A Collaborative Initiative Between

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&

Roche

Indian Clinical Chemistry Benchmarking Survey

Discovering the Landscape of Clinical Laboratory in India

About Clinical Chemistry Benchmarking Exercise For India

Benchmarking is a method used by organisations to measure internal progress and overall performance, as measured against similar organisations in the industry. Benchmarking allows the industry, as a collective, to define measures of what world-class means for itself.

Consortium of Accredited Healthcare Organisations (CAHO), India and Roche Diagnostics India worked together to generate and publish the Indian Clinical Chemistry Benchmarking survey.

This White paper is an effort to establish relatable performance Benchmarks for clinical laboratories in the Indian operating environment.

The Indian Clinical Chemistry Benchmarking (ICCB) survey is powered by Roche Diagnostics' digital platform Lab Insights.

Since its inception in 2010, the Lab Insights benchmarking survey has received over 4000 survey entries from laboratories across 20 countries in the Asia-Pacific region. This white paper is based on Lab Insights survey responses received between November 2022 and the ICCB survey in April 2023.

We would like to thank all the experts who contributed to the success and completion of this survey and white paper.

Authors

Dr. Venkatesh Thuppil
CEO and Director, Foundation for Quality India (FQI) Patron, CAHO.
Dr. Tony Badrick
CEO, Royal College of Pathologists of Australasia Quality Assurance Programs.
Dr. Richard G K Rumnong
Lead - Healthcare Consulting, Roche Diagnostics India.

CAHO Team

Dr. Vijay Agrawal
President of Consortium of Accredited Healthcare Organisations (CAHO).
Dr. Lallu Joseph
Secretary General of Consortium of Accredited Healthcare Organisations (CAHO).
Dr. Aparna Jairam
Secretary, Diagnostics Centres Division Consortium of Accredited Healthcare Organisations (CAHO).

CAHO Committee Members

Dr. Seema Bhargava, Dr. Barnali Das, Dr. J Jayalakshmi, Dr. Reema Bahri, Dr. Bikash Chaudhury, Dr. Sakshi Sharma, and members of the CAHO Community.

The effort was supported by Roche Diagnostics, India.

The survey and data analysis effort was lead by Dr. Richard G K Rumnong and supported by Wong Wai Siu Wesley, Wu Ju Ting Jeanette and Dr. Prachi Chhimwal. Data gathering was supported by Dr. Bejoy Baby and members of the Roche Service Applications team.

Amit Manjure (Head - Strategy Projects and Healthcare Consulting, Roche Diagnostics India) oversaw the survey and publication.

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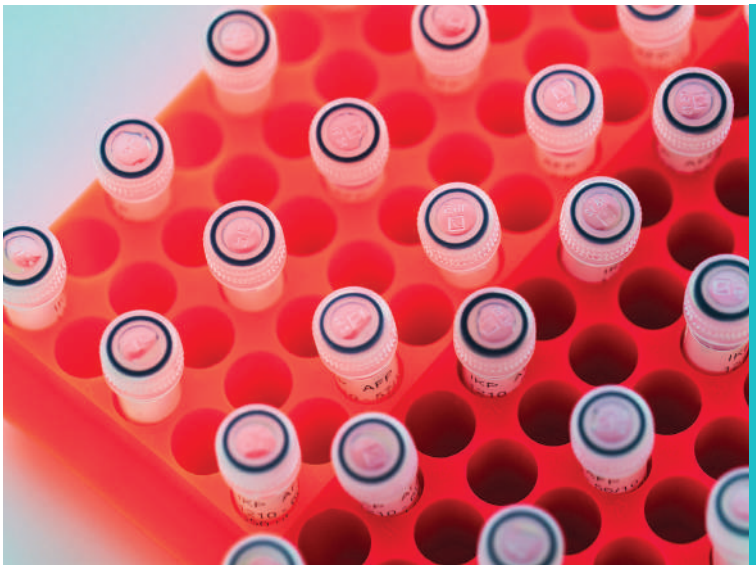
Executive Summary

The value of benchmarking stems from the global requirement of all service organisations to constantly learn and implement best practices that meet the needs of increasingly well-informed customers.[1] Benchmarking serves as a vital tool to aid organisations in identifying areas, systems, or processes warranting improvement. In an effort to establish laboratory benchmarks across clinical laboratories in India, the **Consortium of Accredited Healthcare Organisations (CAHO)**, India in collaboration with Roche Diagnostics India, initiated the ICCB survey. This white paper serves as both documentation and in-depth discussion of the survey findings.

The ICCB survey leverages the power of the Lab Insights clinical chemistry benchmarking survey for the Asia–Pacific region. This Lab Insights survey includes evaluation of over 100 submissions from clinical laboratories across India, along with data from 311 laboratories spanning the Asia–Pacific region. The top seven participating countries in the lab insights survey are Thailand, India, Vietnam, Taiwan, Pakistan, Hong Kong, and Indonesia.

From a management perspective, this document provides descriptive community metrics on expected turnaround time (TAT), samples per day, tests per day, average test density, productivity per square metre. This aids in the direction of efforts to improve service performance in terms of speed, workload capacity, staffing, and laboratory floor space utilisation.

Key performance metrics have been clearly outlined for different peer groups, such as hospitals versus commercial labs, and small, mid-sized, and large laboratories. This facilitates accurate and meaningful comparisons amongst them. Comparisons have also been made across countries to provide benchmarks and describe best practices within or across peer groups. We trust that this paper proves valuable, and a thorough examination of the data presented will offer insights into laboratory practices in India.



Awareness fuels ambition, today's clarity shapes tomorrow's destination.

—Dr. Richard G K Rumnong

Introduction

Benchmarking, a strategic management tool that has become integral to organisational improvement, traces its roots back to *Rank Xerox*, a pioneering entity that played a pivotal role in the widespread adoption of industry benchmarking. Their official benchmarking definition is as follows: a continuous and systematic evaluation of companies acknowledged as leaders in their respective industries, aimed at identifying best practices in business and work processes and establishing rational performance objectives. In practical terms, this is often summarised as the pursuit of industry best practices that result in superior performance.

This practice of benchmarking played a pivotal role in *Rank Xerox's* transformation towards increased productivity and enhanced quality management. This transformative shift also led to the emergence of a comprehensive strategy known as **leadership through quality**, which emphasises the central role of benchmarking in achieving operational excellence and leadership in their respective industries.[2]

A Key Concept

Acknowledging that managing and processing samples and performing and reporting tests are the two fundamental functions of every laboratory service. A successful service is one in which these activities are guided by the concepts of **Quality, Speed, Operational process**, and **Productivity**.

Figure 1: Concept diagram.

Quality as determined by meeting accreditation standards, successful participation in external quality assurance (EQA), an organisational culture that considers key performance indicators (KPIs) with an emphasis on continuous improvement methods.

Speed as assessed by adherence to an established and accepted test report TAT. Submeasures of TAT include laboratory TAT, pre-examination TAT, examination TAT, and post-examination TAT. All measures provide valuable indications of service efficiency.

Operational process dictates the occurrence for specific laboratory practices, e.g. how samples are registered, inter-exchange between departments, interoperability of hospital IT systems, performance of quality checks, considerations in sample transport, and steps in specimens processing.

Productivity describes the utilisation of laboratory resources against key process outcomes, e.g. number of specimens processed/full time staff/day, number of tests done/sq. meter/day, and number of specimens/instrument/day.

Survey Participation and Peer Groups

The ICCB survey includes responses from 103 labs across India. The responses provide a good representation of laboratory classes based on:

- Workload-samples/day, test/day
- Healthcare facility association: private hospital laboratory, university hospital, government hospital, or commercial laboratory
- Geographic representation: India, Asia-Pacific

Figure 2: Response distribution map.

Types of Clinical Labs and Peer Classification

To achieve a meaningful peer comparison, clinical laboratories have been classified based on daily sample workload, samples received in the lab per day, and hospitals classification of number of beds. (National Accreditation Board for Hospitals & Healthcare Providers [NABH] criteria used for Hospital Classification.)

In the data review process, the sample work load classification that worked best in defining peer groups as: A) less than 100, B) 100–300, C) 301–600, D) 601–1200, E) 1201–2000, and F) more than 2000 samples per day.

Participation of university hospital labs, government hospital labs, private hospital labs, or commercial labs is illustrated in Figure 3.

To represent the association between hospital size and effective laboratory workload, a classification criteria of hospitals by bed size was used: up to 100 beds, 101–300 beds, 301–500 beds, and 501 beds and above.

