Overview of Medical Laboratory Technology in India

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ABOUT THE PROFESSION

Medical Laboratory Science is an important subject in the field of Medicine. In each system of Medicine, Diagnosis of disease is primary step because no treatment is possible without a proper diagnosis. It is the Medical Laboratory Technical staffs, who perform this important task by various scientific tools and techniques.

In modern world of Technology the Diagnosis, Treatment & Prognosis of various Diseases depends on results of the investigations carried out in a Clinical Laboratory. Thus Medical Laboratory Technical staff plays a key role in the field of health Care.

Medical Laboratory Technology has played a significant role in the advancement in the field of Medicine, especially in past few decades. Modern medicine is becoming more and more a team effort, and the Medical Technical staff is an important member and integral part of the Medical team. In reality this is a "PROFESSION", not just a "JOB". And as a profession, emphasis is always aimed at giving the best services to the patients, who are served by the medical team.

- **Role of Medical Technology Staff and its integration with the health services.**

a) Need of Accurate diagnosis for better treatment.

b) Monitoring of treatment for better response.

c) Detection of the disease at an early stage.

d) Controlling the development and spreading of infectious disease

e) Participating in National eradication programme of disease like Polio, Malaria, HIV etc.

f) Disaster management.

g) Medical laboratory technical staff also plays an important role in practical teaching of undergraduates/postgraduates Medical Students in Medical Institutions.

h) Medical Laboratory Technical staff is involved in the teaching and training of Medical Laboratory Technology Students.

i) Manufacturing of various vaccines, anti-sera etc like anti-snake venom, yellow fever, meningococcemia, rabies, DPT, meningitis etc.

j) Testing & certifying of medicines, drugs, vaccines, anti-sera, diagnostic kits, reagents.

k) Medical Laboratory Technical Staff are inseparable part of research work.

- **VARIOUS MAJOR DISCIPLINS OF MEDICAL LABORATORIES**

In the modern era of medical science, medical laboratories are adopting Hi-tech technology and various disciplines of laboratories are growing day by day with induction of special investigations and sophisticated computerized instrument and newer techniques. **On the other side manual clinical findings and investigations are also done by this category, where individual's skill and efficiency is only criteria and way to judge the importance in the field routine diagnostic methods. Here even the independent reporting is being done by the Medical Lab. Technical Staff without guidance or supervision of any head, especially in emergency evening & night shifts.**

- **Departments, where the laboratory staff discharges their duties are:**

	LABORATORY DISCIPLINE		LABORATORY SECTIONS
1.	Microbiology	(A) (B) (C) (D) (E) (F)	Bacteriology Serology & Immunology Mycology Virology Parasitology Animal House
2.	Clinical Biochemistry	(A) (B) (C) (D)	Metabolic Laboratory Endocrine Laboratory Gasometry Cardiac Profile Laboratory Emergency Laboratory
3.	Pathology	(A) (B) (C) (D) (E) (F) (G) (H) (I)	ClinicalPathology Immunopathology Haematology Histopathology Cytology ElectronMicroscopy Museum Emergency Laboratory Dept. of Lab. Medicine
4.	Blood Bank & Immuno-haematology	(A) (B) (C) (D) (E)	Blood Grouping, Cross Matching Elisa Testing Blood Transfusion Section Immunoheamatology Section Components Section

		(F)	Emergency Services
5.	Anatomy	(A) (B)	Morbid Anatomy Museum
6.	Physiology	(A) (B)	Experimental Physiology Amphibian Lab.
7.	Pharmacology	(A) (B)	Pharmacy Clinical Pharmacology
8.	Forensic Medicine	(A) (B)	Toxicology Lab. Autopsy
9.	Molecular Medicine	(A) (B) (C)	Molecular Lab PCR Genetics Lab.
10.	Experimental Medicine	(A)	For Research works

all qualified technical staff perform their duties in rotation in almost all the existing disciplines and remain in consistent touch with latest development in the field of research. In the odd hours the lab technologist carry out investigations and reports its results independently often in the absence of any specialist's help and manage most of the mechanical and other type of trouble shooting occurring during the process.

