📚 B. Pharmacy 1st Semester - Pharmaceutics 1 (UNIT – 1)

🏛️ HISTORICAL BACKGROUND & DEVELOPMENT OF PROFESSION OF PHARMACY

Contents to be covered inside this topic:

- ➡️ History Of Pharmacy Profession In India
- ➡️ Industry And Organization
- ➡️ Pharmacy as a Career
- ➡️ Different Pharmacy Practice Areas
- ➡️ History Of Pharmacopoeia
- ➡️ Indian Pharmacopoeia
- ➡️ British Pharmacopoeia
- ➡️ United States Pharmacopoeia (USP)

IN A. HISTORY OF PHARMACY PROFESSION IN INDIA

💊 Pharmacy Definition

Pharmacy is the art, science and economics of preparing and dispensing medications and providing drug-related information to the public. The word "pharmacy" was coined from the Greek word "pharmakon" meaning "medicine" or "drug". Therefore, a pharmacist is a "medicine or drug man".

A pharmacist is a trained person who is certified to make, sell or distribute medicine and medicine compounds. The place where the pharmacist works is the pharmacy, which can be a shop, or a part of hospital.

📖 History of Profession in India in Relation to Pharmacy Education

The allopathic system of medicine was introduced in India during the British rule. It was mainly meant for the ruling class. By the 19th century it became popular and was used for the common people also.

In the beginning the medicines were imported from Europe. Later they were manufactured in India. The Bengal Chemical and Pharmaceutical Works was set up by Acharya P.C. Ray in 1901 in Calcutta. Prof. T.K. Gujjar set up a small factory in Bombay at Parel in 1903 and the Alembic Chemical Works in 1907 at Baroda.

🔄 Continued History

The import of drugs was stopped during the First World War and it was resumed after the war. There was no restriction on the quality of the imported drugs so there were inferior quality drugs in the markets. Therefore a number of Acts were passed to regulate the quality of drugs.

In 1930 a committee was appointed under the leadership of Col. R.N. Chopra to look into the issues related to Pharmacy in India. It reported that Pharmacy did not exist as a specialized profession.

After this Prof. Mahadeva Lal Schroff started the pharmaceutical education in the Banaras Hindu University. The United Province Pharmaceutical Association was set up in 1935 which later became the Indian Pharmaceutical Association.

In 1939 Prof. Mahadeva Lal Schroff started the Indian Journal of Pharmacy. The All India Pharmaceutical Congress Association was set up in 1940

which held its sessions at various places and tried to publicize the idea of Pharmacy.

To regulate the manufacture, import, distribution and sale of drugs the Drugs Act of 1940 was adopted.

🏭 B. INDUSTRY AND ORGANIZATION

The foundation stone of the modern Indian pharmaceutical industry was laid in the beginning of the 20th century when, in 1901, a small factory known as "The Bengal Chemical and Pharmaceutical Works" was established in Calcutta.

Prior to India's Independence, bulk quantity were imported and a very negligible quantity was manufactured in India. The country was dependent largely on the United Kingdom, France and Germany for its requirements of drugs and medicines.

💼 C. PHARMACY AS A CAREER

Pharmacy is an important component of the medical and healthcare system. The pharmaceutical industry as a whole is concerned with the manufacturing, preparation, and marketing of drugs. It is of vital importance to the economy and employs a large number of scientists, technicians, and blue-collar workers.

✅ Members of this profession (Pharmacists) must include the following points:

- Have a comprehensive knowledge of drugs, including their composition, chemical and physical properties, and uses.
- Be familiar with the effects of various drugs on people's health.
- Have a thorough understanding of procedures for testing drug purity & strength.

