University of Jaffna- Sri Lanka

Centre for Open and Distance Learning (CODL)

Template for Certificate Courses

<table>
<tr><td>Course Title</td><td colspan="4">Certificate course in Semenology (Laboratory Andrology)</td></tr>
<tr><td>Course Code</td><td colspan="4">CCE……</td></tr>
<tr><td>Hours</td><td colspan="4">72</td></tr>
<tr><td rowspan="2">Hourly breakdown</td><td>Lecture</td><td>Practical demonstration</td><td>Hands – on Practical</td><td>Total</td></tr>
<tr><td>20</td><td>20</td><td>32</td><td>72 hours</td></tr>
<tr><td colspan="5">Target Group
Medical officers, medical Laboratory Technologist (MLT), nursing officers and Allied Health Professionals with an interest in andrology.</td></tr>
<tr><td colspan="5">Course Fees
LKR: 15,000</td></tr>
<tr><td colspan="5">Objectives
• Provide the fundamental knowledge to the learners in subfertility and andrology
• Develop learners' skill in semen fluid analysis and sperm processing for intra uterine insemination (IUI) or assisted reproductive technology (ART)
• Prepare the learners to independently and ethically practise seminal fluid analysis and sperm processing methods.</td></tr>
<tr><td colspan="5">Intended Learning Outcomes</td></tr>
<tr><td colspan="5">Learning outcomes expected to be acquired by the student at the end of the course:
1. Recognise the scientific knowledge related to andrology and male fertility.
2. Inferring the basics of subfertility management
3. Planning and implementing the andrology laboratory in low resource setting.
4. Checking quality of laboratory equipment and consumables
5. Develop skills to perform the seminal fluid analysis and semen processing techniques.
6. Interpreting the seminal fluid analysis report
7. Executing ethics in laboratory and clinical practise</td></tr>
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Syllabus Content

1. **BASICS OF ANDROLOGY**

- Definition of andrology and components
- Andrology, the branch of medicine that deals exclusively with disorders of the male reproductive system. In 50% of childless couples. It is a male factor that is responsible for the infertility.

2. **SUBFERTILITY**

- Definition of Subfertility is defined as the inability to conceive after at least 12 months of regular unprotected sexual intercourse. After one year, the cumulative spontaneous pregnancy rate following regular unprotected sexual intercourse is around 85%. Subfertility has been recognized as a public health issue by WHO.

- Causes- males, females
    - Female (30%)
    - Male (30%)
    - Mixed (20%)
    - Unexplained (20%)

3. **MALE FERTILITY**

- Male reproductive Physiology-hormonal control of spermatogenesis
- Male reproductive anatomy- testis, epididymis, spermatic cord, prostate, penis

Spermatogenesis

- Stages of spermatogenesis.

Causes of male subfertility

- pre testicular, testicular and post testicular causes.

4. **CLINICAL EVALUATION OF THE INFERTILE MAN**

- Clinical assessment of male fertility

History
Examination
Laboratory investigations

- Seminal fluid and components
  Semen contains sperms, seminal plasma and other cells.
- Semen fluid analysis:
  Seminal fluid analysis is a complex test that should be performed in andrology laboratories by experienced technicians with quality control and validation systems. A routine seminal fluid analysis should include macroscopic examination of semen (color, Viscosity and liquefaction) and microscopic examinations which are concentration, motility and morphology.
- Seminal fluid analysis (SFA) reports interpretations and WHO standards
- Nomenclature and definitions of abnormal seminal fluid analysis
  - Sperm abnormalities.
  - Terminologies
- Other relevant investigations
  - Hormone assay
  - Imaging studies
  - Genetic studies

5. SEMENOLOGY LABORATORY

- Laboratory design and Equipment
  Every Laboratory has its own unique features and the structure of the laboratory depends on the functioning of the laboratory. Requirements involve space/location, non-sterile area, Aseptic region, Trained professionals. Sample collection area should be a clean and calm environment with washrooms.
  Laboratory infrastructure.
  Equipment: Microscope, Incubator, Makler counting chamber, Centrifuge, Laminar air flow,
- Quality control and Regulatory Compliance
  This is ensuring the quality of media used and the proper functioning of instruments and machines used in Assisted Reproductive Technology Laboratory.
- Media Handling
- Waste disposal

6. SEMEN COLLECTION AND ANALYSIS

Semen collection method of collection including surgical sperm retrieval

- Semen collection by the patient can be carried out with or without assistance. Masturbation is a standard method and remains a simple and popular However, medical and psychological concerns might influence masturbation, especially collecting seminal fluid before IUI treatment.

- patient education/ guide

Basic seminal fluid analysis and SFA reporting

Macroscopic and Microscopic examination for count and motility

- Macroscopic examinations: Liquefaction of semen, Semen viscosity, Semen volume.
- Microscopic examinations: Sperm motility assessment, Sperm concentration, Sperm morphology assessment.

7. INTRA UTERINE INSEMINATION (IUI)

- **Definition**
- **Indications**
    - IUI is the first-line therapy for selected couples who have functionally standard tubes.
    - Other causes such as mild to moderate male factor (oligospermia, asthenospermia, teratozoospermia), optimize the donor sperm (Donor sperm insemination) - severe male factor subfertility, Unexplained subfertility, Male sexual dysfunction such as erection and ejaculatory disorders
- **Steps of IUI**
    - Assessment
    - Ovulation Induction
    - Follicular tracking and monitoring of endometrial thickness.
    - Trigger
    - Insemination of processed semen.