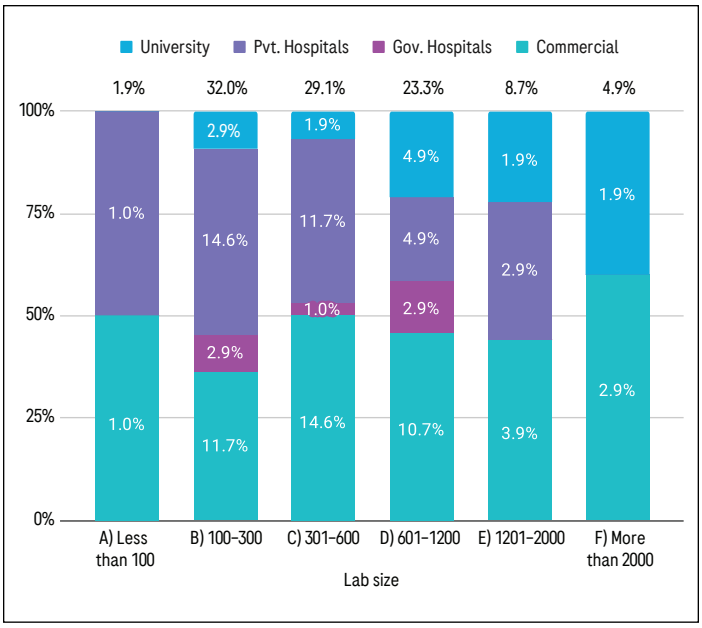


Figure 3: Distribution of participating laboratories.

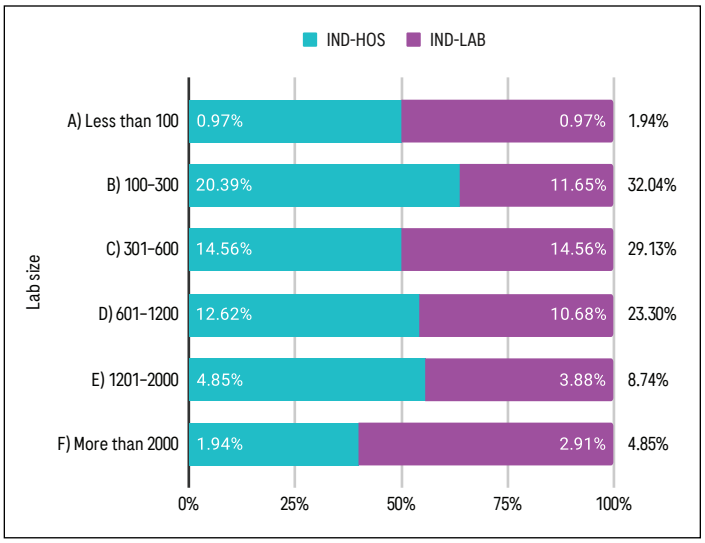


Figure 4: Survey distribution between Indian hospitals and Indian labs by participation and lab size. For simplicity purposes, functional reference was limited to hospital (IND-HOS) and commercial laboratory (IND-LAB).

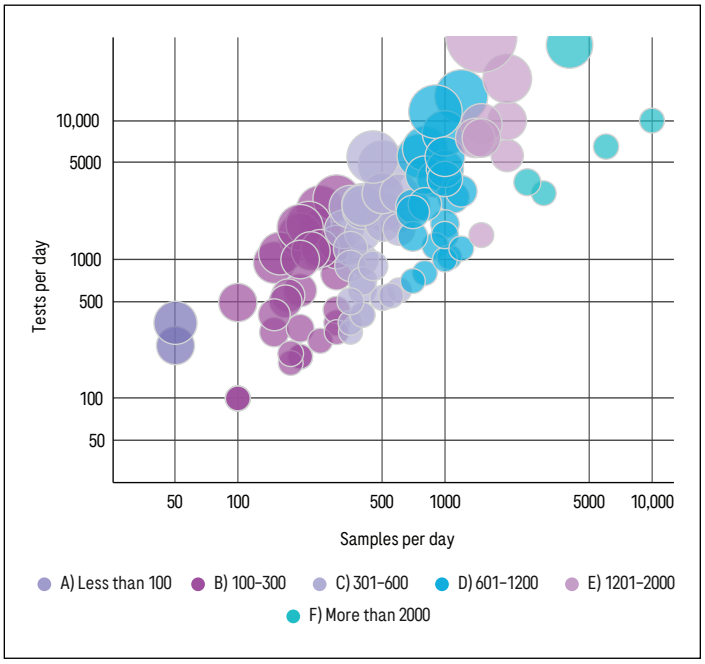


Figure 5: The distribution of Indian labs based on workload described by samples/day (x-axis), tests/day (y-axis) and test density (bubble size). The color of the bubble indicates the lab classification based on the size of the lab.

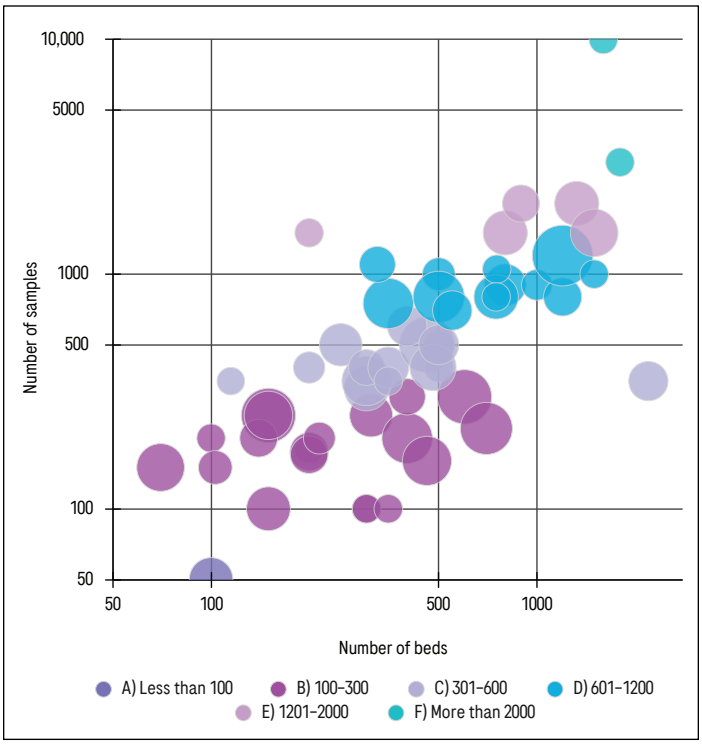


Figure 6: The distribution of Indian labs is based on the type of hospital described by number of beds (x-axis), samples/day (y-axis), and test density (bubble size). The color of the bubble indicates the lab classification based on the size of the lab.

Relationship between hospital size, measured by bed strength and laboratory workload, measured by samples/day has been illustrated in the figures below.

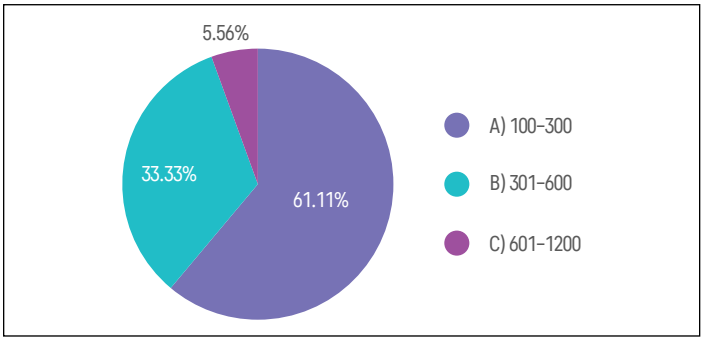


Figure 7a: Lab size by hospital classification for 101-300 beds.

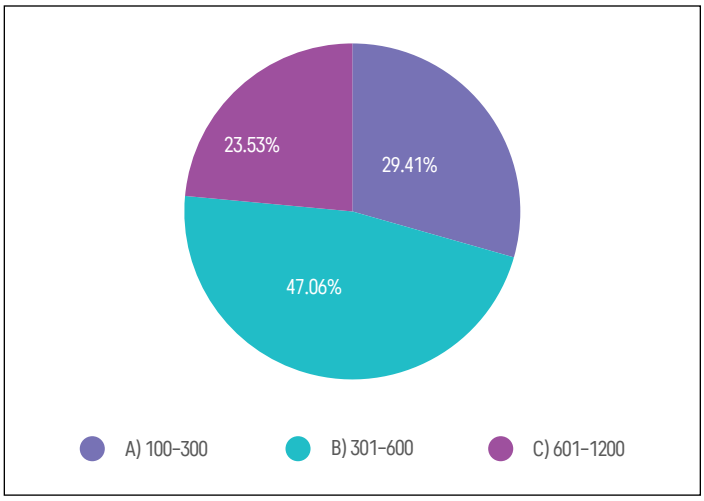


Figure 7b: Lab size by hospital classification for 301–500 beds.

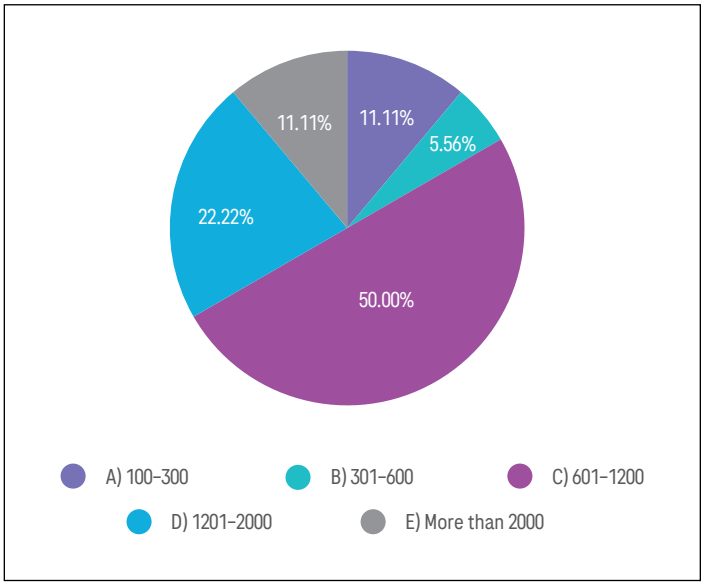


Figure 7c: Lab size by hospital classification for 500 beds and above.