🎯 PRACTICE AREAS AND DESCRIPTIONS

PRACTICE AREAS	DESCRIPTION
Wholesale Pharmacy	It offers opportunities to a limited number of pharmacists to run wholesale business of drugs and medicines. The wholesalers serve as an intermediary between manufacturer and retailer.
Industrial Pharmacy	Pharmaceutical industry offers opportunity to pharmacist of all educational levels. It provides job to a pharmacist in Production, Analytical and Quality Control, Research and Development and New drug discovery, Medico-marketing and sales clinical trials, Clinical Trials
Pharmacy Education (Academics)	Due to rapid growth of pharmaceutical industry and expansion of health services in the country, there is steep increase in the number of pharmacy teaching institutions in the country
Community Pharmacy	A community pharmacy is a healthcare facility that is able to provide pharmacy services to people in a local area or community. A community pharmacy dispenses medicine and typically involves a registered pharmacist with the education, skills and competence to deliver professional services to the community
Hospital Pharmacy	Hospital pharmacists work in a hospital pharmacy service, primarily within the public sector. They are experts in the field of medicines and are not only responsible for the dispensing of prescriptions but also the purchase, manufacture and quality testing of all medicines used in a hospital
Clinical Pharmacy	Direct patient care service that optimizes the use of medication and promotes health, wellness, and disease prevention

PRACTICE AREAS	DESCRIPTION
Veterinary Pharmacy	Called animal pharmacies may fall in the category of hospital pharmacy, retail pharmacy. Veterinary pharmacies stock different varieties and different strengths of medications to fulfill the pharmaceutical needs of animals

📖 PHARMACOPOEIAS

🏛️ A. HISTORY OF PHARMACOPOEIA

Every country has legislation on pharmaceutical preparations that sets standards and obligatory quality indices for medicaments, raw materials and preparations employed in the manufacture of drugs.

These regulations are presented in separate articles, general and specific, relating to individual drugs, and are published in the form of a book called a Pharmacopoeia.

The word pharmacopoeia is derived from the Greek words pharmakon, means a drug or medicine and poieo, means to make.

Pharmacopoeia is an official book, published by the National government containing the approved list of drugs with description, preparation, tests for identification, purity & potency. It gives the official name of each drug along with synonyms and recommended average adult dose.

The first British Pharmacopoeia (B.P) was published in 1864. It was including monographs on benzoic acid, gallic acid, tartaric acid, tannic acid, camphor, lactose, sucrose and seven alkaloids along with their salts.

The first United State Pharmacopoeia (U.S.P.) was released on 15th December, 1820.

📋 LIST OF PHARMACOPOEIA IN VARIOUS COUNTRIES

- Indian Pharmacopoeia (I.P)
- British Pharmacopoeia (B.P)
- United States Pharmacopoeia (U.S.P)
- European Pharmacopoeia (E.P)
- International Pharmacopoeia
- Japanese Pharmacopoeia
- Martindale Extra Pharmacopoeia
- British Pharmaceutical Codex
- Pharmaceutical Codex
- British National Formulary
- United State National Formulary
- National Formulary (N.F.)
- United State Dispensatory
- Indian Pharmaceutical Codex (I.P.C.)

IN B. INDIAN PHARMACOPOEIA

📚 Introduction to Indian Pharmacopoeia

Pharmacopoeia Commission (IPC) is an autonomous institution of the Ministry of Health and Family Welfare which sets standards for all drugs

that are manufactured, sold and consumed in India.

The set of standards are published under the title Indian Pharmacopoeia (IP) which has been modelled over and historically follows from the British Pharmacopoeia.

📄 Monographs

Official drugs and other details about them are gives in "Monographs". Pharmacopoeial monographs give the following details, in the order given below:

i. Name of the drug (Main Title).
ii. Other names of the drug (Subsidiary Titles).
iii. Chemical formula, Molecular weight and Systematic chemical name.
iv. Standards of purity or strength.
v. Description - Gives details about appearance, odour and taste.
vi. Solubility in various solvents.
vii. Identification - Gives specific tests.
viii. Tests of Purity - Gives maximum limit of impurities that may be present in drug.
ix. Assay is the method to estimate the quantity of the drug present.
x. Storage conditions - To maintain the activity of the drug.
xi. Label - Special labelling instructions are given for some drugs.
xii. Preparations - The formulations that may be prepared from the drug.
xiii. Category - Explains the actions and uses of the drug.
xiv. Dose - is given for all drugs except for those used externally.

