaccine), 4. Measles, 5. Hepatitis B, 6. TT (Tetanus Toxoid), etc.

Do you know about the program?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>220 (67)</td>
<td>75 (74)</td>
</tr>
<tr>
<td>Yes</td>
<td>106 (33)</td>
<td>26 (26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58 (53)</td>
</tr>
</tbody>
</table>

Do you have a role to play?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>197 (60)</td>
<td>59 (58)</td>
</tr>
<tr>
<td>Yes</td>
<td>129 (40)</td>
<td>42 (42)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>46 (42)</td>
</tr>
</tbody>
</table>

Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>220 (67)</td>
<td>69 (68)</td>
</tr>
<tr>
<td>Yes</td>
<td>106 (33)</td>
<td>32 (32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>59 (54)</td>
</tr>
</tbody>
</table>

National Tobacco Control Program (NTCP)

Types of benefits of NTCP: 1. To bring about greater awareness about the harmful effects of tobacco use and about the Tobacco Control Laws and 2. To facilitate effective implementation of the Tobacco Control Laws.

Do you know about the program?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>294 (90)</td>
<td>88 (87)</td>
</tr>
<tr>
<td>Yes</td>
<td>32 (10)</td>
<td>13 (13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101 (93)</td>
</tr>
</tbody>
</table>

Do you have a role to play?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>265 (81)</td>
<td>73 (72)</td>
</tr>
<tr>
<td>Yes</td>
<td>61 (19)</td>
<td>28 (28)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>88 (81)</td>
</tr>
</tbody>
</table>

Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>292 (90)</td>
<td>85 (84)</td>
</tr>
<tr>
<td>Yes</td>
<td>34 (10)</td>
<td>16 (16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>104 (95)</td>
</tr>
</tbody>
</table>

National Program for Health Care of the Elderly (NPHCE)

Objective is to provide separate, specialized and comprehensive health care to the senior citizens at various level of State health.
Do you know about the program?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>171 (52)</td>
<td>155 (48)</td>
<td>47 (47)</td>
<td>54 (53)</td>
<td>42 (39)</td>
<td>67 (61)</td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Do you have a role to play?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>176 (54)</td>
<td>150 (46)</td>
<td>56 (55)</td>
<td>45 (45)</td>
<td>34 (31)</td>
<td>75 (69)</td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Are you willing to take part?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>197 (60)</td>
<td>129 (40)</td>
<td>63 (62)</td>
<td>38 (35)</td>
<td>46 (42)</td>
<td>63 (58)</td>
</tr>
<tr>
<td>p</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
* p = < 0.05 was considered significant.

9.3 Pharmacists in National Public Health Programs in India: A Pilot Study Highlighting Physicians’ Perceptions (IV)

Of total 800 physicians, 129 responded, leading to a response rate of 16% (Table 21). Of the respondents, 83% were men and 17% women with a median age of 34 years. Forty-one percent of the respondents had Bachelor of Medicine and Bachelor of Surgery (MBBS) degree and 53% Post Graduate in Medicine (MD) and Master of Surgery (MS) as their highest academic degree. The respondents were working in various sectors, the highest proportion (43% of the respondents) being working in corporate hospitals at the time of the survey. Almost half (43%) of the respondents had less than 5 years’ experience in professional practice, 26% with 5-10 years, 15% with 11-15 years and 20% with over 15 years of experience.
Table 21. Characteristics of the responding physicians (% of the respondents, n=129)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>107 (83)</td>
</tr>
<tr>
<td>Female</td>
<td>22 (17)</td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
</tr>
<tr>
<td>≤ 30</td>
<td>36 (28)</td>
</tr>
<tr>
<td>31-40</td>
<td>47 (36)</td>
</tr>
<tr>
<td>41-50</td>
<td>20 (16)</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>26 (20)</td>
</tr>
<tr>
<td>Education qualification</td>
<td></td>
</tr>
<tr>
<td>MBBS</td>
<td>53 (41)</td>
</tr>
<tr>
<td>MS/MD</td>
<td>69 (53)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (05)</td>
</tr>
<tr>
<td>Number of year in practice</td>
<td></td>
</tr>
<tr>
<td>&lt; 5</td>
<td>55 (43)</td>
</tr>
<tr>
<td>5-10</td>
<td>33 (26)</td>
</tr>
<tr>
<td>11-15</td>
<td>15 (12)</td>
</tr>
<tr>
<td>&gt; 15</td>
<td>26 (20)</td>
</tr>
<tr>
<td>Current designation</td>
<td></td>
</tr>
<tr>
<td>Family doctor</td>
<td>45 (35)</td>
</tr>
<tr>
<td>Medical officer</td>
<td>8 (06)</td>
</tr>
<tr>
<td>CMO</td>
<td>3 (02)</td>
</tr>
<tr>
<td>Surgeon</td>
<td>18 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>55 (43)</td>
</tr>
<tr>
<td>Current practice setting</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>16 (12)</td>
</tr>
<tr>
<td>Corporate</td>
<td>56 (43)</td>
</tr>
<tr>
<td>Government</td>
<td>2 (02)</td>
</tr>
<tr>
<td>Other</td>
<td>55 (43)</td>
</tr>
</tbody>
</table>

Table 22 shows the results of the survey questions related to physicians’ and pharmacists’ interaction and collaboration in general. A majority (90%) of the physicians had a pharmacy close to their practice and 88% of them reported referring patients to buy medicine from those close by pharmacies. Of all responding physicians, 81% indicated contacting their pharmacy frequently for professional matters, 68% of them on daily or at least weekly basis. Physicians with less than 5 years and 5-10 years of practice experience reported contacting pharmacists more frequently (96% and 88%, respectively) than physicians with 11-15 years and over 15 years of professional experience (60% and 54%, respectively). A majority of the physicians also perceived that pharmacists were knowledgeable (84%), service oriented (83%) and were providing very sufficient or sufficient patient counseling on medicines to supplement physician’s counseling, e.g., on administration, dosage and side effects. Again, this perception
was more common in younger physicians with <5 years of practice experience (89%) and 5-10 years of experience (75%), than in senior physicians with 11-15 years’ experience (53%) and >15 years’ experience (69%). Almost all physicians (98%) were comfortable with pharmacists’ roles in general, 96% were comfortable or somewhat comfortable to collaborate with pharmacists and 82% regarded pharmacists as part of health care team.
Table 22. Physicians’ experiences of cooperation and interaction with pharmacists according to their years of professional practice (% of the respondents, n=129)

