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ORIGINAL

Relevance of the Master's Program in Clinical and Molecular Laboratory Diagnosis at the National University of Chimborazo, Ecuador

Pertinencia de programa de Maestría en Diagnóstico de Laboratorio Clínico y Molecular de la Universidad Nacional de Chimborazo, Ecuador

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ABSTRACT

Introduction: relevance studies are a crucial tool to ensure the quality and effectiveness of master's programs, ensuring they meet the expectations of students, society, and educational institutions, the objective of the research was to evaluate the relevance of the Master's program in Clinical and Molecular Laboratory Diagnosis at the National University of Chimborazo concerning current trends, advances in science and technology, and professional demand.
Methods: descriptive investigation with a quantitative approach. The population consisted of 238 professionals, divided into two samples: "A" composed of 205 clinical laboratory professionals, and "B" composed of 23 employers in the same field. A non-probabilistic convenience sampling was used for both samples.
Results: the study confirmed the need to establish this master's program to improve the training of clinical laboratory graduates. 99 % of the respondents expressed interest in pursuing postgraduate studies, supporting the program's feasibility. The 23 employers supported the training of professionals with advanced studies, allowing them to update their knowledge. The program's relevance lies in addressing key areas identified as weaknesses, highlighting the urgency of improving training to provide more effective patient care.
Conclusions: the study confirmed the need for the master's program, with 99 % of respondents interested and employer support, highlighting the importance of updating knowledge and improving skills to offer more effective clinical services.

Keywords: Clinical Laboratory; Laboratory Diagnosis; Graduate Education; Molecular Diagnosis; Professional Competencies.

RESUMEN

Introducción: los estudios de pertinencia son una herramienta crucial para garantizar la calidad y eficacia de los programas de maestría, asegurando que estos cumplan con las expectativas de los estudiantes, la sociedad y las instituciones educativas, el objetivo de esta investigación fue evaluar la pertinencia del programa de Maestría en Diagnóstico de Laboratorio Clínico y Molecular de la carrera de laboratorio clínico de la Universidad Nacional de Chimborazo en relación con las tendencias actuales, los avances en ciencia y tecnología, y la demanda profesional.
Método: investigación descriptiva con un enfoque cuantitativo. La población estuvo conformada por 238 profesionales se dividió en dos muestras: la "A" compuesta por 205 profesionales del laboratorio clínico, y la "B" por 23 empleadores en el mismo ámbito. Se empleó un muestreo no probabilístico por conveniencia para ambas muestras.

Resultados: se confirmó la necesidad de establecer esta maestría para mejorar la formación de los licenciados en laboratorio clínico. El 99 % de los encuestados expresó interés en cursar estudios de cuarto nivel, respaldando la viabilidad del programa. Los 23 empleadores respaldaron la formación de profesionales con estudios avanzados, permitiéndoles actualizar sus conocimientos. La relevancia del programa radica en abordar áreas clave identificadas como puntos de debilidad, destacando la urgencia de mejorar la formación para ofrecer un servicio más eficaz a los pacientes. **Conclusiones:** el estudio confirmó la necesidad de la maestría, con un 99 % de interés por parte de los encuestados y respaldo de empleadores, destacando la relevancia de actualizar conocimientos y mejorar competencias para ofrecer un servicio clínico más eficaz.

Palabras clave: Laboratorio Clínico; Diagnóstico de Laboratorio; Educación de Posgrado; Diagnóstico Molecular; Competencias Profesionales.

INTRODUCTION

Text Higher Education Institutions (HEIs) face the challenge of inserting themselves into a broad, global, complex and changing social and work world, which demands new and greater professional competencies associated with the knowledge society; in addition to the requirements of efficiency in management. To respond to these challenges, HEIs must develop an institutional climate that promotes a close relationship with society, as well as appropriate environments and a curriculum that integrates teaching, research and linkage with society in a pyramidal way.[1]

In recent decades, higher education in Latin America and specifically in Ecuador has undergone significant transformations. However, challenges persist in the legal sphere, financial restrictions and difficulties in accessing education for vulnerable groups, as well as a diversity of institutional structures that still represent challenges for the educational system.[2]

