

## **DIPLOMA IN DIALYSIS TECHNOLOGY (DDT)**

**(Recognized by Directorate of medical Education, Govt of Kerala)**

### **Introduction**

At present there is shortage of qualified Dialysis Technicians. This course is started to address this need and supply necessary qualified and experienced Dialysis Technicians. Of course, excellent employment opportunities await them in India and abroad.

### **A. General Information**

1. Name of the Course: Diploma in Dialysis Technology (DDT)
2. Objective: To train the students to carry out various techniques of Haemodialysis and peritoneal dialysis and to perform techniques of dialysis independently.
3. Eligibility of Admission:
  - a) Minimum Educational Qualification: A pass in the Higher Secondary Examination of the Board of Higher Secondary Education of Kerala or equivalent examinations conducted by any of the Universities in Kerala with Physics, Chemistry and Biology as optional subjects and having secured a minimum of 50% marks in these subjects put together.
  - b) Nativity: Indian citizen of Kerala origin is eligible for admission.
  - c) Age limit: The Candidate should be in the age group of 17-25 years. 5 years relaxation in the upper age limit for SC/ST candidates is allowable.
5. Reservation of seats: As per existing Government guidelines.

### **B. Course Content**

#### **Duration of the Course and Structure:**

- The duration of the course shall be 2 years including one year internship.
- After one year of classes and practical training the candidate has to appear for examination on 2 papers. Practical examination will be conducted by DME, Kerala.
- The successful candidates have to undergo one year of internship following which the degree will be awarded

## **SYLLABUS PRESCRIBED FOR DIPLOMA IN DIALYSIS TECHNOLOGY**

### **Paper I - Fundamentals of Nephrology and Dialysis Technology**

#### **1. General Orientation in Nephrology**

Basic anatomy and physiology of kidney, distribution of total body water and composition of body fluids, function of the normal kidney - Acute Renal Failure - Chronic Renal Failure - function of the artificial Kidney - the technique of haemodialysis. Principles of diet modification in patients on dialysis

#### **2. Histories and Evaluation of Dialysis**

The invention of dialysis - The first artificial kidney - First Human Dialysis - Kolff's Rotating drum Dialyser - parallel flow Dialysers - Twin Coil Dialyser - The scuttle Dialysis system - Introduction of a central Dialysate supply system - Home Dialysis.

#### **3. Principles of Dialysis - Diffusion, Osmosis, Ultra Filtration**

Diffusion - Osmosis - Dialysis defined - concentration gradient - direction of fluid flow hydro-static pressure and resistance - pressure gradient - ultra filtration - dialysate

#### **4. Principles of sterilization and sterile precautions**

Identification of common infections & organisms, cannula site infections, virus infections, disinfections and sterilization

Sterilization: Steam autoclave - ethylene oxide - Gamma Ray sterilization — formaldehyde sterilization, clinical test - Schiff's reagent.

Disinfectants: Formaldehyde zephiran chloride - phenolic disinfectants, Isopropyl alcohol Iodine antiseptic - sampling procedure - contamination problems - sterile technique - isolation techniques.

#### **5. Vascular access for dialysis**

General description of the cannula system - cannula implantation - activity and immobilization of the cannulated limb - position of the cannulated limb - cannula cleaning - cannula complications - cannula infections - cannula clothing - declothing - the subcutaneous arterial venous fistula - advances in the access to the circulation, sub clavian, jugular, femoral access - shunt converted fistula - grafts - single needle dialysis.

#### **4. Anticoagulation in Haemodialysis**

Anticoagulation- anticoagulant - heparin - coumarin - Lee white clotting time - activated clotting times - intermittent infusion and continuous infusion - systemic heparinization - regional heparinization -

rigid heparinization - heparin rebound - heparin modeling - saline dialysis - low molecular weight heparin.

### **7. Functions of dialysis monitors and Principles of its working**

Dialysate composition, preparation - acetate bicarbonate-delivery system, batch type and proportioning type. Water pre-treatment - water pressure regulation - temperature control - temperature sensors - chemical proportioning - degassing - flow and negative pressure control - monitors conductivity cell - chemical concentration monitor - temperature compensation - temperature monitors - pressure monitors - flow rate monitors - blood leak monitors - reader devices - alarms - volumetric ultra filtration - multipatient monitors.

### **8. Artificial kidneys - evolution and types**

Types of dialysers - Coil dialysers - parallel plate dialysers. Hollow fibre dialysers - comparative study of all available dialysers

### **9. Dialyser Reuse, dialyser handling, disinfections and disposal**

Storage and reuse of parallel plate dialysers - reuse of hollow fibre dialysers - Hydrogen peroxide method - fibre bundle volume checking - disinfections or sterilization- heat sterilization - formaldehyde - renalin - quality assurances.

### **10. Water quality and water treatment for dialysis**

Need for water treatment - sand filter - water softener - carbon filter-deionizer-reverse osmosis unit-in line ultraviolet rays - bacterial filters - water sampling - microbiological checking.

### **11. Acute haemodialysis prescription**

Acute haemodialysis prescription: - (a) determining dialysis session length and blood flow (b) choosing a dialyser (c) choosing the dialysis solution (d) choosing the dialysis solution flow rates, temp and UF.

Haemodialysis procedure: (a) Rinsing and Priming (b) obtaining vascular access (c) initiating dialysis (d) alarms (e) Patient monitoring and complications (f) Termination of dialysis (g) Post dialysis evaluation.