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses according to years of professional practice, n (%)</th>
<th>Total (n=129)</th>
<th>&lt; 5 yrs (n=55)</th>
<th>5-10 yrs (n=33)</th>
<th>11-15 yrs (n=15)</th>
<th>&gt;15 yrs (n=26)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there a pharmacy attached or close to your practice?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>116 (90)</td>
<td>55 (100)</td>
<td>32 (97)</td>
<td>12 (80)</td>
<td>17 (65)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>13 (10)</td>
<td>0 (0)</td>
<td>01 (03)</td>
<td>03 (20)</td>
<td>9 (35)</td>
<td></td>
</tr>
<tr>
<td>Do you refer your patients with prescription to a pharmacy in your practice area to buy their medicine?</td>
<td></td>
<td>114 (88)</td>
<td>51 (93)</td>
<td>31 (94)</td>
<td>14 (93)</td>
<td>18 (69)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>15 (12)</td>
<td>4 (07)</td>
<td>2 (06)</td>
<td>1 (07)</td>
<td>8 (31)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>10 (08)</td>
<td>02 (04)</td>
<td>01 (03)</td>
<td>01 (07)</td>
<td>6 (23)</td>
<td></td>
</tr>
<tr>
<td>Do you contact your pharmacy frequently for professional matters?</td>
<td></td>
<td>105 (81)</td>
<td>53 (96)</td>
<td>29 (88)</td>
<td>9 (60)</td>
<td>14 (54)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>24 (19)</td>
<td>2 (04)</td>
<td>4 (12)</td>
<td>6 (40)</td>
<td>12 (46)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>101 (80)</td>
<td>50 (91)</td>
<td>26 (79)</td>
<td>12 (80)</td>
<td>16 (62)</td>
<td></td>
</tr>
<tr>
<td>On an average, please estimate the frequency of your interactions with a pharmacist</td>
<td></td>
<td>40 (31)</td>
<td>17 (31)</td>
<td>15 (45)</td>
<td>4 (27)</td>
<td>4 (15)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Every day</td>
<td></td>
<td>48 (37)</td>
<td>20 (36)</td>
<td>13 (39)</td>
<td>5 (33)</td>
<td>10 (38)</td>
<td></td>
</tr>
<tr>
<td>Once or more than once a week</td>
<td></td>
<td>22 (17)</td>
<td>15 (27)</td>
<td>4 (12)</td>
<td>1 (07)</td>
<td>2 (08)</td>
<td></td>
</tr>
<tr>
<td>Once or more than once a month</td>
<td></td>
<td>19 (15)</td>
<td>3 (5)</td>
<td>1 (03)</td>
<td>5 (33)</td>
<td>10 (38)</td>
<td></td>
</tr>
<tr>
<td>Less than once a month</td>
<td></td>
<td>17 (31)</td>
<td>10 (18)</td>
<td>14 (42)</td>
<td>2 (13)</td>
<td>5 (19)</td>
<td></td>
</tr>
<tr>
<td>Do you think that your pharmacist is knowledgeable?</td>
<td></td>
<td>69 (53)</td>
<td>39 (71)</td>
<td>11 (33)</td>
<td>6 (40)</td>
<td>13 (50)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>15 (12)</td>
<td>3 (05)</td>
<td>4 (12)</td>
<td>4 (27)</td>
<td>4 (15)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>10 (08)</td>
<td>3 (05)</td>
<td>3 (09)</td>
<td>1 (07)</td>
<td>3 (12)</td>
<td></td>
</tr>
<tr>
<td>Do you think that your pharmacist is service oriented?</td>
<td></td>
<td>4 (03)</td>
<td>0 (0)</td>
<td>1 (03)</td>
<td>2 (13)</td>
<td>1 (04)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>107 (83)</td>
<td>53 (96)</td>
<td>26 (79)</td>
<td>12 (80)</td>
<td>16 (62)</td>
<td>0.001</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>22 (17)</td>
<td>2 (04)</td>
<td>7 (21)</td>
<td>3 (20)</td>
<td>10 (38)</td>
<td></td>
</tr>
<tr>
<td>Do you think the pharmacy / your pharmacist is providing patient counseling on medicine, administration, dosage, side effects etc., to supplement your counseling, is at a satisfactory level?</td>
<td></td>
<td>31 (24)</td>
<td>10 (18)</td>
<td>14 (42)</td>
<td>2 (13)</td>
<td>5 (19)</td>
<td></td>
</tr>
<tr>
<td>Very much sufficient</td>
<td></td>
<td>69 (53)</td>
<td>39 (71)</td>
<td>11 (33)</td>
<td>6 (40)</td>
<td>13 (50)</td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td></td>
<td>15 (12)</td>
<td>3 (05)</td>
<td>4 (12)</td>
<td>4 (27)</td>
<td>4 (15)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td>10 (08)</td>
<td>3 (05)</td>
<td>3 (09)</td>
<td>1 (07)</td>
<td>3 (12)</td>
<td></td>
</tr>
<tr>
<td>Not sufficient</td>
<td></td>
<td>4 (03)</td>
<td>0 (0)</td>
<td>1 (03)</td>
<td>2 (13)</td>
<td>1 (04)</td>
<td></td>
</tr>
<tr>
<td>Totally insufficient</td>
<td></td>
<td>81 (63)</td>
<td>40 (73)</td>
<td>24 (73)</td>
<td>03 (20)</td>
<td>14 (54)</td>
<td>0.006</td>
</tr>
<tr>
<td>Please rate your comfort with pharmacist roles described</td>
<td></td>
<td>45 (35)</td>
<td>14 (25)</td>
<td>08 (24)</td>
<td>11 (73)</td>
<td>12 (46)</td>
<td></td>
</tr>
<tr>
<td>Very comfortable</td>
<td></td>
<td>03 (02)</td>
<td>01 (02)</td>
<td>01 (03)</td>
<td>01 (07)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Somewhat comfortable</td>
<td></td>
<td>77 (60)</td>
<td>36 (65)</td>
<td>27 (82)</td>
<td>05 (33)</td>
<td>09 (35)</td>
<td>0.003</td>
</tr>
<tr>
<td>Uncomfortable</td>
<td></td>
<td>47 (36)</td>
<td>18 (33)</td>
<td>05 (15)</td>
<td>09 (60)</td>
<td>15 (58)</td>
<td></td>
</tr>
<tr>
<td>Do you have any barriers to collaborate with pharmacists as a part of health care team?</td>
<td></td>
<td>05 (04)</td>
<td>01 (02)</td>
<td>01 (03)</td>
<td>01 (07)</td>
<td>02 (08)</td>
<td></td>
</tr>
<tr>
<td>Very comfortable</td>
<td></td>
<td>106 (82)</td>
<td>53 (96)</td>
<td>29 (88)</td>
<td>10 (67)</td>
<td>14 (54)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Somewhat comfortable</td>
<td></td>
<td>10 (08)</td>
<td>02 (04)</td>
<td>01 (03)</td>
<td>01 (07)</td>
<td>06 (23)</td>
<td></td>
</tr>
<tr>
<td>Uncomfortable</td>
<td></td>
<td>13 (10)</td>
<td>0 (0)</td>
<td>03 (09)</td>
<td>04 (27)</td>
<td>06 (23)</td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.
* < 0.05 is considered significant.
Table 23 shows the results of physicians’ general opinion on pharmacists’ involvement in NPHPs. Around 50% of all physicians regarded pharmacists as a mere vendor/dispenser of prescription drugs. The physicians with shorter professional practice (Group A and Group B) were more positive (84% and 76%, respectively) on pharmacists’ involvement in NPHPs than physicians having at least 11 years’ experience (Group C: 40% and Group D: 27%, respectively). In the same manner, more physicians from Group A and B (83% and 94%, respectively), perceived that the pharmacists have very important to moderately important role in public health programs, compared to physicians from Group C and D (67% and 62%, respectively). However, 93%, 83%, 73% and 62% of physicians from Group A, B, C and D, respectively, perceived that it is important or moderately important to involve pharmacists in NPHPs. The respective proportions of physicians estimating pharmacists’ knowledge sufficient for the involvement were 80%, 60%, 26% and 35%, p<0.001. The results show a trend in acceptance of pharmacists’ involvement in NPHPs based on the length of physicians’ professional experience: the longer the physicians’ practice experience was, the less favorable they were for pharmacists’ involvement in NPHPs.

Table 23. Physicians general opinions on pharmacists’ involvement in National Public Health Programs (NPHPs) according to their years of professional practice (% of the respondents, n=129).

<table>
<thead>
<tr>
<th>Question</th>
<th>Response according to years of professional practice, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Do you see the pharmacist as a mere vendor/dispenser of prescription drugs?</strong></td>
<td>Total (n=129)</td>
</tr>
<tr>
<td>Yes</td>
<td>57 (44)</td>
</tr>
<tr>
<td>No</td>
<td>64 (50)</td>
</tr>
<tr>
<td>Do not know</td>
<td>08 (06)</td>
</tr>
<tr>
<td><strong>Your perception on pharmacists’ role in National Public Health Programs:</strong></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>84 (65)</td>
</tr>
<tr>
<td>Neutral</td>
<td>24 (19)</td>
</tr>
<tr>
<td>Negative</td>
<td>06 (05)</td>
</tr>
<tr>
<td>No opinion</td>
<td>15 (12)</td>
</tr>
<tr>
<td><strong>Do you feel pharmacists have an important role to play in public health programs?</strong></td>
<td></td>
</tr>
<tr>
<td>Yes, very important</td>
<td>85 (66)</td>
</tr>
<tr>
<td>Yes, moderately important</td>
<td>22 (17)</td>
</tr>
<tr>
<td>No, not important</td>
<td>05 (04)</td>
</tr>
<tr>
<td>No opinion</td>
<td>15 (12)</td>
</tr>
<tr>
<td><strong>Do you think it is important to include pharmacists in National public health programs?</strong></td>
<td></td>
</tr>
</tbody>
</table>

