

# Assessing the Proficiency in Basic and Advanced Life Support Among Physicians in Ecuador: A Cross-Sectional Study

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**Purpose:** Cardiorespiratory arrest's unpredictability poses a global health challenge, with gaps in physicians' life support knowledge potentially leading to poor patient outcomes, a factor yet unstudied among Ecuadorian physicians. This study aims to elucidate the state of physicians' theoretical knowledge in Ecuador based on Basic Life Support (BLS) and Advanced Life Support (ALS) guidelines.

**Patients and methods:** A national cross-sectional online 35-questions survey was conducted between February and March 2023 using a self-administered, expert-validated questionnaire. Participants' responses were obtained through official social media groups (WhatsApp and Facebook). The survey evaluated the theoretical knowledge of BLS and ALS, with scores based on the number of correct answers out of a maximum of 10.0 points. For descriptive analysis, frequencies, percentages, means, and standard deviations (SD) were used. The *T*-test and one-way ANOVA were utilized to analyze the associations between knowledge levels and demographic and academic training variables of Ecuadorian doctors. Values of  $p < 0.05$  were considered statistically significant for all analyses.

**Results:** The survey garnered responses from 385 physicians, with a majority being female (56.6%) and possessing less than 3 years of work experience (75.1%). Of these, 71.7% and 51.9% held BLS and ALS certifications, respectively. Knowledge scores for BLS ( $5.8/10 \pm 1.6$ ) surpassed those for ALS ( $4.7/10 \pm 1.8$ ) ( $p < 0.001$ ). Physicians with less than 3 years of work experience exhibited higher knowledge scores in both BLS and ALS tests ( $p < 0.05$ ).

**Conclusion:** This study revealed a notable deficiency in the theoretical knowledge of BLS and ALS among surveyed Ecuadorian physicians. Factors such as prior certification and years of work experience appeared to influence knowledge levels. Continual training and updates in life support protocols at universities and healthcare institutions are key to enhancing physicians' skills and patient outcomes.

**Keywords:** cardiopulmonary resuscitation, knowledge, education, medical, physicians

## Introduction

Cardiorespiratory arrest, defined as an abrupt and unexpected cessation of heart function and spontaneous breathing, is potentially reversible, albeit catastrophic if not promptly addressed.<sup>1,2</sup> While the heart exhibits a relatively high tolerance to anoxia, the central nervous system suffers irreparable damage after 3 to 4 minutes of oxygen deprivation. Hence, immediate and effective resuscitation, underpinned by sound theoretical and practical knowledge, is of paramount importance.<sup>3</sup> According to the World Health Organization (WHO) (2015), cardiopulmonary arrest accounts for over 60% of ischemic heart disease fatalities.<sup>4</sup> In contemporary medical practice, Cardiopulmonary Resuscitation (CPR) is viewed as a series of maneuvers designed to reverse cardiorespiratory arrest. The primary goal is to substitute and

subsequently restore spontaneous breathing and circulation to avert death from irreversible damage to vital organs, primarily the brain.<sup>5</sup> With the evolution of CPR, two resuscitation frameworks, Basic Life Support (BLS) and Advanced Life Support (ALS), have been established. The American Heart Association (AHA) periodically updates these BLS and ALS guidelines to optimize patient outcomes.<sup>6</sup>

BLS maneuvers, while conceptually straightforward, focus on promoting systemic blood flow via thoracic compression and maintaining blood oxygenation. The quality of these maneuvers is pivotal to successful resuscitation.<sup>2,7</sup> Conversely, ALS encompasses more technically intricate maneuvers targeting the remaining links in the chain of survival, including rapid defibrillation and post-resuscitation care. ALS is typically conducted in hospital settings.<sup>7</sup> Effective training in both BLS and ALS is crucial for any healthcare system aiming to mitigate the severe impacts of cardiorespiratory arrest. Studies reveal that in-hospital and out-of-hospital cardiac arrest survival rates in developed countries stand at 17.6% and a dismal 6.4%, respectively.<sup>8</sup> The quality of resuscitation plays a crucial role in these outcomes. Lower survival rates are linked to ineffective resuscitation; however, when performed by trained professionals, BLS can improve survival rates by 7 to 24%.<sup>9–12</sup> Recent research has highlighted a deficiency in physicians' understanding of basic and advanced cardiopulmonary resuscitation.<sup>13,14</sup> Despite investigations in North America, Europe, and Africa, information regarding the comprehension of life support techniques in South America is scarce.