The Universidad Nacional de Chimborazo (Unach) has proposed an innovative postgraduate program in various areas, in line with its mission and educational model, following the guidelines of the Council of Higher Education (CES).[3] This university offers a bachelor's degree in clinical laboratory to train outstanding professionals in clinical diagnosis. Proposing a specialized master's program in clinical and molecular diagnosis would be invaluable for training experts in this field. This program would allow graduates to expand their knowledge in diagnostic techniques and develop research and teaching skills. Unach is committed to training professionals who are researchers and entrepreneurs, based on scientific and axiological foundations to solve problems in the community and the country.[4]

The expansion and diversification of the academic offerings in higher education, together with its growing internationalization and globalization, pose important challenges that must be taken into account in curricular design processes. Currently, university teaching faces a greater demand and diversity of students.[5]

In Ecuador, fourth-level training, whether in public or private institutions, is governed by the Organic Law of Higher Education (LOES).[6] This legislation arises as a response to the challenges and demands that the accelerated technological and social development of the 21st century has imposed on this educational level. Among these challenges, the need to adopt a new approach stands out, based on the principles of excellence, quality and relevance as a need to respond to expectations, social needs, national planning, development regime, perspective of scientific, humanistic, technological development world and cultural diversity.[2]

In this sense, it is crucial that the generic and specific competencies of fourth-level academic programs are aligned in a coherent manner with the educational model of Unach and with the social responsibility for which they were created. This implies a dialectical approach that is based on the analysis of the relationship between the university and society.[7]

The Master's Degree in Clinical and Molecular Laboratory Diagnosis of Unach is relevant due to the technological progress in molecular biology, genomics and proteomics, which improves diagnostic accuracy and disease treatment. The demand for professionals trained in these technologies reinforces the need for the program. The objective of this study was to evaluate the relevance of the program in relation to current trends, advances in science and technology, and professional demand.

METHOD

Cross-Sectional Study with a Quantitative Approach.

Population and Sample

The study population was divided into two samples: Sample "A" comprised clinical laboratory professionals, and Sample "B" included employers in the same field. Sample "A" was composed of 205 professionals who graduated from the program between January 2018 and June 2022. The sample size was determined using non-

probabilistic convenience sampling. Sample "B" consisted of 23 employers from public and private laboratories belonging to the National Health System of Zone 3, where the program's graduates worked. Convenience non-probabilistic sampling was used for their selection. This technique allows the selection of subjects according to their accessibility and proximity to the researcher, justifying its use due to the geographical dispersion of graduates in the country.

Variables

Relevance of the master's program (evaluated in relation to current trends, advances in science and technology, and professional demand)

Study Population: 205 clinical laboratory professionals and 23 employers

Interest in pursuing postgraduate studies (99 % of respondents)

Support from employers (training of professionals with advanced studies)

Areas of weakness in current training

Improvement in training to offer more effective service to patients

Processing and analysis techniques

The techniques and instruments used for data collection were document review and application of surveys. Two surveys were conducted to explore the inclination of professionals towards postgraduate studies, as well as the justification for demand and employability. Both instruments were validated by applying an expert rubric.

A descriptive statistical analysis was carried out, calculating absolute and relative percentage frequencies.

Ethical Aspects

The ethical principles of scientific research were taken into account by respecting the subjects' self-determination regarding their participation in the research process. Additionally, the respective authorizations were obtained with the commitment of non-maleficence and non-malevolence in the use of the data obtained.

RESULTS

During the analysis process to evaluate the relevance of the Master's program, the objectives of the Ministry of Public Health of Ecuador were taken into account. These objectives include improving the quality of health services, facilitating equitable access to advanced diagnostics, and being crucial in the prevention and control of diseases.

Market demands and existing needs were examined, identifying areas that require strengthening to improve the performance of professionals in healthcare institutions. This will significantly contribute to solving the population's health problems by applying updated knowledge, mastering advanced methodological tools, and utilizing the recent survey results (table 1).