115
Do you feel that pharmacists’ current knowledge on various public health programs is sufficient?

<table>
<thead>
<tr>
<th>Level of Opinion</th>
<th>&lt;5 yrs (n=55)</th>
<th>5-10 yrs (n=33)</th>
<th>11-15 yrs (n=15)</th>
<th>&gt;15 yrs (n=26)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very much sufficient</td>
<td>29 (52)</td>
<td>14 (42)</td>
<td>29 (19)</td>
<td>02 (13)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sufficient</td>
<td>48 (87)</td>
<td>06 (18)</td>
<td>02 (13)</td>
<td>07 (27)</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>14 (26)</td>
<td>03 (09)</td>
<td>04 (27)</td>
<td>03 (12)</td>
<td></td>
</tr>
<tr>
<td>Not sufficient</td>
<td>25 (46)</td>
<td>07 (21)</td>
<td>04 (27)</td>
<td>08 (31)</td>
<td></td>
</tr>
<tr>
<td>Totally insufficient</td>
<td>13 (24)</td>
<td>03 (09)</td>
<td>03 (20)</td>
<td>06 (23)</td>
<td></td>
</tr>
</tbody>
</table>

Chi-square test was used.  
* < 0.05 is considered significant.

Table 24 shows the results of physicians’ opinions on pharmacists’ involvement in 11 selected NPHPs in India. Overall response of accepting pharmacists’ role and involvement in NPHPs was very positive, ranging from 67 – 83% for different programs. Similar trend as in the previous section was found again, where more the physicians’ practice experience, the less the acceptance for pharmacists’ role in particular NPHPs. The trends in their opinions were quite similar in all selected NPHPs. As per the results, Pulse Polio, HIV/AIDS, Tuberculosis and Tobacco control and Leprosy eradication programs were the top five NPHPs where physicians perceived that the pharmacists has a role to play.

Table 24. Physicians’ opinions on pharmacists’ involvement in the major national public health programs established by Indian Government (% of the respondents according to their years of professional practice, n=129)
### Chikungunya in India

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>94 (73)</td>
<td>52 (95)</td>
<td>25 (76)</td>
<td>08 (53)</td>
<td>09 (35)</td>
</tr>
</tbody>
</table>

### National Leprosy Eradication Program (NLEP)

**Objectives of the program:** Early detection & complete treatment of new leprosy cases. Carrying out house hold contact survey in detection. Early diagnosis & prompt MDT, through routine and special efforts. **Information, Education & Communication (IEC) activities** in the community to improve self reporting to Primary Health Centre (PHC) and reduction of stigma. Intensive monitoring and supervision at Primary Health Centre/ Community Health Centre.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>99 (77)</td>
<td>54 (98)</td>
<td>22 (67)</td>
<td>08 (53)</td>
<td>13 (50)</td>
</tr>
</tbody>
</table>

### National Mental Health Program (NMHP)

Objectives: 1) To ensure the availability and accessibility of minimum mental healthcare for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of the population; 2) To encourage the application of mental health knowledge in general healthcare and in social development; and 3) To promote community participation in the mental health service development and to stimulate efforts towards self-help in the community.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>88 (68)</td>
<td>51 (93)</td>
<td>24 (73)</td>
<td>07 (47)</td>
<td>06 (23)</td>
</tr>
</tbody>
</table>

### National Program for Prevention and Control of Deafness (NPPCD)

Objectives: 1) To prevent the avoidable hearing loss on account of disease or injury; 2) Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness; and 3) To strengthen the existing intersectoral linkages for continuity of the rehabilitation program, for persons with deafness.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>87 (67)</td>
<td>50 (91)</td>
<td>24 (73)</td>
<td>07 (47)</td>
<td>06 (23)</td>
</tr>
</tbody>
</table>

### National Program for Control of Blindness (NPCB)

Objectives: 1) To reduce the backlog of blindness through identification and treatment of blind at primary, secondary and tertiary levels; 2) Prevention of visual impairment; through provision of comprehensive eye care services and quality service delivery; 3) To enhance community awareness on eye care and lay stress on preventive measures; and 4) To secure participation of Voluntary organizations/Private Practitioners in eye care.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>87 (67)</td>
<td>50 (91)</td>
<td>24 (73)</td>
<td>07 (47)</td>
<td>06 (23)</td>
</tr>
</tbody>
</table>

### Pulse Polio program

Objectives: Children in the age group of 0-5 years administered Polio drops during the national and sub-nationals immunization rounds. About 172 million children are immunized during each National Immunization Day.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>108 (84)</td>
<td>53 (96)</td>
<td>30 (91)</td>
<td>11 (73)</td>
<td>14 (54)</td>
</tr>
</tbody>
</table>

### Universal Immunization Program (UIP)

Objective: Protection of children from life threatening conditions by providing vaccination. Under UIP, following vaccines are provided: 1) BCG; 2) DPT; 3) OPV (oral polio vaccine); 4) Measles; 5) Hepatitis; 6) TT (Tetanus Toxoid) etc.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 (74)</td>
<td>53 (96)</td>
<td>26 (79)</td>
<td>09 (60)</td>
<td>08 (31)</td>
</tr>
</tbody>
</table>

### National Tobacco Control Program (NTCP)

Objectives: 1) To bring about greater awareness about the harmful effects of tobacco use and about the Tobacco control Laws; and 2) To facilitate effective implementation of the Tobacco Control Laws.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Do not know</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 (74)</td>
<td>53 (96)</td>
<td>26 (79)</td>
<td>09 (60)</td>
<td>08 (31)</td>
</tr>
<tr>
<td>Yes</td>
<td>99 (77)</td>
<td>52 (95)</td>
<td>28 (85)</td>
<td>09 (60)</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>No</td>
<td>22 (17)</td>
<td>03 (05)</td>
<td>03 (09)</td>
<td>03 (20)</td>
</tr>
<tr>
<td>Do not know</td>
<td>08 (06)</td>
<td>0 (0)</td>
<td>02 (06)</td>
<td>03 (20)</td>
</tr>
</tbody>
</table>

**National Program for Health Care of the Elderly (NPHCE)**

Objective is to provide separate, specialized and comprehensive health care to the senior citizen at various level of State health care delivery system including outreach services.

Can the pharmacist play a role in National Program for Health Care of the Elderly (NPHCE)?

<table>
<thead>
<tr>
<th>Yes</th>
<th>93 (72)</th>
<th>53 (96)</th>
<th>25 (76)</th>
<th>08 (53)</th>
<th>07 (27)</th>
<th>&lt;0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>25 (19)</td>
<td>01 (02)</td>
<td>04 (12)</td>
<td>04 (27)</td>
<td>16 (62)</td>
<td></td>
</tr>
<tr>
<td>Do not know</td>
<td>11 (09)</td>
<td>01 (02)</td>
<td>04 (12)</td>
<td>03 (20)</td>
<td>03 (12)</td>
<td></td>
</tr>
</tbody>
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Chi-square test was used.
* < 0.05 is considered significant.
10 DISCUSSION

The results of this study suggest that most of the pharmacy students are not learning enough about NPHPs and health policies in pharmacy programs in India. Among those six assessed pharmacy curriculums, the US and Indian PharmD programs contained most public health and patient care aspects and Indian DPharm and BPharm programs contained least. A sample of final year Indian pharmacy students participating in the classroom survey exhibited positive attitude on pharmacists’ involvement in NPHPs and also opined it is important to take part in national health policies and NPHPs. At the same time, their perceived competences varied according to the curriculum with PharmD students being best prepared. The pilot survey on physicians’ perceptions indicated that Indian physicians are willing to collaborate with pharmacists and are comfortable to involve them in the health care team.

10.1 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison between DPharm, BPharm, and PharmD Programs (I)

The leading pharmacy programs in India, DPharm and BPharm, are industry focused and not pharmacy practice, patient care and public health oriented (I,II). Indian BPharm curriculum contains a significant amount of industry-oriented teaching and training and is ill equipped to do full justice in the community pharmacy and primary care settings.

