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Determinants of the Non-Integration of Vaccination Education in Paramedical Training: A Study in the Instituts Supérieurs des Techniques Médicales of Kinshasa in Democratic Republic of the Congo

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Abstract

Introduction: Vaccination is one of the most effective public health interventions for preventing infectious diseases and reducing mortality. However, in many low- and middle-income countries, vaccinology remains insufficiently integrated into the training curricula of health professionals. In the Democratic Republic of the Congo, the *Instituts Supérieurs des Techniques Médicales* (ISTM)—**Higher Institutes of Medical Techniques—in Kinshasa** play a critical role in training healthcare providers involved in immunization programs. This study aimed to analyze the factors underlying the lack of integration of vaccination courses within ISTMs in Kinshasa. **Methods:** An analytical cross-sectional observational study was conducted in 2024 across eight ISTMs in the city of Kinshasa. The study included a sample of 555 participants, comprising final-year students, teaching staff, and administrative personnel. Data were collected using a structured questionnaire administered through the KoboToolbox platform and supplemented by a documentary review of academic curricula. Statistical analyses were performed using SPSS software, including descriptive statistics, Pearson's chi-square test for bivariate analysis, and logistic regression to identify factors associated with the non-integration of vaccination courses. **Results:** Most participants were students (94.77%), with a mean age of 27 ± 6.44 years. The majority of respondents acknowledged the importance of vaccination education (99.28%) and supported the introduction of a dedicated course within training programs (81.8%). However, 70.3%

reported that they had never received formal instruction on vaccination during their training. The main barriers to course integration included a lack of teaching resources (80.72%), insufficient teacher training (67.21%), and inadequate materials for practical sessions (54.05%). Multivariate analysis revealed that financial constraints (OR = 3.21; $p = 0.007$), lack of teacher training (OR = 4.31; $p < 0.001$), insufficient teaching materials (OR = 2.47; $p = 0.009$), and limited access to digital tools (OR = 6.66; $p < 0.001$) were significantly associated with the non-integration of vaccination courses. **Conclusion:** The absence of vaccination courses in ISTMs in Kinshasa is primarily driven by institutional, pedagogical, and technological constraints. Integrating a structured vaccinology module into paramedical curricula, alongside strengthening faculty capacity and improving teaching resources, could enhance the training of future healthcare professionals and improve the effectiveness of immunization programs in the Democratic Republic of the Congo.

Keywords

Vaccination, Vaccinology, Curriculum, Paramedical Training, ISTM, Democratic Republic of the Congo

1. Introduction

Vaccination is one of the most effective and cost-efficient public health interventions for preventing infectious diseases and reducing mortality, particularly among children. According to the World Health Organization (WHO), immunization currently prevents between 3.5 and 5 million deaths each year worldwide by protecting against diseases such as measles, poliomyelitis, diphtheria, tetanus, and pertussis [1].

Beyond its impact on mortality, vaccination is also one of the most cost-effective public health strategies, contributing significantly to the reduction of morbidity and to improvements in life expectancy across many regions of the world [2]. Despite these substantial advances, many low- and middle-income countries continue to face major challenges in achieving optimal vaccination coverage, largely due to structural, organizational, and human resource constraints that limit the effectiveness of immunization programs.

The success of vaccination programs depends not only on vaccine availability and the logistical organization of health services but also on the technical and scientific competencies of the healthcare professionals responsible for their implementation. Vaccinology, as a scientific discipline encompassing vaccine immunology, immunization program management, cold chain logistics, surveillance of vaccine-preventable diseases, and communication about vaccines, is therefore a critical component of health professional training. Adequate training in this field contributes to improving the quality of vaccine delivery, strengthening public trust in immunization programs, and reducing vaccine hesitancy [3] [4].

In many high-income countries, vaccinology is systematically integrated into

medical and paramedical curricula, enabling students to acquire both theoretical knowledge and practical skills necessary for planning, implementing, and evaluating immunization programs [5]. In contrast, in many developing countries—particularly in sub-Saharan Africa—vaccination education remains fragmented, insufficiently structured, or in some cases absent from health training programs.

Several studies have shown that inadequate training in vaccination constitutes a major barrier to strengthening health systems and improving immunization coverage. Commonly identified factors include a shortage of qualified instructors, insufficient up-to-date teaching resources, the absence of national training frameworks, and the prioritization of curative disciplines over preventive approaches within health training curricula [6]. These educational gaps may lead to insufficient preparedness among future healthcare professionals in managing immunization programs and may compromise the quality of vaccination services.

