



Human resource perceptions of the quality in clinical laboratories: An ethnographic study in two municipalities in the Colombian Pacific

Percepciones del recurso humano sobre la calidad en laboratorios clínicos: Un estudio etnográfico en dos municipios del Pacífico Colombiano

Percepções do recurso humano sobre a qualidade em laboratórios clínicos: Um estudo etnográfico em dois municípios do Pacífico Colombiano



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ABSTRACT

Introduction: A high-quality clinical laboratory plays a key role in healthcare delivery. Staff motivation and training directly influence the quality of service. **Objective:** To explore how laboratory personnel perceive the factors that influence service quality in clinical laboratories in two municipalities of the Colombian Pacific region. **Materials and methods:** This qualitative study used an ethnographic approach and a constructivist paradigm. Researchers conducted semi-structured interviews with 42 staff members and analyzed the data thematically using Atlas.ti software. **Results:** Participants identified regulatory knowledge, quality program implementation, ongoing training, and working conditions as key elements that drive performance and sustain quality systems. **Conclusion:** Strengthening technical skills, regulatory understanding, and employment conditions remains essential. Institutional commitment plays a critical role not only in developing sustainable quality systems but also in fostering a positive organizational climate, increasing motivation, and enhancing job satisfaction, factors that drive continuous improvement in service delivery.

Keywords: Clinical laboratories; quality management systems; training programs; job satisfaction. (Source: DeCS, Bireme).

Sustainable development goals: Good health and well-being. (Source: ODS, WHO).

RESUMEN

Introducción: Un laboratorio clínico de calidad es esencial para la atención en salud. Factores como la motivación y la formación del personal impactan la calidad del servicio. **Objetivo:** Comprender las percepciones del recurso humano sobre los factores que influyen en la calidad del servicio en laboratorios clínicos de dos municipios del Pacífico colombiano. **Materiales y métodos:** Estudio cualitativo con enfoque etnográfico, bajo un paradigma constructivista, realizado mediante entrevistas semiestructuradas a 42 trabajadores. Se utilizó un análisis temático con el software Atlas.ti. **Resultados:** Se identificaron factores como la comprensión normativa, la implementación de programas de calidad, la formación continua, y las condiciones laborales como determinantes del desempeño y la sostenibilidad del sistema de calidad. **Conclusión:** Se requiere fortalecimiento de las competencias técnicas, normativas y modalidades de contratación del personal. El compromiso institucional resulta ser un factor clave, no solo para implementar sistemas de calidad sostenibles, sino también para mejorar el clima organizacional, la motivación y la satisfacción laboral, elementos que coadyuvan a la continuidad y efectividad de los procesos de mejora en el servicio.

Palabras clave: Laboratorios clínicos; sistemas de gestión de la calidad; programas de capacitación; satisfacción laboral. (Fuente: DeCS, Bireme).

Objetivos de desarrollo sostenible: Salud y bienestar. (Fuente: ODS, OMS).

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Citation:
Cardona-Murillo AS, Salcedo-Cifuentes M, Bermúdez-Escobar A. Human resource perceptions of the quality in clinical laboratories: An ethnographic study in two municipalities in the Colombian Pacific. *Univ Salud* [Internet]. 2026; 28(1):e9465. DOI: 10.22267/rus.262801.354

Received: April 29 - 2025
Revised: September 11 - 2025
Accepted: November 26 - 2025
Published: January 01 - 2026



ISSN: 0124-7107 - ISSN (Online): 2389-7066
Univ. Salud 2026 Vol 28 No 1
<https://doi.org/10.22267/rus>

<https://revistas.udenar.edu.co/index.php/usalud>

RESUMO

Acknowledgments:

To the healthcare institutions and clinical laboratories in the cities of Ipiales and Quibdó for their participation and willingness to support this research, and to all interviewees who shared their experiences as part of the study.

Funding sources:

This research was funded by the Ministry of Science, Technology, and Innovation's Call for Proposals "896-2021: Strengthening Regional Health Research Capacities." Colombia, 2022 - ID: 110689684284.