Indian PharmD is evidently a clinical- and community-based program\(^{265}\) and is on par with the PharmD in USA, where pharmacists are learning more clinical practice-based aspects (I, II). The Indian PharmD program does not have much focus on community pharmacy practice settings but has enough emphasis on clinical and hospital pharmacy practice. This can be balanced by reducing some hours in pharmaceutical sciences in the program and adding some Advanced Pharmacy Practice Experiences (APPEs) as in the USA, so that there is scope for the students to learn more community pharmacy aspects, on which the focus is lacking in the current curriculum.
As the Indian curriculum for DPharm and PharmD are prescribed by the PCI, uniform standards are being maintained throughout the country. At the same time, such regulations are creating barriers to bring innovation and creativity to the curriculum development. For example, in the USA, even though all PharmD programs are accredited by the Accreditation Council for Pharmacy Education (ACPE), there is quite a lot of variation in curricular structures and coverage in different universities. Still, the pharmacists in the USA are able to deliver patient focused clinical pharmacy services under PharmD degree.

Indian DPharm curriculum is not comparable with other curriculums in the study (I,II). Lengthwise, DPharm program is too short in comparison to other programs. Out of total 1500 hours of entire DPharm program length, only 175 hours of core area 3, social/behavioral/administration sciences, and 125 hours of core area 4, clinical sciences, are covered. It is understandably not possible to accommodate and train with required knowledge and skills and develop attitude that are needed to produce patient care-oriented pharmacists (“good pharmacists”) in two years during DPharm program. There is no effective clinical pharmacy practice presently being taught in DPharm program and has no focus on pharmaceutical care (I). Therefore, Diploma pharmacists are not equipped for patient care activities, as knowledge and training acquired during the course is limited, with very little practical exposure.

Curriculum evaluation and reforms were least prioritized for both DPharm and BPharm programs in India (I, II), which may be one of the several reasons for not developing patient care-oriented pharmacy practice in India. As the PharmD is a newly introduced program in India, it is important to evaluate the results of the program and make necessary reforms frequently as it is being practiced in developed countries, for example, the University of Helsinki in Finland. Three years after the introduction of the reformed curriculum at the University of Helsinki, the results of the reform were evaluated. These assessment procedures have been an integral part of the faculty’s quality assurance program. This was done by creating discussion forums among the faculty members, institutions, deans, and with the help of students and professional associations as stakeholders.
In India, DPharm holders are the mainstays of pharmacy practice. However, National Commission on Macroeconomics and Health (NCMH) report from India stated that “most of the diploma-trained pharmacists, who are at best equivalent to pharmacy assistants or technicians in developed and many developing countries (such as Ghana, Fiji, and Nigeria), perform tasks normally reserved for registered pharmacists. The knowledge and expertise of most diploma holders are inadequate for community practice”. This challenge is addressed by training new PharmD graduates in India, started in 2008.

The migration of health sector workers is primarily comprised of three main professions: nurses, followed by physicians, and pharmacists. To meet the manpower requirements with the same competency level as PharmD graduates with equal distribution throughout the country, it would take several decades of maintaining admission enrollment per year. As per the National Knowledge Commission’s Report to the Nation2006–2009, “Medical education cannot be stand-alone. It requires support of trained nurses, pharmacists, paramedic workers.” In this direction, the Commission has recommended “gradual phasing out of untrained pharmacists should be considered.”

The diploma in pharmacy should no longer be the minimum qualification for pharmacist registration in India. India should not continue with all different types of programs with wide variation. This will create a huge knowledge gap within the profession in those individuals with the same professional titles. This increases the chance for inter-professional disputes. Therefore, it is important that the statutory authorities act quickly in cooperation with professional associations. When the USA adopted PharmD as the national professional degree, existing pharmacists with BPharm/BS in Pharmacy were provided with sufficient opportunities to obtain additional education, but obtaining a PharmD degree was not mandatory in order to continue to practice pharmacy. The University-framed modules for part-time and distance/e-learning process enhances the existing pharmacists’ knowledge and qualifications. India should work out a similar process to address the knowledge gaps.
One of the educational challenges is that teachers in Indian pharmacy schools are not trained for providing the clerkship, internship, and fellowship components of a PharmD program. The institutions, associations and regulatory authorities should focus on training the teachers on clerkship, internship, and fellowship components and chartering the activities in the curriculum.

10.2 Public Health and Patient Care Aspects in Indian Pharmacy Curricula: A Comparison with USA, Finland and Denmark (II)

The option for community pharmacy and health care orientation in addition to current industry orientation in Indian pharmacy curricula is supported by the existing deployment needs. Nevertheless, Curriculum evaluation and reforms were least prioritized for both DPharm and BPharm programs, which may be one of the several reasons for not developing the curriculums to support patient care oriented pharmacy practice in India.

Indian DPharm program could be converted similar to Finnish 3-year BSc(Pharm) program which is practice-oriented university degree with quite a good proportion of social, behavioral and administrative sciences, and electives. Also the obligatory 6-months internship is designed to support development of pharmacy practice competences, particularly, patient counseling and medication management skills. Another option could be to restructure DPharm program similar to Danish pharmaconomist (pharmacy assistant) program. It is a 3-year vocational program mostly based on workplace training coordinated by a training center (Pharmakon) run by the Danish pharmacy owners association (Danmarks Apotekerforeningen). Danish pharmacies provide cognitive services guided by a protocol for their delivery. The services can be provided by pharmacists and pharmaconomists. The pharmaconomist cannot own or run a pharmacy, but can perform most of the pharmacist’s duties with some limitations, such as medication reviews, dosage corrections and interventions in the prescriptions, which should be done in cooperation with the registered pharmacist. Pharmaconomists can operate pharmacy outlets or medicine delivery facilities as can also Finnish BSc pharmacists.
However, this issue is addressed by PCI by introducing Bachelor of Pharmacy (Practice) in 2014.294

The current ACPE standards allow US colleges and schools to pursue the development of student experiences that will utilize best practices in service learning, plus fulfill the need of introductory practice experiences.295 To gear up future pharmacists’ new roles, introduction of community service in the Indian pharmacy curriculum for DPharm and BPharm courses is suggested. This can be achieved through advanced pharmacy practice experiences (APPEs) as being practiced in USA, where students can be inspired, empowered, and take notice of what is lacking in the scope of practice of a pharmacist, in hopes that they will one day be driven to seek ways to enact changes within the profession.

10.3 Role of Pharmacists in National Public Health Programs in India: A Survey on Pharmacy Students’ Perceived Knowledge and Attitude (III)

Overall results suggest students’ positive overview on pharmacists’ involvement in NPHPs (III). It is clear from the results that both DPharm and PharmD students were showing more interest and motivated to learn about NPHPs than BPharm students. DPharm generally is the mainstay of pharmacy practice in India with over 42,000 admissions per year of the total of 100,000296, while PharmD has been adding to it by providing approximately 5,000 graduates with even more comprehensive clinical skills since 2008.297 Therefore, it is important to focus on these two programs when developing pharmacists’ competences in patient care and public health aspects. BPharm curriculum is industry oriented with more pharmaceutical sciences and less pharmacy practice and patient care aspects.298

This study revealed a gap between “pharmacy students’ willingness to be involved in NPHPs and students’ perceived competencies to actually be involved in NPHPs” (III). Findings of this study are in line with a systematic review from UK which showed that most pharmacists viewed public health services as important, but pharmacists’ confidence in providing public health services was on the whole average to low.299 Pharmacy curriculum and training with better,
well-designed focus on NPHPs would help future pharmacists to prepare better. Introduction of NPHPs to internship programs would also improve students’ understanding of implementation of NPHPs in clinical practice and how pharmacists can contribute. There are encouraging results from USA indicating that time devoted to public health discussions during an Advanced Pharmacy Practice Experience (APPE) has substantial impact on pharmacy students’ knowledgebase and interest in public health.300

HIV/AIDS control, RNTCP, Pulse Polio, NPCB and NTCP were top five National Public Health programs that the responding students knew about and felt that they have a role to play (III). In addition to these top five programs, more than 60% of the students showed interest in most of the other six programs involved in the survey. This means that if the pharmacists are trained in NPHPs, they can be utilized widely to supplement the limited health workforce in Indian public health concerns. Following paragraphs will briefly discuss pharmacists’ potential contributions to those NPHPs that were ranked among top five by the responding pharmacy students.

