Fellowship in Fetal medicine, two years course at Division of Fetal Medicine (DFM), KMC Manipal.

Eligibility criteria for admission:

1.Postgraduate Diploma or Master's Degree in Obstetrics and Gynaecology or Radiology

2. Minimum of two years in clinical practice following Post graduation, this clinical practice should include basic knowledge/experience in obstetrics/obstetric ultrasound. However, preferably those who have passed out of post-graduation not more than 7 years ago.

3.Basic knowledge and skills in Obstetric Ultrasound

4. For candidates who have already completed their 1year Fellowship in Obstetric USG; with us; it is possible to complete another year of training and obtain the Fellowship in Fetal Medicine depending on availability of seats as well as their performance in RITA and exit exam.

Program objective, scope, and motivation:

This course is aimed at Doctors who have already practiced their basic specialty (OBG/Radiology) and have further decided to take up Fetal Medicine as a career. This is not only designed to train them in advanced obstetric imaging, but to incorporate the same into the broader perspective of fetal diagnosis, fetal care and care of the pregnancy as a whole with a multidisciplinary involvement. Therefore, candidate must have some training and skills in obstetric USG as well as practice of high-risk obstetrics, prior to thinking of taking this up as a career option.

Program Structure/highlights:

1. Duration of the program – Two-year programme ; The training is at DFM, KMC Manipal.
2. Syllabus/curriculum

Training curriculum:

First Module (6 months)

1. Orientation and Knobology
2. Acquire basic scanning planes across all gestations
3. Perform NT scans, anomaly scans and growth scans under supervision and register with the Fetal Medicine Foundation for submission of images.
4. Participate in lectures provided by the faculty in obstetric ultrasound
5. Discuss and decide on Research project and obtain necessary approval
6. Participate in counselling in complex clinical scenarios
7. Attend Genetic and other counselling clinics as observer
8. RITA – Rigorous In Training Assessment at the end of 6 months

Second Module (6 months)

1. Further training in advanced radiological aspects of obstetric scans.
2. Develop to learn 3D/4D ultrasound imaging and its application in clinical practice
3. Participate in joint multidisciplinary clinical meeting to present and discuss complex case scenarios

4. Obtain certifications of competency from the Fetal Medicine Foundation.
5. Participate in Genetic counselling, Perinatal mortality meetings in joint association with other centres
6. Present interim results from the research project with aim to present data in national or international conferences
7. RITA – Rigorous internal training assessment at end of year one - to assess if the candidate has successfully completed the competencies as laid in the curriculum and promote to the second year of training.

Third Module (6 months):

1. Able to independently perform ultrasound scans across all gestations with additional emphasis on fetal echocardiography
2. Observe and assist simple fetal interventions like amniocentesis and Chorionic villus sampling
3. Attend special clinics like Maternal Medicine, Genetics, Pathology, Paediatric surgery, Neonatology, Intensive care, Paediatric orthopaedics, Neurology and neurosurgery, Clinical Psychology and to be signed by respective consultants for achieving necessary competencies as part of the curriculum
4. Conduct weekly multidisciplinary meetings between the specialties to gain knowledge and experience
5. Write up first draft of the research and submission to educational supervisor for comments and review.

Fourth Module (6 months):

1. Continuation of the skills learned during the previous three modules to work as an independent operator
2. Perform common fetal invasive procedure like amniocentesis and Chorionic villus sampling under supervision with ability to independently perform some of the cases at the end of their training.
3. Observe and assist complex fetal medicine invasive procedures like intrauterine transfusions, Laser, RFA, shunts and multifetal pregnancy reductions
4. Successful submission of research project, prior to exit exam and RITA
5. RITA before the exit exam to check and certify that necessary competencies have been achieved as laid out in the curriculum.
6. Exit exam at the end of training- with an external examiner (Theory and practical components)
8. Issue of certificate for successful candidates following completion of the training modules and achieving a pass mark in the exit examination.