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Ethics approval and consent to participate:

Minutes No. 050-021 of November 9, 2022, issued in Santiago de Cali, Colombia, by the Health Research Ethics Committee (CEIS) of the Universidad del Valle.

Conflict of interest:

The authors declare that there is no conflict of interest among them.

Disclaimer:

The authors declare that they are responsible for the content and its accuracy.

Consent to publication:

All authors reviewed and approved the final version for publication in the journal.

Introdução: Um laboratório clínico de qualidade é essencial para o atendimento em saúde. Fatores como a motivação e a formação da equipe impactam diretamente na qualidade do serviço. **Objetivo:** Compreender as percepções dos profissionais sobre os fatores que influenciam a qualidade do serviço em laboratórios clínicos de dois municípios do pacífico colombiano. **Materiais e métodos:** Estudo qualitativo com abordagem etnográfica, sob um paradigma construtivista, realizado por meio de entrevistas semiestruturadas com 42 trabalhadores. Utilizou-se análise temática com o software Atlas.ti. **Resultados:** Foram identificados fatores como o conhecimento das normas, a implementação de programas de qualidade, a formação continuada e as condições de trabalho como determinantes do desempenho e da sustentabilidade do sistema de qualidade. **Conclusão:** É necessário fortalecer as competências técnicas, normativas e as modalidades de contratação do pessoal. O compromisso institucional se mostra como um fator chave, não apenas para a implementação de sistemas de qualidade sustentáveis, mas também para melhorar o clima organizacional, a motivação e a satisfação no trabalho, elementos que contribuem para a continuidade e eficácia dos processos de melhoria do serviço.

Palavras-chave: Laboratórios clínicos; sistemas de gestão da qualidade; programas de treinamento; satisfação no trabalho. (Fonte: DeCS, Bireme).

Metas de desenvolvimento sustentável: Saúde e bem-estar. (Fonte: MDS, OMS).

INTRODUCTION

Clinical laboratories play a fundamental role in modern healthcare by providing accurate and timely information, that enables healthcare professionals to make informed clinical decisions and improve patients' quality of life. Recent data show that between 70% and 75% of medical diagnoses are based on laboratory results, underscoring the direct influence of these services on clinical outcomes⁽¹⁾.

In this context, the implementation of quality management systems has become increasingly important, as it ensures that pre-analytical, analytical, and post-analytical processes comply with legal and regulatory requirements, thereby guaranteeing technical competence and the quality of the service provided⁽²⁾. However, the performance of these systems depends largely on the institutional environment, the available infrastructure, and human resource capabilities.

Various factors influence the quality of laboratory results. Avedis Donabedian's model distinguishes three dimensions. Structure process and outcome structure encompasses material, regulatory, and human resources, as well as institutional organization. Processes include management activities, training, the application of technical procedures, in addition to the interaction between staff and users. Outcomes reflect performance, satisfaction, and sustainability of the quality system⁽³⁾. In low- and middle-income countries, such as Colombia, gaps persist in infrastructure, equipment maintenance, availability of trained personnel, and consolidation of quality programs⁽⁴⁾.

Human resources are a key factor in the implementation and sustainability of quality management systems in clinical laboratories^(5,6). Their active participation is influenced by the training they receive, job security, motivation, and opportunities for professional development, as well as their perception of institutional recognition⁽⁶⁻⁸⁾. However, several studies have documented a significant gap between theoretical knowledge and daily practice in quality management, with a significant percentage of staff acquiring competencies empirically during their professional practice^(9,10). Although the role of the staff member is paramount, much of the literature continues to focus on regulatory tools and technical procedures, relegating to the background the

experiences and working conditions of human resources, who rarely participate in the formulation, monitoring, or evaluation of quality systems⁽¹¹⁾.

