ALIGARH MUSLIM UNIVERSITY, ALIGARH

FACULTY OF MEDICINE

SYLLABUS FOR

MASTER OF DIALYSIS THERAPY TECHNOLOGY

1. HUMAN ANATOMY
2. HUMAN PHYSIOLOGY
3. BIOCHEMISTRY
4. MICROBIOLOGY
5. PATHOLOGY
6. GENERAL PHARMACOLOGY
7. APPLIED ANATOMY AND PHYSIOLOGY OF KIDNEY
8. RENAL DISEASES
9. NUTRITION
10. PHARMACOLOGY RELATED TO DIALYSIS
11. BASICS OF DIALYSIS THERAPY
12. APPLIED DIALYSIS THERAPY
13. KIDNEY TRANSPLANTATION
14. ADVANCE THERAPIES
15. RESEARCH METHODOLOGY

1. HUMAN ANATOMY

Human body as a whole, Cardiovascular system, Gastro-intestinal system, Respiratory system, Peritoneum, Urinary system, Reproductive system, Endocrine glands, Nervous system

2.HUMAN PHYSIOLOGY

Blood, Cardiovascular system, Excretory System, Muscle nerve physiology, Skin, Endocrine System.

3.BIOCHEMISTRY

Specimen collection, Acids and Bases- Definition, physical and chemical properties with examples. Arrhenius concept of acids and bases, Lowry – Bronsted theory of acids and bases. Classification of acids and bases. Differences between bases and alkali, acidity and basicity, monoprotic and polyprotic acids and bases. Concepts of acid base reaction, hydrogen ion concentration, ionization of water, buffer, and pH value of a solution. Preparation of buffer solutions using pH meter. Salts: definition, classification, water of crystallization, definition and different types, deliquescent and hygroscopic salts. Acid- base indicators: Definition, concept, mechanism of dissociation of an indicator, color change of an indicator in acidic and basic conditions, use of standard buffer solution and indicators for pH determinations, preparation and its application, list of commonly used indicators and their pH range, suitable pH indicators used in different titrations, universal indicators.

Special Investigations- Serum electrophoresis, immunoglobulins, drugs: digitoxin, theophylline, regulation of acid base status, Henderson Hassel Bach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers, nutrition, nutritional support with special emphasis on parental nutrition, calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins.

Carbohydrate- properties, metabolism of fructose, Glycolysis, TCA cycle, Gluconeogenesis and its biological importance, Lipid- properties, metabolism and its biological importance, Protein - properties, metabolism, degradation of fatty acids and its biological importance, Nucleoproteins- chemistry, structure and function, Hemoglobinopathies- structure, properties and abnormal Hb Enzymes- definition, classification, coenzymes, factors affecting their action, enzyme inhibition, enzymes of clinical importance, Vitamins- classification, functions, source, deficiency.

. Organ function tests – Liver function test, Renal Function test.

4.PATHOLOGY

Introduction to pathology & basic terminologies,Introduction to pathology,Recognize the relevance of Pathology, Define the basic terminologies and branches of Pathology, cell injury and adaptation, necrosis, inflammation and its types, edema and its different types, clinical features of edema, shock and its different type, pathogenesis of septic shock, thrombosis, factors influencing thrombosis, embolism and its types with examples, infraction, clinical significance of infraction, blood vessels and heart, hypertension, classification, effects of hypertension on various organs, atherosclerosis, clinical effect of atherosclerosis, complications, Ischemic heart disease/coronary artery disease, Define ischemic heart diseases, Describe the clinical spectrum of the disease (with reference to angina and myocardial, infarction, Aneurysm, List the causes, types and complications of aneurysms

Gastrointestinal tract & liver Gastric & duodenal ulcers, Definition gastric and duodenal ulcer,List the types of common GIT malignancies,Describe their predisposing factors & clinical features, Jaundice-Define jaundice, List the types of jaundice with examples,

Viral hepatitis-Describe the aetiology of viral hepatitis,List the modes of infection, Describe the clinical features of viral hepatitis

Cirrhosis of liver-1. Define cirrhosis 2. List the causes of cirrhosis,Liver failure, Define liver failure, List the causes of liver failure, Describe its pathophysiology & clinical features

Renal system-Define nephrotic syndrome & nephritic syndrome with suitable examples Renal failure-1. Define renal failure,2. List its types & describe the clinical features

Endocrine system- Define hyperthyroidism & hypothyroidism,Describe the causes, clinical features and laboratory diagnosis of hyperthyroidism and hypothyroidis, Describe the types,

causes & clinical features of goiter,Describe types, clinical features, complications & laboratory diagnosis of diabetes.