In the Democratic Republic of the Congo (DRC), the *Instituts Supérieurs des Techniques Médicales* (ISTM)—**Higher Institutes of Medical Techniques—in Kinshasa** play a strategic role in training paramedical professionals, including health technicians and nurses who operate on the front line of healthcare delivery. These professionals are essential actors in the implementation of the Expanded Program on Immunization (EPI), which aims to protect populations against vaccine-preventable diseases and improve public health at the national level. However, despite the importance of these programs, the formal integration of vaccination teaching into ISTM curricula remains limited and insufficiently documented.

In the city of Kinshasa, which hosts a significant proportion of the country's paramedical training institutions, academic programs show varying levels of integration of vaccination-related content. Some institutions address vaccination indirectly through public health or pediatrics courses, while others lack a dedicated vaccinology module altogether. This situation raises important questions regarding the institutional, pedagogical, and organizational factors that may explain the absence or insufficient integration of this teaching within training programs.

Despite the strategic importance of vaccination for public health and health system performance, few studies have systematically examined the determinants of vaccinology integration in paramedical training programs in the Democratic Republic of the Congo. The lack of empirical evidence on this issue limits the ability of academic and health policymakers to implement curriculum reforms tailored to the needs of the health system.

In this context, the present study aims to analyze the factors underlying the non-integration of vaccination courses in the *Instituts Supérieurs des Techniques Médicales* of Kinshasa. More specifically, it seeks to identify the pedagogical, institutional, and organizational barriers that may influence the integration of this teaching into training curricula, with a view to proposing actionable strategies to strengthen the training of future healthcare professionals and support national immunization efforts.

2. Materials and Methods

2.1. Study Design and Setting

This was an analytical cross-sectional observational study conducted in the field of public health education, specifically focusing on the teaching of vaccination (vaccinology) within the *Instituts Supérieurs des Techniques Médicales* (ISTM) in Kinshasa, Democratic Republic of the Congo (DRC). This study design allows for the examination of relationships between explanatory variables and the integration of vaccination courses into paramedical training programs at a given point in time [7].

The study was carried out between January and July 2024 in eight paramedical training institutions located in Kinshasa: ISTM Matete, ISTM UFA, ISTM Croix-Rouge, ISTM Kinshasa, ISETEM, ISTM Ngiri-Ngiri Kimbanguiste, ISTAM Kinkole, and ISTM CEPROMAD.

These institutions were selected due to their key role in training paramedical professionals involved in the implementation of vaccination programs in the Democratic Republic of the Congo.

2.2. Study Population

The study population consisted of all stakeholders involved in the training process within the selected ISTMs, including:

- final-year students enrolled in paramedical programs;
- teaching staff involved in academic training;
- administrative personnel engaged in academic management.

Final-year students were prioritized, as they represent future healthcare professionals likely to be directly involved in national immunization programs.

Inclusion and exclusion criteria

Inclusion criteria

The following participants were included:

- final-year students officially enrolled in the selected ISTMs;
- teachers involved in delivering public health or vaccination-related courses;
- administrative staff involved in academic program management;
- participants who provided informed consent.

Exclusion criteria

The following were excluded:

- students absent during data collection;
- teachers or administrative staff who declined participation;
- incomplete questionnaires or those containing inconsistent data.

2.3. Sample Size

The minimum sample size was estimated using Schwartz's formula for cross-sectional studies:

$$n = \frac{Z^2 \times p(1-p)}{d^2}$$

where:

- n = minimum sample size;
- Z = standard normal deviate corresponding to a 95% confidence level (1.96);
- p = expected proportion of the phenomenon under study;
- d = desired precision (margin of error).

In the absence of prior data on the proportion of vaccination course integration in ISTMs in Kinshasa, a conservative estimate of 50% was used to maximize the sample size. After applying the formula and accounting for a 10% non-response rate, the minimum sample size was set at 555 participants.

2.4. Sampling Method

A stratified probabilistic sampling method was used to ensure balanced representation of participants from the different selected institutions [7].

First, the ISTMs were considered as institutional strata. Within each institution, participants were randomly selected from among final-year students, teaching staff, and administrative personnel.