Participation by the Asia–Pacific Region

The Lab Insights laboratory benchmarking survey is one of the largest and most relevant clinical laboratory benchmarking exercises available in the world today.[3]

A key benefit of the ICCB survey is the availability of Asia–Pacific peer group data. This allows an individual laboratory to participate and compare its current performance to relevant peer groups across the Asia–Pacific region.

For the purposes of this white paper, peer performance of Indian labs has been contrasted against peers from 311 labs from 12 countries across Asia–Pacific region.

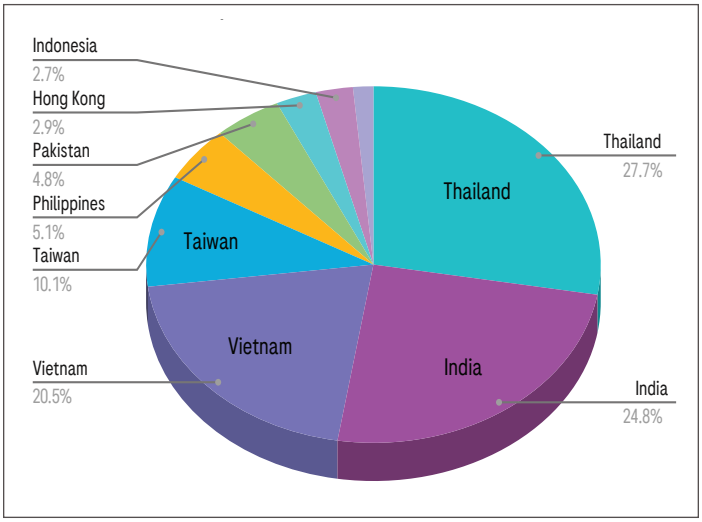


Figure 8a: Regional participation from the Asia–Pacific region.

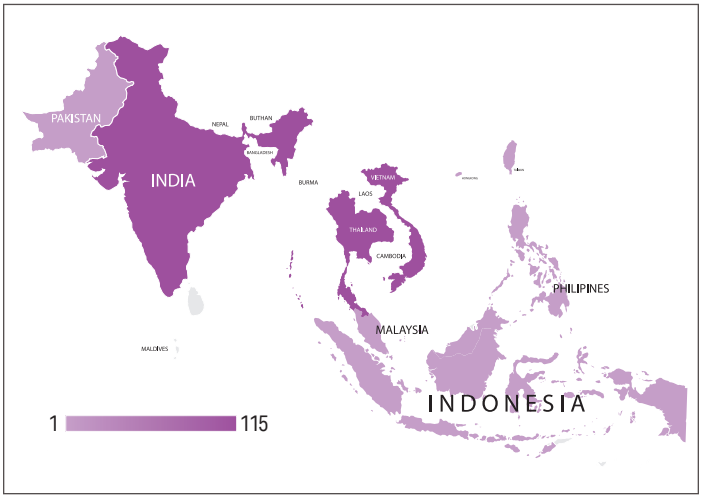


Figure 8b: Regional participation from the Asia–Pacific region.

Results from the Indian Clinical Chemistry Benchmarking Survey

This section provides a summary of the survey results. Data from India and the Asian–Pacific region includes labs of all sizes and types. A concentrated effort has been made to examine the collected data in order to determine the correlations between size, productivity, quality improvement initiatives, administration, and technology. Possible benchmarks for use to evaluate laboratory productivity measures and TAT have also been calculated.

Quality

Accreditation

The goal of accreditation is to ensure that laboratories use standard methods and processes to deliver a consistent and an acceptable level of testing services. Accreditation bodies have developed standards that were in accord with the international accreditation process whilst aligning with specific cultural and national requirements.

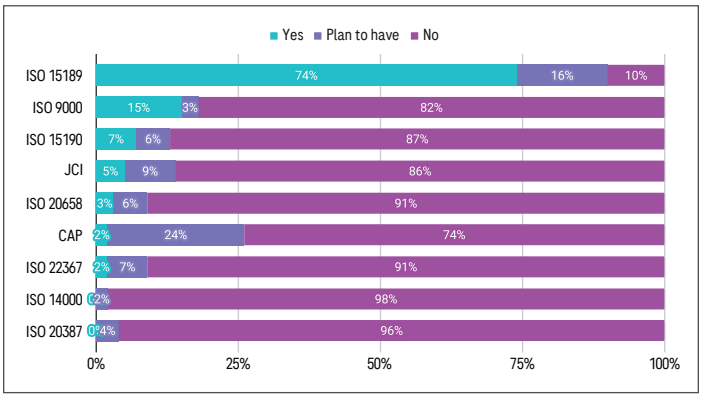


Figure 9: India-international accreditation.

Results: ISO15189 medical laboratories-requirements for quality and competence remains the dominant accreditation standard for clinical laboratories across the world and is strong in India. The National Accreditation Board for Testing and Calibration Laboratories (NABL) accreditation, remains the key body for providing medical testing laboratories in accordance with ISO 15189.

Indian laboratories are also increasingly participating in international accreditations like Joint Commission International (JCI) and College of American Pathologists (CAP).

External Quality Assurance (EQA)

External quality assurance assists labs to identify poorly performing methods and processes. It also assesses the effectiveness of the internal quality processes of the labs and is the most commonly used external proficiency testing program followed.

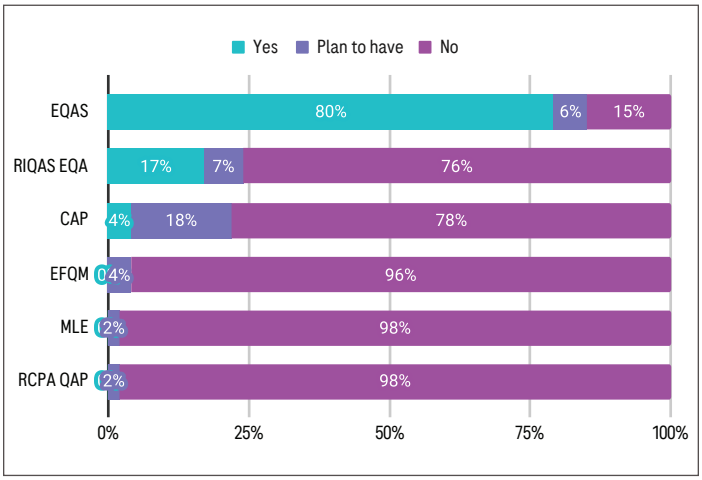


Figure 10a: India-external quality control (EQC).

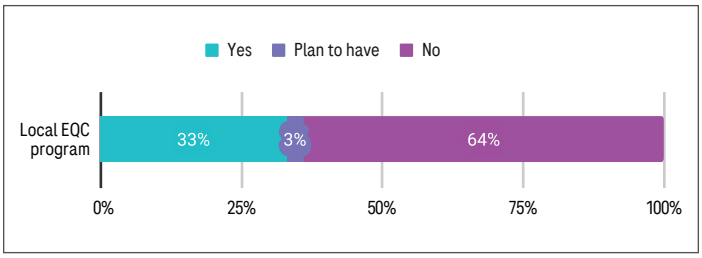


Figure 10b: India-external quality control (EQC).

Results: The ICCB survey also documents that 80% of respondents used Biorad EQAS followed by 17% usage of Randox RIQAS EQA, with other programs being minimally used.

A significant response was recorded for local EQA programs with 33% of respondents using local EQAs. The local EQA programs prominently include CMC-EQAS followed by ISHTM-AIIMS, RML-QAP, Neu-QAP, IAMM EQAS, and MHL EQAS.

Continuous Improvement Initiatives

Continuous improvement refers to an organisation's ongoing attempts to enhance all aspects of its service operations and delivery. This approach of incremental improvement is based on the idea that small, ongoing positive changes are the driving force for relevant transformative change for an organisation.

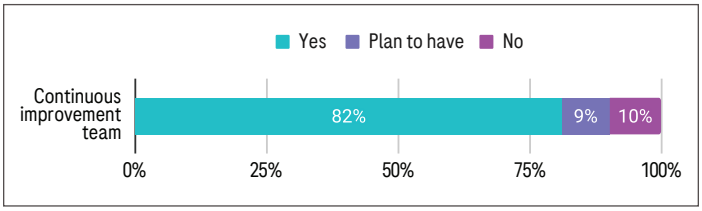


Figure 11a: India-continuous improvement team.

Results: 82% of respondents recognised the value of continuous improvement with the availability of a continuous improvement team.

The top 6 continuous improvement tools include complaint feedback system, employee continuous training, customer satisfaction survey, employee performance measurement, accreditation, and employee satisfaction survey.

The less frequently adopted continuous improvement initiatives include lean improvement, activity-based costing, and carbon footprint reduction.