The accreditation of clinical laboratories under the international ISO 15189 standard serves as a mechanism for recognizing technical competence and ensuring service quality. However, in Latin America, its impact has been limited, and in most countries, it remains a voluntary requirement, unlike in contexts such as the United States, Canada, or some European countries, where its adoption is more widespread and often mandatory⁽¹²⁻¹⁴⁾. In Colombia, recent studies of laboratories in the Pacific public network show that compliance with the standard depends heavily on the availability of resources and on staff training in quality management⁽¹⁵⁾. In addition, findings from the National Laboratory Policy (CONPES 3957), which documents shortcomings in human capital and specific training needs in metrology and quality, contributing to a lack of awareness and partial adoption of standards such as ISO 15189:2022 in healthcare setting⁽¹⁶⁾.

Given this context, this study aims to understand, from the perspective of clinical laboratory staff, the factors that influence service quality in two municipalities on the Colombian Pacific coast. Based on the dimensions of Donabedian's model, the study seeks to provide a contextualized overview of the working, organizational, and technical conditions that determine the quality of these services.

MATERIALS AND METHODS

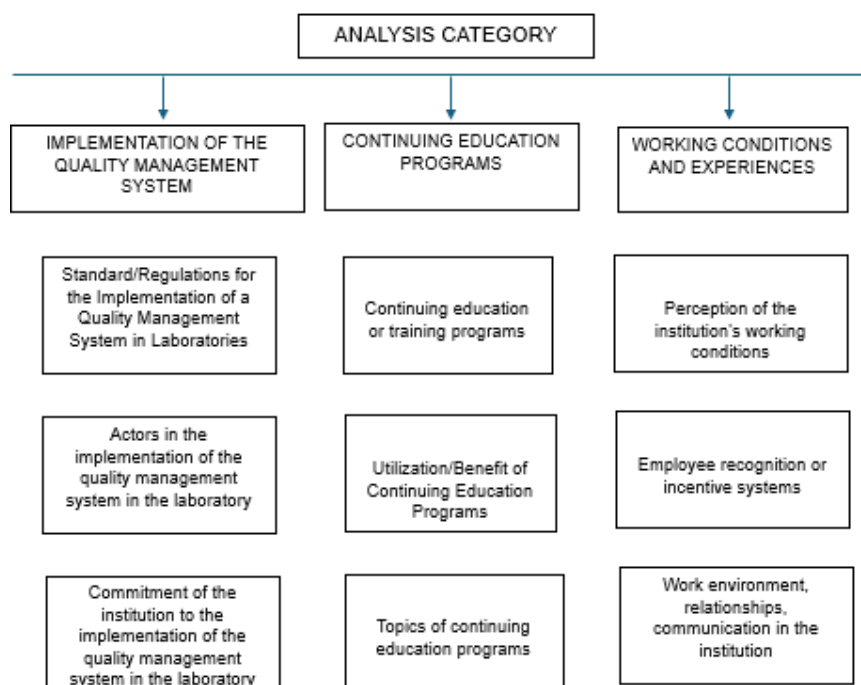
A qualitative study with an ethnographic approach was conducted within a constructivist framework to understand staff perceptions of the factors that influence service quality in clinical laboratories. Fieldwork was conducted between 2022 and 2024 in four laboratories (two in Ipiales, Nariño—LAB1-IPI and LAB2-IPI—and two in Quibdó, Chocó—LAB1-QUB and LAB2-QUB), representing varied levels of complexity and institutional types (public and private). Purposive sampling was used, involving 42 workers (technical and administrative assistants, bacteriologists, the laboratory coordinator, and the quality leader) (Table 1).