## Methods

### Study Question and Objectives

This study was developed using a testing strategy based on objectively describing a measurable phenomenon. Our research question was: What is the level of theoretical knowledge about BLS and ALS among Ecuadorian physicians?

Therefore, the primary objective of this study is to explore the theoretical understanding of BLS and ALS among doctors in Ecuador. Additionally, the secondary objectives of this research are: 1) identify the state of training and preparation in BLS and ALS among Ecuadorian physicians, 2) examining differences in the level of theoretical knowledge of BLS and ALS among Ecuadorian physicians based on demographic characteristics, and 3) evaluating differences in the level of theoretical knowledge of BLS and ALS among Ecuadorian physicians according to training variables.

### Study Design

We conducted a descriptive, cross-sectional, nationwide study utilizing a 35-question online survey to gather information from volunteer Ecuadorian physicians.

### Setting and Participants

Between January 2023 and March 2023, an online survey was executed, targeting graduate physicians based in Ecuador. A convenience, non-probabilistic sampling method was used for participant selection.

### Data Measurement and Questionnaire

Our research team crafted a comprehensive questionnaire to evaluate Ecuadorian physicians' knowledge of BLS and ALS. We formulated questions about the theoretical underpinnings of basic and advanced life support, drawing from the questionnaire developed by Passali et al,<sup>13</sup> the AHA guidelines for BLS and ALS in their 2020 update,<sup>6</sup> and the demographic and work characteristics of the participants.

Prior to full-scale deployment, we conducted a pilot study with 20 Ecuadorian physicians to detect potential comprehension issues or questionnaire design errors. Based on feedback from the pilot study, we revised several questions and finalized a 35-item Spanish questionnaire. This questionnaire was subsequently validated by three emergency medicine experts. For the purposes of this report, an English version of the questionnaire was also produced ([Supplementary File 1](#)).

The final version of the online research questionnaire was made up of four sections:

1. Demographic Variables: Seven questions regarding gender, age, academic level, and workplace characteristics.

2. Life Support Training and Practice: Eight questions assessing participants' college-based life support training, BLS and ALS certification, practice, and extracurricular preparation.
3. BLS Theoretical Knowledge: Ten multiple-choice questions to measure BLS theoretical understanding.
4. ALS Theoretical Knowledge: Ten multiple-choice questions to gauge ALS theoretical knowledge.

## Data Collection

We used the freely available “Google Forms” tool for data collection. Participants accessed the questionnaire via a unique link shared through social media dissemination groups (Facebook and WhatsApp). The questionnaire preamble provided a brief explanation of the study's purpose, a confidentiality assurance, and an informed consent request. All responses collected were anonymous, ensuring no personally identifiable information was solicited.

## Bias

We implemented several measures to mitigate potential biases throughout the data collection and management process. To prevent duplicate responses, the “Google Forms” tool was configured to limit each IP device to a single questionnaire submission. Moreover, to reduce bias during analysis, results were independently scrutinized by researchers. Any discrepancies were collectively resolved by the research team to ensure only valid responses were included in the study's findings.

## Study Size

The required sample size was calculated using an equation for finite or known populations:<sup>15</sup>

$$n = \frac{(N \cdot Z^2) \cdot (p \cdot q)}{d^2 \cdot (N - 1) + Z^2 \cdot p \cdot q}$$

Based on Ecuador's total physician population in 2019 ( $N=40,230$ ),<sup>16</sup> and assuming a 95% confidence level ( $Z=95\%$ ), a 5% margin of error ( $d=5\%$ ), and an expected distribution of 50% for both positive ( $p$ ) and negative ( $q$ ) outcomes, a sample size of  $n=381$  participants was obtained.