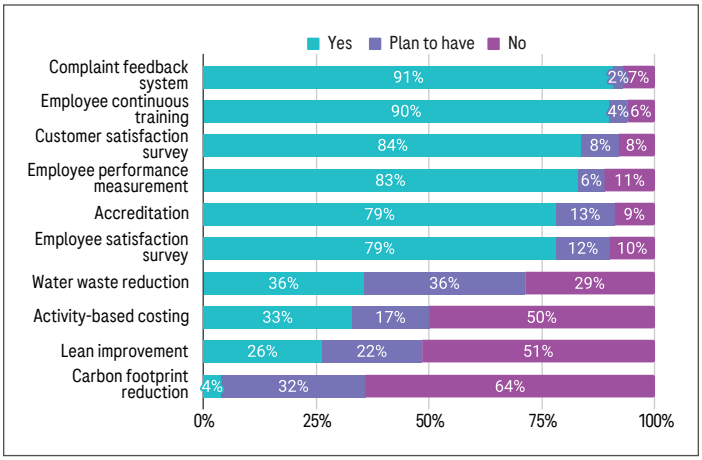


Figure 11b: India-continuous improvement.

Quick Note on Trending Topics for Discussion

Listed below are emerging improvement methodologies that have demonstrated their effectiveness in various industries but remain relatively underappreciated. However, they offer valuable contributions and warrant closer attention. These are:

Lean improvement as a method has been the mainstay for most companies seeking large-scale operational improvements. Often when coupled with Six Sigma, the combination has delivered significant success for both manufacturing and service companies.

Activity–based costing is a method of allocating costs to activities occurring within a process step. This makes it possible to trace and attribute resources and overhead costs to certain actions or activities taking place in a process step.

Carbon footprint reduction is a component of the Green Hospital and Sustainable Healthcare effort, which aims to accelerate the healing process while utilising natural resources efficiently.

Key Performance Indicators

Laboratory KPIs are measures of the performance of the laboratory and its activities, such as processes, products, or services. Key performance indicators in laboratories are also used to track the performance of the inventory, devices, environment, data, and results.

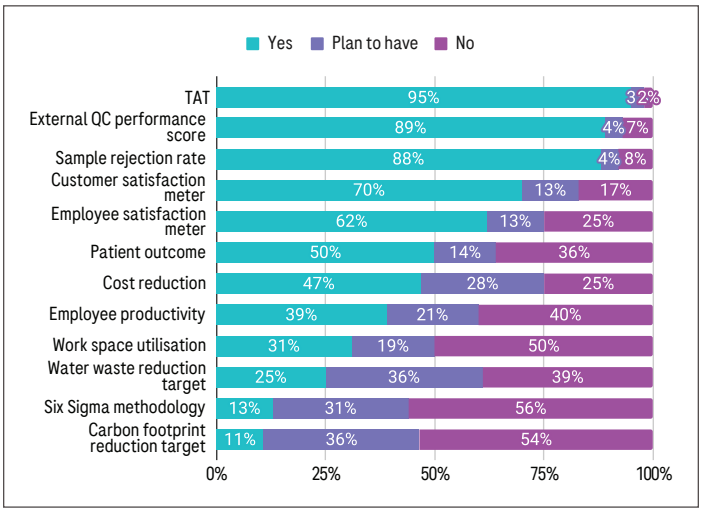


Figure 12: India-Key performance indicators.

Results: The top 5 KPIs include TAT monitoring, EQA performance, sample rejection rate, customer satisfaction, and employee satisfaction. The remaining 7 KPIs are important aspects of operations and many respondents are looking towards increasing adoption of these KPIs into practice.

Speed

TAT, or turnaround time, is a crucial KPI in any clinical laboratory. Reduced turnaround times allow for faster diagnosis, accurate therapy initiation, and timely plan adjustments, all of which can contribute to better patient results. Furthermore, it ensures that the emphasis is on completing procedures in a timely, scheduled, and resource-optimised manner. Process consistency improves, productivity rises, and revenue-generating opportunities are maximised.

The ability to detect, record, and monitor reliable timestamps is required for determining TAT. A timestamp is a record of the precise time and location inside the work area when a certain process workflow activity began or ended. The time difference between successive timestamps serves as the foundation for all TAT measurements.

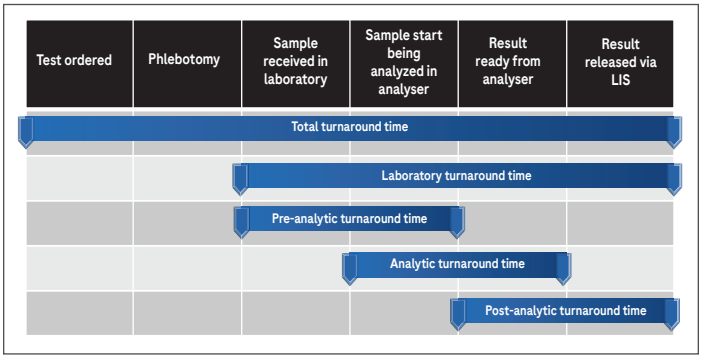


Figure 13: Representation of the various TATs discussed in the ICCB survey.

Total turnaround time, or time for the total testing process (TTP) refers to the amount of time it takes from the moment a diagnostic test is ordered to when the results are available for interpretation and subsequent treatment decisions.

Lab turnaround time refers to the interval of time that occurs between sample receipt in the lab and sample reported in Laboratory Information System (LIS). Laboratory TAT data can be expressed at the test level, such as for key assays like troponin and Arterial Blood Gas (ABG), or at the batch average of samples collected over the course of the day, such as the average TAT for samples. It is a real-time indicator of laboratory production efficiency.

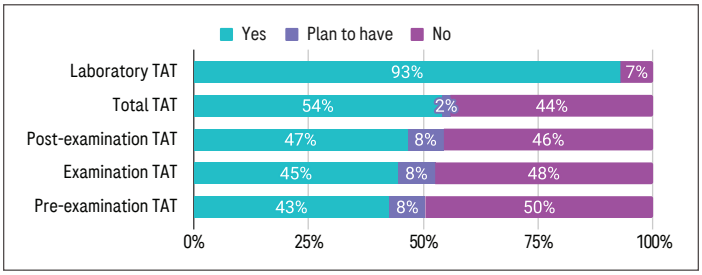


Figure 14: India-turnaround time (TAT) monitoring.

Results: According to the ICCB survey, laboratory TAT remains the backbone of TAT monitoring, with a few laboratories in India additionally measuring total TAT.

Overall laboratory TAT is an important indicator, although pre-examination, post-examination, and examination TAT are less closely monitored, which is likely due to the availability of data capturing and monitoring systems such as laboratory middleware. TAT for pre-examination is a major measure of sample management efficiency, TAT for post-examination is a critical indicator of test reporting, and TAT for examination is an indicator of the performance of analytical systems utilised.

Routine Biochemistry and Immunoassay Tests

The inherent differences between hospital and commercial laboratories, such as sample delivery, test density, sample workload, and TAT demands, have been considered separately.[4] The evaluation also takes into account immunoassay and biochemistry lab TAT separately.

Routine Tests in Hospital Laboratories

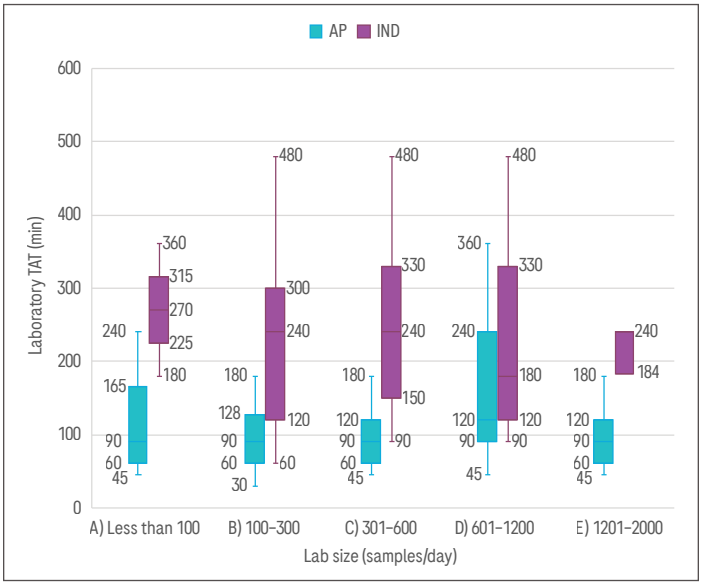


Figure 15a: Routine target TAT for biochemistry-hospitals.