⭐ Salient Features of Indian Pharmacopoeia

- IP is an official document meant for overall Quality Control and Assurance of Pharmaceutical products marketed in India by way of contributing on their safety, efficacy and affordability.
- Collection of authoritative procedures of analysis and specifications for Drugs.
- The IP, or any part of it, has got legal status under the Second Schedule of the Drugs & Cosmetics Act, 1940 and Rules 1945 there under.
- For identity, purity and strength of drugs essentially required from health care perspective of human beings and animals.
- Authoritative in nature.
- Enforced by the Regulatory authorities for quality control of medicines
- During Quality Assurance and at the time of dispute in the court of law the IP standards are legally acceptable.

📊 DIFFERENT EDITIONS OF INDIAN PHARMACOPOEIA

EDITION	SUPPLEMENT	FEATURES
1st - 1955	1960	• Covers 986 monographs • Titles of monograph in Latin language • Weight and measure in metric system
2nd - 1966	1975	• Titles of monograph in Latin language to English • Name of drugs first came • New analytical technique was added
3rd - 1985 (2 Volume)	1989 and 1991	• Dissolution had been added • Microbial limit test prescribed for liquid preparation • Flame photometry electrophoresis, fluorometry was added
4th - 1996 (2 Volume)	2000, 2002 and 2005	• Computer generated formulae was used • IR and UV spectrophotometry test was added • Contain 1149 monographs and 123 appendices
5th - 2007 (3 Volume)	2008	• Volume one contain general notice, structure of IPC • Volume three contain general monographs
6th - 2010 (3 Volume)	2012	• Products of biotechnology, herbal products was added • Antiretroviral drug was added
7th - 2014 (4 Volume)	2015 and 2016	• Contain 2567 monographs • Radiopharmaceutical monographs was added
8th - 2018 (4 Volume)	2019	• General chemical test and TLC eliminated • More specific test like IR, UV Spectrophotometer was added • Pyrogen test replaced by Bacterial Endotoxin Test

GB C. BRITISH PHARMACOPOEIA

The British Pharmacopoeia (BP) is the national pharmacopoeia of the United Kingdom. It is an annually published collection of quality standards for UK medicinal substances, which is used by individuals and organizations involved in pharmaceutical research, development, manufacture and testing.

It contains all texts and monographs of the European Pharmacopoeia (signposted with a chaplet of stars), as well as the national standards developed by the BP.

📋 Key Features of British Pharmacopoeia:

- It has been published annually.
- In BP 2007 monographs has been introduced for material specifically used in preparation of Traditional Chinese Medicines.
- Term "Prolonged release" has been replaced the term "Slow" and the term "Gastro-resistant" has been replaced with "Enteric coated" in number of monographs.
- BP 2008 contains approximately 3100 monographs for substances preparations and articles used in practice.
- It has been made effective from 1st January 2008.
- BP 2007–2009 were given in 06 Volumes i.e. Vol. I to Vol. VI.

📚 Historical Development:

✅ First edition of BP was published in 1864 & consist of two sections:

- Part I: Materia Medica

- Part II: Preparation & compounds
- Second edition of BP was published in 1867
- Third edition of BP was published in 1885
- Fourth edition of BP was published in 1898
- Fifth edition of BP was published in 1914
- Eighth edition of BP was published in 1953: Titles of drugs & preparations were in English instead of Latin and metric system.

📖 Volume and Content of British Pharmacopoeia

Volume	Content
Volume I and II	• Medicinal substances
Volume III	• Formulated preparations • Blood related products • Immunological products radiopharmaceutical preparations surgical materials • Homoeopathic preparations
Volume IV	• Appendices • Infrared reference spectra • Index
Volume V	• British pharmacopoeia (veterinary)
Volume VI (CD ROM version)	• British pharmacopoeia • British pharmacopoeia (veterinary)

US D. UNITED STATES PHARMACOPOEIA (USP)

The United States Pharmacopoeia is a pharmacopoeia for the United States published annually by the United States Pharmacopeial Convention, a nonprofit organization that owns the trademark and also owns the copyright on the pharmacopoeia itself.

📋 Key Features of USP:

- The first edition of United States Pharmacopoeia was published by United States Pharmacopoeial Convention on December 15th, 1820 in both Latin and English.
- It listed 217 drugs considered worthy of recognition.
- It was earlier revised every 10 years but after 1940, the convention decided that it must be revised after every 5 years.
- Interim supplements were issued whenever necessary to maintain satisfactory standards.
- USP XIX (1975) was the last USP to be published individually as subsequent editions were published in combination with the National Formulary.