Necessary training is planned in such a way that the students receive the training on par with international standards.

There would be continuous exchange of clinical learning material combined with classroom and online lectures which would help in continuous learning of the candidate on a wide range of clinical conditions. We aim to closely involve our adjunct faculty (Expert foetal medicine specialists in India) in teaching program so that our trainees get the maximum benefit from their experience in the field.

3. Attendance : 95% mandatory

4. Examination pattern : Exit exam at the end of training; with an external examiner (Theory and practical components).

5. Minimum for pass - MAHE BoS Meeting held on 19/02/2021 has modified this - Criteria for passing – kept at 50% , Minimum 50% independently in theory and practical's, if the candidate gets >75% - pass with distinction

6. Number of attempts - 2

7. Reference list of books & journals

Textbooks

1. Callens Textbook of USG in Obstetrics and Gynecology
2. Fetology, a textbook on Fetal Abnormalities
3. Creisy and Resnik's Textbook on Maternal Fetal Medicine
4. Textbook on Fetal Cardiology – Abuhamad et al
5. Textbook on Fetal CNS Imaging – Dr B S Ramamoorthy

Journals:

- Ultrasound in Obstetrics and Gynecology
- Prenatal Diagnosis
- Journal of Ultrasound in Medicine
- Fetal Diagnosis and therapy

Websites: for reference and education
www.isuog.com
www.perinatology.com
fetalmedicine.org

8. Collaborations with other departments Institutions/ Genetics, radiology, paediatrics, neonatology, paediatric surgery, pathology, neurology, Neurosurgery,paediatric orthopaedics, clinical psychology and other departments as relevant to cases.

9. Industry placements/Internships – NA

10. Prospects & Placements – This Fellowship is aimed at preparing the candidate for practice of Fetal Medicine as a subspecialty. This subspecialty is a rapidly growing field in India and there is huge scope for young trained Fetal Medicine specialists. To practice Fetal Medicine, there must be knowledge in high-risk Obstetrics, maternal-fetal medicine, obstetric USG, as well as advanced aspects of radiology. Currently, most of the Fetal Medicine Fellowships in India are offered by private Fetal Medicine Centers, without any collaboration with a medical

college/teaching institution. They are offered by a trainer, who is either an obstetrician or a radiologist, thus not exposed to the core areas of other specialty. Obstetrician lacks core training and experience in radiology and vice versa for the radiologist. This fellowship helps to cover up for this deficiency, by giving exposure to multidisciplinary fetal medicine environment as well as high end technical component of radiology training. ***Exposure to the multidisciplinary care and research at this tertiary care center will give them an edge over other candidates; This will open up their opportunities for overseas experience as well as research placements in overseas universities.***

In addition, most trained fetal medicine experts are available in major metropolitan cities. There is still a huge demand for this service at district level and second tier cities across the country. It would be good job opportunity and a rewarding career for the prospective fetal medicine specialists in the years to come.

Detailed Syllabus/Curriculum:

Manages the key conditions targeted by the Fetal Anomaly Screening Programme
Diagnoses, provides a differential diagnosis for, and manages the full range of rare fetal structural abnormalities.
Demonstrates how these ultrasound findings are researched and managed
Takes an appropriate history and constructs, where appropriate, a family tree in women with or chance of genetic conditions.
Explains common modes of Mendelian inheritance.
Counsels for previous aneuploidy.
Offers other prenatal tests appropriately.
Recognises when to refer to tertiary centre and how best to share care and monitoring.
Liaises appropriately with the tertiary centre and the multidisciplinary team.
In collaboration with specialists, formulates, implements and where appropriate modifies management plan.
Counsels women and their partners regarding the fetal risks, implications for the pregnancy and the long-term outcome.
Signposts to external sources of information and support.
Constructs a follow-up plan for the pregnancy.
Plans birth and appropriate neonatal support in collaboration with fetal medicine specialist.
Experienced in the ultrasound diagnosis and management of pregnancies complicated by a wide range of fetal abnormalities (with the minimum listed in knowledge criteria).
Offers other prenatal tests appropriately.
Liaises appropriately with the tertiary centre and the multidisciplinary team.
In collaboration with specialists, formulates, implements and where appropriate modifies management plan.
Counsels women and their partners regarding the fetal risks, implications for the pregnancy and the long-term outcome.
Signposts to external sources of information and support.

