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Editorial

# Pharmacology actual teaching aesthetics

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ABSTRACT

Pharmacology is one of the most interesting common subjects of studies to pharmaceutical sciences or pharmacy, medicine and some life sciences and biomedical sciences undergraduates, postgraduates, doctorates, and Post doctorates. The art of teaching Pharmacology and Clinical Pharmacology lies in the in-depth knowledge of the tutor or the in-charge professor. This editorial deals with actual teaching aesthetics of teaching Pharmacology and Clinical Pharmacology right away from the basics and in advance science. The article will be useful for all the tutors and professors in pharmaceutical sciences or pharmacy, medicine, and biomedical sciences to implement effective teaching and learning in pharmacology and clinical pharmacology.



## 1. Introduction

Definition of Pharmacology: Pharmacology is broad definition of science of what do the drugs do the body or response of drugs on the human body.

The Pharmacology subject is broadly classified into following branches and several textbooks have quoted and stated them as the basic branches of pharmacology. They are the applied divisions of basic science of pharmacology and mentioned as follows:

### *1.1. Pharmacology*

This the basic branch. And already defined above in number of ways. Mostly the studies of this branch are taken up by Medicine, Pharmacy or Pharmaceutical Sciences, Life Sciences and Biomedical Sciences undergraduates till post doctorates. The main streams of university degrees studying Pharmacology are Medicine (M.B.B.S), Pharmacy or Pharmaceutical Sciences (D.Pharm, B.Pharm, M.Pharm, Doctor of Pharmacy (Pharm D), PhD and D.Sc and D. Litt). Further to elaborate the study at post graduate level is being taken up by Pharmacy specializations such as M.Pharm in Pharmacology, M.Pharm in Medicinal Chemistry and by Medicine Post graduates at their Doctor of Medicine (MD) studies and t their Doctorate of Medicine or DM studies at PhD level.

Futher there are several courses such as M.Sc in Pharmacology, M.Sc in Pharmacology and Toxicology and M.Sc in Medical Pharmacology who take up this course after their graduation in CBZ (Chemistry, biology and Zoology), Pharmacy (B.Pharm) and M.Sc in Medical Sciences in Pharmacology or M.Sc in Health Sciences. The eligilbiltiy is B.Pharm with GATE or GPAT. And Lifescience graduates can persue the same after GATE or NET/ SET or equivalent exam conducted by Indian Ministry/ Govt. of India.

Bachelor of Pharmacy holders are Pharmacological Science experts unless they specialize in their subject of interest.

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### *1.2. Clinical pharmacology*

Most of the wise physicians in medicine field say what pharmacology they study is not the pharmacology what Pharmacy graduates or Pharmaceutical Sciences graduate study. In fact, they have high superiority complex of being Clinical Pharmacologists. In fact, this is very true although what pharmacology taught at the undergraduate, postgraduates and doctorate level in MBBS in India and Pharmacy field is the same course of the study., the highly intelligent Pharmacist with basic knowledge of pharmacology fail drastically at hospital set up. They are inefficient to give IV/ IM and far away from the invasive Injection procedures. According to the highly intellectuals of Pharmacy, to administer medicine is job of nurse and not of a Pharmacologist with Pharmacy Background.

Coming upto the point, the treatment regimens design is failure with Pharmacy postgraduates in Pharmacology and lack severely in this area making them hopeless to be recruited at the Hospital Levels. Exceptions are some Indian Universities wherein the Clinical Pharmacology is part of curriculum and their graduates of Pharmacy and Pharmaceutical Sciences and are splendid at ambulatory care of patients at the Hospital level.

However for the current scenario of shortage of physicians, it will be better to consider the Pharmacist graduates only for the Hospital role despite of this lacunae, rather than giving preference to the Unani, Ayurved and other AYUSH graduates as they are devoid of anything which deals with pharmacology and far away from any practice of clinical pharmacology. A six / twelve months short term certificate course in Pharmacology does not inculcate in them the indigenous pharmacology principles. They are huge failures in terms of allopathy practice and should refrain the same.