Table 1. Analysis of the relevance of the Master's program in Clinical and Molecular Laboratory Diagnosis at Unach's Clinical Laboratory program

Category	Analysis Results
Market Demand	Ninety-nine percent of respondents want to pursue a postgraduate degree. This demonstrates a significant demand, supporting the feasibility and relevance of launching the program.
Region's Needs	The availability of clinical and molecular laboratory services is limited in Zone 3. A master's program in this area could meet the demand for trained professionals.
Curriculum Design	It consists of 2 academic periods and includes the planning, organization, and development of the study plan. The first period: consists of 5 modules comprising advanced disciplinary training units and the first graduation project unit. The second period: consists of 5 modules comprising advanced disciplinary training units and the second graduation project unit.
Infrastructure and Resources	Laboratories equipped for performing clinical and molecular laboratory techniques Bibliographic resources, both digital and physical Classrooms and spaces designated for theoretical instruction, conferences, and seminars

To evaluate the curricular component in relation to the training process, the opinions of the graduates from sample "A" and their employers from sample "B" were analyzed. The results are presented in table 2.

Table 2. Opinions of graduates and employers on the relevance of implementing a Master's program in Clinical and Molecular Laboratory Diagnosis in the Clinical Laboratory program at Unach

Category	Analysis Results
Need for training professionals with fourth-level studies	The 91 % of surveyed employers support the importance of training clinical laboratory professionals with postgraduate studies.
Priority to professionals with a master's degree for admission to the institution.	When it comes to the preference for selecting professionals with a master's degree in institutions, 59 % of employers are completely in favor.
Postgraduate studies would improve the performance of professionals	96 % of employers maintain that pursuing postgraduate studies enhances the performance of laboratory professionals working within institutions.
Professionals interested in enhancing their knowledge through a master's degree	99 % of professionals are interested in improving their education, a key signal of demand to launch the postgraduate program.
Areas that need strengthening	Mainly strengthen the areas of microbiology, molecular biology, clinical biochemistry, and research.
Limitations to finding employment	Job saturation, lack of academic training in specific areas, low appreciation of the obtained degree, and lack of experience
Remuneration based on the minimum wage established in Ecuador	55 % of respondents report receiving 1 to 2 basic salaries for their work.
Assigned functions	69,7 % of surveyed professionals perform the function of laboratory diagnosis, which includes pre-analytical, analytical, and post-analytical processes.
Social sector to which the institution where the graduate worked belongs	The private sector turned out to be the most represented.

The analysis of the variables included in the questionnaire revealed that 91 % of employers consider the creation of a postgraduate program necessary for training clinical laboratory professionals. When exploring occupational fields, 96 % of employers agree that employment opportunities significantly increase for professionals who have pursued postgraduate studies. This increase translates into better job performance within the institution, which, in turn, reflects in providing more efficient and quality services to patients. Specifically, the survey revealed that the main areas requiring strengthening to improve the performance of laboratorians in institutions are molecular biology, clinical biochemistry, and microbiology.

The results of the survey of sample "B" indicate that employers especially value postgraduate studies, general and specific knowledge, and skills when hiring clinical laboratory personnel. These competencies are necessary for better performance in certain areas of professional practice, as they are closely related to the tasks these professionals perform in various institutions.

DISCUSSION

Text González et al.[8] highlight the importance of updating educational programs and connecting them with the labor market. This involves anticipating market needs to transform reality. In Ecuador, a social focus in master's programs can positively impact the country's economic, cultural, and social development.[3]

Unach implements a relevance evaluation process for its master's programs. First, the program's need, alignment with public policies, and development trends are analyzed. Subsequently, the curricular structure is designed, covering the admission and graduation profiles, infrastructure, faculty, budget, linkage, and research, treating the program comprehensively with the substantive functions. Finally, the program is uploaded to the CES platform for approval.[3] In this context, measures have been taken to align the master's program with the demands of postgraduate training. An integral relevance study was conducted, following the guidelines established by the university. This proposal is closely linked to development projections and key government policies in Ecuador, addressing the training needs of fourth-level professionals in the health sciences area.

Regarding the evaluation of the master's program's relevance, the study data indicate that most surveyed professionals, mainly residents of Pichincha and Chimborazo, show notable interest. The strategic location of Riobamba facilitates access for those living in these central provinces. Since many of them do not hold a postgraduate degree, the master's program presents an opportunity to improve their academic training.

Ecuador's 2021-2025 Plan for the Creation of Opportunities[9] seeks to address various challenges in areas such as the economy, society, comprehensive security, ecological transition, and institutions. This plan is crucial for transforming the country into a prosperous nation with equitable opportunities. The Master's program in Clinical and Molecular Laboratory Diagnosis would contribute to these goals by providing greater job opportunities and improving performance in areas such as molecular diagnosis, biochemistry, and microbiology. This would result in greater standardization, efficiency, and performance in public and private institutions, meeting health needs, especially in zone 3 of the country.