 Constructs a follow-up plan for the pregnancy.
 Plans birth and appropriate neonatal support in collaboration with fetal medicine specialist.
 Formulates management plan for future pregnancy in collaboration with specialists.
 Explains common modes of Mendelian inheritance and how these determine chances of recurrence.
 Recognises the need for referral to genetics services with rarer/unique aneuploidy.
 Communicates without judgement the types of tests on offer, their scope and their potential complications and disadvantages.
 Takes an appropriate history and constructs, where appropriate, a family tree in women with or at chance of genetic disease

Rarer chromosomal/genetic abnormalities:
In addition to common chromosomal abnormalities, they need to be aware of rarer problems like microdeletions and duplications which can only be diagnosed with chromosomal micrarray
Other aneuplopidies: the implications of Turner syndrome (45XO), Kleinfelter syndrome (47 XXY) and 47 XXX, tetrasomy 12p (Pallister-Killan's syndrome) and appreciate the approach to managing pregnancies complicated by much rarer/unique chromosomal abnormalities
The underlying genetic inheritance patterns and prenatal testing for cystic fibrosis, muscular dystrophy and fragile X, and the need for liaison with clinical genetics
Manages a pregnancy at elevated chance of, or affected by, aneuploidy
Takes an appropriate history and arranges appropriate parental investigations.
 Communicates effectively with women and their partners/families, regarding risk, screening and testing options.
 Manages the care of a woman with a personal or family history of a chromosomal abnormality, including assessment of risk, prenatal diagnostic options, and further management options after testing.
 Manages an ongoing aneuploid pregnancy, including plans for birth and a multidisciplinary approach to the care of the newborn.
 Recognises when advice from, and referral to, clinical genetics services is needed.

Manages a pregnancy with a chance of a single gene disorder in a structurally normal fetus
Takes an appropriate history, constructs a family tree and arranges appropriate parental investigations.
 Communicates effectively with women and their partners/families, regarding risk, screening and testing options.
 Manages the care of a woman with a personal or family history of a single gene disorder including assessment of risk, prenatal diagnostic options, and further management options after testing.

 Manages an ongoing pregnancy affected by a single gene disorder, including communication and planning with paediatric services.
 Recognises when advice from, and referral to, clinical genetics services is needed

Diagnoses and manages genetic and syndromic disorders in the structurally abnormal fetus
Carries out appropriate counselling and management in families with a previous child with multiple anomalies or syndromic disorder.
 Accesses online highest quality information regarding very rare syndromic and genetic problems.
 Manages the care of a woman with a personal or family history of syndromic anomaly, providing information, screening and prenatal testing options.
 Uses a dysmorphology database to reach a differential diagnosis.
 Recognises when referral is indicated for more specialised counselling and genetic advice.
 Provides options for management in an affected pregnancy, including termination of pregnancy, without judgement.
 Manages an ongoing pregnancy, including planning for birth and a multidisciplinary approach to the care of the newborn.