10.3.1 HIV/AIDS Control Program

HIV/AIDS control program was the most well-known among the responding students (III). This may be because of Indian Pharmaceutical Association’s (IPA) initiatives since 2000 in creating awareness on the roles and opportunities for pharmacists in HIV/AIDS care and prevention. Among the initiatives there has been National Pharmacy Week 2000 with the theme “Pharmacists to fight against HIV/AIDS”; prepared “guiding principles for pharmacists”301 trained -trainers, in-service pharmacists, and training programs in schools. IPA had also several endorsements and statements to promote pharmacists role in HIV/AIDS. WHO-India recommended integrating pharmacists in National AIDS Control Organization’s (NACO) programs such as in procurement, storage, distribution and proper use of Antiretroviral ARV medicines.302 In line with this, as a mandatory training, pharmacists working in Antiretroviral Therapy (ART) centers and Link ART centers (LAC) were being trained by the Department of AIDS Control. 303 An extension of such training for pharmacists working in private pharmacies
and students/interns would increase the impact in several folds, which is supported by 83% percent of students’ interest to take active part in HIV/AIDS Control program (III).

10.3.2 Revised National Tuberculosis Control Program (RNTCP)

Eighty three percent of the responding students were willing to take part in RNTCP (III). According to a previous research, pharmacists can be key players in prevention and treatment of tuberculosis by promoting adherence, assessing patients of risk factors for resistant disease, providing information about disease control and prevention, and monitoring for effectiveness, adverse effects, and drug interactions. Private pharmacies play a key role in influencing patients’ treatment choices and in guiding them to appropriate health care facilities. Providing continuing education on TB control to diploma-trained community pharmacists can improve case detection and rational use of anti-TB medicines. Because of which, Ministry of Health took a step forward in utilizing the community pharmacies and pharmacist workforce by preparing a training module for community pharmacists jointly with IPA. For the first time in 2010, RNTCP guidelines mentioned “pharmacists” as specialists with expertise in managing Multi-Drug-Resistant Tuberculosis (MDR-TB), which is very motivating for the profession in the country.

10.3.3 Pulse Polio and Universal Immunization Programs

Eighty percent of the respondents knew Pulse Polio and Universal Immunization programs and about 70% were willing to take part in these programs (III). National Vaccine Policy suggests that it is important to have experts from pharmacy to reduce time lag from availability of a vaccine to its use in National Immunization Programs. Internationally, the provision of immunization services involving pharmacists trained and certified to administer vaccines, utilizing agreed protocols and collaborative arrangements, is now well accepted in countries such as the USA, UK, Ireland and Portugal. Such success stories can be adopted by Indian pharmacists to take initiatives by taking up pilot project to create evidence to become part of health care team.
10.3.4 National Tobacco Control Program (NTCP)
In this survey, 90% of the responding pharmacy students were willing to take active role in Tobacco Control (III). This is quite similar result as was obtained in a previous study in 2003 (92.5%). This acknowledges that pharmacists have a continuous interest in promoting smoking cessation. Smoking is among the most important risk factors jeopardizing public health. Thus, pharmacists’ are easily accessible healthcare professionals to be involved in NTCP. Potential for Indian pharmacy students and pharmacists to make a definitive contribution to public health protection though NTCP should be utilized by the government of India.

10.3.5 National Program on Control of Blindness (NPCB)
Though 72% of the responding students showed enthusiasm to take active role in NPCB (III), there is no documented evidence on pharmacist involvement in NPCB as there is on HIV/AIDS control program, RNTCP and NTCP. Therefore, it is important to take initiatives by the professional bodies to find out how pharmacists can contribute in NPCB and create evidence.

The above experiences and examples show that there are many ways that the Indian government can utilize pharmacists’ expertise in different public health programs. As pharmacy students seem to be interested in contributing to NPHPs, it is important that professional organizations, such as IPA and the Pharmacy Council of India will cooperate with pharmacy schools in curriculum development and shaping new public health roles and services for pharmacists. The Pharmacy Council of India, responsible statutory body for regulation of profession and practice of pharmacy, is also promoting pharmacists’ role in public health.

10.4 Pharmacists in National Public Health Programs in India: A Pilot Study Highlighting Physicians’ Perceptions (IV)
This small-scale pilot study indicates that Indian physicians are willing to collaborate with pharmacists and are comfortable to involve them in the health care team (IV). The same positive trend was found in the physicians’ general opinions on: i) interaction and cooperation with pharmacists; ii) pharmacists’ involvement in NPHPs; and iii) pharmacists’ role in 11 major
individual NPHPs in India. The survey also revealed differences in opinions between junior and senior physicians: the longer the physicians’ practice experience was, the less favorable they were for pharmacists’ involvement in NPHPs.

Differences in opinions between junior and senior physicians concerning pharmacists’ involvement in NPHPs can be related to pharmacists’ qualifications in India. Most of the pharmacists practicing in community pharmacies in India are DPharm holders with 2 years education and without continuing education. Physicians with more than 10 years practice experience may build their perceptions of pharmacists’ skills and knowledge on these least trained professionals that use the same title as, e.g., PharmDs who have three times longer training which is also more clinically oriented. Thus, upcoming PharmD graduates with 6 years education (training initiated in 2008) focused mainly towards clinical and community aspects should be able to change collaborative practice models and physicians’ perceptions in the future.

World Health Organization (WHO) and its partners recognize interprofessional collaboration in education and practice as an innovative strategy. Strong working relationships between pharmacists and physicians are needed to optimize patient care. A study from Canada reveals that community pharmacists and physicians agree that collaborative practice can optimize patient outcomes and would like to collaborate more.

Physicians who participated in this survey had opined that pharmacists can take an important role in all the NPHPs (IV). This provides pharmacists huge opportunities to contribute to public health and patient care. However, practicing pharmacists need proper continuing education for being prepared for more patient-oriented practice. Some suitable continuing education is already available, e.g., implementation of National Health Mission is providing a course for BSc in Community Health for mid-level clinical care provider, including pharmacists. Such courses for in-service pharmacists would provide opportunities to improve their competencies and collaborative networks. The Planning Commission of India has approved schemes for "Setting
up of college of pharmacy in government medical colleges" to facilitate quality education and ensure availability of skilled competent workforce to the society. This initiative in long run, provides better understanding of physician expectations provide collaborative opportunities for the pharmacists.

To create such evidence, pharmacists need to make strategies with the help of professional associations. It is also important to conduct a separate study to understand reasons for these differences.

As per the survey results, Pulse Polio, HIV/AIDS, Tuberculosis-, Tobacco Control and Leprosy Eradication programs were the top five NPHPs where physicians perceived that pharmacists can play an important role (IV). It is also important to note that, none of the other selected programs were completely ignored by the respondents (>65% positive response for all other programs). If pharmacists are trained in NPHPs, this untapped potential of one million pharmacists can be utilized to supplement the health workforce in India to meet challenges in public health sector. Therefore, it is important to conduct a large scale study to understand the needs of training that is required for the pharmacists to make them part of NPHPs.

Policy makers in India are yet to realize full potential of pharmacists’ role in NPHPs. Physicians in this survey clearly indicated that pharmacists can play an important role in the major health programs and the physicians are willing to collaborate. A Malaysian study suggests that General Physicians (GPs) support the extension of community pharmacists’ role in patient care activities, which is almost the same as in this study.

As both the pharmacists and physicians want pharmacists’ involvement in NPHPs, now pharmacy professionals have to find ways to make pharmacists as part of public health providers. A live example for such initiatives comes from South Africa. Over the past few years, a range of initiatives to recruit and retain health professionals we taken, which includes mandatory one-year community service in public sector facility to all pharmacists willing to
become registered pharmacist with the South African Pharmacy Council. Similar initiatives in collaboration with Pharmacy Council of India will improve pharmacists’ image in society and with policy makers.