Histopathology-Introduction to histopathology,Receiving of specimen in the laboratory, Grossing technique, Mounting techniques: various mountants, Maintenance of records and filing of the slides, Use & care of microscope,Various fixatives, mode of action, preparation and indication,Section cutting,Tissue processing for routine paraffin sections, Decalcification of tissues,Staining of tissues: H & E Staining, Bio-medical waste management.

Clinical Pathology- Introduction to clinical pathology, Collection, transport, preservation, and processing of various clinical specimens,Urine Examination: collection and preservation of urine, physical, chemical, microscopic examination, Examination of body fluids,Examination of cerebro spinal fluid (CSF),Sputum examination, Examination of faeces.

Hematology- Introduction to hematology,Normal constituents of blood, their structure and function,Collection of blood samples, Anticoagulants used in hematology, Instruments and glassware used in hematology, preparation and use of glassware,Laboratory safety guidelines, SI units and conventional units in hospital laboratory, Hb, PCV,ESR, Normal hemostasis,Bleeding time, clotting time, prothrombin time, activated partial thromboplastin time.

Blood Bank- Introduction,Blood grouping and Rh types,Cross matching.

5.MICROBIOLOGY

Introduction To Medical Microbiology, Virology, Mycology & Parasitology,Morphology-Classification of microorganisms, size, shape and structure of bacteria. Growth and nutrition-Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology. Culture media - Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test. Sterilization and Disinfection - Principles and use of equipment of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptic and disinfectants. Immunology -Immunity, vaccines, types of vaccine and immunization schedule, principles and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HBsAg (excluding technical details). Systematic Bacteriology-Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure and pathogenicity), Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, *E. coli*, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes. Mycology-Morphology, diseases caused and lab diagnosis of following fungi. Candida. Virology- General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

Hospital infection -Causative agents, transmission methods, investigation, prevention and control of hospital infection. Principles and practice Biomedical waste management

6.GENERAL PHARMACOLOGY

General Pharmacology- Introduction,Routes of drug administration, Pharmacokinetics Pharmacodynamics, Drug toxicity and safety. Central nervous system- General anesthetics (GAs),Local anesthetics (LAs),Sedative & hypnotics, Opioids,NSAIDs ,Drug treatment of rheumatoid arthritis (RA), Drug treatment of gout: Psychopharmacology,Parkinsonism, Alcohol,Antiepileptic drugs.GIT- Drugs for peptic ulcer, Antiemetics, Laxatives and antidiarrheals Blood-Hematinic,Anticoagulants,Antiplatelet drugs ,Fibrinolytics. Cardiovascular system- Diuretics,Drugs used in congestive heart failure (CHF) Anti hypertensives, Anti anginal drugs, Hypolipidemic.

7.APPLIED ANATOMY AND PHYSIOLOGY OF KIDNEY

Applied Anatomy

Basic anatomy of urinary system: structural anatomy of kidney, bladder, ureter, urethra, Prostate, Histology of kidney, Blood supply of kidney, Development of kidney in brief, Anatomy of peritoneum including concept of abdominal hernias, Anatomy of vascular system: Upper limb vessels: course, distribution, branches, origin & abnormalities, Neck vessels: course, distribution, branches, origin & abnormalities,Femoral vessels: course, distribution, branches, origin & abnormalities. Artery & Veins used for dialysis, Histology of bladder, urethra Innervation of urinary bladder

Applied Physiology

Mechanism of urine formation, Glomerular filtration rate (GFR), Clearance studies, Physiological values of urea, creatinine, electrolytes, calcium, phosphorous, uric acid, magnesium, glucose; 24 hours urinary indices – urea, creatinine, electrolytes, calcium, Magnesium,Juxta Glomerular Apparatus,Micturition reflux

Physiology of renal circulation, Factors contributing & modifying renal circulation, Auto regulation, Hormones produced by kidney & physiologic alterations in pregnancy, Haemostasias: coagulation cascade, coagulation factors, auto regulation, BT, CT, PT, PTT, thrombin time. Acid base balance: basic principles & common abnormalities like hypokalemia, hyponatremia, hyperkalemia, hypernatremia, hypocalcemia, hypercalcemia, pH, etc.