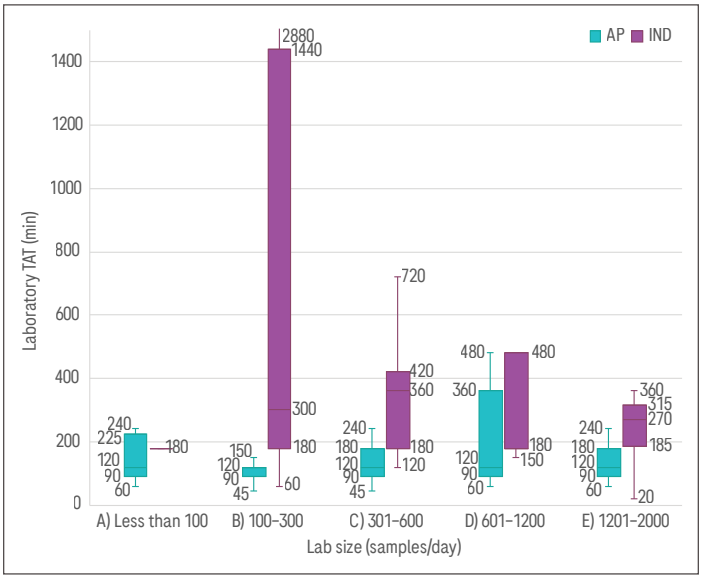


Figure 15b: Routine target TAT for immunoassay-hospitals.

Results: The median laboratory TAT for biochemistry tests in Indian hospitals is from 180 to 270 minutes, whereas that in Asia–Pacific ranges from 90 to 120 minutes. Based on the distribution of survey results, it appears that there is a fairly uniform consensus of biochemistry lab TAT across Asia–Pacific hospital laboratories, regardless of sample workload.

Similar patterns may be observed in the median hospital laboratory TAT for immunoassay, which ranges between 180 and 360 minutes for laboratories in India and is consistent at 120 minutes for laboratories in Asia–Pacific.

Routine Tests in Commercial Laboratories

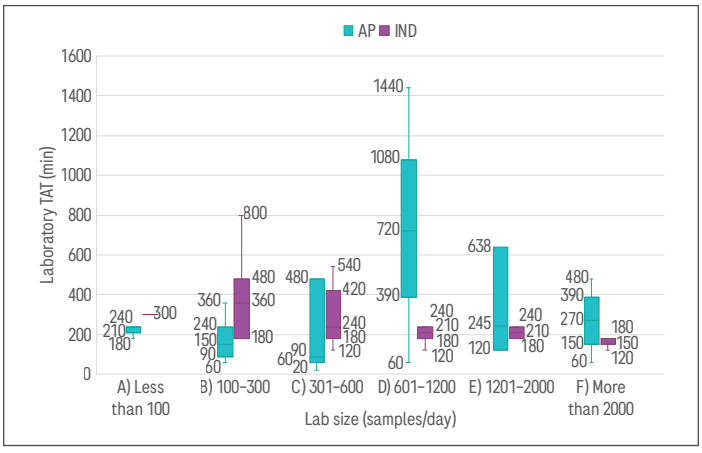


Figure 16a: Routine target TAT for biochemistry-labs.

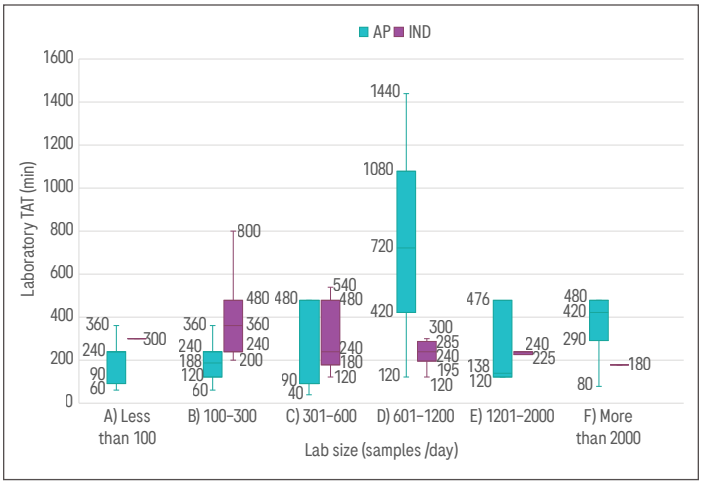


Figure 16b: Routine target TAT for immunoassay-labs.

Results: Indian commercial laboratories show a more consistent trend. A median laboratory TAT for both biochemistry and immunoassay tests in Indian commercial laboratories ranges from 180 to 360 minutes, whereas that in Asia–Pacific ranges from 90 to 720 minutes. Indian commercial laboratories processing more than 600 samples per day demonstrate the highest consistency in laboratory TAT.

STAT Tests

STAT testing is often handled by dedicated personnel, dedicated instruments, or a dedicated laboratory. Every approach has a different set of workflow requirements, and there are differences in the TAT for validated results. STAT testing protocols are typically tailored to the specific healthcare environment in which they are required.[5] STAT has been presented here from a hospital laboratory perspective.

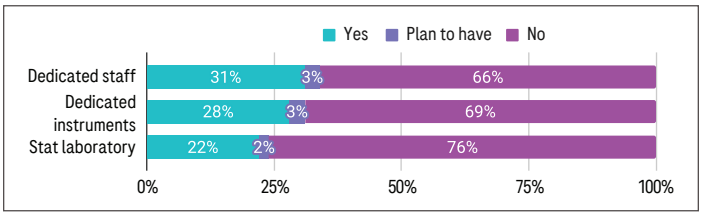


Figure 17: India-STAT sample handling in lab.

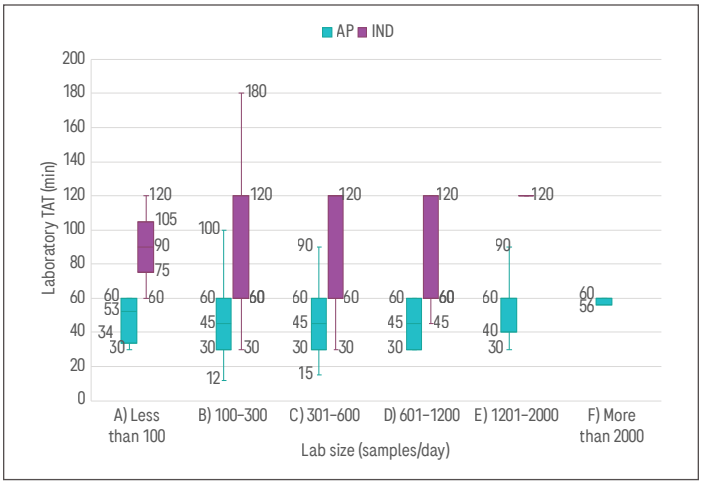


Figure 18a: Routine target STAT-TAT for biochemistry-hospitals.

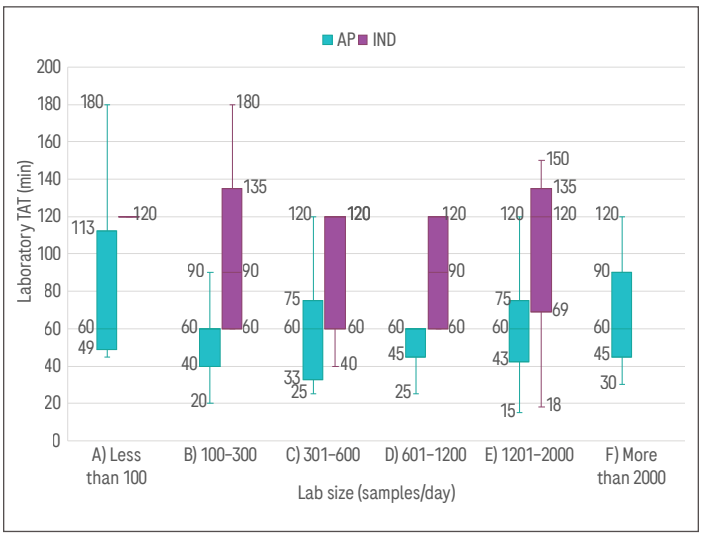


Figure 18b: Routine target STAT-TAT for immunoassay-hospitals.

Results: The most common STAT workflow in India is the use of dedicated workers. Median TAT for STAT samples in Asia–Pacific is 45–60 minutes for biochemistry and 60 minutes for immunoassay. The median TAT for STAT samples in Indian hospitals is 60–120 minutes for biochemistry and 90–120 minutes for immunoassay.

Regarding cardiac markers, the typical observer TAT for hospitals in Asia–Pacific is 45 minutes; however, for Indian hospitals, it is 60 minutes.

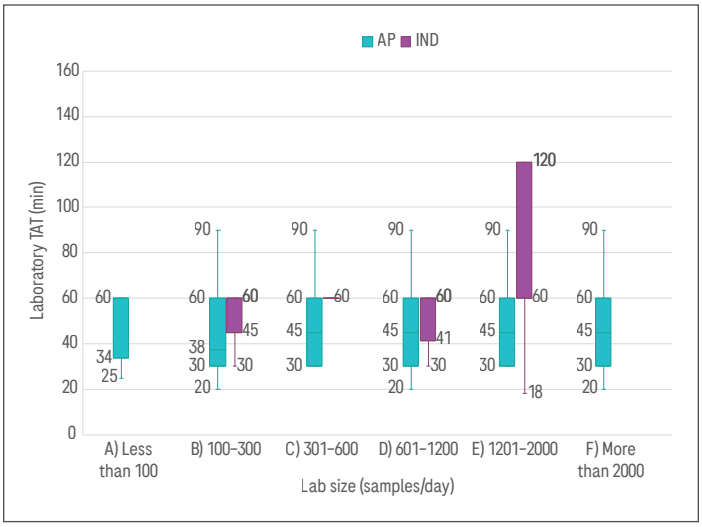


Figure 19: Target TAT for hospital cardiac assays.

