

# ***CURRICULUM***

## ***DM NEONATOLOGY***

***2009-10***



**JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION &  
RESEARCH (JIPMER),  
PUDUCHERRY-605 006**

# **CURRICULUM OUTLINE AND SYLLABUS OF THE DOCTOR OF MEDICINE (DM) COURSE IN NEONATOLOGY**

## **1. AIM**

The aim of the DM Programme is to provide advanced training in Neonatology to produce competent super-specialists who are able to provide clinical care of the highest order to the newborn infants, and serve as future teachers, trainers, researchers and leaders in the field of Neonatology.

## **2. LEARNING OBJECTIVES**

*After completing the DM (Neonatology) course, the student will be able to :*

1. Analyse neonatal health problems scientifically, taking into account the biological basis as well as the socio-behavioural epidemiology of perinatal-neonatal disease, and advise and implement strategies aimed at prevention of neonatal morbidity and mortality.
2. Provide primary, secondary and tertiary care to all newborn infants including intensive care of the highest standard to the critically sick and the very low birth weight neonates using advanced therapeutic and supportive modalities and skills.
3. Implement a comprehensive follow up and early intervention programme for the 'at risk' newborn infants, and plan, counsel and advise rehabilitation of the neurodevelopmentally challenged infants.
4. Take rational decisions in the face of ethical dilemmas in neonatal-perinatal practice.
5. Exhibit communication skills of a high order and demonstrate compassionate attributes befitting a caring neonatologist.
6. Plan and carry out research in neonatal health in clinical, community and laboratory settings.
7. Teach newborn care to the medical and the nursing students as well as grassroots health functionaries, and develop learning resource materials for them.
8. Plan, establish and manage level II and level III neonatal units independently.

9. Use and maintain the essential neonatal equipment and keep abreast with advances in newborn care technology.
10. Organize newborn care in the community and at the secondary level of health system, and play the assigned role in the national programmes aimed at the health of mothers and their infants.
11. Work as a productive member of the interdisciplinary team consisting of obstetricians, pediatricians, pediatric surgeons, other doctors, nurses, and grassroots functionaries providing care to the pregnant mother, the fetus and the newborn in any setting of health care system.
12. Seek and analyse new literature and information on neonatology, update the concepts, and practise evidence-based neonatology.

### **3. DURATION**

3 years

### **4. ELIGIBILITY**

- Candidates who have passed M.D. Pediatrics approved by Medical Council of India (MCI)
- Candidates who have passed Diplomate of National Board (DNB) in Pediatrics.
- Candidates who have appeared for MD/DNB Pediatrics exam and expecting results may also submit their application subject to the condition that they pass their qualifying examination before admission.

### **5. SELECTION**

- The selection of candidates for the DM neonatology course will be based on their knowledge - assessed through a Theory Test consisting of multiple choice questions covering neonatology and rest of pediatrics of the level of MD (Pediatrics)
- The written test consists of 100 MCQs (40 in General Pediatrics and 60 in Neonatology). The duration of the examination will be 1 1/2 hours.

- After the written examination there will be a personal interview for the merit listed candidates at the rate of 5 candidates for one seat.
- The personal interview will carry 20 marks.
- The final merit list will be drawn on the basis of marks obtained both in written examination and in personal interview.

## **6. POSTINGS**

### **6.1 Overview**

The total period of DM course is 36 months. Of this, at least three fourths (27 months) will be spent in the newborn service, 6 months will be meant for essential rotations in related specialties and the rest 3 months will be apportioned for either optional rotations or for the newborn service.

### **6.2 Newborn services**

The candidates will have at least 27 months of posting in the newborn services. The candidates must get adequate exposure to neonatal follow up, neonatal emergencies, delivery room care of neonates and acquisition of practical skills (specified in Annexure I).

### **6.3 Essential Rotations**

- Perinatology – obstetrics (Deptt. of Obstetrics-Gynecology) : 2 months
- Neonatal surgery (Deptt of Pediatric Surgery) : 1 months
- Elective\* : 3 months

\*The candidates can undertake upto 3 months' elective rotation at the parent or other institutions in the country or abroad at centres approved by the Department.

### **6.4 Optional rotations**

The departments will have the flexibility of additional rotations for upto 3 months in the above mentioned disciplines or in other relevant areas such as neonatal cardiology/cardiac surgery, rehabilitation service, genetics perinatal pathology, imaging, anaesthesiology, neonatal ophthalmology, epidemiology/bostatistics, informatics and education technology etc. depending upon the strength of the disciplines and functional requirements at the concerned institutions. [Under no circumstances however, would the

training in neonatal services be of less than 27 months i.e three fourths of the total course.]

## **7. LEARNING OPPORTUNITIES**

Learning in DM neonatology will essentially be self-directed and will take place while working in various areas and through interactions in the rounds.