Table 1.
Study Population - Clinical Laboratories in Ipiales and Quibdó, 2022–2024

| Laboratory | Role | Total partic. | Women | Men | Age (\pm SD) | Length of Service |
|------------|---|---------------|-------|-----|--------------------|--------------------|
| LAB I-IPI | Administrative Assistant | 2 | 2 | 0 | 49.0 (\pm 9.9) | 19.0 (\pm 1.4) |
| LAB I-IPI | Laboratory Assistant | 4 | 1 | 3 | 38.5 (\pm 13.5) | 7.0 (\pm 8.3) |
| LAB I-IPI | Bacteriologist | 2 | 2 | 0 | 32.5 (\pm 3.5) | 9.0 (\pm 2.8) |
| LAB I-IPI | Bacteriologist - Quality Coordinator | 1 | 1 | 0 | 30.0 (\pm 0.0) | 1.0 (\pm 0.0) |
| LAB I-IPI | Bacteriologist - Transfusion | 2 | 2 | 0 | 37.0 (\pm 15.6) | 2.2 (\pm 2.6) |
| LAB I-IPI | Bacteriologist - Laboratory Coordinator | 1 | 1 | 0 | 55.0 (\pm 0.0) | 22.0 (\pm 0.0) |
| LAB I-IPI | IPS Quality Leader | 1 | 1 | 0 | 40.0 (\pm 0.0) | 9.0 (\pm 0.0) |
| LAB2-IPI | Administrative Assistant | 1 | 1 | 0 | 36.0 (\pm 0.0) | 6.0 (\pm 0.0) |
| LAB2-IPI | Laboratory Assistant | 3 | 3 | 0 | 31.0 (\pm 4.4) | 2.0 (\pm 1.7) |
| LAB2-IPI | Bacteriologist | 2 | 2 | 0 | 24.5 (\pm 0.7) | 0.9 (\pm 0.2) |
| LAB2-IPI | Bacteriologist, Quality Coordinator | 1 | 1 | 0 | 30.0 (\pm 0.0) | 1.0 (\pm 0.0) |
| LAB2-IPI | Bacteriologist, Laboratory Coordinator | 1 | 1 | 0 | 47.0 (\pm 0.0) | 13.0 (\pm 0.0) |
| LAB2-IPI | IPS Quality Leader | 1 | 0 | 1 | 32.0 (\pm 0.0) | 1.0 (\pm 0.0) |
| LAB2-IPI | Physician | 1 | 0 | 1 | 62.0 (\pm 0.0) | 30.0 (\pm 0.0) |
| LAB I-QUB | Laboratory Assistant | 4 | 4 | 0 | 40.2 (\pm 9.3) | 10.7 (\pm 10.9) |
| LAB I-QUB | Bacteriologist | 3 | 3 | 0 | 35.7 (\pm 3.5) | 3.7 (\pm 1.5) |
| LAB I-QUB | Bacteriologist, Laboratory Coordinator | 1 | 1 | 0 | 41.0 (\pm 0.0) | 14.0 (\pm 0.0) |
| LAB I-QUB | IPS Quality Leader | 1 | 1 | 0 | 33.0 (\pm 0.0) | 5.0 (\pm 0.0) |
| LAB2-QUB | Administrative Assistant | 2 | 2 | 0 | 28.5 (\pm 6.4) | 1.0 (\pm 0.0) |
| LAB2-QUB | Laboratory Assistant | 3 | 3 | 0 | 30.7 (\pm 4.0) | 1.0 (\pm 0.9) |
| LAB2-QUB | Bacteriologist | 2 | 2 | 0 | 44.0 (\pm 5.7) | 3.0 (\pm 2.8) |
| LAB2-QUB | Bacteriologist – Laboratory Coordinator | 1 | 1 | 0 | 46.0 (\pm 0.0) | 6.0 (\pm 0.0) |
| LAB2-QUB | Laboratory Quality Leader | 1 | 1 | 0 | 32.0 (\pm 0.0) | 2.0 (\pm 0.0) |
| LAB2-QUB | Quality Office | 1 | 1 | 0 | 41.0 (\pm 0.0) | 4.0 (\pm 0.0) |

A semi-structured interview guide previously designed and validated by the research team, was used. The interviews were audio- recorded in M4A format, transcribed, and anonymized. Data were analyzed using inductive thematic coding with the support of Atlas.ti 23 software, following Donabedian’s quality model as an interpretive framework (Figure 1).

