Review Article

Clinical Laboratory Sciences in the Kingdom of Saudi Arabia: History, Education, and Current Landscape

Anwar Borai

King Abdullah International Medical Research Center (KAIMRC), King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), King Abdulaziz Medical City, Ministry of National Guard Health Affairs, Jeddah, Saudi Arabia

Article info:
Received: 15 November 2025
Revised: 25 December 2025
Accepted: 05 January 2026

* **Corresponding Author:**

Anwar Borai, PhD, King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences, King Abdulaziz Medical City, Jeddah, Saudi Arabia
Email: boraiaa@mngha.med.sa

ABSTRACT

Understanding the historical evolution and institutional framework of Clinical Laboratory Sciences (CLS) in the Kingdom of Saudi Arabia is essential for recognizing its growing significance within the healthcare system. This article explores the origins, expansion, and academic development of CLS programs across Saudi universities, highlighting how these programs have evolved to meet national and international standards. It also discusses the formation and roles of specialized scientific societies and professional associations, which contribute to the advancement, recognition, and standardization of the profession. In addition to this it will discuss the current landscape of Clinical Laboratories in Saudi Arabia. The integration of CLS into national healthcare goals, such as Vision 2030, underscores the strategic importance of laboratory professionals in public health. By tracing the timeline of education, practice, and professional organization, this review provides a foundational understanding of the CLS field's identity and progress in Saudi Arabia.

Keywords: Saudi Arabia, CLS, SCFHS, SSCC

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Citation: Borai A. Clinical Laboratory Sciences in the Kingdom of Saudi Arabia: History, Education, and Current Landscape. Acta Biochimica Iranica. 2026;4(1):33-39.

https://doi.org/10.18502/abi.v4i1.21857

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Introduction

The field of Clinical Laboratory Sciences (CLS) in the Kingdom of Saudi Arabia has witnessed rapid development over the past four decades, evolving from hospital-based diagnostic services into a structured academic and professional discipline. This article provides a comprehensive overview of the historical evolution, educational programs, and professional societies shaping the CLS landscape in Saudi Arabia. It outlines the establishment and expansion of degree programs across leading public and private universities, the role of diploma and bridging pathways, and alignment with national healthcare strategies such as Vision 2030. Additionally, it highlights the establishment of key professional societies affiliated with the Saudi Commission for Health Specialties (SCFHS) and major universities, which have played an essential role in promoting education, research, and professional networking. This review serves as a foundational resource for educators, students, faculties, and healthcare professionals about the advancement of Clinical Laboratory Sciences in the Kingdom of Saudi Arabia.

Brief History

The field of CLS began in Saudi Arabia in 1980s–1990s, as medical services expanded and hospitals established local diagnostic laboratories. One of the earliest programs in Clinical Laboratory Sciences was at King Abdulaziz University, Jeddah. The program introduced a Bachelor (BSc) of Science in Medical Laboratory Technology in 1980. It was the first CLS program in the Kingdom of Saudi Arabia. The program was initially established under the umbrella of the College of Medicine and Medical Sciences. In the year 2004, the program was transformed into an academic department under the College of Applied Medical Sciences. In 1981, King Saud University, Riyadh introduced the CLS program and offered a BSc degree in Medical Laboratory Sciences. The Department of CLS was established under the umbrella of the College of Allied Health Sciences. The first graduating class of the program included both male and female students. Other universities formally started to introduce bachelor's programs in Medical Laboratory Technology between 1980s and early 1990s. A summary of the most significant programs is presented in Table 1.

Education & Curriculum

BSc Program Duration

A BSc in Medical/Clinical Laboratory Sciences generally takes 4 academic years plus 1 year of internship/practical training (minimum 12 months),

Table 1. The Main universities and colleges that offer BSc courses in clinical laboratory sciences

University/College	Program	Year First Launched	Citation(s)
King Abdulaziz University (KAU)	BSc Clinical Laboratory Sciences	1980	(1)
King Saud University (KSU)	BSc Clinical Laboratory Sciences	1981	(2)
Umm al-Qura University, Makkah (UQU)	BSc in Laboratory Medicine	1983	(3)
Imam Abdulrahman Bin Faisal University, Dammam	BSc in Clinical Laboratory Sciences	1989	(4)
Qassim University, Buraydah	BSc in Medical Laboratory Sciences	2007	(5)
King Saud bin Abdulaziz University for Health Sciences (KSAU-HS)	BSc Medical Laboratory Sciences	Riyadh 2013 Al-Ahsa 2014 Jeddah 2015	(6)
Jouf University (College of Applied Medical Sciences)	BSc in Clinical Laboratory Sciences	2003	(7)
Prince Sultan Military College of Health Sciences (Dhahran)	BSc in Clinical Laboratory Sciences	1988	(8)
Riyadh Elm University (private, Riyadh)	BSc in Medical Laboratory Technology	2004	(9)
Al-Ghad International Health Sciences Colleges (private, Riyadh & branches)	BSc in Clinical Laboratory Science	2009	(10)