This approach helped reduce selection bias and improve sample representativeness.

A total of 620 participants were invited, of whom 555 were included in the final analysis, yielding a response rate of 89.5%.

The distribution by category was as follows:

- final-year students: n = 526;
- teachers: n = 18;
- administrative staff: n = 11.

A two-stage stratified random sampling method was used:

1) Stratification by institution (ISTM);

2) Within-institution stratification by participant category.

Within each stratum, a list of eligible participants was established, followed by simple random selection.

2.5. Study Variables

Dependent variable

The dependent variable was the level of integration of vaccination education in ISTM curricula. This variable was constructed using a triangulation of two data sources:

(i) participants' reports regarding the existence of formal vaccination teaching;

(ii) documentary analysis of curricula and course outlines.

Three categories were defined:

- **Full integration**: presence of a structured, dedicated vaccinology module in the curriculum;

- **Partial integration**: vaccination-related content embedded within other courses (e.g., public health, pediatrics) without a dedicated module;
- **No integration**: absence of identifiable vaccination-related content in the curriculum.

For statistical analysis, this variable was dichotomized into:

- integration (full or partial)
- non-integration

Independent variables

The explanatory variables included:

1) Sociodemographic characteristics

- age
- sex
- marital status
- education level
- occupation

2) Knowledge and perception-related factors

- level of knowledge about vaccination
- perception of the importance of vaccination courses
- practical experience in vaccine administration

3) Institutional and pedagogical factors

- availability of teaching resources
- teacher training
- availability of instructional materials
- access to online modules
- availability of digital tools
- collaboration between ISTMs and the Expanded Programme on Immunization (EPI)

2.6. Data Collection

Data were collected using a structured questionnaire administered face-to-face by trained interviewers. The questionnaire included closed and semi-closed questions addressing sociodemographic characteristics, knowledge of vaccination, participants' perceptions, as well as barriers and needs related to the integration of vaccination courses.

Data collection was conducted using the KoboToolbox digital platform, allowing electronic data entry and reducing transcription errors.

In addition, a documentary review of curricula and course outlines from the different institutions was performed to identify the presence or absence of a specific vaccination module.

Prior to the main data collection, a pilot test of the questionnaire was conducted on a small sample of students to assess clarity and improve the validity of the data collection tool.

2.7. Measurement of Key Variables

- Level of knowledge: assessed using 10 questions (immunization, vaccination schedule, cold chain). Scores were categorized as:
  - low (< 50%)
  - moderate (50% - 74%)
  - high (≥ 75%)
- Financial constraints: binary variable (yes/no), based on participants' perception of insufficient institutional funding.
- Teacher training: considered insufficient when participants reported lack of continuous or specialized training in vaccinology.
- Access to digital tools: assessed based on availability of computers, internet access, and learning platforms (composite score dichotomized).

2.8. Statistical Analysis

The collected data were exported and analyzed using SPSS version 25. The statistical analysis was conducted in three stages:

2.8.1. Descriptive Analysis

Qualitative variables were summarized using frequencies and percentages, while quantitative variables were described using means and standard deviations.

2.8.2. Bivariate Analysis

Pearson's chi-square (χ^2) test was used to examine associations between explanatory variables and the integration of vaccination courses in ISTMs. Statistical significance was set at $p < 0.05$.

2.8.3. Multivariate Analysis

Binary logistic regression was performed to identify factors independently associated with the non-integration of vaccination courses. Results were presented as Odds Ratios (OR) with their 95% confidence intervals (95% CI).

Variables included in the logistic regression model were selected based on a p-value < 0.20 in bivariate analysis, as well as their theoretical relevance. Independent variables were coded as binary variables (0 = absence, 1 = presence). A binary logistic regression model was fitted using a backward stepwise approach. Multicollinearity among explanatory variables was assessed using the Variance Inflation Factor (VIF). Clustering effects at the institutional level (ISTM) were not explicitly modeled, which constitutes a methodological limitation.

2.9. Ethical Considerations

This study was conducted in accordance with ethical principles governing research involving human subjects. Authorization to conduct the study was obtained from the academic authorities of the participating institutions.

Prior to data collection, each participant received a detailed explanation of the study objectives and provided informed consent. Participation was voluntary, and

participants were free to withdraw at any time without any consequences.

Confidentiality was ensured by anonymizing questionnaires and using the data solely for scientific purposes.