A considerable number of recent graduates currently face unemployment or short-term contracts, forcing them to accept precarious jobs that do not match their professional profiles. It is essential to highlight this phenomenon, as its consequences affect both the professionals and the labor market as a whole.[10] The processes

of job insertion focus on identifying behavior and knowledge trends for hiring candidates, aligning with public policies and the socio-educational, business, and employer interest conditions.[11] In this social context, job incorporation will require increasing levels of professional training.[12]

The general perception among respondents is that obtaining a master's degree would open new job opportunities, improve job performance, facilitate the development of specific competencies, and lead to more favorable economic remuneration. Other studies[13,14,15] have also found evidence related to the motivation for pursuing master's studies to aspire to better job offers.

This postgraduate proposal is strategically aligned with current field needs, placing it favorably to generate demand. The majority interest expressed by professionals in pursuing fourth-level studies as a means to improve their professional training indicates considerable demand supporting the viability and relevance of opening the program.

In this study, the surveyed employers fully support the need to train clinical laboratory professionals with fourth-level studies. This training will ensure that university graduates are prepared to complement, update, and deepen their knowledge and skills directly related to their professional practice, improving job performance, contributing to research centers and hospitals, and providing higher-quality patient services.

Employers and professionals emphasize the need to improve training, especially in areas such as molecular biology, clinical biochemistry, microbiology, and quality control. These areas are identified as weak points, highlighting the urgency to strengthen training to provide more effective patient services. Oreyana and Sanhueza[16] suggest that health institutions implement training actions to develop competencies in graduates, which they consider crucial for improving the quality of health services.

Fourth-level training, according to LOES[6], addresses current educational challenges due to technological and social progress. In the clinical laboratory, automated technology, informatics, and artificial intelligence are fundamental. To adapt, health services must update and humanize their work, using innovative methods to determine analytes in various samples.[17-19]

Additionally, as part of the program design, a competitive advantage analysis was conducted, considering similar program offerings at national and international levels to determine the differentiating factor of this program. This approach was based on the specific regulatory requirements of the Ecuadorian context and the academic and professional standards necessary for the effective performance of the master's functions. This approach ensures human mobility within and outside the country, guaranteeing the program's relevance and quality in different work scenarios.

The curriculum subjects were strategically distributed according to their specific objectives in two curricular organization units: the "advanced disciplinary training unit" and the "graduation unit." These are integrated coherently with the fields of epistemological training, advanced research, and professional training, also responding to Unach's educational model.

For this particular program, the "advanced disciplinary training unit" includes subjects such as Bioethics and Interculturality, Hematology, Genetics and Molecular Biology, and Biochemistry in module 1. In module 2 of the same unit, subjects such as Clinical Microbiology, Immunology and Immunodiagnosis, Clinical Biochemistry and Quality Control, and Laboratory Legislation are included.

On the other hand, the "graduation unit" encompasses the study of Graduation Seminar I and Graduation Seminar II. This curriculum design aims to offer a comprehensive structure that addresses the fundamental aspects of advanced disciplinary training and culminates with a specific focus on the graduation stage.

The thesis work will be individual and incorporate a descriptive, analytical, or correlational research component. The study mode will be face-to-face, as provided in Article 71 of the Academic Regime Regulation.[20] Enrollment is projected for a total of 30 students. The linkage aspect is also considered as part of the solution to the identified problem, allowing future professionals to gain more on-the-ground experience, share experiences, and, above all, understand the realities each community and citizen faces.

To improve future research, it is necessary to consider expanding the sample size and study duration, as well as incorporating a control group. These aspects were identified as limitations in this relevance study.

CONCLUSIONS

The study concludes that implementing the Master's program in Clinical and Molecular Laboratory Diagnosis at the National University of Chimborazo is relevant and necessary to elevate the training of laboratory professionals in zone 3. Additionally, the master's program offers clinical laboratory graduates the opportunity to enrich their job competencies and update their knowledge, allowing them to perform more effectively in various fields. Finally, employers consider it essential for graduates to pursue master's studies to be prepared for the current challenges of the profession, as development trends in the health field demand professionals capable of contributing their knowledge to the advancement of science

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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