8.RENAL DISEASES

Acute Kidney Injury, Glomerular pathology Primary and Secondary, Renal biopsy, Nephrotic syndrome – primary & secondary, Nephritic syndrome, UTI (urinary tract infections.), Asymptomatic urinary abnormalities, Chronic Kidney Diseases, Renal stone diseases, Obstructive uropathies, Congenital abnormalities of urinary system, Inherited renal diseases, Tumors of kidney & Urinary Bladder, Pregnancy associated renal diseases, Renal vascular disorders & hypertension associated renal diseases, Tubulo-interstitial diseases, Renal vascular disorders, Pathology of kidney in hypertension, diabetes mellitus, Pathology of peritoneum, peritonitis, bacterial, tubular & sclerosing peritonitis,dialysis induced changes.

Hepatotropic viruses in detail: mode of transfusion, universal precautions vaccinations, Human immunodeficiency virus (HIV), mode of transfusion, universal precautions & HIV, Opportunistic

infections, Microbiology of vascular access infection (femoral, jugular, subclavian catheters), Sampling methodologies for culture & sensitivity, Reflux Nephropathy.

9.NUTRITION

Basics of Nutrition, Nutritional Screening and Assessment-Introduction,Mini Nutritional Assessment,Nutritional Assessment,Nutritional management in CKD patient (pre-dialysis) fluid and electrolytes- Determine of Nutritional care in CKD patient, Nutritional care indications, Nutrient guidance for adult patient with pre-ESRD, Management of fluid in patient with pre-ESKD and electrolytes management in patient with pre-ESRD, Nutritional management of HD patient,Purpose of nutritional management in HD patient factors favoring nutritional status, Nutrient guidance in HD patient, Intentions of nutrition care in HD patient, Diet in HD patient,Nutritional management of Peritoneal Dialysis (PD) patient ,Nutrient guidance in PD patient, Intentions of nutrition care in PD patient, Diet in PD patient.

10.PHARMACOLOGY RELATED TO HD & PD

IV fluid therapy with special emphasis in renal diseases- Basics of fluid therapy,Calculation of fluid infusion, Intra-venous fluid administration,Commonly used iv fluids, Diuretics- Diuretics and its classification, actions, dosage, side effects & contraindications, Anti-hypertensive-Classification of anti-hypertensive drugs, its actions, dosage, side effects & contraindications, special reference during dialysis, vasopressors, drugs used in hypotension, Drugs and dialysis, importance of dialyzabilty of drugs, Factors affecting the dialyzability of drugs, Dialyzability of phenobarbital, Dialyzability of lithium, Dialyzability of methanol Vitamin-D & its analogues, Erythropoiesis Stimulating Agent (ESA),Use of ESAs, Different types of ESAs, Mechanism of action of ESAs, Pharmacokinetics of ESAs ,Therapeutic use of ESAs , Adverse effect of ESAs, Precautions and contraindications of ESAs.

Heparin and low molecular weight heparin (LMWH), MOA of LMWH,Mechanism, adverse effects of heparin and LMWH, HIT. Protamine sulphate-Therapeutic use of Protamine Sulphate, Dosage and administration, Adverse reaction, Newer anticoagulants.

Chemicals Used in Dialysis Unit (Renalin- Peroxyacetic Acid, Formalin, Citrate, Sodium hypochlorite and hydrogen peroxide), Hemodialysis concentrates, Composition of hemodialysis concentrates, Types of hemodialysis concentrates and write it"s advantages and disadvantages, Clinical implication of altered dialysate composition, Peritoneal dialysis (PD) fluid, Buffer and pH of PD fluid, Electrolyte concentrations of PD fluid,Newer PD Solutions

11.BASICS OF DIALYSIS THERAPY

Hemodialysis equipment-Hemodialysis apparatus, function of dialysis machine, parts of extracorporeal circuit of dialysis machine, parts of dialysis delivery system, Initiation of dialysis therapy-Initiating of dialysis therapy, choice of modality, options of renal replacement therapy, when to initiate dialysis, relationship between uremic syndrome and eGFR, indications of dialysis in the chronic setting and concept of early initiation of dialysis.

Dialyzer and its types, composition of dialysis solution, preparation of dialysate, Vascular access and its types, pre assessment, indications to creat access, choice of access, creation, immediate complications, delayed complications, advantages and disadvantages of each access, AVF and AVG cannulation, anastomosis types, failure of permanent access, Vascular access surveillance

Types of hemodialysis modalities, Categorize types of HD, Incenter hemodialysis and its advantages and its disadvantages,home hemodialysis – its indications, contraindications, Requirements, Ideal characteristics, Machines, types advantages and its disadvantages.