Manages rare complications of multiple gestations
Diagnoses and manages TTTS, and provides follow-up care.
 Manages discordant anomaly, including counselling on the selective termination of pregnancy.
 Recognises and manages TRAP sequence.
 Refers to quarternary services for high level procedures where indicated.
 Manages monoamniotic twin pregnancies.
 Manages triplet and higher order multiple gestations, including the provision of counselling, without judgement, on multifetal pregnancy reduction.
 Diagnoses and manages severe early onset selective fetal growth restriction in monochorionic and dichorionic multiple pregnancies
The techniques used for selective termination of pregnancy for discordant anomalies in multiple gestations, and the risks involved
 Indian law on termination of pregnancy, including justifying criteria, gestational limits and when to perform fetocide
 The significance of signs of life following a termination
 The various methods of termination of pregnancy, and the pros and cons of each method

Fetal anemia, other red cell/platelet alloimmune disorders of the fetus:
Red cell alloimmunization:
Explains the potential fetal and maternal risks of red cell antibodies.

• Liaises with blood transfusion and neonatal services.
• Classifies the risks for any pregnancy complicated by red cell antibodies.
• Performs and interprets MCA Doppler.
• Refers to a fetal transfusion centre in a timely and appropriate manner.
Explains the potential fetal and maternal risks of red cell antibodies.
□ Provides surveillance for pregnancies complicated by Parvovirus infections.
□ Liaises with blood transfusion and neonatal services.
□ Classifies risks for any pregnancy complicated by red cell antibodies and provides appropriate surveillance for fetal anaemia.
□ Prepares women and their partners for the neonatal care necessary in cases of HDFN.
Which red cell antibodies carry the greatest chance of haemolytic disease of the fetus and newborn, what thresholds there are for commencing surveillance for fetal anaemia, when to refer for fetal blood sampling and transfusion, how this is perfomed, and how the newborn is managed when chance of haemolytic disease
□ Explains the risks of maternal antiplatelet antibodies and knows when they should be tested for.
How platelet antibody-antigen combinations commonly cause neonatal alloimmune thrombocytopaenia and what the outcomes can be, and how the chance of harm can be
□ Manages a pregnancy complicated by maternal antiplatelet antibodies, including birth and neonatal care

Manages infections in pregnancy which may have an impact on the fetus
Investigates appropriately for common fetal infections (with the minimum listed in the knowledge criteria).
□ Is able to interpret laboratory results for each infection in liaison with virology.
□ Explains the potential fetal, newborn and long-term effects of fetal infections.
□ Recognises when to refer and how best to share care and monitoring.
□ Liaises appropriately with the tertiary centre and the multidisciplinary team.
The clinical features, prevention, vertical transmission risk, ultrasound features, short- and longer-term implications for the fetus and newborn, laboratory investigation and pregnancy management of CMV, toxoplasmosis, parvovirus and varicella.
□ The role of the clinical virologist and the limitations of any antenatal treatment options

Fetal Hydrops:
Constructs a differential diagnosis and targets appropriate investigations.
□ Treats reversible causes.
□ Manages pregnancies where the cause of the hydrops remains unclear.
□ Pursues the diagnosis post-birth and provides counselling for future pregnancies

Prenatal diagnostic procedures:

describes, obtains informed consent for and performs amniocentesis
Explains the risks of each procedure and any alternatives.
Communicates the scope and the limitations of these tests.
Describes how prenatal samples are processed and when, and how, the results are given.
Obtains informed consent for amniocentesis.
* Conducts the test independently in a safe manner in a singleton pregnancy.*
* Documents the procedure accurately, including use of anti-D where appropriate.*
* Describes how and when results will be given.*
* Recognises when a test is likely to be technically challenging.*
* Debriefs and provides advice following procedure.*
* Counsels following amniocentesis for both normal and abnormal results.*
* Manages complications of amniocentesis*
The indications for offering invasive testing, its risk and benefits
* The types of analysis that may be applied (QF-PCR analysis, full karyotyping, array analysis and targeted molecular genetic examination for family history of genetic conditions) – and how to discuss these appropriately*
* The potential for sensitisation – Rhesus alloimmunisation – and the importance of maternal blood group*
* The implications of maternal blood born viruses*
* When sample should be stored in case of further analysis*
* Aseptic technique, how to optimize the ultrasound image, when amniocentesis is not likely to be straightforward and the options available*
* What the test is not able to show, the significance of the result and the options available following an abnormal result*
* The options following test failure, mosaicism, and the role of parental karyotyping in the interpretation of results*

Genetic tests:
Requests and uses a wide range of molecular, cytogenetic and biochemical tests for prenatal diagnosis
Is able to take non-directive informed consent for performing these tests.
Is able to interpret and communicate the results of these tests and know when a multidisciplinary approach is required.