- **SERVICES AND PLACES OF APPOINTMENT:** Medical Laboratory Technologists are usually employed by:

  - Central Government Hospitals/ institutions
  - State Government Hospitals
  - Railway Hospitals
  - Medical colleges

- Municipal Corporations, NDMC and other local statutory bodies
- C.G.H.S. Dispensaries
- Medical and Health Institutions in private/ public sector
- E.S.I. Corporation Hospitals and Dispensaries
- Research Institutions like CSIR, ICMR, ICAR, BARC, IOP, NACO etc.
- Institutions of international fame like Central Research Institute, Kasauli (H.P), BCG Guindy, Central Drug Laboratories, National Institute of Serology, National Institute of Immunology, Institute of Public Health & hygiene, National tuberculosis Institute, Central Institute of Psychiatry, Port & Airport Health Organisations, NVDCP and NICD etc.
- Autonomous & other bodies like AIIMS, PGI Chandigarh, Red Cross Blood Bank etc.
- Public undertakings hospitals and Dispensaries.
- National health Institutions.
- Trauma Centers.
- Private Hospitals/Health institutions, Medical colleges etc.
- Private Health centre/dispensaries
- Clinical/Diagnostic and research Laboratories

- **NATURE OF WORK OF MEDICAL LABORATORY TECHNICAL STAFF**

Duties and responsibilities of medical laboratory technical staff is highly specialized, sophisticated and very sensitive. Clinical laboratory personnel need good analytical judgment and the ability to work under stress. Close attention to detail is essential, because small differences or changes in test results or

numerical readouts can be crucial for patient care. Manual dexterity and normal color vision are highly desirable. With the widespread use of automated laboratory equipment, computer skills are important. In addition, Medical Laboratory technical staff in particular is expected to be good at problem solving. A graduate degree in medical technology, one of the biological sciences, Biochemistry, management, or education usually speeds advancement. A doctorate is needed to become a laboratory director/ Laboratory Head; however, complex laboratories to have either a master's degree or a bachelor's degree, combined with the appropriate amount of training and experience.

- **The Nature of duties of medical laboratory technical staff includes:-**

1) Collection and receiving of Specimens (Infectious samples i.e. Blood, Urine, Stool, Sputum, Pus, Semen, Tissues and Body fluids) for various Biochemical, Pathological, Microbiological and
2) Blood Bank investigations.
3) To perform various investigations for the purpose of differential Diagnosis and Research
4) Calibration and standardization of glassware's and other laboratory equipments.
5) Standardization and selection of test analytical procedures.
6) Maintenance of supplies of laboratory reagents / diagnostic kits.
7) Evolution of reagents and diagnostic kit for diagnostic suitability
8) Maintenance of Quality control for reliability of lab. reports.
9) Preparation of Chemical Reagents as well as Biological reagents

10) Supervision, organization of work and personnel management.

11) Reporting of results.

12) Maintenance of Records and preparation of Statistics.

13) Clinical laboratory personnel examine and analyze body fluids, and cells.

14) They look for bacteria, parasites, and other microorganisms; analyze the Biochemical content of fluids; match blood for transfusions; and test for drug levels in the blood to show how a patient is responding to treatment.

15) Technologists also prepare specimens for examination, count cells, and look for abnormal cells in blood and body fluids.

16) They use automated equipment and computerized instruments capable of performing a number of tests simultaneously, as well as microscopes, cell counters, and other sophisticated laboratory equipment.

17) Then they analyze the results and relay them to physicians.

18) With increasing automation and the use of computer technology, the work of technologists and technicians has become less hands-on and more analytical.

19) The complexity of tests performed, the level of judgment needed, and the amount of responsibility workers assume depend largely on the amount of education and experience they possess.
20) They make cultures of body fluid and tissue samples, to determine the presence of bacteria, fungi, parasites, Viruses or other microorganisms.
21) Clinical laboratory technologists analyze samples for chemical content or a chemical reaction and determine concentrations of compounds such as blood glucose and cholesterol, Enzymes and Hormones levels.

22) They also type and cross match blood samples for transfusions. Clinical laboratory staff evaluate test results, develop and modify procedures, and establish and monitor programs, to ensure the accuracy of tests. Senior technologists supervise clinical laboratory technicians.
23) Medical Laboratory Tech. staffs in small laboratories perform many types of tests, whereas those in large laboratories generally specialize.
24) Laboratory Technical staffs who prepare specimens and analyze the chemical, hormonal and Enzymes contents of body fluids are called clinical chemistry technologists.
25) Those who examine and identify bacteria and other microorganisms are microbiology technologists.
26) Blood bank technologists or immunohematology technologists collect, type and cross match blood and prepare its components for transfusions. They also analyse the blood for safe and infection free transfusion (Like HIV, Hepatitis, Syphilis, TPHA, Malaria Parasite etc.).
27) Immunology technologists examine elements of the human immune system and its response to foreign bodies.
28) Cytotechnologists prepare slides of body cells and examine these cells microscopically for abnormalities that may signal the beginning of a cancerous growth.
29) Molecular biology technologists perform complex protein and nucleic acid testing on cell samples.