Following minimum formal sessions are recommended in order to facilitate and supplement the efforts of the faculty and students :

- Journal club (once in 2 weeks)
- Perinatal round (once in 2 weeks)
- Seminar (once in 2 weeks)
- Clinical case discussion (once a week)

In addition, depending on the strength of the institutions sessions or imaging, pathology, microbiology, as well as interdepartmental seminars may be undertaken.

The candidate must attend continuing education symposia, workshops and conferences including meetings of the National Neonatology Forum, workshops neonatal resuscitation and ventilation etc.

Two papers for publication in indexed journal(s) before appearing for the final DM examination is desirable.

## **8. LOG BOOK**

The candidate is expected to maintain a Log Book of all his/her activities with respect to (1) Bio-data (2) Complete List of Postings with periods and dates (3) Interesting cases seen and worked up during the period of posting (4) List of Short Reviews presented (5) List of Long Reviews presented (6) List of Journals reviewed (7) List of Cases presented and discussed in Bed-side clinics (8) List and abstracts of presentations in JIPMER Scientific Society, Conferences, PG Seminars, CPCs etc. (12) Abstracts and lists of papers published or sent for publication. (13) Any other research projects undertaken. (14) Any other interesting detail.

This Log Book would be scrutinized and certified by the Head of Department and other Consultants and presented to the external examiners at the time of the final examination

## 8.1. Long Reviews:

- Complete updated review of literature with critical analysis of major topics in neonatology. These should be presented with slides and should be bound in the form of a book. Minimum number of Long reviews to be done is three during the entire course.
- The long reviews presented during the period of the course should be compiled and bound in the form of a book incorporating any diagrams, flow charts, algorithms etc and a complete list of up to date references and this along with the CD containing slides of these reviews should be submitted for scrutiny before the examination.

## 9. TEACHING EXPERIENCE

- The candidates will be regularly involved in the teaching of undergraduate medical/nursing students and pediatrics postgraduate students. Their teaching skills will be assessed and shall form part of the internal assessment.

## 10. ASSESSMENT

### 10.1 Overview of DM Assessment

- **A maximum of 800 marks will be awarded. The candidate must obtain at least 50% (i.e. 400) marks to pass the examination**
- **A total of 800 marks, will be assigned to the Final Examination (Theory 400, Practicals 400). It will be essential to pass theory and practical both separately in the Final Examination by securing at least 50% marks in each.**
- **Periodic internal evaluation will be undertaken throughout the three years of the course.**

## 10.2 Final Examination

**10.2.1 Final assessment will be carried out by two EXTERNAL EXAMINERS and two INTERNAL EXAMINERS.** The summary of the examination is shown in Table 1.

*Table 1 : Summary of final DM Examination*

1	<b>Theory</b> <ul style="list-style-type: none"><li>• Paper I</li><li>• Paper II</li><li>• Paper III</li><li>• Paper IV</li></ul>	<b>400</b> 100 100 100 100
2	<b>Practical</b> <ul style="list-style-type: none"><li>• Long case</li><li>• Short case I</li><li>• Short case II</li><li>• OSCE/Spots</li><li>• Viva Voce</li></ul>	<b>400</b> 100 50 50 100 100
<b>NB: Candidates must pass in theory and practical independently by obtaining at least 200 marks in theory as well as in practicals</b>		

### 10.2.2 Final theory examination

- This will have four papers of 100 marks each. The broad areas covered in the these papers will be as follows:
  - **Paper I:** Basic sciences as applied to neonatology and perionatology; research methods ( 100 marks )
  - **Paper II:** Principles and Practice of neonatology ( 100 marks )
  - **Paper III:** Community neonatology; perinatology; national MCH programmes; allied disciplines such as; neonatal surgery; neurodevelopment follow up, rehabilitation etc. ( 100 marks )
  - **Paper IV:** Recent advances in Neonatology. ( 100 marks )

Each theory paper will consist of ten questions carrying equal marks

### **10.2.3 Final Practical Examination (400 marks)**

- Long case (100 marks)
- Short case I (50 marks)
- Short case II (50 marks)
- Objective Structured Clinical Examination (OSCE) (100 marks)
- Structured Viva Voce (100 marks)
  - Patient management problems
  - General viva (including radio- imaging Investigations i.e. ultrasound/CT/MRI records, interpretation of ABGs' neurophysiological records such as BERA, EEG; national programmes.