Basic knowledge of genetics for fetal medicine specialists:
Normal chromosome structure and function
* Gene structure and function, including gene control, mechanisms and effects of mutation, genetic heterogeneity*
* Patterns of genetic inheritance and susceptibility, expression and penetrance, multifactorial and mitochondrial inheritance*
* Cell division (meiosis and mitosis), and abnormalities arising from these processes*
* Types of aneuploidy, including structural rearrangements, deletions and common microdeletions, trisomies, sex chromosome anomalies (including*

Monosomy X, Klinefelter syndrome and Triple X), extra markers, mosaicism (fetal and placental), uniparental disomy, triploidy
The underlying genetic aetiology of the single gene disorders mentioned in CiP 2 and 3, AND the following conditions:
o myotonic dystrophy
o Huntington's disease
o Haemoglobinpaothies, hameophilia and other common bleeding disorders
o Inborn errors of metaboilism
Detailed knowledge of the following syndromes and associations:
o DiGeorge
o Fryn's
o Beckwith-Wiedemann
o Meckel Gruber
o Smith-Lemli-Opitz
o VATER/VACTERL
The pre- and postnatal phenotypes of these common aneuploidies, single gene disorders, and syndromes, including prognosis
Methods of screening for aneuploidy, including ultrasound, biochemical and non-invasive DNA based techniques
The statistical terms relevant to screening, including sensitivity, specificity, false positive rates, positive predictive rates, and how these are inter-dependent
The meaning of likelihood ratios in risk calculations
Current screening programmes, including national implementation, audit, quality control, the National Screening Committee and regional screening co-ordinators
How recurrence risks for chromosomal and single gene disorders are derived
Prenatal testing options, both invasive and non-invasive, including ultrasound, MRI, NIPT, amniocentesis, chorionic villus sampling, fetal blood sampling
Laboratory techniques for analysing parental and fetal samples, including quantitative PCR,
FISH, karyotyping, microarray, CGH, MLPA, mutational analysis, Next Generation sequencing, WES, Trio WES, Clinical Exom Sequencing, Genetic panel tests, enzymatic analysis, analyte assessment

Higher level fetal interventional procedures/options of fetal therapy:
Counsels on and takes consent for high level interventional procedures.
Conditions amenable to prenatal therapy, e.g. fetal arrhythmias, spina bifida, CDH, and how these treatments are administered and the complications of them
The indications, methods, potential benefits and complications of the following high-level fetal medicine procedures; vesicocentesis, pleural and vesical shunt

placement, placental laser, radiofrequency ablation, cord occlusion, fetal blood transfusion
- *The structure of the local paediatric network, including surgical services*
- *Paediatric network guidelines for the management of newborn problems*

Counsels on and manages termination of pregnancy for fetal abnormality
Raises the option of termination of pregnancy for fetal abnormality appropriately.
- *Counsels regarding the different methods of termination, when termination is offered and when fetocide is legally mandated.*
- *Organises termination of pregnancy for fetal abnormality.*
- *Adjusts care around termination of pregnancy in high risk situations.*
- *Manages complications of termination of pregnancy*

Provides follow up and counselling after a pregnancy complicated by fetal abnormality
Explains the role of the post-mortem and any other relevant post-birth tests.
- *Explains the findings and implications of any additional post-birth investigations.*
- *Refers, where appropriate, to the wider multi-disciplinary team.*
- *Counsels regarding chance of recurrence across the range of conditions targeted by FASP.*
- *Proposes a plan for future pregnancy management*