Operations

Laboratory Operations

While testing is carried out methodically and under supervision in all clinical laboratories, the processes differ from lab to lab.[6] This section examines variations in pre-examination and post-examination procedures across laboratories in India.

The survey examined a number of laboratory operating procedures. This section will go over some of these processes, including test ordering, sample quality check, sample aliquot, sample rejection, critical result notification, and add-on testing.

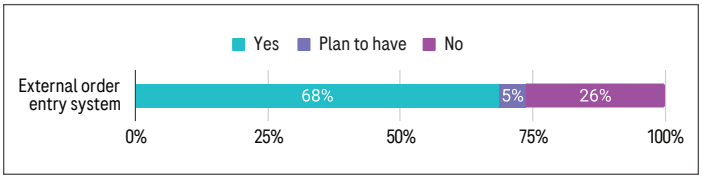


Figure 20: India-test ordering.

Results: The capacity to receive diagnostic test orders via digital platforms from sources other than the LIS is referred to as external order entry (EOE). Institutions may gain from enhanced online tracking and transparency, reduced redundant tasks, reduced order entry errors, and a saving in manual labor and time if they implement EOE capabilities.[7] The survey reveals that 68% of survey participants have this feature enabled.

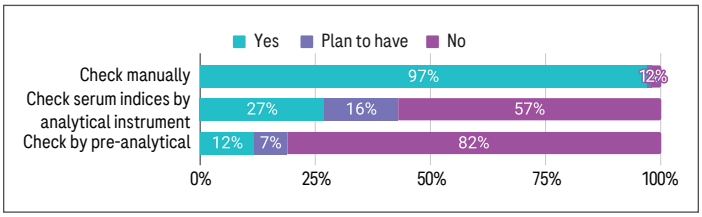


Figure 21: India-sample quality check.

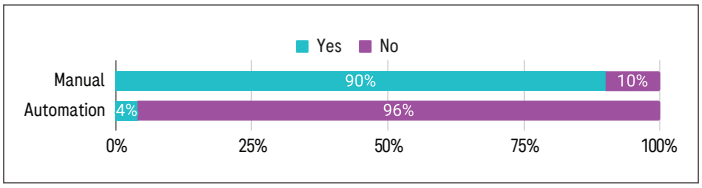


Figure 22: India-sample aliquot.

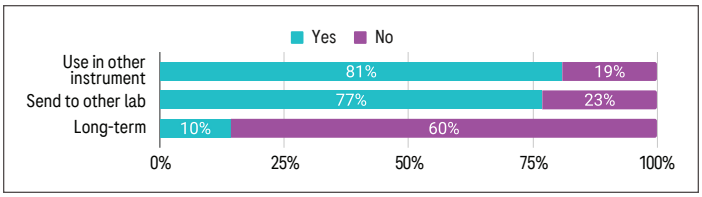


Figure 23: India-reason for sample aliquot.

Results: A sample quality check is an HIL [hemolysis (H), icterus (I) and lipaemia (L)] index check. This process is carried out manually in 97% of laboratories, with analytical equipment being used in 27% and preanalytical instruments in 12% of labs.

Sample aliquoting is likewise done manually in 90% of the labs assessed, with just 4% automating the procedure. 81% of respondents state that testing the sample on various instruments is the main reason for aliquoting. 77% of the samples are aliquoted and sent to an external laboratory. Only 10% of the laboratories surveyed employ aliquoting from long-term storage.

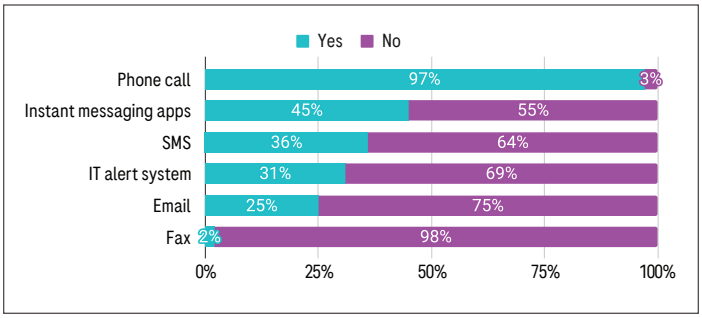


Figure 24: India-informing on sample rejection.

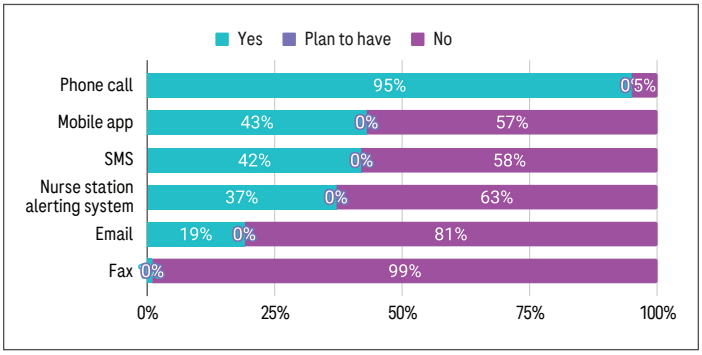


Figure 25: India-critical result notification.

Results: The laboratory's successful contact with clinicians was also reviewed as part of the assessment of laboratory operations. The primary method of contact with clinicians in both critical result notifications and samples rejections, is over the phone. Less often used were mobile apps, SMS, and IT/nursing station alert systems, etc.

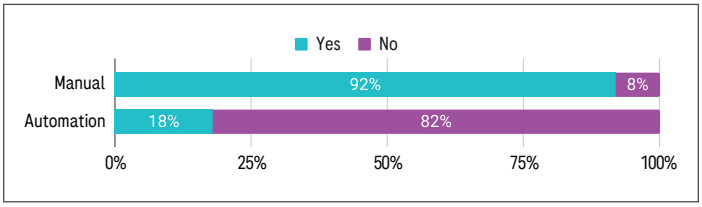


Figure 26: India-add on tests.

Results: Add-on testing is the term used when a laboratory gets more requests to conduct tests on specimens that are already on file. Add-on testing might result from a legitimate clinical necessity or from a mistake in the initial test ordering. In any case, add-on testing enables a lab to execute additional tests without the requirement for resampling. Of the labs surveyed, 92% carry out this task manually, while 18% have automated it.

IT and Workflows

Middleware is a software solution that sits between laboratory equipment and the LIS to improve the laboratory's capacity to manage enormous amounts of data provided by the instruments. A middleware helps laboratories comply with regulatory laboratory certification schemes and adhere to globally acknowledged best practices.

Customised rules for real-time analysis, autoverification, holding and flagging laboratory results that might need further action, enhancing data display for quality control (QC) review, approval, and analytics, and controlling robotic automation systems are just a few of the middleware's functions.[8]

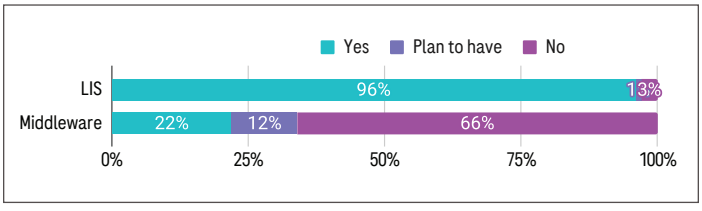


Figure 27: India-LIS and middleware.

Results: Laboratory information systems serve as the primary IT asset for a laboratory. The value of middleware is being seen with 22% of the labs using middleware to manage data-driven operations within the lab.

The survey also records the most commonly used laboratory IT functionalities used in Indian laboratories today.

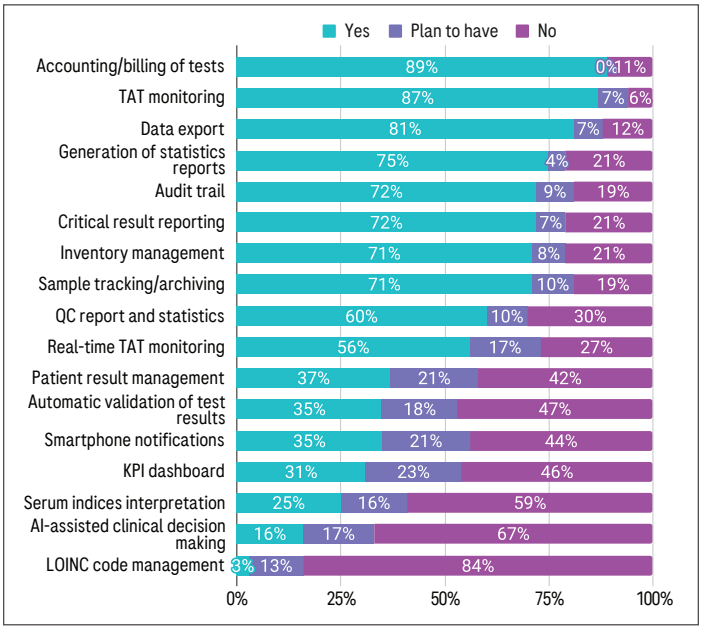


Figure 28: India-IT functionalities.