## **ANNEXURE I - DM (Neonatology) Programme**

### **LIST OF SKILLS**

#### **CLINICAL**

- Neonatal examination, anthropometry and developmental assessment
- Neonatal resuscitation
- Neonatal ventilation : CPAP, IMV; newer modes of ventilation
- Blood sampling : Capillary, venous, arterial
- Insertion of peripheral venous, umbilical venous and umbilical arterial catheters
- Monitoring : invasive, non-invasive
- Enteral feeding (katori-spoon, gavage, breast)
- Lactation management
- Parenteral nutrition
- Lumbar puncture and ventricular tap
- Placing of 'chest tube'
- Exchange transfusion
- Bed side tests : shake test, sepsis screen, hematocrit, urine examination, CSF examination, Kleihauer technique, Apt test etc.
- Neonatal drug therapy
- Nursery house keeping routines and asepsis procedures
- Universal precautions
- Handling, effective utilization and trouble shooting of neonatal equipment.

#### **COMMUNICATION**

- Communication with parents, families and communities

#### **EDUCATION/TRAINING**

- Teaching skills : lectures, tutorials
- Participatory and small group learning skill
- Principles of educational objectives, assessment and media
- Preparing learning resource material

#### **SELF-DIRECTED LEARNING**

- Learning needs assessment, literature search, evaluating evidence

#### **RESEARCH METHOD**

- Framing of research question, designing and conducting study, analyzing and interpreting data and writing a paper.

## ANNEXURE II -Contents For DM Neonatology Course

### A) BASIC SCIENCES

- Basic genetics
- Fetal and neonatal immunology
- Mechanism of disease
- Applied anatomy and embryology
- Feto-placental physiology
- Neonatal adaptation
- Development and maturation of lungs, respiratory control, lung functions, ventilation, gas exchange, ventilation perfusion.
- Physiology and development of cardiovascular system, developmental defects, physiology and hemodynamics of congenital heart disease.
- Fetal and intrauterine growth.
- Development and maturation of nervous system, cerebral blood flow, blood brain barrier.
- Fetal and neonatal endocrine physiology
- Developmental pharmacology
- Developmental hematology, bilirubin metabolism
- Renal physiology
- Physiology of gastrointestinal tract, digestion, absorption.
- Electrolyte balance
- Metabolic pathways pertaining to glucose, calcium and magnesium
- Biochemical basis of inborn errors of metabolism

### B) GENERAL TOPICS

- Research methodology
- Biostatistics
- Ethics in perinatology/neonatology
- Principles of education (objectives, curriculum, assessment and use of media)
- Computer, informations technology, internet

## **C) PERINATOLOGY**

- Perinatal and neonatal mortality, morbidity, epidemiology.
- High risk pregnancy: detection, monitoring and management.
- Fetal monitoring, clinical, electronic; invasive, and non-invasive
- Intrapartum monitoring and procedures
- Assessment of fetal risk, and decision for termination of pregnancy
- Diagnosis and management of fetal diseases
- Medical diseases affecting pregnancy and fetus, psychological and ethical considerations
- Fetal interventions.
- Fetal origin of adult disease

## **D) NEONATAL RESUSCITATION**

## **E) NEONATAL VENTILATION**

## **F) BLOOD GAS AND ACID BASE DISORDERS**

## **G) NEONATAL ASSESSMENT AND FOLLOW UP**

- Assessment of gestation, neonatal behaviour, neonatal reflexes
- Developmental assessment, detection of neuromotor delay, stimulation techniques
- Immunization

## **H) BODY SYSTEMS**

### **i) RESPIRATORY SYSTEM**

- Neonatal airways: physiology, pathology; management
- Pulmonary diseases: Hyaline membrane disease, transient tachypnea, aspiration pneumonia, pulmonary air leak syndromes, pulmonary hemorrhage, developmental defects
- Oxygen therapy and its monitoring
- Pulmonary infections
- Miscellaneous pulmonary disorders

## **ii) Cardiovascular system**

- Fetal circulation, transition from fetal to neonatal physiology
- Examination and interpretation of cardiovascular signs and symptoms
- Special tests and procedures (Echocardiography, angiography)
- Diagnosis and management of congenital heart diseases
- Rhythm disturbances
- Hypertension in neonates
- Shock: pathophysiology, monitoring, management.

## **iii) Gastrointestinal system**

- Disorders of liver and biliary system.
- Bilirubin metabolism
- Neonatal jaundice: diagnosis, monitoring, management, phototherapy, exchange transfusion.
- Prolonged hyperbilirubinemia
- Kernicterus
- Congenital malformations
- Necrotising enterocolitis

## **iv) Nutrition**

- Fetal nutrition
- Physiology of lactation
- Breast feeding
- Lactation management, breast milk banking, maternal medications and nursing
- Parenteral nutrition
- Vitamins and micronutrients in newborn health

## **v) Renal system**

- Developmental disorders
- Renal functions
- Fluid and electrolyte management
- Acute renal failure (diagnosis, monitoring, management).