## 2. Difference between Clinical Pharmacology and Pharmacology

Pharmacology is science of what drugs do the human body and Clinical Pharmacology entails additional principles of Diagnosis and Pathology to be taught in detail for effective drug treatment regimes. Although Pharmacology is a broad term and entails both pre-clinical and clinical pharmacology.

### *2.1. Pharmacodynamics*

Extent up to drug shows its action on human body is pharmacodynamics.

### *2.2. Pharmacokinetics*

What human body does to the drugs is pharmacokinetics.

### *2.3. Pharmacogenomics*

Genomic basis for the drug action or individualized medicine.

### *2.4. Pharmametabolomics*

Study of metabolites of drugs and their pharmacological action.

### *2.5. Medicinal & biochemical chemistry*

Chemical basis of pharmacological action is biochemical or medicinal chemistry.

### *2.6. Molecular pharmacology/ molecular medicine*

Pharmacology or clinical pharmacology at molecular level including diagnosis and treatment is molecular pharmacology or molecular medicine.

1. Actual Teaching Aesthetics in Clinical Pharmacology

   (a) Diagnosis: Although Diagnosis is part of Pharmacy graduates but studying it as Clinical Pharmacology subject should inculcate the causes and first and foremost the definition. This also includes the Greek terminologies for the diagnosis, the disease and treatment. This is the basic to study the Diagnosis at theoretical level. Doctor of Pharmacy graduates have an exposure to the clinical ward rotation or stewardship hence deal with this area efficiently and effectively than ordinary B.Pharm graduates.

   (b) Pathological basis of disease: The most important is to teach the students the Greek terminologies. Several pathology textbooks give this as the First chapter and these terms to be remembered and of course there is a way to remember the pathological terms with terminologies. Further findings in Pathology and Clinical approach are part of common sense and know how. For example, administering a blood test for vitamin D3 deficiency and X-ray for aching joint pain is part or real common sense than only asking for the alone of the either. Further to advise Rheumatoid Arthritis Factor (RA) is part of expertise. The students should be trained in these areas and pathological findings are the basis of the diagnosis of disease.

   (c) Biochemical basis of disease: It is seldom seen that metabolic disorders should accompany with biochemical profile of the blood/ urine . The correlation between the biochemical profiles and the disease state should be taught with mild, acute and chronic conditions. This becomes the basis for the Clinical Pharmacology practice.

(d) Rational prescribing: Rational Prescribing devoid of cut practice should be explained to the students. Adjuvants and synergists to the drug regimen should be explained and given preference while explaining the drug treatment regimens.

(e) Potency: The biosimilars should be explained in many details. It is always better to do the correct treatment with what you have available at Home, clinic or hospital. Lower the dose with same pharmacological effect and efficacy should be explained to give preference than higher dose long initiation of action or short duration of Drug actions. Etoricoxib 60mg + Thiocolchicoside 4 mg is always preferred over Aceclofenac 100mg + Thiocolchicoside 4mg in orthopaedic conditions. To reduce the xenobiotic load on liver and other organs. Although both are NSAIDS.

(f) Actual treatment regimens: Always remember each ailment and each complain should be addressed with one or more medicines while prescribing and care to be taken that it is devoid of any drug interactions. For example : Divalproate and Aripiprazole goes perfectly fine both in seizure patients and bipolar maniac patients rather than treating the same Quetiapine high dose and Risperidone combination.

i. Diluents of IV, IV Bolus and IM: NS: Normal Saline: Seldom used as diluent for IV and IM.
DNS: Dextrose Normal Saline: Seldom used as diluent for non-interacting drugs with it for IV and IM.
RLS: Ringers' Lactate Solution: Rehydrating and diluent for many IV and IM drugs.
Mannitol: To reduce CSP and IOP and Cranial Pressure.
WFI: Water for Injection: It is commonly used and preferred diluent for small volume parenterals.
The above principles should be explained from case-to-case basis.

ii. Dose: Dose conversions for 6 months to 1 year old paediatric patients should be taught in detail. Also Geriatric, Paediatric doses should be taught for effective prescribing.

iii. Drug regimens: Also called as Treatment plan or Treatment regimen should comply with actual treatment regimen as stated in point f. The benefit should outweigh the risk. This principle should be taught in detail.

iv. Pharmacological monographs: This is matter of study for undergraduates and matter of reference for the graduated practicing Physicians and Pharmacists. Contraindications., ADR and Side effects should be dealt in detail and should be applicable and explained to the students for better prescribing.