3. Results

3.1. Univariate Analysis

3.1.1. Institutional Characteristics of Participants

A total of 555 participants were included in the study, drawn from eight *Instituts Supérieurs des Techniques Médicales* (ISTM) in Kinshasa. The majority of participants were from ISTM Croix-Rouge (33.69%) and ISTM Kinshasa (28.47%), while the other institutions contributed smaller proportions (**Table 1**).

Table 1. Distribution of participants by ISTM.

ISTM	Frequency	%
ISTM Matete	31	5.59
ISTM UFA	47	8.47
ISTM Croix-Rouge	187	33.69
ISTM Kinshasa	158	28.47
ISETEM	42	7.57
ISTM Ngiri-Ngiri Kimbanguiste	16	2.88
ISTAM Kinkole	34	6.13
ISTM CEPROMAD	40	7.20
Total	**555**	**100**

Furthermore, 87.5% of the institutions were privately managed, compared to 12.5% under public management.

3.1.2. Sociodemographic Characteristics

The mean age of participants was 27 ± 6.44 years, with the majority under 30 years of age (80.6%). The sex distribution was nearly equal (**Table 2**).

Table 2. Sociodemographic characteristics of participants.

Variable	Frequency	%
Age (years)		
< 24	228	41.1
24 - 29	219	39.5
30 - 36	63	11.4
37 - 43	24	4.3
≥ 44	21	3.8
Sex		
Male	280	50.45
Female	275	49.55

Continued

Marital status		
Single	431	77.66
Married	119	21.44
Divorced	4	0.72
Widowed	1	0.18
Profession		
Student	526	94.77
Administrative staff	11	1.98
Teaching assistant	4	0.72
Senior lecturer	9	1.62
Professor	5	0.90

These findings indicate that the sample predominantly consisted of paramedical students, reflecting the target population of future healthcare providers.

3.1.3. Knowledge and Perceptions of Vaccination

Most participants (72.97%) considered that the benefits of vaccines outweigh their side effects, while 99.28% agreed that vaccination courses are important for future healthcare professionals (Table 3).

Table 3. Participants' perceptions of vaccination.

Variable	Frequency	%
Benefits of vaccines outweigh side effects		
Yes	405	72.97
No	150	27.03
Vaccination course is important for future providers		
Yes	551	99.28
No	4	0.72

These results reflect a highly favorable perception of vaccination and its teaching among participants.

3.1.4. Level of Knowledge and Training on Vaccination

Despite this positive perception, 70.3% of participants reported that they had never received a specific course on vaccination during their training (Table 4).

Table 4. Knowledge level and training on vaccination.

Variable	Frequency	%
Level of knowledge on vaccination		
Low	51	9.70

Continued

Moderate	229	43.54
High	246	46.77
Has received a vaccination course		
Yes	156	29.7
No	370	70.3

These findings highlight a notable paradox: a relatively acceptable level of knowledge despite the absence of structured formal teaching in most training programs.

3.1.5. Barriers to the Integration of Vaccination Courses

The main barriers identified are presented in Table 5.

Table 5. Barriers to the integration of vaccination courses.

Barriers	Yes (%)	No (%)
Lack of teaching resources	80.72	19.28
Insufficient teacher training	67.21	32.79
Lack of materials for practical sessions	54.05	45.95
Curriculum overload	17.48	82.52
Low student motivation	17.84	82.16

The lack of teaching resources emerged as the most prominent barrier to the integration of vaccination courses.

3.2. Bivariate Analysis

Factors Associated with Course Integration

Bivariate analysis revealed statistically significant associations between the integration of vaccination courses and certain sociodemographic and academic variables (Table 6).

Table 6. Association between participant characteristics and course integration.

Variable	χ^2	p-value
Profession	14.45	0.006
Education level	42.09	<0.001
Level of study	13.08	0.011

These results suggest that participants' academic profiles significantly influence the integration of vaccination courses.

3.3. Multivariate Analysis

Logistic regression analysis identified several factors associated with the non-in-

tegration of vaccination courses (Table 7).

Table 7. Factors associated with non-integration of vaccination courses.

Factor	OR	95% CI	p-value
Financial constraints	3.21	1.38 - 7.49	0.007
Insufficient teacher training	4.31	2.07 - 8.94	<0.001
Lack of teaching materials	2.47	1.25 - 4.88	0.009
Limited access to digital tools	6.66	3.29 - 13.49	<0.001

Limited access to digital tools was the factor most strongly associated with the non-integration of vaccination courses.