Figure 1.
Analysis Categories - Ipiales and Quibdó, 2022–2024



The study was approved by the Health Research Ethics Committee (CEIS) of the Universidad del Valle (Minutes No. 050-021), in accordance with Resolution 8430 of 1993⁽¹⁷⁾. Informed consent, anonymity, and confidentiality were ensured for all participants.

RESULTS

The findings are presented in three main categories: 1) Implementation of the quality management system, 2) Training and continuing education, and 3) Working conditions and organizational climate. Each category is interpreted according to Donabedian's model, so that the findings are organized in relation to structure (resources, staff qualifications, and institutional organization), process (management actions, training, interactions, and care practices), and outcomes (perceived effects on performance, satisfaction, and sustainability). The following sections explain this correspondence, showing how each category integrates elements from all three dimensions.

Category 1. Implementation of the quality management system

Quality management processes were identified in all participating laboratories, although with varying degrees of implementation. In general, national regulatory frameworks are used to ensure compliance with quality standards at the institutional level, as required for service delivery, such as Decree 1011 of 2006⁽¹⁸⁾ and Resolution 3100 of 2019⁽¹⁹⁾. ISO 9001 is the most widely recognized standard; however, not all laboratories are certified under this standard. In contrast, ISO 15189 was mentioned less frequently, and in some cases, as a standard desired for the future. Although standardized processes and the departments responsible for the quality management system at each institution are recognized, not all interviewees identified the standards on which that system is based. In Ipiales, of the 13 interviewees from LAB1-IPI, only 6 said they knew which accreditation standard was used, and at LAB2-IPI, 3 out of 10 interviewees, only stated they were familiar with the regulatory framework. In Quibdó, all interviewees from both LAB1-QUB and LAB2-QUB stated that they were familiar with the quality management system but not with the regulations, attributing responsibility for its implementation to the department in charge of this process within each healthcare institution.

In the two municipalities included in the study, there is a recognized need for improved management and institutional commitment, particularly in public laboratories, to ensure the implementation and sustainability of quality management systems. Perceptions vary depending on staff roles: while operational staff perceive a lack of support in the face of structural shortcomings, managers tend to hold a less critical view of institutional operations. In Chocó, this difference is evident among laboratories. At LAB1-QUB (public), limited institutional commitment is reported due to financial crises, a lack of supplies, and infrastructure deficiencies. In contrast, at LAB2-QUB (private), there is a notable active interest in achieving accreditation, a situation that has fostered the standardization of processes and physical improvements in the laboratory.

Category 2. Training and Continuing Education

At the Ipiales laboratories, there is an annual schedule of in-house training sessions—both in-person and online—focused on practical and context-specific aspects of clinical laboratory work. At LAB1-IPI, the institutional training plan includes general activities for all departments and specific sessions for the laboratory, conducted by the staff themselves or, occasionally, by external experts. At LAB2-IPI, training sessions are led by staff members in the department; interviewees emphasize the need to collaborate with other institutions to address specialized topics that exceed their technical expertise.

In my view, if we lack knowledge on a topic or the topic is very specific, we need to reach out to other institutions (...) to establish contact and have them come give presentations. I think that's appropriate, because the training is conducted by the process leaders themselves, and they often end up covering the same topics again [E8_LAB2_IPI].

In Quibdó, LAB1-QUB offers an internal training program focused on operational and quality issues, led by laboratory staff. At LAB2-QUB, training includes content on occupational health and safety, quality management, and soft skills, coordinated by the quality department with support from the psychology team. Additionally, a monthly training plan is developed to address emerging service needs, including common diseases in the region such as Chagas disease and malaria.

Interviewees from both municipalities rated the training sessions positively, noting that they strengthen technical knowledge, improve patient care, and prepare the team for audits. They also highlighted that, because the sessions are conducted internally, they promote knowledge sharing among colleagues and strengthen workplace relationships, which translates into better performance on the job.

Training is part of continuous improvement; just as the professional growth of each person, of each employee, is beneficial to the institution, so too is ensuring that people are trained so that there is adherence to all established and standardized processes [E2_LAB1_IPI].