Quick Note on Trending Topics for Discussion

Auto validation, also known as auto verification or AV, refers to the use of computer-based rules to verify clinical laboratory test results without the need for manual review by a laboratory technologist or pathologist. It expedites the release of test results by eliminating the need for manual review of routine and well-defined test results. Deviations or abnormalities in the test results alert the laboratory staff and facilitate timely corrective actions. By automating the validation process for routine tests, laboratory technologists and pathologists can focus their expertise and attention on more complex or critical cases. Designed to adhere to predefined rules and algorithms, it ensures consistency in result interpretation across different laboratory settings, reduces inter-observer variability, and minimizes the risk of human error.

The Clinical and Laboratory Standard Institute (CLSI) guideline for Auto Validation of Clinical Laboratory Test Results (AUTO-15) includes detailed information for designing, testing, validating, implementing, and providing ongoing support for an autoverification algorithm system for use in the medical laboratory.

Productivity

Choosing the right number of employees for a laboratory department is one of the most crucial considerations that management must make. Clinical laboratories that are understaffed run the risk of compromising quality and throughput, while overstaffing drives up testing expenses needlessly.

Full-Time Staff (FTS) described as the number of personnel working on the bench for a full working day in the laboratory, or the number of tests completed divided by the number of FTS are examples of labor productivity ratios that can be used to inform staffing decisions. These ratios can also be used to estimate the productivity that can be reasonably expected from technical staff, as well as the amount of labor-saving automation used in the department and the resources required to complete the process.[10]

Management must also rationally decide how to effectively use existing laboratory floor space inside a healthcare facility or plan for new laboratory floor space to boost service capacity. For this purpose, workspace utilisation

represented as samples processed per square metre or Test reported per square metre may be applied.

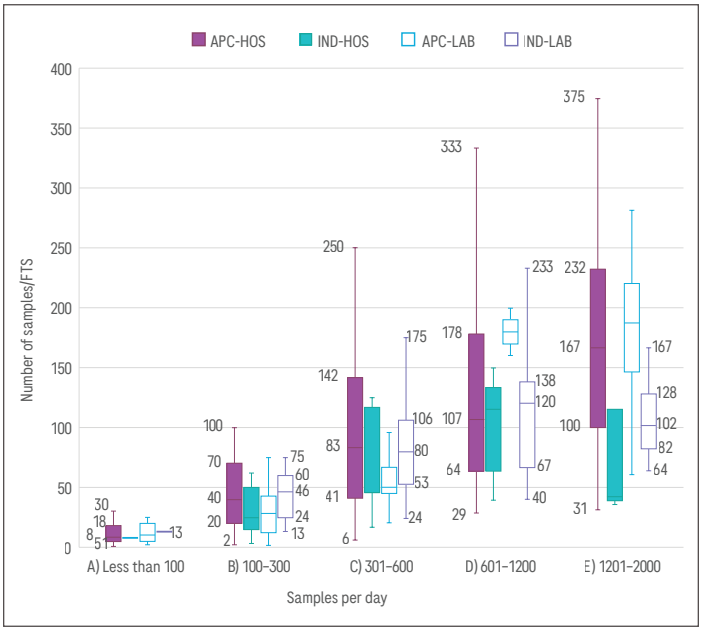


Figure 29: Sample/FTS.

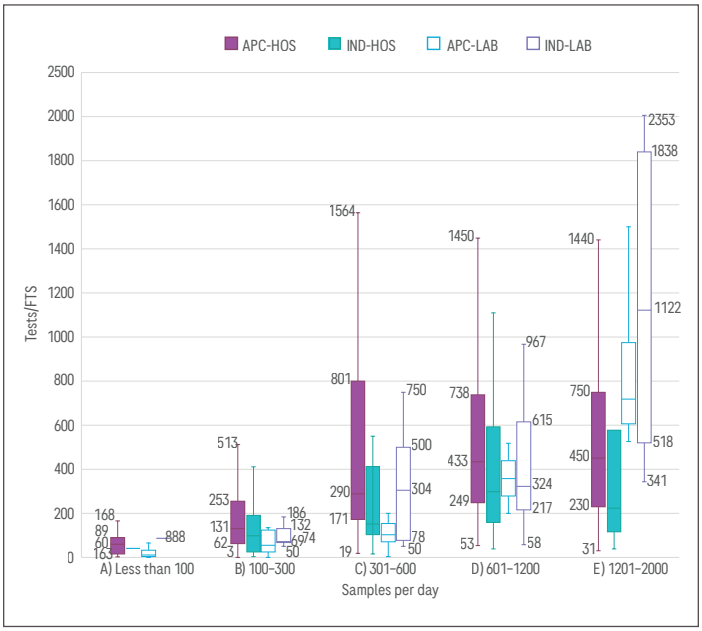


Figure 30: Tests/FTS.

Results: Hospitals in the Asia-Pacific region demonstrate a consistent trend with medians progressing from 4, 40, 83, 107, and 167 samples/FTS across increasing laboratory sizes. For tests/FTS, Asia-Pacific commercial laboratories demonstrate an increasing trend of 9, 58, 85, 360, and 718 tests/FTS.

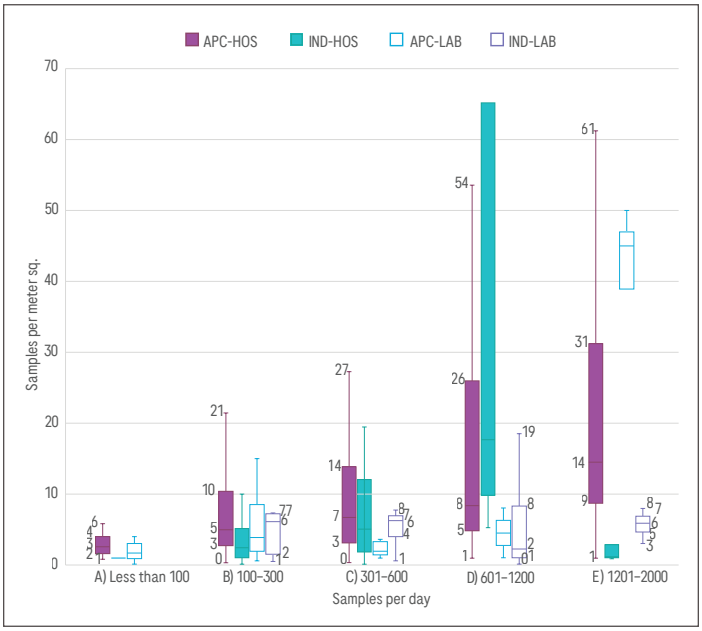


Figure 31: Sample/m^2.

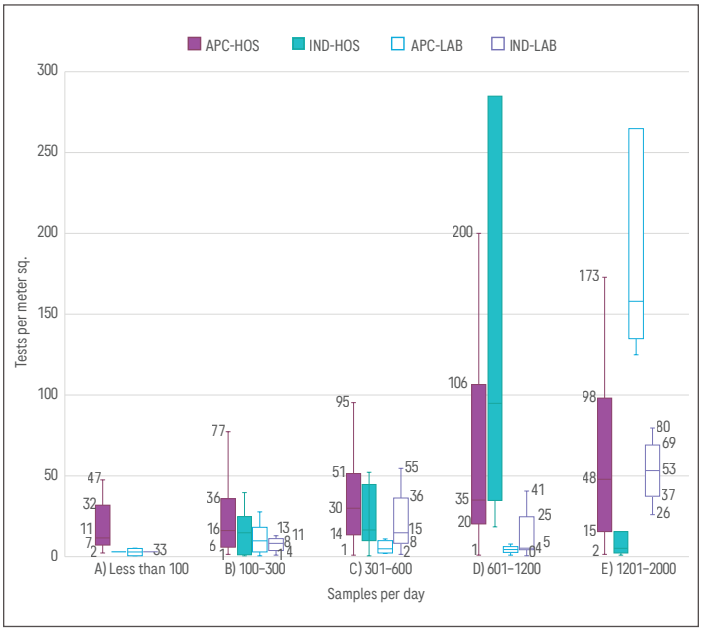


Figure 32: Tests/m^2.

Results: Asia-Pacific hospitals demonstrate a consistent trend in workspace utilisation with the medians progressing at 3, 5, 7, 8, and 14 samples/m^2 and 11, 16, 30, 35, and 48 test/m^2.

Other Field Benchmarks

Test Density

The average number of tests ordered for each tube is known as test density. It can serve as a gauge for assessing instrument workload and assessing testing ordering patterns. The amount of processing capacity that laboratory equipment needs depends on test density. The following lists the test density patterns for Indian laboratories.