📖 E. EXTRA PHARMACOPOEIA (MARTINDALE)

Martindale contains information on drugs in clinical use worldwide, as well as selected investigational and veterinary drugs, herbal and complementary medicines, pharmaceutical excipients, vitamins and nutritional agents, vaccines, radiopharmaceuticals, contrast media and diagnostic agents, medicinal gases, drugs of abuse and recreational drugs, toxic substances, disinfectants, and pesticides.

📋 Key Features:

- It is published by the Royal Pharmaceutical Society of Great Britain and was first published in 1883 by William Martindale
- It is an authoritative reference book on drugs and medicines users.

- It aims to provide practicing pharmacists and physicians with up to date information on all drug substances, official, unofficial & proprietary that are currently used in pharmacy.

💊 DOSAGE FORMS

Contents to be covered in this topic:

→ Introduction
→ Need/Objectives of 'Dosage Forms'
→ Importance/significance of Dosage Forms
→ Classification of dosage form
→ Based on physical state
▪ Solid dosage form
▪ Liquid dosage form
▪ Semi-solid dosage form
→ Based on route of administration
→ Based on site of application(Eye, Skin, Tooth, Foot, Ear, Nose)
→ Based on usage(Internal, External)
→ Novel drug delivery system (NDDS)

📋 DEFINITION

Dosage forms are the safe, effective and stable terms in which medication will be delivered into the body. Dosage forms are essentially pharmaceutical product which are marketed for use typically involving a mixture of active drug components and excipients (non-drug components).

🎯 Need/Objectives of 'Dosage Forms'

A drug may be defined as an agent, intended for use in the diagnosis, mitigation, treatment, cure or prevention of disease in man or in other animals. Drugs are administered in different dosage forms after converting them into a suitable formulation.

Every dosage form is a combination of the drug (API) and different kinds of non-drug components called "additives". The additives are used to give a particular shape to the formulation, to increase its stability and also to increase its palatability as well as to give more elegance to the preparation.

⭐ Importance/significance of Dosage Forms

Transformation of drug into different dosage forms is done to following reasons:

i. Protect the drug from oxidation, hydrolysis and reduction.
ii. Provide a safe and convenient delivery of accurate dosage.
iii. Mask the bitter, salty taste and odour of a drug.
iv. Provide optimum drug action through inhalation, e.g., Aerosols.
v. Provide maximum drug action.
vi. Provide sustained release action.
vii. Protect the drug from destructive effect of gastric juice.
viii. Provide the drugs within body tissues, e.g., Injections

🗂️ CLASSIFICATION OF DOSAGE FORM

The dosage form is classified as follows: A. Based on physical state
B. Based on route of administration
C. Based on site of application
D. Based on usage

🧱 A. BASED ON PHYSICAL STATE

I. Solid Dosage Form:

The solid dosage form may be classified into unit solid dosage form and bulk solid dosage form intended either internal or external use.

II. Liquid Dosage Form:

Liquid dosage form meant for either internal, external or parenteral use. These may be classified into:

i. **Monophasic** - These consist of only a single phase and have either aqueous or non-aqueous solvents as the base. These can be either true or colloidal solutions or solubilized systems.

ii. **Biphasic** - These dosage forms are represented by emulsions and suspensions and consist of two immiscible phases, the continuous phase being a liquid and dispersed phase may be liquid or solid or both.

III. Semi-solid Dosage Form:

- Semi-solid dosage forms occupy an intermediate position between liquid and solid dosage forms with respect to their consistency.
- These do not flow under gravity but are soft enough to deform and spread by applying a small pressure.
- A widely used semi-solid drug product for oral consumption is Avaleha Chavanprash.