Though the physicians are welcoming, it is also important that pharmacists are prepared and learn about the NPHPs, either through training programs or in the curriculum, or both. In recent years, pharmacists and professional associations have been actively promoting the pharmacist’s role in public health. There are examples of pharmacists taking initiatives to be a part of national health programs, such as the Revised National Tuberculosis Control Program (RNTCP). For the first time, the RNTCP guidelines have mentioned the word “pharmacist” as a specialist with expertise in managing Multi-Drug-Resistant Tuberculosis (MDR-TB)\(^{323}\) which is a step forward. Teaching more clinical practice would be helpful in pharmacists taking a larger role in national health programs such as malaria and leprosy eradication programs, diabetes, HIV/AIDS, and family and welfare programs. In a published study, dispensing practices for tuberculosis and knowledge about the national tuberculosis program of 300 pharmacies were assessed. Although 95% of pharmacists were not aware of the existence of the tuberculosis program, majority (97%) were willing to learn and contribute toward tuberculosis control.\(^{324}\)

Hence, creating awareness on NPHPs and the opportunities available for pharmacists should be actively promoted by professional associations and pharmacy schools, so that pharmacists take initiatives in NPHPs.

10.5 Role of Professional Associations in Strengthening Pharmacists’ Position in NPHPs

Productive partnerships could be public-private-professional organizational collaborations. For example, All India Organisation of Chemists and Druggists (AIOCD) with its approximately 700,000 members and Indian Pharmaceutical Association with 10,000 members operating in 17 state branches and 33 local branches could be potential resources to disseminate information on various NPHPs. The NPHP coordinators could utilize this vast network to create awareness and better image about the roles of pharmacists in NPHPs.
11 STUDY LIMITATIONS

- National and International curriculum comparison of pharmacy programs (I, II)

The strength of this study was use of national curricula for DPharm and PharmD from PCI, and for BPharm program the AICTEs’ model curriculum (individual universities have freedom to modify the curriculum). Selection of University of Florida curriculum to represent entire USA is a limitation, as all the US universities follow the ACPE guidelines, but they can modify the curriculum as per their needs. Thus, limitation of the national level comparison study was that there was no opportunity to study curricula variations in different universities (I, II).

In the International comparison study (II), selection was limited to four countries form three WHO regions. A wider range of selection from Western Pacific, Eastern Mediterranean Regions and African Regions would have given more insights. Particularly, inclusion of UK and Australian curricula could have provided more insights in public health and patient care orientation in pharmacy curricula, and thus, enriched our analysis. However, the comparison was limited to India, USA, Finland and Denmark on the basis of the reasons given in the Methods Section.

- Pharmacist role in NPHPs – students’ perceptions (III)

The strength of this classroom survey was that there is equal number of participants from the three different pharmacy programs. Classroom survey method facilitates inclusion of all students which decreases the influence of selection bias on results.

One of the major limitations is the number of colleges and students’ participation, as the study was limited to five colleges in South India (III). Therefore, it can be considered as a pilot study to test the method and get some insights in pharmacy students’ knowledge and attitude on NPHPs. A national level study with larger random sample of students from entire India would give more insights to the situation. Every year, there is a possibility for over 100,000 admissions in over 1800 pharmacy colleges in India. Reaching all these students to organize such a large study by using random sampling would only be possible by taking initiatives by Pharmacy Council of India or Indian Association of Colleges of Pharmacies. Such a large study would be
useful for professional bodies to start negotiations with policy makers to include pharmacists in national health policies and NPHPs to make pharmacists a part of health care team.

- **Pharmacist role in NPHPs – physicians perceptions (IV)**

The strength of this survey was that there was statistically comparable and valid number of participants from all the groups of the physicians with different levels of experience. There are over 885,000 registered physicians practicing in the country. One of the limitations is number of physicians participating in this study which is limited to 129 (IV). As this study was conducted only in South India, it can be considered as a pilot study to test the method and get some insights in physicians’ perceptions on pharmacist role in NPHPs. A larger national level study covering all parts of India would give more insights to the situation.
RECOMMENDATIONS

To develop patient care and public health aspects, curriculum development teams and statutory authorities in India should start thinking of including these aspects in curricula at all levels. As part of the solution, it would be useful to have an alternative curriculum line focusing on patient care and pharmacy practice aspects in Indian DPharm and BPharm programs (I). In 2014, PCI has addressed this issue by introducing Bachelor of Pharmacy (Practice). This gives a positive scope for the development of the profession. If pharmacists are included in National Health and Pharmaceutical Policies, it is likely that increased exposure to public health services will have more positive perceptions of health care professionals and the common public on pharmacists image. As suggested in WHO resolution WHA 47.12, it is high time to recognize key role of pharmacists in public health care which should reflect in curriculum content. Poor enforcement of regulations in pharmacy sector is seen at all levels in India. Along with bringing the new regulations, the regulatory bodies taking stringent steps towards enforcement of the regulations is hoped to change the face of the profession.

The curriculum plays a major role in developing and changing the face of the profession. DPharm and BPharm curriculums in India are not preparing pharmacists to take part in public health, patient and pharmaceutical care services, and to become a part of health care team. The PharmD program is covering most of the care and service aspects and giving hope to the current situation.

The research reveals that the student pharmacists are also motivated to learn more about NPHPs and be part of NPHPs (III). The research also reveals that physicians are willing to cooperate and accepting pharmacists taking important role in NPHPs (IV). The pharmacists representing organizations can utilize these findings to make arguments to provide a platform for pharmacist workforce in NPHPs at national level.
This study is first of its kind in India, providing evidence to curriculum development teams, professional associations, statutory bodies and policy makers for making plans to utilize the pharmacist workforce in NPHPs and health policies. Curriculum development teams and statutory authorities in India should start thinking of including public health aspects, NPHPs in curricula at all levels. This study will also be helpful to statutory authorities and curriculum reform committees in India and other countries where pharmacists’ role is continuing to evolve towards inclusion of public health and patient care.

This study will be useful to make new policies and bring reformations in pharmacy education at all levels. An example of reforms is as India developed a separate curriculum for BPharm (practice) to foster practicing pharmacists’ skills.
14 CONCLUSIONS

- The curriculum plays a major role in developing and changing the face of the profession. The Indian pharmacy programs do not have the same length and knowledge levels in patient care and public health, but the graduates from all three programs obtain the same title as pharmacists. The PharmD curriculum contains more clinical subjects and patient oriented services than industrial aspects.

- The US and Indian PharmD programs contain most and the Indian DPharm and BPharm least public health and patient care aspects of all the six pharmacy programs which were assessed. It would be useful to have an alternative curriculum line focusing on patient care and pharmacy practice aspects in Indian DPharm and BPharm programs.

- Students exhibited positive attitude on pharmacists’ involvement in NPHPs, although their different student groups, PharmD and DPharm students being most positive towards pharmacists’ involvement. The study also revealed the need for increasing contents supporting NPHPs to all pharmacy programs, particularly to BPharm program.

- The pilot study among physicians indicates that Indian physicians are willing to collaborate with pharmacists and are comfortable to involve them in the health care team. The survey also revealed differences in opinions between junior and senior physicians: the longer physicians’ practice experience was, the less favorable they were for pharmacists’ involvement in NPHPs.

- Larger scale studies are needed in the future to learn more about pharmacists’ role in patient care and public health in India and how it can be supported by pharmacy education.

As it is suggested in WHO resolution WHA 47.12, it is high time to recognize the key role of pharmacists in public health care which should reflect to curriculum content.\(^{327}\)
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APPENDICES

Appendix 1: Questionnaire to assess pharmacy students’ knowledge and attitude on NPHPs

A survey to assess pharmacy students’ knowledge and attitude on National Public Health Programs

**General description:** This survey is to be completed by final year DPharm, BPharm and PharmD students from any college in India. The main objective of this survey is to compare the knowledge levels and attitudes of final year DPharm, BPharm and PharmD students towards their role as pharmacists in public health and patient care.

**Demographics**

Name: ____________________________  College name: ____________________________

Age: ________  Gender: □ Male  □ Female

Geographical region: □ North  □ South  □ East  □ West

Educational program: □ DPharm  □ BPharm  □ PharmD

**Assessment of pharmacy students’ knowledge in National Public Health Programs**

This section covers questions related to National Public Health Programs. The respondents MUST answer ALL questions. Please answer independently, without taking help or opinions from others.