Table 1: For Indian laboratories

Institution type	25th percentile	50th percentile	75th percentile	90th percentile
1) Hospitals up to 100 beds	**1.00**	**1.00**	**4.80**	**5.72**
A) Less than 100 s/d	4.80	4.80	4.80	4.80
B) 100–300 s/d	0.95	1.00	2.33	4.73
2) Hospitals 101–300 beds	**1.00**	**2.50**	**4.40**	**6.60**
A) Less than 100 s/d	1.00	1.00	1.00	1.00
B) 100–300 s/d	1.45	2.97	3.64	6.43
C) 301–600 s/d	1.18	2.50	4.74	5.79
E) 1201–2000 s/d	1.00	1.00	1.00	1.00
3) Hospitals 301–500 beds	**1.80**	**3.60**	**6.91**	**7.64**
B) 100–300 s/d	2.62	4.60	6.91	7.26
C) 301–600 s/d	1.05	3.55	4.34	6.91
D) 601–1200 s/d	2.36	4.94	7.46	7.70
4) Hospitals 500 and above	**1.10**	**3.44**	**5.04**	**8.48**
B) 100–300 s/d	8.43	8.67	8.92	9.07
C) 301–600 s/d	3.43	3.43	3.43	3.43
D) 601–1200 s/d	1.00	3.13	4.22	6.54
E) 1201–2000 s/d	4.45	5.00	5.32	5.89
F) More than 2000 s/d	1.00	1.00	1.00	1.00
5) Commercial laboratory	**1.44**	**3.27**	**5.63**	**8.58**
A) Less than 100 s/d	7.00	7.00	7.00	7.00
B) 100–300 s/d	1.17	3.25	4.85	5.10
C) 301–600 s/d	1.43	2.57	6.00	6.18
D) 601–1200 s/d	1.80	3.14	5.00	8.10
E) 1201–2000 s/d	5.27	7.68	14.17	21.67
F) More than 2000 s/d	1.26	1.44	5.10	7.29

Number of Parameters Empanelled

It was observed that the number of test parameters conducted in various laboratory setups varied. The trends for the empanelment of immunology and clinical chemistry tests across various laboratory settings in India are shown in the table below.

Table 2a: For hospitals

	Clinical Chemistry parameters			Immunoassay parameters		
Hospital	**25th percentile**	**50th percentile**	**75th percentile**	**25th percentile**	**50th percentile**	**75th percentile**
A) Less than 100	17	18	20	7	7	7
B) 100–300	30	35	43	17	20	24
C) 301–600	38	40	70	20	24	40
D) 601–1200	40	75	100	20	33	80
E) 1201–2000	86	86	105	25	37	59
F) More than 2000	33	39	44	28	35	43

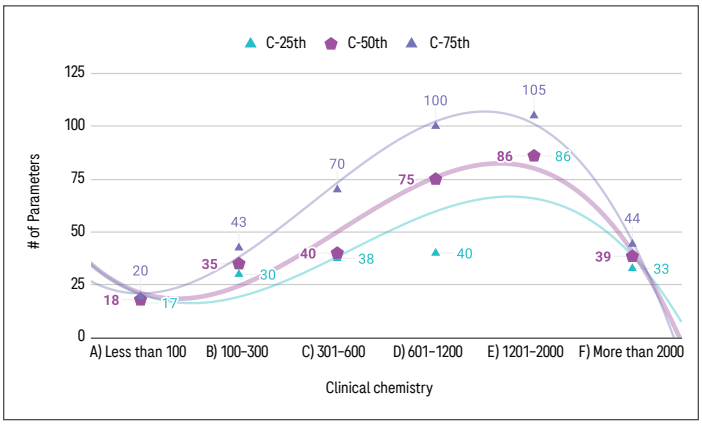


Figure 33a: Clinical parameters for Clinical Chemistry.

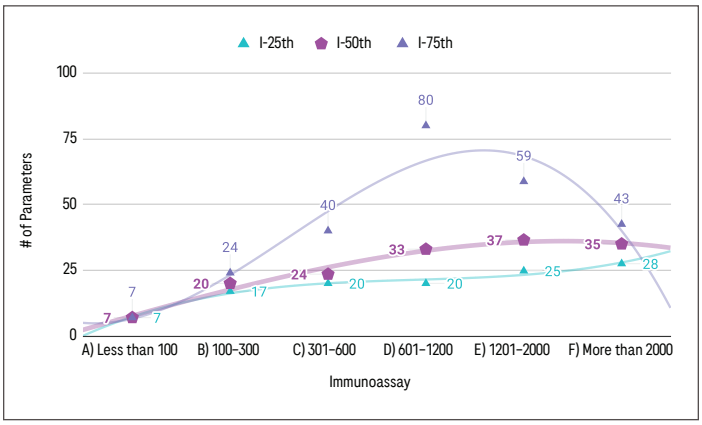


Figure 33b: Clinical parameters for Immunoassay.

Table 2b: For commercial laboratories

	Clinical chemistry parameters			Immunoassay parameters		
Commercial laboratory	**25th percentile**	**50th percentile**	**75th percentile**	**25th percentile**	**50th percentile**	**75th percentile**
A) Less than 100	25	25	25	11	11	11
B) 100–300	35	36	58	24	30	36
C) 301–600	33	40	50	26	30	45
D) 601–1200	49	54	70	35	41	53
E) 1201–2000	40	55	73	31	35	39
F) More than 2000	53	80	80	34	50	85

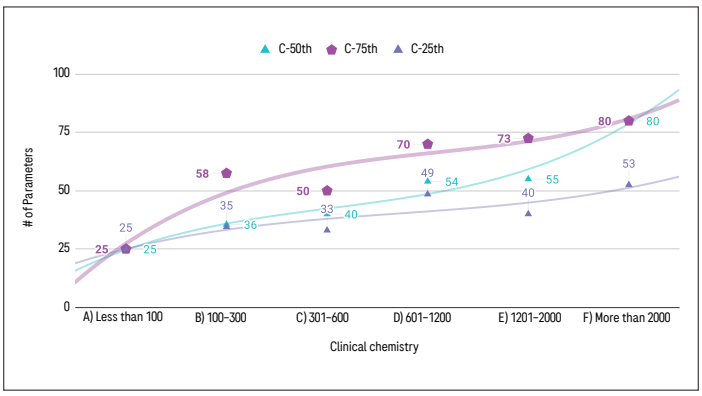


Figure 34a: Clinical parameters for Clinical Chemistry.

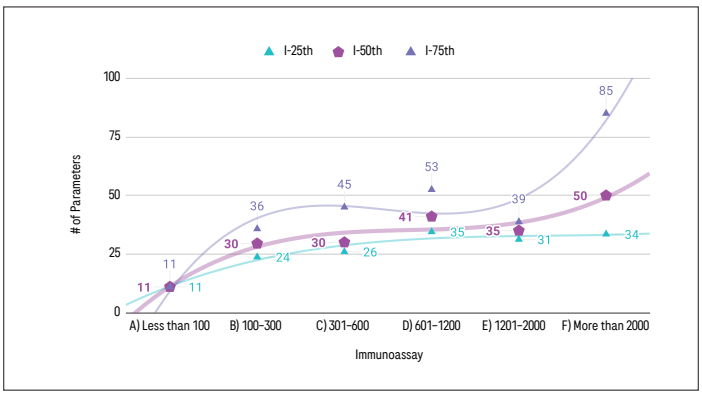


Figure 34b: Clinical parameters for Immunoassay.

Community Discussion

> *You are not lost in the crowd, let the community be your guide.*

The attempt of this white paper is to build a community understanding of current laboratory practices in India, to initiate the discussion of goals and best practices, relevant laboratory metrics and performance indicators, and finally community participation in a continuous community improvement effort. We urge all laboratories to participate in the survey and play a role in evolving best practices in India.

Observation of the editorial board and community are as follows:

Quality: The cornerstone of quality remains the ISO 15189:2012/22 guidelines determined through accreditation standards prescribed by the NABL and similar bodies. Due consideration needs to be given to KPIs and implementation on continuous Improvement methods like Lean Six Sigma, and activity-based costing.

Processes: Evaluate reason and occurrence of specific laboratory practices that can be pivotal to establishing efficiencies in laboratory workflows, viz. sample registration, interoperability of hospital IT systems, sample quality check, sample transport, method and need for aliquot specimens, etc.

Speed is ideally assessed by time from request of a test to time to reporting of the test-total TAT. However, measures, such as laboratory TAT, pre-examination TAT, examination TAT, and post-examination TAT, also provide valuable indications of service efficiency.

Productivity is a ratio of either laboratory input-total number of specimens for clinical chemistry (CC) arriving in the lab or total number of CC tests done by the lab to 3 key resources of the lab-staff, laboratory floor space, and instruments.

Now with measuring indicators, relevant data, and industry comparisons available from India and the Asia Pacific region, every laboratory has the opportunity to reflect on and review their current operations in order to identify potential for improvements.

Concluding Remarks

The ICCB survey provides valuable information on clinical laboratory practices in India and the Asia-Pacific area. It demonstrates that while many laboratories have similar problems, there are also common solutions that may be found by applying a quality systems approach that incorporates lean concepts, automation, increased use of IT, accreditation and productivity metrics.

There are certain methodological limitations concerning this study that need to be carefully considered. First, there is a need for increased involvement in the group of smaller laboratories that process less than 300 samples daily, as well as hospitals and laboratories that process more than 2000 samples daily.

The operational dynamics of these entities require more detailed description in order to improve the study's comprehension. Furthermore, wider participation of non-accredited laboratories will improve the applicability of the findings to the wider clinical laboratory industry. We would like to thank the participants of this survey, the laboratory team from CAHO for bringing this publication to life.

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Contact Information

+919870318781

office@caho.in

G-100 , Sector 44, Noida, Uttar Pradesh, India, 201303

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