3.4. Curriculum Analysis of ISTMs

Documentary analysis of curricula showed that:

- 2 ISTMs (25%) had a dedicated vaccination module;
- 3 ISTMs (37.5%) had partial integration;
- 3 ISTMs (37.5%) had no formal vaccination content.

These findings highlight a substantial heterogeneity in the integration of vaccinology across institutions.

4. Discussion

The present study aimed to identify the factors underlying the non-integration of vaccination courses into the training programs of the *Instituts Supérieurs des Techniques Médicales* (ISTM) in Kinshasa. The findings highlight several institutional, pedagogical, and technological determinants that may influence the integration of vaccinology into paramedical curricula. In a context where vaccine-preventable diseases continue to impose a significant burden on health systems, strengthening the competencies of healthcare professionals remains a critical lever for improving the effectiveness of immunization programs [1] [8].

The analysis of sociodemographic characteristics shows that the study population consisted predominantly of young students nearing the completion of their training. This demographic profile is consistent with observations from several health training institutions across Africa. For instance, Afolabi and Adebisi reported that students represent a key component of the future workforce involved in vaccination programs within African health systems [9]. These findings underscore the importance of strengthening vaccination-related competencies during initial training to ensure the availability of a qualified health workforce.

The results also indicate that the majority of participants recognize the importance of vaccination and support the introduction of a dedicated course within paramedical training programs. This positive perception is consistent with the work of Dubé, Vivion, and MacDonald, who demonstrated that health sciences students generally exhibit favorable attitudes toward vaccination and acknowledge its

central role in preventing infectious diseases [3]. Similarly, Larson et al. emphasized that healthcare professionals' knowledge and attitudes play a crucial role in shaping public confidence in immunization programs [4].

However, despite this favorable perception, a substantial proportion of participants reported never having received formal training in vaccination during their studies. This discrepancy between the recognition of vaccination importance and the absence of structured teaching reflects a challenge observed in several low-resource settings. Afolabi and Adebisi notably highlighted that gaps in the training of healthcare professionals constitute a major barrier to the effective implementation of immunization programs in Africa [9].

Although the results indicate a moderate to high level of knowledge among a substantial proportion of participants, these findings should be interpreted with caution. Indeed, the absence of formal training reported by a large proportion of participants suggests that this knowledge may have been acquired through informal sources, such as practical training or internships, participation in vaccination campaigns, or exposure to media and other forms of non-structured learning. Therefore, self-reported knowledge does not necessarily reflect adequate academic preparation for managing vaccination programs.

This distinction is particularly important within the framework of competency-based education, where theoretical knowledge alone is insufficient to ensure safe and effective clinical practice. In line with Miller's pyramid of clinical competence, the assessment in this study primarily captures the "knows" level, without addressing higher levels such as "shows how" and "does", which are essential for vaccination practice.

These findings underscore the importance of integrating structured and standardized vaccinology education into paramedical training programs in order to ensure both theoretical understanding and practical competency among future healthcare professionals.

The findings further reveal the critical role of institutional factors in the non-integration of vaccination courses. The lack of teaching resources, insufficient training of instructors, and limited availability of materials for practical sessions emerged as the main barriers identified by participants. These observations align with the conclusions of the Lancet Commission on the Education of Health Professionals, led by Frenk et al., which emphasized that many health training systems in low- and middle-income countries suffer from inadequate educational infrastructure and insufficient learning resources [6].

Another key finding of this study concerns the impact of digital infrastructure on the integration of vaccination education. Multivariate analysis showed that limited access to digital tools was one of the strongest factors associated with the non-integration of vaccination courses. In a context where higher education is increasingly shifting toward hybrid and digital learning approaches, UNESCO highlights that access to information and communication technologies is essential for improving the quality of university education [10].

The results also emphasize the importance of strengthening collaboration between training institutions and national immunization programs. According to the World Health Organization, partnerships between educational institutions and immunization programs can enhance students' practical training and strengthen the competencies of future healthcare professionals [8].

At the global level, the WHO further underscores that health workforce training is a cornerstone for achieving the objectives of the Immunization Agenda 2030 [8]. In low- and middle-income countries, gaps in the training of healthcare professionals may limit the performance of vaccination programs and contribute to persistently low immunization coverage [1].