Dialyzer reprocessing-Need for Dialyzer reprocessing, techniques, chemicals used, steps of reprocessing, advantages and disadvantages, Anti-coagulation and its types, Hemodialysis adequacy, urea kinetic modelling (UKM), urea as a marker for uremic toxins,
urea reduction ratio (URR), advantages and disadvantages of URR, single pool kt/v,
double pool UKM and eq kt/v.

Water treatment unit (WTU),Purpose of water treatment for dialysis, various sources of water, types of contaminants in water, various contaminants in water and its effect, components of a dialysis center"s WTU, pre-treatment components, primary treatment components, distribution system, monitoring and testing of dialysis water treatment system, microbial testing and chemical monitoring.

Medications used in dialysis patients, Infection control and universal precaution
Prevention of infection in dialysis unit, infection control practices in dialysis unit,
Universal precaution, current recommendation for immunization in patients with chronic kidney disease,

12.APPLIED DIALYSIS THERAPY

1. Hemodialysis procedure-Patient assessment, management and prevention– General, pre, intra and post Dialysis, Lab data analysis, Machine monitoring during hemodialysis, Hemodialysis prescription , Acute complication, Classify intra-dialytic complications- frequent and less commonly occurring, Sign, symptoms, prevention and management, Lab-data analysis-Various laboratory test use assess kidney disease- urea, creatinine.
Peritoneal dialysis, History of peritoneal dialysis, Physiology of PD – Kinetics of PD, Three-pore model & Distributive Model, Acute peritoneal dialysis, Indications- Strong indications, PD preferences, non-renal indications,Contraindications for chronic PD- relative contraindications to peritoneal,dialysis and Peritoneal dialysis is not preferred but is possible in select circumstances. Peritoneal dialysis apparatus, Peritoneal dialysis process & Therapies, Peritoneal dialysis complications & management, Pediatric dialysis , Pregnancy in dialysis patients

13.KIDNEY TRANSPLANTATION

Renal Transplantation, Types of organ donors (Living and deceased donors), Types of deceased organ donors – Deceased heart beating donors and non-heart beating donors, Types of transplantation, Indications and contraindications for transplantation,Types of kidney transplantation, Importance of immunosuppressive drugs in kidney transplantation
Brain stem death, the tests to confirm brain stem death and their importance, the brain stem death importance in organ transplantation, Explain the Human Organ Transplantation Act and ethical issues related to transplantation
Basics of immunology, Immunology related to kidney transplantation.
Renal Transplantation Procedure- pre-renal transplant donor (Living and deceased) and recipient evaluation.
Living Donor kidney donation process- Process of coordinating and monitoring living donor kidney transplantation, Importance of document preparation for kidney transplantation,

Apply the acquired knowledge of transplantation for giving awareness about kidney disease and transplantation (Patient education)

Deceased donor kidney donation process of identification of donor, declaration of brain stem death and evaluation of donor,Explain the process of coordinating and monitoring the deceased donor kidney transplantation (Approaching the family members of donor, Coordination with regional committees, Allocation, Matching, organ procurement, storage, and transportation) Explain the process of creating a kidney transplantation registry,Apply the acquired knowledge of transplantation giving awareness about deceased donor transplantation and becoming a deceased donor in the society.

14.ADVANCE THERAPIES

Hi-flux dialysis and Hi-efficiency dialysis, Slow continuous therapies, indication & contraindication of CRRT, vascular access and types of CRRT, complications.
SLED, prescription, advantages and disadvantages, Plasmapheresis, indications and contraindications, various replacement solutions used in PP, complication, Hemoperfusion, indications of HP, technical requirements, complications during HP.
Hemodiafiltration, Preparation replacement fluid, Techniques of HDF, Technical aspects Advantages and disadvantages.

15.RESEARCH METHODOLOGY

Introduction to the Process of Conducting Research, Steps in the Process of Research, identifying a hypothesis and/or research problem, specifying a purpose, Research Designs, creating research questions, Review of literature, Ethics of research and informed consent, Research proposal writing & components of Research paper.
Introduction to Qualitative, Quantitative and Mixed methods Research Essence of Qualitative Data, Sampling, Collection Techniques, Biography, Essence of Quantitative Data, Collection and Analysis Techniques,
Epidemiological Methods-Measuring disease frequency, Descriptive and analytical studies-observational and experimental studies and Biases in Epidemiological Studies
Introduction to Probability, distributions and sampling,Applications to health sciences, Sampling methods, uses of sampling, Sample size, Descriptive Statistics
Introduction,Mean, mode and standard deviation, testing of hypothesis.