## Data Management

Demographic variables included the work sector, classified as either public or private based on the funding source of the workplace. Single-choice responses evaluated participants' training experiences and their perceived knowledge of basic and advanced life support.

Knowledge levels in both BLS and ALS tests were gauged using a decimal numerical rating scale, with a maximum of 10 points for each questionnaire.<sup>17</sup> Correctly answered questions were assigned a value of 1 point, while incorrect answers received 0 points (incorrect responses did not lead to point deduction). Consequently, the highest attainable score for both the BLS and ALS questionnaires was 10.0 points, with the lowest being 0.0 points.

## Statistical Analysis

For categorical variables, descriptive analysis was conducted using frequencies and percentages. Quantitative variables were analyzed through measures of central tendency (mean) and dispersion (standard deviation). Associations between the categorical variables—“sex”, “work sector”, “university training”, “BLS certification”, “ALS certification”, “belief of adequate BLS knowledge”, and “belief of adequate ALS knowledge”—and BLS and ALS knowledge scores were identified using Student's *T*-test. For associations between multi-category variables such as “age”, “academic level”, “place of work”, “hospital work area”, “work experience”, “BLS practice”, “ALS practice”, and “extracurricular training” with BLS and ALS knowledge levels, one-way ANOVA analysis was used, considering “BLS score” and “ALS score” as dependent variables. Analyses with a  $p$ -value  $< 0.05$  were deemed statistically significant. Data analysis was conducted using IBM SPSS version 26.0 software.

## Ethics Approval and Consent to Participate

This research adhered to strict ethical standards, utilizing anonymized data and voluntary participation. The research protocol was reviewed and approved by the Ethics Committee of the Hospital San Francisco de Quito (HSFQ) under the code CEISH-HGSF-2023-011, ensuring compliance with ethical guidelines and standards.

## Results

### Demographic and Work Characteristics

A total of 385 responses from Ecuadorian physicians were collected. Of these, 56.6% (n=218) were women and 76.6% (n=295) were resident physicians. Regarding work settings, 58.2% (n=224) were public health sector workers, 52.2% (n=201) worked in first-level care, and 49.6% (n=191) in outpatient consultations. Additionally, 75.1% (n=289) had less than 3 years of work experience (Table 1).

### Life Support Training

The majority of participants, 81.0% (n=312), reported receiving some form of life support training during their undergraduate studies. The most common extracurricular training method was reviewing official AHA life support guides, but only 38.7% (149) did so. Regarding BLS, 71.7% (n=276) confirmed achieving BLS certification at some point, and 65.5% (n=252) believed they had sufficient theoretical BLS knowledge. However, 73.2% (n=282) had practiced BLS less than three times (Table 2).

In terms of ALS training and preparation, only half of the respondents (51.9%) reported ALS certification, a similar percentage (50.1%) believed they had adequate ALS knowledge, and 74.5% (n=149) of certified ALS physicians had practiced ALS less than three times (Table 2).

**Table 1** Demographic and Work Characteristics of the Participants

		n	(%)
Sex	Male	167	43.4
	Female	218	56.6
Age (years mean $\pm$ SD)		29.57	4.74
Academic level	Residency	295	76.6
	Postgraduate	18	4.7
	Specialist	19	4.9
	Master's degree	48	12.5
	PhD	5	1.3
Work sector	Public	224	58.2
	Private	161	41.8
Level of care	First level	201	52.2
	Second level	131	34.0
	Third level	53	13.8
Hospital work area	Administrative	13	3.4
	Outpatient Consultation	191	49.6
	Clinical Specialty Areas	59	15.3
	Surgical Specialty Areas	34	8.8
	Anesthesiology	5	1.3
	Emergency	75	19.5
	Intensive Care Unit	8	2.1
	Work experience	Less than 3 years	289
	3 to 6 years	61	15.8
	6 to 10 years	14	3.6
	More than 10 years	21	5.5