Despite certain limitations, including the high proportion of students in the sample and the cross-sectional nature of the study, this research represents one of the first empirical analyses of vaccinology integration into paramedical training programs in the Democratic Republic of the Congo. The findings provide valuable evidence to inform curriculum reforms and strengthen the training of healthcare professionals involved in immunization programs.

5. Study Limitations

This study has several limitations. First, the majority of participants were students, which may limit the representativeness of the perspectives of teachers and academic decision-makers. Second, the cross-sectional design does not allow for the establishment of causal relationships between the variables studied. Third, some data were based on self-reported responses, which may introduce social desirability bias. Finally, as the study was conducted only in Kinshasa, caution should be exercised when generalizing the findings to all paramedical training institutions in the Democratic Republic of the Congo.

6. Conclusions

This study highlights that the non-integration of vaccination courses into the training programs of the *Instituts Supérieurs des Techniques Médicales* (ISTM) in Kinshasa results from a complex interplay of institutional, pedagogical, and technological factors. Despite a broadly favorable perception among both students and instructors regarding the importance of vaccination in the training of future healthcare professionals, the effective integration of structured vaccinology teaching remains limited in several institutions.

The findings indicate that the main barriers to course integration are related to the lack of teaching resources, insufficient training of instructors, limited access to educational materials and digital infrastructure, as well as institutional financial constraints. These factors contribute to a persistent gap between the needs of the health system in terms of vaccination and the competencies acquired by future healthcare professionals during their training.

In a context where vaccine-preventable diseases continue to pose a major public health challenge in the Democratic Republic of the Congo, strengthening vacci-

nology training emerges as a strategic priority to improve the quality of vaccination services and support national immunization efforts.

The integration of a structured vaccinology module into ISTM curricula, combined with the development of appropriate teaching resources and continuous professional development for instructors, could enhance the competencies of future healthcare providers and improve the performance of vaccination programs.

7. Recommendations

Based on the findings, several recommendations can be proposed to promote the sustainable integration of vaccinology teaching into paramedical training programs:

7.1. Curriculum Reform

It is recommended that the Ministry of Higher and University Education, in collaboration with the Ministry of Health, develop a national competency framework in vaccinology for paramedical training institutions.

This framework could include:
- vaccine immunology
- cold chain management
- surveillance of vaccine-preventable diseases
- communication strategies and addressing vaccine hesitancy

7.2. Strengthening Teacher Capacity

Continuing professional development programs in vaccinology should be established for ISTM instructors to enhance their scientific and pedagogical competencies in this field.

These programs could be developed in partnership with:
- the Expanded Program on Immunization (EPI)
- schools of public health
- international organizations such as WHO and UNICEF

7.3. Development of Teaching Resources

Training institutions should be equipped with up-to-date teaching materials, including:
- vaccinology textbooks
- practical guidelines
- digital modules
- online learning platforms

The integration of digital technologies into teaching could improve access to educational resources and enhance the overall quality of training.

7.4. Strengthening Practical Training

It is also recommended to expand practical training opportunities in vaccination

services, allowing students to gain hands-on experience in the implementation of immunization programs.

These placements could be organized in collaboration with health facilities, health districts, and national immunization programs.

8. Study Contribution

This study makes several scientific and operational contributions to the field of health professional training and public health in the Democratic Republic of the Congo.

First, it represents one of the earliest empirical investigations examining the determinants of vaccinology integration into paramedical training programs within the *Instituts Supérieurs des Techniques Médicales* (ISTM) in Kinshasa. By identifying institutional, pedagogical, and technological barriers to the integration of vaccination courses, this study contributes to the existing body of literature on health workforce education in low- and middle-income countries.

Second, the findings highlight existing gaps in the initial training of future healthcare professionals in vaccination, despite a broadly favorable perception of the importance of this field. These results provide evidence that can inform curriculum reforms within paramedical training institutions.

Third, this study offers practical avenues for improvement, including strengthening teachers' pedagogical capacity, enhancing educational resources, and fostering partnerships between training institutions and national immunization programs.

Overall, this research contributes to ongoing efforts to strengthen the competencies of healthcare professionals and improve the performance of vaccination programs in the Democratic Republic of the Congo.

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Authors' Contributions

All authors have read and approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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