Category 3. Working Conditions and Organizational Climate

The institutions included in the study vary in complexity, a situation reflected in the scope of services provided and the availability of human, technological, and financial resources. In Ipiales, LAB1-IPI (public, tertiary care) faces high demand with limited staff, leading to worker overload and fatigue, especially during peak hours. This situation contrasts with LAB2-IPI (public, primary care), where demand is lower and no service overload is reported. In Quibdó, LAB1-QUB (public, secondary care) serves a large volume of patients at the departmental level; which increases the intensity of daily work. In contrast, LAB2-QUB (private, high-complexity) reports low demand and an organized work environment, with a clear distribution of duties and a lower perceived workload.

It's relative; there are months, there are weeks when you say, "I'm tired, I can't take it anymore," but there are also other weeks when you're more balanced. It also depends on the time of year; for example, right now we're in San Pacho, which is the town's festival, so the service is definitely more overwhelmed [E5_LAB1_QUB].

We operate on a shift schedule and handle all procedures; we have set turnaround times for general test results and specialized test results, and everything is completed in full within the established and applicable timeframes [E9_LAB2_QUB].

Perceptions of working conditions were heavily influenced by the type of employment contract. In public institutions, interviewees expressed dissatisfaction with service-based contracts, which do not guarantee job stability or employee benefits. They identified risks such as low pay, lack of recognition, excessive workloads, and contractual insecurity situations they attribute to dependence on municipal and national funding, despite the institutions' administrative autonomy. In contrast, at LAB2-QUB, workers expressed satisfaction with their formal contracts that include social benefits, a feature they consider a rare strength in the regional context of the health sector.

I don't like the type of contract we have, because they renew our contracts every two months—sometimes every three months. I think the service-based contract is terrible; even though we get paid on time, we don't receive any benefits—we don't get vacation time, we don't get a bonus, we don't get time off—you have to be here working shifts [E8_LAB1_IPI].

In Ipiales, none of the institutions have a formal recognition system for laboratory staff. At LAB1-IPI, the coordinators have implemented some informal strategies, but the interviewees noted that they do not feel recognized or motivated. At LAB2-IPI, there were also calls to establish a system that values performance through breaks, recognition for achievements, and institutional celebrations. In Quibdó, LAB1-QUB also lacks an incentive program, although peer recognition occurs spontaneously. In contrast, LAB2-QUB has a symbolic annual voting system, perceived as an incentive that promotes motivation and a sense of belonging.

In both municipalities, interviewees highlighted the positive work environment and a strong commitment to teamwork and service quality processes. However, they also pointed out difficulties and challenges related to communication, the emotional well-being of staff, and institutional factors that affect both job performance and the organizational climate. In Ipiales, LAB1-IPI staff indicated the need to improve coordination with other areas such as emergency care and general medicine, as well as to strengthen the supply chain, ensure the availability of supplies, and improve

training. They also proposed fostering team integration. At LAB2-IPI, communication problems with administration were evident, especially regarding resource allocation, leading to suggestions for greater institutional support, particularly in administrative and financial aspects related to the relationship with Health Benefit Plan Administrators (EAPB).

There should be an efficient supplier evaluation process that truly assesses whether the supplier is qualified to provide the service and is financially sound, because sometimes when we place orders, they say they don't have the supplies we need at that moment [E7_LAB1_IPI].

At the institutional level, there should be greater support for implementing the quality system. There needs to be a comprehensive approach within the institution to implement the system fully. In other words, there needs to be greater commitment from staff, both in the quality management and planning offices, as well as from staff in the field [E1_LAB2_IPI].

In Quibdó, respondents from LAB1-QUB identified institutional financial crises as the main risk factor, as these affect working conditions, service continuity, and the availability of supplies. At LAB2-QUB, while institutional commitment to quality management was acknowledged, the need to strengthen ongoing training processes was highlighted to ensure sustainability and promote staff adherence.