🚀 B. BASED ON ROUTE OF ADMINISTRATION

S.No	ROUTES	EXAMPLES
1	**Inhaled Dosage Forms**	Aerosols, Gases, Sprays, Inhalers & metered dose inhalers, and Solution for nebulisers
2	**Ophthalmic Dosage Forms**	Eye drops (solution or suspension), Ophthalmic gels, and Ophthalmic ointments
3	**Oral Dosage Forms**	Capsules, Powders, Solutions, Suspension, Emulsions, Syrups, Gels, Pills, Tablets, and Buccal or sublingual tablets
4	**Parenteral Dosage Forms**	Solutions, Emulsions, and Suspension for injection
5	**Rectal Dosage Forms**	Enemas, Ointments, and Suppositories
6	**Topical Dosage Forms**	Creams, Gels, Liniments, Lotions, Ointments, Powders, Pastes, Plasters, and Transdermal patches
7	**Vaginal Dosage Forms**	Douches, Ointments, Foams, Intrauterine devices, Pessaries (Vaginal suppositories), Vaginal rings, and Vaginal tablets
8	**Urethral Dosage Forms**	Suppositories
9	**Sublingual Dosage Forms**	Lozenges, and Tablets
10	**Otic Dosage Forms**	Ear drops (solution or suspension), and Ointments

SOLID DOSAGE FORM

The solid dosage forms, which are solid in nature which contain one or more drugs for therapeutic effects and excipients like Binders, Sweeteners, coloring agents, etc.

➤ Advantages of Solid Dosage Form:

1. More stable than other dosage forms.
2. Easy to handle.
3. More accurate of the dosage form.
4. No preservation required.

➤ Disadvantages of Solid Dosage Form:

1. Difficult to swallow by some children.
2. Not useful in unconscious patient.
3. Onset of action is slow.
4. Some drug may cause GIT irritation.

💧 LIQUID DOSAGE FORM

Liquid form of a dose of a drug used as a drug or medication intended for administration or consumption. Dosage forms meant either for internal, external or parenteral use may be sub-classified into monophasic or biphasic liquid dosage forms.

➤ Merits of Liquid Dosage Forms:

1. Onset of action is quick as compared to tablets and capsules.
2. Certain medicaments can only be given in liquid form, e.g., castor oil.

3. Certain drugs are to be given in suspended form to produce maximum surface
4. A few drugs if taken in dry form may cause pain and irritation.
5. Psychological satisfaction to a patient of something is in the bottle.

➤ Demerits of Liquid Dosage Forms:

1. Dose has to be measured.
2. Stability and preservation possess a problem.
3. Storage should be proper.
4. Possibility of breaking the containers during transport.
5. Costly dosage form than the solid dosage form.

SEMI-SOLID DOSAGE FORM

✓ Semisolid dosage forms are the topical dosage form used for the therapeutic, protective or cosmetic functions. It may be applied to the skin, nasal, vaginal, or rectal cavity.

✓ Ideal Properties of Semisolid Dosage Forms:

- Smooth texture
- Elegant in appearance
- Non-dehydrating
- Non-gritty
- Non-greasy and non-staining
- Non-hygroscopic

➤ Advantages of Semi-solid Dosage Form:

- It is used externally
- The probability of side effects can be reduced
- First pass gut and hepatic metabolism is avoided
- Local action and Site-specific action of the drug on the affected area
- Convenient for unconscious patients or patients to have difficulty in oral administration
- Suitable dosage form for bitter drugs
- More stable than a liquid dosage form

➤ Disadvantages of Semi-solid Dosage Form:

- May cause staining
- They are bulky to handle
- Application with a finger may cause contamination
- Physico-chemical is less stable than a solid dosage form
- May cause irritation or allergy to some patients
- The accuracy can't be measured for the semisolid dosage form

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🆕 NEW DRUG DELIVERY SYSTEM

"Novel" means something new. Thus, the term "Novel Drug Delivery Systems" refers to dosage forms different from the conventional systems. The conventional dosage forms such as tablets, capsules, injectables, etc., are even today widely used all over the world but the use of NDDS will enhance and boost the level of delivery of medicine in the body.

➤ Advantages over Conventional Dosage Forms:

1. They give the controlled rate of delivery from the administered therapeutic dose.
2. They maintain the optimum therapeutic drug concentration during prolonged duration of treatment
3. There is maximum efficacy-dose relationship.
4. The chances of adverse side effects are minimal.
5. Frequencies of dose intake are minimized
6. These drug delivery systems are suitable for the hospitalized patients who are not to be disturbed during their sleeping time.