Table 2. SCFHS Classification Levels for Clinical Laboratory Specialists

Classification Level	Educational Requirements	Experience Requirements	Notes
Technician	Bachelor's degree of science in microbiology or biochemistry (or Diploma with at least 2 years of related laboratory experience or additional training)	No additional post-qualification experience required	Expected to assist with routine testing (phlebotomy); not a specialist
Specialist	Bachelor's degree in clinical laboratory sciences	Not specifically stated; implied minimal clinical training or internship completed	Responsible for independent performance of standard lab tests
Senior Specialist	Master's degree (or equivalent) in a relevant field	A combination of study and professional experience totaling approximately 4 years	Higher autonomy, possibly supervisory responsibilities
Consultant	Doctorate (PhD) or equivalent academic credential in the specific laboratory discipline	Minimum of 3 years of relevant professional experience after completing PhD	Top classification reserved for experts in the field; provides leadership and consultancy

before the Saudi Commission for Health Specialties (SCFHS) exam certification.

Curriculum Content

1st year: Basic Sciences: Anatomy, Physiology, Biochemistry

2nd, 3rd and 4th years: Core Disciplines, including Clinical Chemistry, Microbiology, Hematology, Blood Bank, Immunology, Medical Genetics, Molecular Biology, Molecular Genetics, Histopathology & Cytology.

Additional Topics: Lab management, quality systems, occupational safety, toxicology and phlebotomy.

Programs include lectures, lab practicums, clinical rotations, and quality management training.

The 5th year is the internship where the student should have extensive training in clinical laboratory for 12 months before he/she becomes ready for the work.

For Diploma Programs, technical colleges and vocational institutions offer 2–3 year diplomas in laboratory science. Graduates can become phlebotomists, Medical Laboratory Technicians, or Assistants. Some institutions allow diploma holders to bridge into BSc programs.

Number of graduates and Market Prospects

Number of Graduates: Though exact data isn't centralized, combined annual output from KSU, KAU, Umm al-Qura, Imam, Majma'ah, and KSAU-HS likely exceeds several hundred to over a thousand of Saudi graduates.

CLS Classification by the SCHS

The Saudi Commission for Health Specialties (SCFHS) classifies Clinical Laboratory Specialists into several professional categories based on their academic qualifications, work experience, and professional competencies. These classifications define the scope of practice, responsibilities, and career progression for professionals working in medical laboratories across the Kingdom of Saudi Arabia (11).

An overview list of the main classification levels for Clinical Laboratory Specialists by SCFHS as lab Technician, Lab Specialist, Senior Specialist, and Specialist Consultant. For more details see Table 2 (12).

CLS board programs

The SCFHS currently offers several Board programs to laboratory specialists (BSc graduates), with training tracks targeting graduates in clinical laboratory sciences. The board programs offered for lab specialists are specialized in biochemistry and microbiology. The programs are four-year programs. Another high Diploma program is in blood bank (two years). The applicants should have at least three years of experience in the same specialist before they can become accepted (13).

For Medical students graduates or medical graduates (MBBS holders) in Saudi Arabia, the SCFHS offers residency programs in Laboratory Medicine and Pathology specialties, rather than general Clinical Laboratory Science programs (which are typically designed for allied health science graduates) (14).

The main postgraduate programs under SCFHS for medical graduates

1. Saudi Board in Laboratory Medicine
2. Saudi Board in Anatomic Pathology / Histopathology
3. Saudi Board in Clinical Pathology
4. Combined Anatomic and Clinical Pathology Program (AP/CP)

Employment

Government hospitals and private healthcare systems hire graduates. In addition to this graduates can join diagnostic companies in the sales sections or as application specialists. In addition to this, the BSc graduates can join universities to become lab specialists or to continue their postgraduate studies for master's and PhD degrees to become faculty members. BLS graduates can join research centers as lab techs or to

Table 3. The key professional societies in Saudi Arabia related to laboratory science, blood banking, and blood transfusion.