You feel very demotivated because sometimes you want to much more but lack the necessary resources.; it's discouraging when a patient arrives with ten tests and we can only perform two or three. Also, regarding working conditions, sometimes we go months without being paid (...) but we maintain a strong sense of humanity and commitment and our commitment is so strong that, if the hospital can't afford to buy a reagent, we find a way to buy it ourselves to care for the patient [E1_LAB1_QUB].

Quality isn't a one-time action; it's a habit. Quality is something you build every day. If we do it consistently, if we keep everything organized, if we focus on the processes, but I think some people are reluctant to engage to work on quality. But you realize that working on quality helps you keep

everything organized; for example, we had a visit, and all the information was stored, so we did not have to rush [E10_LAB2_QUB].

DISCUSSION

Quality management systems in healthcare are essential for ensuring safety, effectiveness, and accessibility of care. Accreditation under the standard medical laboratories—Requirements for quality and competence (ISO 15189) has been shown to strengthen technical competence and the reliability of results; however, its adoption in Latin America remains limited^(13,14). A regional study reported that only 12% of laboratories in the region are accredited, while in Argentina, although there are established regulatory frameworks, coverage remains partial. Regional reports from the International Federation of Clinical Chemistry (IFCC) confirm that gaps are common in most countries, linked to limitations in infrastructure, resources, and institutional support⁽²⁰⁾. However, have been identified as key opportunities such as training, leadership, and institutional commitment present opportunities to initiate transformation processes that strengthen the implementation of this standard⁽⁴⁾.

In Colombia, few studies have evaluated that evaluate clinical laboratories against this regulatory framework and interpret their results in light of Donabedian's quality model⁽²¹⁾. This study contributes to this field by showing that staff knowledge of quality standards is limited and tends to reduce the concept of quality to the routine fulfillment of controls and audits, without fully incorporating planning, continuous improvement, and interdisciplinary work^(15,16), as reflected in workers' accounts that they learn quality management primarily through practice, with an emphasis on the preanalytical phase and internal or external quality control, and less focus on aspects such as metrological traceability, uncertainty estimation, and the use of reference materials^(22,23). In addition, there are heterogeneous and insufficient institutional training programs, which limit the development of competencies for technical leadership, the analysis of adverse events, and the updating of operating procedures^(9,24,25).

According to authors such as Theodorsson⁽¹⁶⁾, laboratory staff have not fully recognized their potential or the significant contribution each individual

makes to the quality of results; thus, the staff's knowledge, skills, and the laboratory environment are crucial to ensuring quality. A professional trained in the guidelines and concepts related to quality assurance is likely to be a professional who will define and apply these concepts in their daily practice; therefore, it is very important that laboratory professionals recognize this⁽²³⁾. This study identifies the need for clinical laboratories to strengthen their staff's management skills so that they can gain a real understanding of how to address the needs that arise in all phases of testing.

Furthermore, although there is a quality management system in place across healthcare institutions, it is not sufficient to ensure that staff adhere to all its procedures; a conclusion supported by other authors⁽²⁶⁾. To achieve this, support staff must be assigned within the department to serve as quality managers, constantly analyzing adverse events at all points of care and review, in order to prevent the reprocessing of information, as well as the duplication and obsolescence of guidelines or operational protocols. In this regard, various studies have shown that the role of quality champions or ambassadors is an effective alternative for driving the implementation of innovations and organizational improvements, as it facilitates staff adherence, optimizes communication, and promotes the sustainability of changes without the need to create additional positions⁽²⁷⁻²⁹⁾.

Although risks in clinical laboratories are inherent to the practice, the findings of this study show that staff tend to associate them primarily with the preanalytical phase or with equipment calibration, neglecting other aspects of quality assurance. This narrow view highlights the need to strengthen risk management competencies by incorporating systematic activities such as proficiency testing programs (ISO 17043), internal quality control, uncertainty calculation, method verification, and the use of reference materials, as well as the implementation of risk-based protocols that enable the identification, assessment, and mitigation of events affecting patient safety⁽³⁰⁾.