📝 PRESCRIPTION

Contents to be covered in this topic:

- DEFINITION
- TYPES OF PRESCRIPTION FORMS
- PARTS OF PRESCRIPTION
- FORMAT OF PRESCRIPTION
- HANDLING OF PRESCRIPTION
- SOURCES OF ERRORS IN PRESCRIPTION

📋 What is a Prescription

A prescription is a legal document or order written by a qualified health care professional for diagnosis, prevention or treatment of a specific

patient's disease. Is written by a licensed practitioner.

📋 Definition

➤ A prescription is a written order from a registered medical practitioner such as dentist, veterinarian etc., to a pharmacist to compounding and dispenses a specific medication for the patient.
➤ The prescriptions are generally written in the English language but Latin words or abbreviations are frequently used in order to save time

📄 Types of Prescription Forms

1. **Private prescription form:** This type of prescription generally written on a form that includes name, address and qualification of prescriber. This is issued by private prescribers.
2. **National Health Service (NHS) prescription form:** Issued by Government Prescribers

🧩 Parts of Prescription

1. Date
2. Patient Information
3. Superscription
4. Inscription
5. Subscription
6. Signa
7. Signature lines, signature, degree, brand name indication
8. Prescriber information

9. DEA (Drug enforcement administration) if required
10. Refills
11. Warnings/label

📝 Format of Prescription

1. Date

➤ It helps a pharmacist to find out the date of prescribing and date of prescription for filling the prescription.
➤ The prescription which prescribe narcotic or other habit forming drug, must bear the date, so as to avoid the misuse of prescription if it is presented by the patient, a number of times for dispensing.

2. Name, Age, Sex and Address of the Patient

➤ Must be written in the prescription because it serves to identify the prescription.
➤ In case, if any of this information is missing in the prescription, the same may be included by the pharmacist after proper enquiry from the patient.
➤ Age and sex of the patient especially in case of children, helps the pharmacist to check the prescribed dose of medication. Also used in dose calculation of children.

3. Superscription

➤ It is represented by Rx symbol.
➤ It is Latin word. It means you take.
➤ In older days, the symbol was considered to be originated from the sign of Jupiter, god of healing.

➤ This symbol was employed by the ancient in requesting god for the quick recovery of the patient.

4. Inscription

➤ This is the main part of the prescription order; contains the names and quantities of the prescribed ingredients.
➤ The name of each ingredient is written on a separate line along with its quantity.
➤ In complex prescription in divided into three parts: (a) Base: - the active medicaments which are intended to produced the therapeutic effect
(b) Adjuvant: - It is included either to enhance the action of medicament or to improve the palatability of the preparation.
(c) Vehicle: - It is included in the prescription either to dissolve the solid ingredients or to increase the volume of the preparation.

5. Subscription

➤ This comprises direction to the pharmacist for preparing prescription.
➤ Which is usually 'mix' 'send tablets' or 'capsules' and number of doses to be dispensed.
➤ But now a days majority of the prescription are not compounded (prepared) by the pharmacist therefore, the prescribers are not writing the prescription.

6. Signatura or Transcription

➤ This consists of the direction to be given to the patient regarding the administration of drug.
➤ It is usually written as 'Sig' on the prescription.

➤ The instructions given in the prescription are required to be transferred to the container in which the medicament is to be dispensed, so that the patient can follow it.

7. Refills or Renewal Instruction

➤ Indicate either no refills or the number of refills you want (do not leave it blank). Determines maximum duration of therapy.

8. Signature, Address, and Registration Number of the Prescriber

➤ The prescription must bear the signature of the prescriber along with its registration number and address.
➤ It is very important particularly in the prescription containing the narcotic and habit forming drugs to prevent its misuse.

🔄 Handling of Prescription

The following procedure should be adopted by the pharmacist while handling the prescription for compounding and dispensing:

1. **Receiving**
2. **Reading and checking**
3. **Collecting and weighting the materials**
4. **Compounding, labeling and packaging**

1. Receiving

The prescription should be revised from the patient by the pharmacist himself. While receiving a prescription, a pharmacist should not change his

facial expression which gives an impression to the patient that he is surprised or confused after seeing the prescription.