Society / Association	Focus Area	Year Established	Affiliation	Notes	Ref.
Saudi Society for Clinical Chemistry (SSCC)	Clinical Chemistry & Laboratory Medicine	2014	SCFHS	Promotes clinical chemistry education, research, and standardization.	(15)
Saudi Society of Laboratory Medicine (SSLM)	General Laboratory Medicine	2001	King Abdulaziz University (KAU), Jeddah	One of the earliest lab societies supports lab professionals and education.	(16)
Saudi Society for Clinical Laboratory Sciences (SSCLS)	Clinical Laboratory Sciences	2008	King Saud University (KSU), Riyadh	Affiliated with KSU College of Applied Medical Sciences; promotes lab science development.	(17)
Saudi Society of Blood Transfusion Medicine and Services (SSTM)	Blood Transfusion Medicine	2010	SCFHS	Supports best practices in blood banks, donor safety, and transfusion services.	(18)
Saudi Society for Blood Disorders (SSBD)	Hematology & Blood Disorders	2018	SCFHS	Covers thalassemia, leukemia, sickle cell disease, and blood donation campaigns.	(19)
Saudi Society of Medical Microbiology and Infectious Diseases	Medical microbiology and infectious diseases (SSMMID)	2004	Imam Abdulrahman bin Faisal University	Improves genetic services and increases public awareness of hereditary and genetic diseases in the Kingdom.	(20)
Saudi Society of Medical Genetics (SSMG)	Genetic Medicine	2008	SCFHS	Promote scientific knowledge, research, and professional collaboration in medical microbiology and infectious diseases.	(21)

become research scientists in case they pursue their MSc and PhD degrees.

SCFHS classification must be obtained by each graduate before joining any clinical lab. Graduates may pursue postgraduate studies in biotechnology, bioinformatics, or to work in research centers. The job market remains open to new graduates. Although the annual number of graduates is high, the demand for recruiting Saudi laboratory professionals continues.

Career Pathways & Future Trends

Common roles include:

- Medical Laboratory Technologists, Scientists (chemistry, microbiology, immunology, hematology, genetics, histology), Supervisory, Quality, Management, Clinical Scientist, and consultant.
- Research assistants or research specialists
- Faculties at university: Lecturer, Assistant Professor, Associate Professor, and Professor.
- Diagnostic companies: sales officer, application specialist

Emerging Trends

Many of the CLS graduates are now specialized in highly advanced lab automation, and sciences of advanced artificial intelligence (AI), molecular diagnostics, genetics, bioinformatics, and precision medicine, as these are the demand for lab technical proficiency. Some CLS graduates pursue international certifications (e.g., ASCP) for global career mobility and recognition.

Professional Societies and Scientific Associations in Saudi Arabia

The Kingdom of Saudi Arabia is home to several professional societies dedicated to clinical laboratory sciences and blood transfusion medicine. These organizations play a crucial role in advancing education, research, standardization, and advocacy for laboratory professionals. Some are affiliated with national regulatory bodies such as the SCFHS, while others are supported by academic institutions like King Saud University and King Abdulaziz University. Their scope spans general laboratory medicine, clinical chemistry, hematology,



Figure 1. A modern medical laboratory reception connected to the pre-analytical area.



Figure 2. The full automated laboratory instruments connected to the spiral sample track system.

transfusion services, and laboratory education, reflecting the growing recognition and professionalization of the field within the Kingdom. List of Clinical laboratory societies and associations related to the field of CLS is summarized in Table 3.

Current Landscape of Clinical Laboratories in Saudi Arabia

Saudi Arabia's clinical laboratories have undergone a remarkable transformation in recent years. Fueled by national healthcare goals under Vision 2030, laboratories (public and private) now reflect cutting-edge innovation and advanced capability.

Advanced Technology & Automation

Laboratories across the Kingdom, particularly in tertiary hospitals and research centers, have embraced full automation (Figure 1 & 2). These facilities now utilize advanced technologies such as automated analyzers across various disciplines including clinical chemistry, hematology, immunology, coagulation, and microbiology enhancing accuracy and efficiency. Robotic pre-analytical systems are also employed to automate processes such as sample sorting, de-capping, and aliquoting, thereby reducing manual handling and minimizing the risk of contamination and laboratory errors. Furthermore, Laboratory Information Systems (LIS) are seamlessly integrated with diagnostic instruments to enable real-time result delivery, improved workflow management, and efficient operational tracking.

Artificial Intelligence & Digital Analytics

AI is rapidly becoming a cornerstone of diagnostic workflows in clinical laboratories in Saudi Arabia. Advanced AI-driven image analysis capabilities such as interpreting digital microscopy for blood slides and immunofluorescence technique significantly enhance both speed and diagnostic accuracy. Using barcoded

samples integrated within LIS is essential for any laboratory operation in Saudi Arabia, as it minimizes errors and ultimately improves patient care.

Quality Assurance & Accreditation

Clinical laboratories in Saudi Arabia continue to uphold high standards of practice, demonstrated by their attainment of prestigious certifications and accreditations. Many laboratories are certified under ISO 15189, which ensures competence and quality in medical laboratory services. Tertiary hospitals, in particular, often achieve accreditation from the College of American Pathologists (CAP), reflecting adherence to internationally recognized benchmarks. Additionally, approval by the Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) highlights compliance with national standards for healthcare quality and patient safety.