1. Have you studied about National Health Policy in your pharmacy curriculum?
   - □ Yes  □ No  □ Do not know  □ Do not remember

2. Have you studied pharmaceutical policy in your pharmacy curriculum?
   - □ Yes  □ No  □ Do not know  □ Do not remember

3. Do you know the national public health programs in India?
   - □ Yes, I know well  □ Yes, I know to some extent
   - □ Yes, I have heard about, but do not know contents  □ No, I have never heard about them

4. Name all the National Public Health Programs that you know:

   __________________________________________
   __________________________________________
   __________________________________________

5. Have you received lectures or completed any courses that provided information on national public health programs?
   - □ Yes, I have received lectures during my basic studies
   - □ Yes, I have received at least one course in continuing education
   - □ Yes, I have studied about national health programs as self-study
   - □ I have not received any training on national health programs

   Other comments: __________________________________________

6. Is the amount of time devoted to learn public health aspects sufficient? (Basic pharmacy studies)
   - □ Yes, it is sufficient  □ No, not sufficient  □ No opinion

   Other comments: __________________________________________

7. Based on your pharmacy education, do you have adequate knowledge to take part in national public health programs?
   - □ Yes  □ No  □ No opinion  □ Not necessary for pharmacists

   Other comments: __________________________________________

8. Have you studied about disease prevention and dissemination of information in National Public Health Programs?
   - □ Yes  □ No  □ Do not know
9. Is it necessary for the pharmacists to know about national public health programs?
☐ Yes  ☐ No  ☐ No opinion

**Assessment of pharmacy students’ attitude on National Public Health Programs**

**Assessment of pharmacy students’ attitude on importance and participation of National Public Health Programs.** This section covers questions to assess attitude of DPharm, BPharm and PharmD students on National Public Health Programs. The respondents MUST answer ALL the questions. Please answer the questions independently, without taking help or opinions from others.

10. Do you think that it is important to include National Public Health Programs in normal training program for pharmacists?
☐ Very important  ☐ Important  ☐ Moderately
☐ Of little importance  ☐ Unimportant

11. Do you feel that your current knowledge about public health programs in the country is sufficient?
☐ Very much sufficient  ☐ Sufficient  ☐ Neutral
☐ Not sufficient  ☐ Totally insufficient

12. Do you feel you have an important role to play in public health programs?
☐ Very important  ☐ Important  ☐ Moderately
☐ Of little importance  ☐ Unimportant

13. During your pharmacy education program, have you ever involved in any public health program(s)?
☐ Yes  ☐ No
If your answer is YES, please describe in which program you have participated and in which way:

14. Have you ever involved in any public health program(s) during your internship?
☐ Yes  ☐ No
If your answer is YES, please describe in which program you have participated and in which way:

15. Are you willing to take up a professional role in public health program?
☐ Yes  ☐ No  ☐ Do not know

16. Do you want to learn or learn more about Public Health programs in your curriculum?
☐ Yes, I want to learn  ☐ Yes, I want to learn more  ☐ No, it is not relevant
☐ No do not want to learn  ☐ Do not know
If your answer is YES, please mention which program you want to learn / learn more:

17. Where do you plan to work after graduation?
*Please select top two priorities (write 1 and 2 in the relevant boxes below):*
☐ Community Pharmacy  ☐ Regulatory officer in government
☐ Hospital Pharmacy  ☐ Marketing
☐ Drug Manufacturing Industry  ☐ Higher studies
☐ R&D  ☐ Teaching
☐ Clinical Research  ☐ Work abroad
☐ Regulatory affairs in industry  ☐ Any other, please specify
### Knowledge in individual National Public Health Programs

**Assessment of pharmacy students’ knowledge in different National Public Health Programs (e.g. HIV/AIDS, TB, Pulse Polio, Blindness and Deafness Control Programs, Tobacco Control, Universal Immunization Program, etc.).**

This section covers questions related to individual National Public Health programs. The respondents MUST answer ALL the questions. Please answer the questions independently without taking help or opinions from others.

18. Major programs in communicable diseases:

<table>
<thead>
<tr>
<th>Program</th>
<th>Do you know about the program</th>
<th>Do you have a role to play</th>
<th>Are you willing to take part</th>
<th>What kind of role? (please describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS control program</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NACO envisions an India where every person living with HIV has access to quality care and is treated with dignity. Effective prevention, care and support for HIV/AIDS is possible in an environment where human rights are respected and where those infected or affected by HIV/AIDS live a life without stigma and discrimination.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Revised National Tuberculosis Control Program (RNTCP)</td>
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<tr>
<td>The objective of TB control Program is to achieve and maintain cure rate of at least 85% in new sputum positive pulmonary TB patients, and to achieve and maintain detection of at least 70% of such cases. Directly Observed Treatment is highlight of this program.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>National Vector Borne Disease Control program (NVBDCP):</td>
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<tr>
<td>The objective of the program is to prevent and control Malaria, Dengue, Lymphatic Filariasis, Kala-azar, Japanese Encephalitis and Chikungunya in India.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>National Leprosy Eradication Program (NLEP)</td>
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<tr>
<td>Highlights of the program: Early detection &amp; complete treatment of new leprosy cases. Carrying out house hold contact survey in detection. Early diagnosis &amp; prompt MDT, through routine and special efforts. Information, Education &amp; Communication (IEC) activities in the community to improve self reporting to Primary Health Centre (PHC) and reduction of stigma. Intensive monitoring and supervision at Primary Health Centre/Community Health Centre.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
19. Major programs in non-communicable diseases:

<table>
<thead>
<tr>
<th>Program</th>
<th>Do you know about the program</th>
<th>Do you have a role to play</th>
<th>Are you willing to take part</th>
<th>Mention your role as pharmacist? (please describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Mental Health Program (NMHP)</td>
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<tr>
<td>Objectives: 1. To ensure the availability and accessibility of minimum mental healthcare for all in the foreseeable future, particularly to the most vulnerable and underprivileged sections of the population; 2. To encourage the application of mental health knowledge in general healthcare and in social development; and 3. To promote community participation in the mental health service development and to stimulate efforts towards self-help in the community.</td>
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<tr>
<td>National Program for Prevention and Control of Deafness (NPPCD)</td>
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<tr>
<td>Highlights: 1. To prevent the avoidable hearing loss on account of disease or injury. 2. Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness. 3. To strengthen the existing inter-sectoral linkages for continuity of the rehabilitation programme, for persons with deafness.</td>
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<tr>
<td>National Program for Control of Blindness (NPCB)</td>
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<tr>
<td>Highlights: 1. To reduce the backlog of blindness through identification and treatment of blind at primary, secondary and tertiary levels. 2. Prevention of visual impairment; through provision of comprehensive eye care services and quality service delivery. 3. To enhance community awareness on eye care and lay stress on preventive measures; 4. To secure participation of Voluntary Organizations/Private Practitioners in eye Care.</td>
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<tr>
<td>Pulse Polio program</td>
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<tr>
<td>Objectives: Children in the age group of 0-5 years administered Polio drops during the national and sub-nationals immunization rounds. About 172 million children are immunized during each National Immunization Day.</td>
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<tr>
<td>Universal Immunization Program (UIP)</td>
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<tr>
<td>Objective: Protection of children from life threatening conditions by providing vaccination. Under UIP, following vaccines are provided: 1. BCG, 2. DPT, 3. OPV (Oral Polio Vaccine), 4. Measles, 5. Hepatitis B, 6. TT (Tetanus Toxoid), etc.</td>
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</tbody>
</table>
APPENDICES

Appendix 1: Questionnaire to assess pharmacy students’ knowledge and attitude on NPHPs

20. Other important National Public Health Programs:

<table>
<thead>
<tr>
<th>Program</th>
<th>Do you know about the program</th>
<th>Do you have a role to play</th>
<th>Are you willing to take part</th>
<th>What kind of role? (please describe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Tobacco Control Program (NTCP)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Types of benefits of NTCP:</td>
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<tr>
<td>1. To bring about greater awareness about the harmful effects of tobacco use and about the Tobacco Control Laws and 2. To facilitate effective implementation of the Tobacco Control Laws.</td>
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<tr>
<td>National Program for Health Care of the Elderly (NPHCE)</td>
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<tr>
<td>Objective is to provide separate, specialized and comprehensive health care to the senior citizens at various level of State health care delivery system including outreach services.</td>
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</tbody>
</table>

Thank you for participating in this important survey. We will share the results of the study. If you have any questions, please feel free contact us by e-mail: prassu117@gmail.com
Appendix 2: Questionnaire to assess Physicians’ perception on pharmacist role in NPHPs

A survey to assess Physicians’ perception on pharmacist role in National Public Health Programs

General description: This survey is to be completed by family physicians/specialists/surgeon doctors practicing in any type of practice setting in any part of India. The objective of this survey is to characterize physician perceptions on the role of pharmacists in public health and patient care aspects.