2. Reading and Checking

On receiving a prescription, always check it that it is written in proper format. A prescription should always be screened behind the counter. In case of any doubt regarding the prescription ingredients or directions, the pharmacist should consult the other pharmacist or prescriber.

3. Collecting and Weighting the Materials

Before compounding the prescription, all the materials required for it, should be collected on the left hand side of the balance. After weighing the material it should be shifted to right hand side of the balance.

4. Compounding, Labeling and Packaging

Compounding should be carried out in a neat place. Required should be thoroughly cleaned and dried. Only 1 prescription should be compounded at one time.

❌ Sources of Errors in Prescription

1. Abbreviations
2. Name of drug
3. Strength of preparation
4. Dosage form of the drug prescribed
5. Dose
6. Instruction for the patient

7. Incompatibilities

💊 POSOLOGY

Contents to be covered in this topic:

➡️ DEFINITION OF POSOLOGY
➡️ FACTOR AFFECTING POSOLOGY
➡️ CALCULATION OF DOSES

📋 Definition

The word posology is derived from the Greek words 'posos' meaning how much and 'logos' meaning science. So posology is a branch of medical science which deals with dose or quantity of drugs which can be administered to a patient to get the desired pharmacological actions.

🎯 Factors Affecting Posology

✤ AGE

The pharmacokinetics of many drugs changes with age. Children and old people need lesser amount of drug than adult dose, because they do not excrete the drug as that of adult. Children and old people need lesser amount of drug than the normal adult dose, because they are unable to excrete drugs to that extent as adults.

❖ SEX

Morphine and Barbiturates produce more excitement before sedation in women than men. When drug are administered during menstruation, pregnancy, lactation special care must be taken.

❖ IDIOSYNCRASY

This an Exceptional response to a drug in few individual patients.

❖ BODY WEIGHT

The average adult dose is calculated for a person with 70 kg Body Weight (BW). For exceptionally obese (fat) or lean (thin) patient the dose may be calculated on body weight basis.

❖ ROUTE OF ADMINISTRATION

I.V doses of drug are usually smaller than the oral doses. Intravenous route this might enhance the chances of drug toxicity. The effectiveness of drug formulation is generally controlled by the route of administration.

❖ TIME OF ADMINISTRATION

Presence of food in the stomach delay the absorption of drug & rapidly absorbed from the empty stomach. But it does not mean that much effective when taken during or after meal. Iron, arsenic & cod-liver oil should be given after meal & antacid drugs taken before meal.

❖ PRESENCE OF DISEASE

Drugs like barbiturates & chlorpromazine may produce unusually prolonged effect in patient having liver cirrhosis. Such as, streptomycin produce toxic effect on these patient their kidney function is not working properly because streptomycin excreted through kidney.

❖ ANTAGONISM

When the action of one drug is opposed by the other drug on the same physiological system is known as drug antagonism. The use of antagonistic response to drugs is valuable in the treatment of poisoning.

❖ ACCUMULATION

Some drugs produces the toxic effect if it is repeatedly administered for long time because these drugs excreted slowly. This occurs due to accumulative effect of the drug.

❖ ADDITIVE EFFECT

When two or more drugs administered together is equivalent to sum of their individual pharmacological action, the phenomenon is called as additive effect.

❖ SYNERGISM

When desired therapeutic result needed is difficult to achieve with single drug at that time two or more drugs are used in the combination form for increasing their action this phenomenon is called synergism.

❖ TOLERANCE

Some time higher dose of a drug is required to produce a given response (previously less dose was required). The drug tolerance is of two types:

- **True tolerance:** which is produced by oral & parenteral administration of the drug.
- **Pseudo tolerance:** which is produced only to the oral route of administration.

❖ TACHYPHYLAXIS

When some drugs administered repeatedly at short intervals, the cell receptors get blocked up & pharmacological response to that drug decreased. The decreased response cannot be reversed by increasing the dose this phenomenon is called tachyphylaxis or acute tolerance.