(g) Prognosis and dose tapering: The correlation between prognosis in a disease condition and dose tapering effects should be explained to the students. This has special reference in neuropsychopharmacology and clinical psychology.

(h) Referencing: CIMS and MIMS, it is given under Pharmacological Monograph the most popular books have been stated here.

(i) Medicinal chemical structures and correlation: This is not important from Physicians point of view but actual clinical pharmacologists what they see the organic chemical structures in textbooks of pharmacology is not biochemistry, but it is in real sense the Medicinal Chemistry. The Clinical Pharmacologists with Pharmacy background are well acquainted with this discipline and make accurate choices of drugs based on the Structure Activity relationships (SAR) and should be taught to the students in details. For example, in SAR of Hydantoins, Phenytoin alone is the most potent and accompanied with long duration of action than the other phenotypes or the substitutes in the same genre. This can be applied to make good choice of drugs for rational use and prescribing.

(j) Receptor theory: Drugs act on receptor and receptors are in their localization to show both desired and untoward side-effect or adverse effect. Receptor Localization charts and diagrams should be taught while explaining the drugs. For example, localization of alpha-adrenergic receptor from CNS to Kidney can lead to better choice of Centrally acting alpha receptor Drug and explaining untoward side effects or ADRs on other organs or tissues and pharmacological effect.

2. Actual Teaching Aesthetics in Pharmacology

(a) Receptor theory: As described in point j. of clinical pharmacology teaching aesthetics section I.

(b) ADR and Side effects: Activation of unspecific receptors leads to untoward and undesired effects. Further the difference between Adverse Drug Reaction (ADR) and Side effect should be taught and explained.

(c) Medicinal or Biochemical Chemical Basis of MoA: 90% of the drugs are organic medicinal compounds, proper basis of medicinal action are the functional group and heterocyclic nuclei. The correlation between SAR and pharmacological action should be taught in depth to correlated with mechanism of action. The MoA majorly occurs through various types of chemical bonding and need to be explained. For example: AchE has irreversible covalent bonding upto aging with Organophosphates before which the antidotes such as pralidoxime (2-PAM) work. Another example is phenoxybenzamine binds covalently with the Alpha adrenoreceptor.

(d) Drug regimens: As described previously in section of clinical pharmacology, it should be taught in detail.

(e) Dose: As described previously in section of clinical pharmacology, it should be taught in detail.

(f) Biochemical & Pathological basis of disease: As described previously in section of clinical pharmacology, it should be taught in detail.

(g) Pharmacological monographs: Should be explained with emphasis on its contents such as C/I, S/E, Indications, ADR, Dose, etc and should be dealt and taught in detail.

3. Actual Teaching Aesthetics in Pre-Clinical Pharmacology (Experimental Pharmacology)

90% of the Pharmacy Doctorates are the specialized in Pre-Clinical Pharmacology or experimental Pharmacology in current scenario as it is very difficult to get Human Ethical Committee clearances for thesis topics at the institutional level of Pharmacy degree research centres.

**The actual teaching aesthetics in Pre-clinical Pharmacology are as follows:**

(a) Design of experiments: Standard, control, test and vehicle should be taught along with standard battery of tests and stastical level of significance.

(b) Animal experimentation: Handling of Animals should be taught in detail right away from operative procedures in CVS animal models till anaesthesia and euthanasia.

(c) Observation: Now a days with digital cameras are used to record the observations however basics in each standard battery of tests such as plus maze, rat swim model, rota rod model, photo actometer, etc should be taught in detail.

Interdisciplinary respect for the pharmacology specialized profession from diverse background shall soon be able to solve the problem of shortage of physicians at primary health centres and at higher educational and healthcare systems.

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