**Abbreviation:** SD, standard deviation.

**Table 2** Traits of BLS and ALS Training of the Participants

		n	(%)
Training during University	No	73	19.0
	Yes	312	81.0
	Total	385	100.0
BLS Certification	No	109	28.3
	Yes	276	71.7
	Total	385	100.0
BLS Practice	Less than 3 times	202	73.2
	Between 3 to 6 times	36	13.0
	More than 6 times	38	13.8
	Total	276	100.0
Believe you have sufficient knowledge of BLS	No	133	34.5
	Yes	252	65.5
	Total	385	100.0
ALS Certification	No	185	48.1
	Yes	200	51.9
	Total	385	100.0
ALS Practice	Less than 3 times	149	74.5
	Between 3 to 6 times	23	11.5
	More than 6 times	28	14.0
	Total	200	100.0
Believe you have sufficient knowledge of ALS	No	192	49.9
	Yes	193	50.1
	Total	385	100.0
Extra-curricular training	Scientific articles	66	17.1
	Official Guides	149	38.7
	Evidence-based summaries	38	9.9
	Video	49	12.7
	Other	30	7.8
	None	53	13.8
	Total	385	100.0

**Abbreviations:** BLS, Basic Life Support; ALS, Advanced Life Support.

## Basic Life Support (BLS) Knowledge

In terms of BLS knowledge, the overall mean score was 5.8 / 10 ( $\pm 1.6$  points). There were no significant differences in scores based on gender, age, or academic level of participants. Notably, those working in private sector health centers had a greater BLS knowledge score of 6.1 / 10 ( $\pm 1.6$  points) ( $p < 0.001$ ), and physicians with less than 3 years of work experience with 5.9 / 10 ( $\pm 1.5$  points) ( $p = 0.038$ ) (Table 3).

In relation to training, it was evident that doctors who claimed to have received official certification in BLS and ALS scored higher on the BLS test, with averages of 6.0/10  $\pm$  1.5 and 6.2/10  $\pm$  1.5 points, respectively ( $p < 0.001$ ), compared to their counterparts without such certification (Table 3).

## Advanced Life Support (ALS) Knowledge

In relation to the ALS knowledge test, the average score was 4.7/10 ( $\pm 1.8$  points). Physicians with less than 3 years of work experience scored marginally higher, also averaging 4.7/10 ( $\pm 1.8$  points) ( $p = 0.038$ ). Those working in the Intensive Care Unit (ICU) achieved a higher average score of 5.3 ( $\pm 1.6$ ), though this difference was not statistically significant (Table 4). Finally, comparative analysis revealed that physicians' overall score in BLS knowledge was significantly higher than in ALS knowledge ( $p < 0.001$ ).

**Table 3** Mean Difference in BLS Knowledge Score According to the Characteristics of Ecuadorian Physicians

Variable		BLS Knowledge	
		Mean/10.0 Points $\pm$ SD	P value
Sex	Male	5.9 $\pm$ 1.4	0.168
	Female	5.7 $\pm$ 1.7	
Academic level	Residency	5.8 $\pm$ 1.5	0.380*
	Postgraduate	5.7 $\pm$ 1.8	
	Specialist	5.5 $\pm$ 1.3	
	Master's degree	6.0 $\pm$ 1.5	
	PhD degree	4.6 $\pm$ 2.5	
Work Sector	Public	5.5 $\pm$ 1.5	< 0.001
	Private	6.1 $\pm$ 1.6	
Level of care	First level	5.9 $\pm$ 1.5	0.091*
	Second level	5.6 $\pm$ 1.6	
	Third level	6.1 $\pm$ 1.6	
Hospital work area	Administrative	6.0 $\pm$ 1.8	0.532*
	Outpatient Consultation	5.8 $\pm$ 1.5	
	Clinical Specialty Areas	5.9 $\pm$ 1.8	
	Surgical Specialty Areas	5.3 $\pm$ 1.7	
	Anesthesiology	6.0 $\pm$ 0.7	
	Emergency	5.8 $\pm$ 1.4	
	Intensive Care Unit	6.3 $\pm$ 0.9	
Work experience	Less than 3 years	5.9 $\pm$ 1.5	0.038*
	3 to 6 years	5.7 $\pm$ 1.5	
	6 to 10 years	4.9 $\pm$ 1.3	
	More than 10 years	5.2 $\pm$ 1.6	
Training during University	No	5.9 $\pm$ 1.7	0.498
	Yes	5.8 $\pm$ 1.5	
BLS Certification	No	5.3 $\pm$ 1.6	< 0.001
	Yes	6.0 $\pm$ 1.5	
BLS Practice	Less than 3 times	6.0 $\pm$ 1.6	0.922*
	Between 3 to 6 times	5.9 $\pm$ 1.5	
	More than 6 times	5.9 $\pm$ 1.3	
Believe you have sufficient knowledge of BLS	No	5.5 $\pm$ 1.4	0.014
	Yes	5.9 $\pm$ 1.6	
ALS Certification	No	5.4 $\pm$ 1.6	< 0.001
	Yes	6.2 $\pm$ 1.5	
ALS Practice	Less than 3 times	6.3 $\pm$ 1.5	0.189*
	Between 3 to 6 times	5.8 $\pm$ 1.0	
	More than 6 times	5.9 $\pm$ 1.2	
Believe you have sufficient knowledge of ALS	No	5.7 $\pm$ 1.5	0.107
	Yes	5.9 $\pm$ 1.6	
Extra-curricular training	Scientific articles	5.7 $\pm$ 1.7	0.004*
	Official Guides	6.1 $\pm$ 1.4	
	Evidence-based summaries	5.5 $\pm$ 1.2	
	Video	6.0 $\pm$ 1.5	
	Other	5.4 $\pm$ 1.7	
	None	5.2 $\pm$ 1.8	