🧮 Calculation of Doses

❖ ON THE BASIS OF AGE

NAME	FORMULA'S USED TO CALCULATE
YOUNG'S FORMULA	For children under 12 years of age
DILLING'S FORMULA	Doses for children in between 4 to 20 years of age
COWLING'S FORMULA	For children above 1 year
FRIED'S FORMULA	Children under age of one year
BASTEDO'S FORMULA	For children based on age

i. Young's Formula

Child's dose = (Age of child / Age of child + 12) × Adult dose

ii. Dilling's Formula

Child's dose = (Age of child / 20) × Adult dose

iii. Cowling's Formula

Child's dose = (Age at next birthday / 24) × Adult dose

iv. Fried's Formula

Child's dose = (Age in months / 150) × Adult dose

v. Bastedo's Formula

Child's dose = (Age in years + 3 / 30) × Adult dose

❖ ON THE BASIS OF BODY WEIGHT

NAME	FORMULA'S USED TO CALCULATE
CLARK'S FORMULA	Dose for the children according to body weight

Clark's Formula: Child's dose = (Weight of child in kg / 70) × Adult dose

❖ ON THE BASIS OF SURFACE AREA

NAME	FORMULA'S USED TO CALCULATE
CATZEL'S FORMULA	Dose for the children according to surface area

Catzel's Formula: Child's dose = (Surface area of child / 1.73) × Adult dose

📊 Determination of Children's Dose from Adult Dose on the Basis of Body Surface Area

S.NO.	Weight (Kg)	Approx. Surface area in sq. meters	Approx. % of adult dose
1	2	0.15	9%
2	4	0.25	14%
3	6	0.33	19%
4	8	0.40	23%
5	10	0.46	27%
6	15	0.63	36%
7	20	0.80	46%
8	25	0.95	55%
9	30	1.08	62%
10	35	1.20	70%
11	40	1.30	75%
12	45	1.40	81%
13	50	1.51	87%
14	55	1.58	91%

GAUBIN'S FORMULA

AGE (in year)	DOSE FOR CHILDREN WITH RESPECT TO ADULT DOSE
Under 1	1/12
1 – 2	1/8
2 – 3	1/6
3 – 4	1/4
4 – 7	1/3
7 – 14	1/2
14 – 20	2/3
21 – 60	Full adult dose
60 – 70	4/5
70 – 80	3/4
Over 90	1/2

📚 SUMMARY

This comprehensive unit covers the fundamental aspects of pharmaceutical sciences including:

🏛️ Historical Background

- Development of pharmacy profession in India from British colonial period to modern times
- Evolution of pharmaceutical industry and regulatory frameworks
- Establishment of key pharmaceutical institutions and associations

📖 Pharmacopoeias

- Official compendia of drug standards (IP, BP, USP, Martindale)
- Monograph structure and content
- Historical development and current editions
- Quality control and regulatory importance

💊 Dosage Forms

- Classification based on physical state, route of administration, and application site
- Solid, liquid, and semi-solid dosage forms with their advantages and disadvantages
- Novel drug delivery systems and their benefits over conventional forms

📝 Prescription

- Legal document structure and components
- Proper handling procedures for pharmacists
- Common sources of errors and prevention strategies
- Types of prescription forms (private vs. NHS)

💊 Posology

- Science of drug dosing and factors affecting dose determination
- Age, weight, disease state, and route-dependent dose modifications
- Pediatric dose calculation formulas based on age, body weight, and surface area
- Drug interactions, tolerance, and special considerations

This unit provides the foundational knowledge essential for understanding pharmaceutical practice, drug formulation principles, and safe medication dispensing practices in the healthcare system.

🎯 Learning Objectives Achieved

Upon completion of this unit, students should be able to:

- ✅ Understand the historical development of pharmacy profession in India
- ✅ Identify different types of pharmacopoeias and their significance
- ✅ Classify dosage forms based on various criteria
- ✅ Recognize the components and proper handling of prescriptions
- ✅ Calculate appropriate doses for different patient populations
- ✅ Apply posological principles in clinical practice
- ✅ Understand the evolution from conventional to novel drug delivery systems

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This completes Unit-1 of B. Pharmacy 1st Semester Pharmaceutics covering all essential topics as per the prescribed syllabus.