Human resources are one of the four pillars of health care, along with infrastructure, technology, and a commitment to quality in care processes⁽³¹⁾. For this reason, emphasis is placed on the need for well-rounded human resources, a condition that ensures both the initiation and the successful

completion of quality care⁽³²⁾. In this study, respondents expressed dissatisfaction with hiring practices and highlighted the need to improve onboarding and recruit more experienced staff. Actions aimed at strengthening and ensuring the satisfaction of human resources are therefore essential. Health organizations must think strategically about how to motivate their employees and implement mechanisms to foster a sense of belonging, starting with hiring processes that make them feel part of the institution^(33,34); it has been demonstrated that appropriate selection processes, accompanied by wellness and recognition policies, influence staff adherence to quality systems^(7,8). Furthermore, although performance quality is related to individual training and skills, it also depends on the continuing education provided by the employer. Various studies show that training for staff who interact with the public improves the user experience and helps prevent safety errors in laboratories⁽³⁵⁾.

In this study, workers expressed dissatisfaction with the service-based employment model, the lack of professional recognition, and the limited institutional support. These conditions affect motivation and, consequently, the quality of service. Motivation in the workplace can be defined as the degree to which an individual is willing to exert and sustain effort toward organizational goals⁽⁸⁾. The performance of the health sector depends critically on worker motivation, with service quality, efficiency, and equity all directly influenced by workers' willingness to dedicate themselves to their tasks. Workplace motivation depends not only on financial incentives, but also on professional recognition and stability^(36,37). Strategic human talent management must include onboarding, continuous training, organizational well-being, and a sense of belonging⁽¹¹⁾. In this regard, Law 841 of 2003, Article 8⁽³⁸⁾ states that bacteriologists are entitled to working conditions that protect their physical and mental well-being, as well as ongoing training to keep them scientifically up to date. These provisions not only promote motivation, but also dignify professional practice, integrating ethics with the well-being and development of human talent in clinical laboratories.

Previous studies have also shown that senior management commitment, collaborative work, and ongoing training programs are key to the

effective implementation of quality models in clinical laboratories^(34,39). This study identifies that, in human resource management, it is necessary to consider the laboratory's installed capacity, including a clinical leadership role responsible for the intensive monitoring of the pre-analytical phase both in the laboratory and at all specimen collection sites. Similarly, a lack of equipment, poor interdepartmental communication, and limited availability of trained staff have been identified as recurring barriers^(9,10,36), which aligns with the results of this study.

The findings suggest the need to move toward a comprehensive quality management model for this service, aligned with international standards such as ISO 15189 and following processes for the gradual improvement of clinical laboratories, such as those proposed by the World Health Organization (WHO)⁽⁴⁰⁾, which highlight how quality management in clinical laboratories is strengthened through training, institutional leadership, and sustained improvements toward accreditation. In these improvement processes, academia can provide closer and more regular support to the services. This is the first study in Colombia to gather, from the perspective of laboratory staff, the factors that influence the sustainability of a quality management system. Its results provide evidence to guide institutional decision-making and the design of public policies in the health sector. However, this study should be replicated in other municipalities, as the findings are limited to two municipalities in a region of the country with highly vulnerable health service infrastructure, which may limit the generalizability of the findings. Furthermore, to obtain a broader perspective from all stakeholders, it would be advisable to include institutional leaders or indirect service users, such as medical staff.

CONCLUSIONS

The study demonstrated that the quality of clinical laboratory services is determined by a coordinated management approach encompassing the organizational structure, process standardization, and staff working conditions. Limited knowledge among staff regarding current regulatory and technical frameworks was identified, hindering their active participation in quality systems. The main training weaknesses were found in continuing education programs, which focus almost exclusively on the preanalytical phase and internal quality control, neglecting essential aspects such as metrological traceability, measurement uncertainty, method validation, and risk management—all of which are fundamental to current standards. In addition, marked differences were observed between public and private laboratories in terms of infrastructure, available resources, and employment conditions—factors that influence the work environment, staff motivation, and their sense of belonging, ultimately affecting the reliability of results and patient safety.

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