**Note:** \*p-values calculated from one-way ANOVA.

**Abbreviations:** BLS, Basic Life Support; ALS, Advanced Life Support.

**Table 4** Mean Difference in ALS Knowledge Score According to the Characteristics of the Ecuadorian Physicians

Variable		ALS Knowledge	
		Mean/10.0 Points $\pm$ SD	P value
Sex	Male	4.7 $\pm$ 1.8	0.813
	Female	4.6 $\pm$ 1.7	
Academic level	Residency	4.6 $\pm$ 1.8	0.380*
	Postgraduate	5.1 $\pm$ 2.0	
	Specialist	4.4 $\pm$ 1.7	
	Master's degree	4.9 $\pm$ 1.7	
	PhD	3.8 $\pm$ 1.3	
Work sector	Public	4.7 $\pm$ 1.8	0.249
	Private	4.5 $\pm$ 1.8	
Level of care	First level	4.8 $\pm$ 1.9	0.091
	Second level	4.4 $\pm$ 1.7	
	Third level	4.9 $\pm$ 1.7	
Hospital work area	Administrative	4.8 $\pm$ 2.0	0.532*
	Outpatient Consultation	4.7 $\pm$ 1.9	
	Clinical Specialty Areas	4.6 $\pm$ 1.7	
	Surgical Specialty Areas	4.2 $\pm$ 1.6	
	Anesthesiology	3.6 $\pm$ 1.1	
	Emergency	4.7 $\pm$ 1.6	
	Intensive Care Unit	5.3 $\pm$ 1.6	
Work experience	Less than 3 years	4.7 $\pm$ 1.8	0.038*
	3 to 6 years	4.7 $\pm$ 1.8	
	6 to 10 years	4.3 $\pm$ 1.4	
	More than 10 years	4.0 $\pm$ 1.6	
Training during University	No	4.9 $\pm$ 1.7	0.206
	Yes	4.6 $\pm$ 1.8	
BLS Certification	No	4.7 $\pm$ 1.8	0.853
	Yes	4.6 $\pm$ 1.8	
BLS Practice	Less than 3 times	4.6 $\pm$ 1.8	0.922*
	Between 3 to 6 times	4.6 $\pm$ 1.8	
	More than 6 times	5.1 $\pm$ 1.6	
Believe you have sufficient knowledge of BLS	No	4.5 $\pm$ 1.8	0.214
	Yes	4.7 $\pm$ 1.8	
ALS Certification	No	4.6 $\pm$ 1.8	0.749
	Yes	4.7 $\pm$ 1.8	
ALS Practice	Less than 3 times	4.6 $\pm$ 1.8	0.189*
	Between 3 to 6 times	4.6 $\pm$ 1.6	
	More than 6 times	5.0 $\pm$ 1.6	
Believe you have sufficient knowledge of ALS	No	4.6 $\pm$ 1.8	0.562
	Yes	4.7 $\pm$ 1.8	
Extra-curricular training	Scientific articles	4.6 $\pm$ 1.7	0.847*
	Official Guides	4.7 $\pm$ 1.7	
	Evidence-based summaries	4.6 $\pm$ 2.2	
	Video	4.8 $\pm$ 2.0	
	Other	4.4 $\pm$ 1.7	
	None	4.5 $\pm$ 1.7	