### **12. Complications during dialysis - short term and long term**

Blood leaks - clotting - acute bleeding -line cannula separations - hypotension - hypertension - fever - nausea - pyrogenic vomiting - head ache - cardiac arrhythmias - chest pain - reactions muscle cramps - restlessness - pruritus - convulsion - congestive heart failure - secondary hyper-parathyroid disease - metastatic calcification - blood requirements - peripheral neuropathy arthritis - hepatitis - uremia pericarditis

### **13. Adequacy of dialysis**

Clinical well being, Oedema, hypertension, food intake, ability to work, rehabilitation. Investigations: PCV, Urea, creatinine, creatinine clearances, serum calcium, phosphorus, alkaline phosphates, radiology, EMG. Methods of assessing dialysis adequacy, consequences of inadequate dialysis, Pitfalls in proving adequate dialysis

### **14. Infection diseases and Infection control**

Non-Infectious agents in Hemodialysis patients: - Endotoxin, Exotoxin-A, Other Biological Toxins. Blood borne Pathogens: Hepatitis B Virus, Hepatitis C Virus, Human Immunodeficiency virus. Bacterial Infections: Vascular - Access Related Infections, Infections through contaminated hemodialysis equipment or dialysate, or errors in reprocessing, Vancomycin-resistant enterococci and other antimicrobial-resistant bacteria. Infection control measures for hemodialysis units: Dialysis unit precautions, control measures for hepatitis B, drug-resistant microorganisms, recommendations for screening for hepatitis C.

### **15. Laboratory investigations in relation to dialysis**

Patient: Urine examination, Renal Function test. Dialysate - Electrolyte, P H, temperature, contamination.

## **Paper II - Recent Advance in Nephrology and Dialysis Technology**

### **1. Peritoneal Dialysis**

Theory-types of peritoneal dialysis: intermittent and continuous-patient-criteria-indications for PD - complications of PD - patient management during PD — CAPD - automated PD - PD catheters techniques of acute and chronic PD, complications of CAPD, its prevention and management, monitoring patients on CAPD

### **2. Recent advances in dialysis**

#### **2.1 H-E, H-F therapies in clinical dialysis**

High efficiency, high flux therapies in clinical dialysis - definition of H-E therapy - characteristics of H-E therapy - technical consideration - clinical application of H-E therapy - limitations and future of rapid H-E therapy

#### **2.2 Alternatives in uremia therapy**

Hemofiltration - difference between HF and HD - technical aspect of HF - isolated ultra-filtration - continuous arterio-venous haemofiltration- biofiltration

### **2.3 Sorbent dialysis**

Ready sorbent system- dialysis machine - sorbent cartridge - dialysate bath - acetate bicarbonate chloride bath- sodium balance

### **2.4 Continuous Renal replacement therapy**

CAVH, CVVH, CA VHD, 'CVVHD, CAVHDF, CVVHDF, SCVF - Technical and operational concerns in continuous renal replacement therapy — clotting - anticoagulation - science of clotting — bleeding - therapeutic drug removal with CA VH.

**2.5 Pediatric CAVH Pediatric ARF - Operational principles of CAVH- characteristics of available hemofilters**

### **2.6 Haemoperfusion and dialysis in poisoning**

Dialysis and haemoperfusion- a choice of therapy- priming of haemoperfusion circuit - heparinization — duration — complication - management of poisoning with selected agent.

### **2.7 Plasmapheresis**

Definition: Indication - mechanism of action - principles of treatment - technical consideration - anticoagulation — complication - new technique (cascade filtration, cryofiltration, thermofiltration, specific immunoglobulin absorption) - HELP system.

## **III. Instructional period**

- Lectures by members of the faculty in the department of Nephrology and related specialties (4 hrs/week x 52 weeks = 156 hrs)
- Lectures by Dialysis Technicians - 6 hrs/week x 52 weeks = 312 hrs
- Internship (2<sup>nd</sup> year): Practical training and work in Dialysis room and intensive care (36 hrs/week x 52 weeks = 1872 hrs)
- Topic presentations and project work by students (2 hrs/week x 52 weeks = 104 hrs)

### **Requirements to appear in the final exam**

- Attendance : 80% Minimum
- Number of works or exercises to be involved in the procedure of doing 100 dialyses, Heamoperfusion CAVH, CVVH & Plasmapheresis
- Internal Assessment : 50%
- Certificate of satisfactory completion of the course by the HOD

#### **IV. Evaluation**

- Regular evaluation by internal assessment
- Method: Theory Exam and Practical
- Frequency of evaluation : Every three months/ Average is taken

#### **V. Examinations:**

Final examination at the end of the first year

- Theory: No. of papers : Two, Maximum marks : 100 each
- Practical: Demonstration of various procedures Related to dialysis technology followed by Viva voce.
  - Duration of practical exam-2 hours
  - Maximum marks-100 marks (50 for practical and 50 for Viva)
- Criteria for a pass in the subject:
  - Minimum marks in Theory: 50%
  - Minimum marks in Practical: 50%
  - Minimum marks for the subject: 50%
- Awarding of First Class and Rank:
  - 50 - 64 % - Pass.
  - 65 - 74 % - First Class
  - 75 % and Above - Distinction
- Supplementary exam: Candidates who fail in the regular examination can appear for supplementary examinations six months after the regular examination.
- No additional instruction is required. Scheme of the examination shall be similar to the final regular examination.
- Question paper: Each Question paper should have section A &B having 50 marks each.
- Examiners Minimum Qualification: Faculty Members (DM Nephro)
- Authority to conduct exam and award Diploma : Director of Medical Education