#### **vi) Endocrine and metabolism**

- Glucose metabolism, hypoglycemia, hyperglycemia
- Calcium disorders
- Magnesium disorders
- Thyroid disorders
- Adrenal disorders
- Ambiguous genitalia
- Inborn errors of metabolism

#### **vii) Hematology**

- Physiology
- Anemia
- Polycythemia
- Bleeding and coagulation disorders
- Rh hemolytic disease

#### **viii) Neurology**

- Clinical neurological assessment
- EEG, ultrasonography, CT scan
- Neonatal seizures
- Intracranial hemorrhage
- Brain imaging
- Hypoxic ischemic encephalopathy
- Neuro-muscular disorders
- Degenerative diseases
- CNS malformation

#### **ix) Surgery and orthopedics**

- Diagnosis of neonatal surgical conditions
- Pre and post operative care
- Neonatal anesthesia
- Metabolic changes during anesthesia and surgery
- Orthopedic problems

#### **x) Neonatal infections**

- Intrauterine infections
- Superficial infections
- Diarrhea
- Septicemia
- Meningitis
- Osteomyelitis and arthritis
- Pneumonias
- Perinatal HIV
- Miscellaneous infective disorders including HBV and candidemia

#### **xi) Neonatal Imaging**

- X-rays, ultrasound, MRI, CT Scan etc.

#### **xii) Neonatal ophthalmology**

- Developmental aspects
- Retinopathy of prematurity
- Sequelae of perinatal infections

#### **xiii) Neonatal dermatology**

#### **I) Transport of neonates**

#### **J) Neonatal procedures**

#### **K) Developmental assessment and follow up**

#### **xviii) Organization of neonatal care**

#### **xix) Community neonatology**

- Vital statistics, health system;
- Causes of neonatal, perinatal death
- Neonatal care priorities
- Care at secondary level of care
- Care at primary health centre
- Role of different health functionaries
- National programmes

**DM (Neonatology)**

**Model Question Paper**

**Paper I-Basic Sciences as applied to Neonatology; Research Methodology**

Time –  
3hrs  
Max mark  
100

- \* Answer all questions
- \* All questions carry equal mark

1. Evidence based data on the usefulness of Kangaroo Mother Care and steps to promote KMC in the community.
2. Pulmonary graphics – physiology and interpretation
3. Analgesia and sedation in ventilated neonates.
4. Metabolic consequences of intra uterine growth restriction
5. Indices of Neonatal health care
6. Gene therapy – clinical applications
7. Define with examples
  - P value
  - Standard Deviation
  - Correlation Coefficient
8. New born screening
9. Case control studies
10. Direct hyperbilirubinemia in newborn

**DM (Neonatology)**

**Model Question Paper**

**Paper II-Principle and Practice of Neonatology**

Time –  
3hrs  
Max mark  
100

- \* Answer all questions
- \* All questions carry equal mark

1. Discuss post resuscitation strategies to avoid ongoing injury following intra partum hypoxic ischemic insult
2. Newer diagnostic test for the early onset sepsis
3. Briefly discuss pathophysiology of hypotension in preterm and outline the management
4. How will you investigate refractory hypoglycemia and outline the management
5. Approach to a neonate with acute renal failure.
6. Pathogenesis of periventricular leucomalacia
7. Delivery room strategies with specific reference to respiratory support
8. The late preterm neonate
9. Pathogenesis of Meconium aspiration
10. Problems of Infants of diabetic mothers.



**DM (Neonatology)**

**Model Question Paper**

**Paper III-Perinatology, Neonatal sub specialties and Community Neonatology**

Time –  
3hrs  
Max mark  
100

- \* Answer all questions
- \* All questions carry equal mark

1. Prevention and treatment of neural tube defects
2. Ophthalmic complications of perinatal outcome and its impact in long term follow up
3. Cost of a low birth weight baby – long term economics
4. Perinatal aspects of iron metabolism
5. Antenatal Doppler evaluation and implication to the fetus and neonate
6. Medication errors – Recognition , definition and prevention
7. Home based newborn care vs facility based new born care
8. Newborn skin – Role in preventing infection and Role of skin cleansing strategies to prevent infection.
9. Maternal medications and fetal adverse outcome
10. Congenital Toxoplasmosis – Diagnosis and treatment

**DM (Neonatology)**

**Model Question Paper**

**Paper IV- Recent Advances in Neonatology**

Time –  
3hrs  
Max mark  
100

- \* Answer all questions
- \* All questions carry equal mark

1. Oxidative stress in perinatal asphyxia
2. Liquid ventilation
3. Therapeutic Hypothermia
4. Intrauterine fetal therapy
5. Nitric oxide therapy
6. Late morbidities among intrauterine growth restricted babies
7. Zinc supplementation for low birth weight babies
8. Complications of Total Parenteral Nutrition.
9. Prevention of vertical transmission of HIV infection
10. Cerebral function monitoring