**Note:** \*p-values calculated from one-way ANOVA.

**Abbreviations:** BLS, Basic Life Support; ALS, Advanced Life Support.

## Discussion

Health professionals, particularly physicians, are expected to have adequate knowledge and skills to perform high-quality cardiopulmonary resuscitation (CPR) irrespective of their workplace.<sup>(14)</sup> To our knowledge, this study is the first to assess the theoretical knowledge of Ecuadorian physicians regarding this crucial topic in medical training. Our findings reveal that the majority of participants were young physicians with minimal work experience (less than 3 years). Moreover, the most significant group of respondents consisted of women (56.6%), which could be attributed to the current predominance of women in health-related university careers in Ecuador.<sup>18</sup> Research also suggests that women are more likely to respond to self-administered electronic surveys.<sup>19</sup>

The academic curriculum for medical careers in Ecuador has revealed deficiencies, such as the absence of periodic updates and non-compliance with scheduled classes and syllabus.<sup>20</sup> In the context of training in Basic and Advanced Life Support (BLS and ALS), these topics are not formally included in the academic curriculum of several Ecuadorian universities.<sup>21,22</sup> Our research shows that 19% (n=73) of physicians reported never encountering these topics during their undergraduate education. Consequently, a majority of professionals in this study independently sought BLS (71.7%) and ALS (51.9%) certifications.

Regarding self-perception of knowledge levels among the participants, it was higher for BLS. Furthermore, knowledge measurement revealed a similar trend: the average BLS knowledge score ( $5.8/10 \pm 1.6$  points) was higher than that for ALS ( $4.7/10 \pm 1.8$  points). This discrepancy might be expected due to the greater complexity of ALS. However, our analysis revealed inadequate knowledge for both BLS and ALS among Ecuadorian doctors, as the average score of correct answers did not reach 60% of the total score (10.0 points) in any of the tests. These findings are particularly concerning given the critical importance of these skills in clinical practice and are unprecedented; similar knowledge gaps have been observed among Nigerian, Greek, Thai, Indian, Ethiopian, and Arab physicians.<sup>13,23–27</sup>

Exploring the influence of participant characteristics on knowledge levels yielded intriguing results. While education during college showed no correlation with better BLS or ALS knowledge, those with certificates in BLS and ALS scored higher on BLS tests ( $p < 0.001$ ). However, this correlation was absent in ALS test scores, aligning with findings by Good et al, where 60 American healthcare professionals, despite ALS certification, showed poor competence in different settings.<sup>28</sup> Thus, establishing a direct relationship between certification and high knowledge levels in life support is challenging based on our findings. Contrastingly, studies in Ethiopia and Nepal indicated that prior training significantly improved CPR knowledge.<sup>29,30</sup> A potential explanation for these discrepancies might be the effect of time on knowledge retention; CPR knowledge scores have been shown to decline after six months post-training.<sup>31</sup>

Sources of extracurricular preparation among participants showed higher levels of BLS knowledge ( $p = 0.004$ ) among those using resources like the AHA Official Guides to Life Support and video materials. Physicians consulting these guidelines better understand theoretical and practical aspects of life support, aiding in the retention of algorithms and guidelines.<sup>29</sup>