8. **ADVANCED SEMEN ANALYSIS FOR IUI AND ASSISTED REPRODUCTIVE TECHNOLOGY (ART)**

Sperm processing procedure

- **Sperm washing**

Processing seminal fluid is essential before IUI to remove debris, dead or immobile sperms, and prevent prostaglandin –included uterine contraction. It can be achieved by relatively simple procedures. The most frequently used methods are centrifuging spermatozoa through culture medium or density gradients followed by re suspension in suitable culture media. Sperm Washing is the primary method for seminal plasma removal from the sperm. It involves dilution and centrifugation to remove decapitation factor(s) and other detrimental elements and to the concentration of all sperm within the ejaculate.

- **Media and Protein supplementation**

Centrifuge Recommendations for media and protein supplementation are somewhat arbitrary and subject to laboratory personnel opinion. BWW, Earls, Hams F-10 or HTF; all are commercially available. Protein supplementation is essential during centrifugation and for the general maintenance of sperm viability. Such protein supplementation appears to stabilize sperm membrane integrity and may also absorb free oxygen radicals already present or additionally generated during centrifugation. Protein supplements generally recommended for sperm dilution and processing is either Bovine Serum Albumin, 0.2 to 0.5gm%, Human Serum Albumin, 10gm%, heat-inactivated (56^{o}C for 20minutes) patient serum 5 to 10 %.

- **Sperm washing methodology-** Various sperm separation or isolation methods exits to select sperm cells. These include
    - **Sperm migration method**
      Procedures based on this concept mimic sperm migration through the cervical mucus- Selection Based on Motility of Sperm.
    - **Density gradient method**
      Sperm are selected based on their motility, size and density differential as they are centrifuged through a continuous or discontinuous density gradient of either colloidal or salinized silica. Compared with sperm swim up or swim down procedures, density gradient centrifugation procedures yield a higher concentration of motile sperm and are therefore considered to be industry-standard procedures for processing semen for IUI. However, the DGC method is not recommended for extremely low sperm content semen samples, highly viscous semen samples, or samples containing a large percentage of cellular debris.
    - **Colum adherence method**
      Sperm are selected based on the fundamental concept that nonviable sperm are ''sticky,'' and therefore more likely to adhere to the glass wool column than otherwise motile and functionally intact spermatozoa.

- Trouble shooting in IUI and special clinical circumstances- retrograde ejaculation, severe oligospermia

- Sperm cryopreservation methodology- fertility preservation in malignant patients

9. DOCUMENTATION AND ETHICAL PRACTICES

- Safe practices to avoid documentation errors in reporting results
- To remind users in basic ethics in the use of laboratory
- Safety of personnel, materials and equipment

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- Maintenance of quality / standards
- Adhering to regulations

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<tr><td>Teaching and Learning Methods/Activities</td><td>Lectures, e-based learning, practical (Hands on Session), Log book assessment.</td></tr>
<tr><td>Evaluation</td><td>Formative assessment (In-course):
Practical assessment of seminal fluid analysis and sperm processing methods (60 marks)
• Receiving samples and checking the patient identify
• Sample handling
• Correct technique to perform SFA and sperm processing
• Waste disposal according to the standard protocol
• Documentation and reporting

Summative Assessment:
At the end of the course (40marks)
1. 20 single best questions in andrology (20 marks)
2. Viva voce (20 marks)
Total of 100 marks and need to obtain more than 50 to award certificate.</td></tr>
<tr><td colspan="2">Recommended Readings:

• Jeyendran RS. Interpretation of semen analysis results: A practical guide. Cambridge: Cambridge University Press; 2000.
• Jeyendran RS. Protocols for Semen Analysis in Clinical Diagnosis. New York: Taylor & Francis; 2002.
• Jeyendran RS. Patient Guide to Semen Analysis. New York: iUniverse; 2003.
• Jeyendran RS. Sperm Collection and processing Methods: A practical guide. Cambridge: Cambridge University Press; 2003.
• Jeyendran RS. Confessions of a human sperm. Bloomington: iUniverse; 2013.
• Raguraman S., Muhunthan K. Intra uterine insemination. Sri Lanka J of Obstet Gynaecol. 2021;43(4):314-321.
• Raguraman S. Intrauterine insemination: A practical guide. Sri Lanka: semmamadu publications; 2022.
• WHO laboratory manual for the examination and processing of human semen, 6th edition
• Raguraman S, Jeyendran R, Sukirthan T Sperm processing techniques for Intra-Uterine

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Checked by: Prof.K.Muhunthan and Prof MG Sadiadas

Resource persons

1. Dr.S.Raguraman- Course coordinator
2. Dr.B. Balagobi – Course coordinator
3. Dr R S Jeyendran
4. Professor. K. Muhunthan
5. Dr.A.Murugananthan
6. Mrs.T.Sukrithan

Approval of Management Committee:

Content with time frame

Serial No	Title	Duration Hrs		
		Theory	Practical demonstration	Hands- on Practical
1	Basic Andrology	2	-	-
2	Sub fertility	2	-	-
3	Male fertility	2	-	-
4	Clinical evaluation of the infertile man	2	-	-
5	Semenology Laboratory	2	-	-
6	Semen collection and analysis	2	10	15
7	Intra Uterine Insemination	2	-	-
8	Advanced semen analysis for iui and assisted reproductive technology (ART)	4	10	17
9	Documentation and Ethical practices	2	-	-
Total hours		20	20	32