Point-of-Care Testing (POCT) Evolution

Point-of-care testing (POCT) has expanded significantly in recent years in all Saudi hospitals, playing an increasingly vital role in both outpatient and emergency settings. It now encompasses a wide range of critical assays, including glucose, blood gas, rapid detection of highly sensitive troponin, creatinine, hemoglobin A1c, and polymerase chain reaction (PCR). The expansion of POCT has enhanced diagnostic speed, improved patient management, and supported timely clinical decision-making at the bedside, especially in medical cities as well as rural areas of Saudi Arabia.

National Clinical Laboratory-Based Screening Programs in Saudi Arabia

In Saudi Arabia, several national healthcare programs rely heavily on clinical laboratory testing to support disease prevention and public health. These programs include premarital screening, newborn screening, and drug-of-abuse testing before employment. Premarital screening aims to reduce the incidence of inherited and infectious diseases, while newborn screening enables the early detection of metabolic and genetic disorders for prompt intervention. In addition, drug-of-abuse screening is commonly required before employment in many sectors. These specialized tests are performed in highly equipped laboratories, including regional laboratories, metabolic laboratories, and toxicology centers distributed across different geographical regions of Saudi Arabia, to ensure accurate and reliable results with a short turnaround time.

Research-Driven Laboratory Innovation

Institutions such as the King Abdullah International Medical Research Center (KAIMRC), King Faisal Specialist Hospital & Research Center (KFSH&RC), and King Fahad Research Center (KFRC) are leading academic and research laboratories in diagnostic science in Saudi Arabia. Their work spans various fields, including molecular diagnostics such as PCR-based pathogen detection and genetic variant analysis as well as next-generation sequencing (NGS) to support precision medicine and oncology workflows. Additionally, these institutions are driving innovation in omics-based biomarker discovery, including proteomics and metabolomics, aimed at early disease detection and the development of targeted therapies. These research centers are recognized as primary sources of high-quality publications on clinical laboratories in Saudi Arabia.

Workforce and Training Readiness

Supported by ongoing professional development through national and international conferences, workshops, webinars, and symposiums, laboratories in Saudi Arabia are staffed by a highly trained workforce skilled in AI, automation, and diagnostic innovation. Continuous education ensures that Saudi laboratory specialists remain well-equipped to work alongside advanced technologies and systems, contributing to improved diagnostic accuracy and patient care.

Discussion

The development of clinical laboratory sciences in Saudi Arabia reflects a remarkable transformation from limited diagnostic capabilities to a highly advanced, well-regulated field with strong academic, clinical, and professional foundations. Early laboratory services in the 1980s operated with modest infrastructure, but decades of consistent investment have led to sophisticated, fully serviced laboratories across both public and private sectors. Governmental hospitals under the Ministry of Health, and other sectors now operate advanced laboratory departments with cutting-edge automation, quality control systems, highly skilled Saudi lab scientists and digital reporting tools.

The governmental and private labs have also seen exponential growth, with hundreds of licensed laboratories serving a growing population. A significant high number of these laboratories are accredited by local bodies such as the CBAHI, CAP and ISO 15189 standards. This recognition demonstrates Saudi Arabia's commitment to maintaining international quality benchmarks in laboratory medicine based on Saudi graduates equipped with advanced education in clinical lab profession.

On the academic front, the expansion of educational offerings has been equally impressive. In addition to the widespread availability of diploma and Bachelor's degree programs, many universities have introduced Master's and PhD degrees in specialized fields of clinical laboratory sciences, including molecular diagnostics, hematology, toxicology, clinical chemistry, and microbiology. These programs meet international academic standards and are often comparable in scope and rigor to global counterparts, ensuring that graduates are well-equipped for both local and international professional needs.

Conclusion

The profession of Medical Laboratory Science in Saudi Arabia has grown significantly since the 1980s. Universities now offer structured BSc programs aligned with SCFHS, while vocational programs support technician-level roles. Career prospects are strong across government, private, and research sectors, bolstered by Vision 2030 and Saudization policies. Emerging technologies and global opportunities continue to shape the future of this critical healthcare field in the Kingdom of Saudi Arabia.

Acknowledgments

This manuscript was published on behalf of the Saudi Society for Clinical Chemistry (SSCC). The author extends sincere gratitude to all universities and colleges that contributed by providing the necessary information. Special thanks are also extended to Dr. Sulaiman Al Habib Medical Group for supplying the automated laboratory photographs used for illustration in this study.

Conflicts of Interest

The author declares no conflicts of interest

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