Regarding work experience, less experience correlated with greater average knowledge in both BLS and ALS ( $p < 0.05$ ) among our participants. This trend, though not fully understood, mirrors findings in other studies. For instance, a Pakistani study found that younger doctors scored higher on a BLS knowledge questionnaire,<sup>32</sup> and an Indian study showed that doctors with less than five years of experience had greater BLS and ALS knowledge.<sup>25</sup> Conversely, Irfan et al observed that greater experience among Pakistani physicians correlated with better BLS knowledge,<sup>14</sup> aligning with Sánchez et al's findings among more experienced Spanish doctors having more certifications and hence greater CPR knowledge.<sup>33</sup> Despite these contradictions, we hypothesize that the difference in our study might be because younger and non-specialized Ecuadorian doctors are more likely to work with critically ill patients, mainly in emergency departments. As physicians specialize, their interaction with emergency services decreases.<sup>32</sup>

Furthermore, while not part of formal academic training, factors like the work environment must be considered in doctors' knowledge acquisition. Physicians in private healthcare facilities scored higher on BLS knowledge than those in the public sector ( $p < 0.001$ ). This could be due to increased training opportunities in life support in the private sector. However, it's notable that physicians working in emergency departments did not significantly excel in BLS and ALS



knowledge compared to others. This finding is surprising because Adal and Emishaw reported higher ALS knowledge levels among physicians working in the emergency department for 10 years or more.<sup>26</sup>

In Ecuador, and across much of South America, BLS and ALS certifications are mandatory for most healthcare jobs. Many new graduates hold these certifications, yet our findings suggest that certification does not guarantee acceptable knowledge levels, which is concerning. Knowledge acquisition is multifaceted, and identifying factors that directly influence life support knowledge levels is complex. Nevertheless, we believe that formal training, certification, and regular recertification are crucial to enhancing physicians' knowledge and competency in basic and advanced life support. This is particularly important in Ecuador and other South American countries, where emergency response team efficiency may not match that of developed countries.<sup>34,35</sup> Longer wait times for emergency services significantly impact patient outcomes, emphasizing the critical role of well-trained physicians in life-threatening situations. A physician's knowledge in basic and advanced life support can be life-saving in these crucial moments.<sup>36</sup>

Therefore, we urge primary healthcare stakeholders, including national health authorities, universities, and hospitals, to develop accreditation policies and regular training programs. By doing so, we aim to create a healthcare system staffed with well-trained and qualified physicians, capable of providing life-saving interventions when most needed. This goal is not only pertinent to Ecuador but is also fundamental for the entire South American region, ultimately fostering a more resilient healthcare system capable of delivering better patient outcomes.

## Strengths and Limitations

This study has several limitations that may affect the robustness of its conclusions. Firstly, its self-report design inherently introduces a risk of selection bias, since physicians with a specific interest in life support and emergency medicine might have been more likely to participate. Secondly, the evaluation system used to assess participants' knowledge, developed specifically for this study, may impact the generalizability of the findings. However, rigorous steps were taken to validate this instrument, including expert review to ensure equal weighting of questions and use of a decimal-type numerical rating scale considering each question separately.

The questionnaire itself is another limitation, as it only measures theoretical knowledge of basic and advanced life support. This represents a potential direction for future research to incorporate practical skill assessment. To prevent duplicate responses, the survey, using "Google Forms", allowed only one response per device, potentially restricting multiple legitimate respondents sharing a device.

Lastly, social desirability bias could have played a role due to concerns over response anonymity. While we emphasized the anonymity of data collected and the importance of honesty in response, this may not have completely mitigated this bias.

## Conclusions

Ecuadorian physicians demonstrate a level of theoretical knowledge in basic and advanced life support that is generally deficient. The knowledge of basic life support was significantly higher than that of advanced life support, albeit the differences were not as expected. The most influential factor on knowledge levels was having less than 3 years of work experience. However, the critical importance of robust knowledge in both basic and advanced life support across all scenarios is irrefutable. To address this, key stakeholders in academic training, such as universities and healthcare facilities, should prioritize promoting regular training and academic updates on life support.

## Data Sharing Statement

The dataset of this research can be freely accessed at the following DOI of the "figshare" online repository: 10.6084/m9.figshare.23264654. The summary of the questionnaire and its results are included in this article.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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