Definition: In this study the National Public Health Programs means that major programs that are being carried out by the Ministry of Health and Family Welfare, the Government of India. The programs that we are focusing in this survey are: HIV/AIDS, Revised National TB Control Programme, National Vector Borne Disease Control Programme, National Leprosy Eradication Programme, National Mental Health Programme, National Programme for Prevention and Control of Blindness, National Programme for Control of Deafness, National Programme for Control of Blindness, Pulse Polio Programme, Universal Immunization Programme, National Tobacco Control Programme and National Programme for Health Care of the Elderly.

Demographics

Name: _______________________ Type of practice setting: _______________________

Age: __________ Gender: □ Male □ Female Email: _______________________

Geographical region: □ North □ South □ East □ West

Highest Medical qualification: □ MBBS □ MS/MD □ Other

Please select the year group in which you obtained your highest medical qualification

How many years have you been practicing: □ < 5 □ 5-10 □ 11-15 □ > 15

Current designation: □ Family doctor □ Medical officer □ CMO □ Surgeon □ Other

1. Is there a pharmacy attached or close to your practice?
□ Yes □ No

2. Do you refer your patients with prescription to a pharmacy in your practice area to buy their medicine?
□ Yes □ No

3. Do you contact your pharmacy frequently for professional matters?
□ Yes □ No

4. On an average, please estimate the frequency of your interactions with a pharmacist:
□ Every day □ More than once/week □ Once a week □ Once a month □ Less than once/month

5. Do you think that your pharmacist is knowledgeable?
□ Yes □ No

6. Do you think that your pharmacist is service oriented?
□ Yes □ No

7. Do you think the pharmacy / your pharmacist is providing patient counseling on medicine, administration, dosage, side effects etc., to supplement your counseling, is at a satisfactory level?
□ Very much sufficient □ Sufficient □ Neutral □ Not sufficient □ Totally insufficient

Physicians’ perception on pharmacist role in national public health and patient care

This section covers questions related physicians’ perception on pharmacist role in National Public Health Programs. The respondents MUST answer ALL questions.

8. Do you see the pharmacist as a mere vendor/dispenser of prescription drugs?
□ Yes □ No □ Do not know

9. Your perception on pharmacist role in National Public Health Programs:
□ Positive □ Neutral □ Negative □ No opinion

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Appendix 2: Questionnaire to assess Physicians’ perception on pharmacist role in NPHPs

10. Do you feel pharmacists have an important role to play in public health programs?
   - Yes, very important
   - Yes, moderately important
   - No, not important
   - No opinion

   Other comments:

   If yes please answer question no. 11. If no, please go to question no. 12.

11. What kind of role pharmacist can play in public health and patient care? (Select one or more)
   - Disease prevention
   - Patient counseling on correct use of medicine
   - Dispensing prescriptions
   - Help to select medication (medical representative)
   - Patient care services e.g. check on inhalation technique
   - Pharmacoeconomics
   - No, pharmacists has no role to play

   Other roles, please mentions here:

12. Do you think it is important to include pharmacists in National public health programs?
   - Yes, very important
   - Yes, moderately important
   - No, not important
   - No opinion

   Other comments:

13. Do you feel that pharmacists’ current knowledge on various health public programs is sufficient?
   - Very much sufficient
   - Sufficient
   - Neutral
   - Not sufficient
   - Totally insufficient

Physicians’ opinion on pharmacist role in individual National Public Health Programs

This section covers questions related to the assessment of physicians’ perception on the role of pharmacists in individual national health programs that are being implemented by the Government of India (e.g. HIV/AIDS, TB, Pulse Polio, Blindness and Deafness Control Programs, Tobacco Control, Universal Immunization Program, etc.). The respondents MUST answer ALL the questions.

Major programs in communicable diseases

14. Can the pharmacist play a role in HIV/AIDS Control Program?
   - Yes
   - No
   - Do not know

   If your answer is YES, please select one or more example roles
   - Disease prevention
   - Patient counseling
   - Dispensing prescriptions

   Other roles:

15. Can the pharmacist play a role in Revised National Tuberculosis Control Program (RNTCP)?
   - Yes
   - No
   - Do not know

   If your answer is YES, please select one or more example roles
   - Disease prevention
   - Patient counseling
   - Dispensing prescriptions

   Other roles:

16. Can the pharmacist play a role in National Vector Borne Disease Control program (NVBDCP)?
   [In prevention and control of Malaria, Dengue, Lymphatic Filariasis, Kala-azar, Japanese Encephalitis and Chikungunya in India]
   - Yes
   - No
   - Do not know

   If your answer is YES, please select one or more example roles
   - Disease prevention
   - Patient counseling
   - Dispensing prescriptions

   Other roles:
Appendix 2: Questionnaire to assess Physicians' perception on pharmacist role in NPHPs

17. Can the pharmacist play a role in National Leprosy Eradication Program (NLEP)? [Information, Education and Communication activities in the community to improve self reporting to Primary Health Centre and reduction of stigma]
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 
   
   Major programs in non-communicable diseases

18. Can the pharmacist play a role in National Mental Health Program (NMHP)?
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 
   
19. Can the pharmacist play a role in National Program for Prevention and Control of Deafness (NPPCD)?
   [To prevent the avoidable hearing loss on account of disease or injury. Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness. To strengthen the existing intersectoral linkages for continuity of the rehabilitation program, for persons with deafness]
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 
   
20. Can the pharmacist play a role in National Program for Control of Blindness (NPCB)?
   [To enhance community awareness on eye care and lay stress on preventive measures]
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 
   
21. Can the pharmacist play a role in Pulse Polio program?
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 
   
22. Can the pharmacist play a role in Universal Immunization Program (UIP)?
   - Yes
   - No
   - Do not know
   If your answer is YES, please select one or more example roles
     - Disease prevention
     - Patient counseling
     - Dispensing prescriptions
     - Other roles: 

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Appendix 2: Questionnaire to assess Physicians’ perception on pharmacist role in NPHPs

Other important National Public Health Programs

23. Can the pharmacist play a role in National Tobacco Control Program (NTCP)?
   □ Yes   □ No   □ Do not know
   If your answer is YES, please select one or more example roles
   □ Disease prevention   □ Dissemination of information
   □ Patient counseling   □ Improve patient adherence
   □ Dispensing prescriptions   □ Drug management
   Other roles:

24. Can the pharmacist play a role in National Program for Health Care of the Elderly (NPHCE)?
   □ Yes   □ No   □ Do not know
   If your answer is YES, please select one or more example roles
   □ Disease prevention   □ Dissemination of information
   □ Patient counseling   □ Improve patient adherence
   □ Dispensing prescriptions   □ Drug management
   Other roles:

General perception of physicians on pharmacists and the pharmacy profession
This section covers general questions related to the physician opinion on pharmacist and pharmacy profession and inter-professional collaboration between pharmacists and physicians.

25. Please rate your comfort with pharmacist roles described above:
   □ Very comfortable   □ Somewhat comfortable   □ Uncomfortable

26. Do you have any barriers to collaborate with pharmacists as a part of health care team?
   □ Very comfortable   □ Somewhat comfortable   □ Uncomfortable

27. Do you see pharmacists as a part of health care team?
   □ Yes   □ No   □ No opinion

28. Please indicate any comments/ideas/improvements needed for pharmacist roles in national public health:

Thank you for participating in this important survey. We will share the results of the study. If you have any questions, please feel free contact us by e-mail: prassu117@gmail.com