INSTRUMENTS USED BY MEDICAL LABORATORY STAFF.

Following Various Hi-tech and Sophisticated Instruments are used by Medical Laboratory Staff.

- Various type of particle (Cell) counters in Haematology Lab.
- Various type of Auto Analyzers in Biochemistry Lab.
- ELISA Readers for Hormonal & other assays
- Gamma Counters Radio Immuno assay
- Spectrophotometers

- Deferent type of Microscope i.e. Dark field Microscope, Fluorescent Microscope, Phase contrast Microscope and Electron Microscope.
- Polymerase Chain Reaction (PCR) Instrument
- High Pressure Liquid Chromatography (HPLC) Instrument
- Thin Layer Chromatography (TLC) Instrument
- Blood gas Analyzers
- Fraction Collector
- Mini Cold Lab. (Electrophoresis System)
- Cryostat Microtome
- Histokinate

HAZARDOUS AND TOXIC CHEMICALS USED BY MEDICAL LABORATORY STAFF.

Following hazardous and toxic chemicals are used by Medical Laboratory Staff.

- Potassium cyanide (Highly Toxic substance in the world)
- Acids in Concentrated form i.e. Hydrochloric Acid, Sulphuric Acid, Nitric Acid etc.
- Alkalis in Concentrated form i.e. Sodium Hydroxide, Potassium Hydroxide etc
- Formaldehydes
- Phenol (Carbolic Acid)
- Tricloro- acetic Acid (TCA) etc.
- Highly inflammable Chemicals i.e. Acetone, Alcohol, Ether etc.
- Chemicals with sedative effect i.e. Chloroform.

- Carcinogenic Chemicals like Benzedine, Orthotoluedine etc.

QUALIFICATION REQUIRED FOR MEDICAL LABORATORY TECHNICAL STAFF.

The usual requirement for an entry-level position as a medical laboratory staff in India is a 10+2 with Science + Diploma in Medical Laboratory Technology + 1 Yr. Exp./ BSc. + DMLT / Bachelor's degree in Medical Laboratory Technology BscMLT/BMLT.

Universities, Institutions and hospitals offer medical technology programs. DMLT / Bachelor's degree programs in medical technology include courses in Biochemistry, Clinical Pathology, Histopathology, Haematology, Cytology, Blood Bank, microbiology and statistics, as well as specialized courses devoted to knowledge and skills used in the clinical laboratory. Many programs also offer or require courses in management and computer applications. Some Institutes / Universities also running Postgraduate / Doctorate courses in relevant fields.

Some States require laboratory personnel to be licensed or registered as a number of states have constituted council for Medical Laboratory Technologists at State Level. Also for licensing of Blood Banks the qualifications of Medical Laboratory Technologists / Blood Bank Technicians is a prerequisite under the Drug & Cosmetic Act 1940, and the Rules 1945.

- Medical Laboratory Technical staff are organizing and attending National and International Scientific. Seminars and Workshops to keep their knowledge updated.
- Continue Medical Education and Continue Education Programme are also running for the benefits of staff.
- Most of them are involved in research work and so many Research Publications are published by them.
- Like U.S.A and U.K, in India also many books on the subject of Medical Technology and Clinical Laboratory are written by Medical Technologists.

- Many of Medical Laboratories Technical staffs are attached with Inter National Organizations e.g. *International Federation of Biomedical Laboratory* Scientist (IFBLS) and they are getting research projects from them.

Following professionals' detail regarding various points are under process of compilation and will be uploaded very soon after completion of Comprehensive study work on Allied health professionals.

1. Expected Total workforce of Medical Laboratory Technical Staffs in India under Central Government Departments/State government/Autonomous health intuitions/local health centers and private health establishments in India.
2. Role of Medical laboratory Technologists with all relevant pictures
3. Uneven Entry Qualifications, Designations, and pay scales
4. Various issues like Right of Practice and Scope of practice
5. Court and Government order for Medical Laboratories
6. Present regulatory framework for various department of labs like blood banks etc.
7. International Scenario of medical laboratory Sciences
8. International Act and regulations for medical laboratory Sciences
9. Expected Global Laboratory Workforce.
10. Indian and International organisations /associations of Medical laboratory sciences