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PREVALENCE OF HEALTHCARE- ASSOCIATED INFECTIONS IN THE INTENSIVE CARE UNIT OF A NORTHERN PERUVIAN HOSPITAL

Karina Marleny Torrel Páez

Bachelor's Degree in Nursing, Master's Degree in University Teaching and Pedagogical Research, Universidad Nacional de Tumbes

<https://orcid.org/0000-0002-6983-9045>

Yrene Esperanza Urbina Rojas

Licentiate in Nursing, Doctor in Nursing, RENACYT Professor. National University of Tumbes - Peru

<https://orcid.org/0000-0001-6834-6284>

Jaime Uxon Plasencia Castillo

Dental Surgeon, Doctor in Criminalistics and Master in Stomatology, Universidad César Vallejo filial Piura - Perú

<https://orcid.org/0000-0001-8086-2206>

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Abstract: Objective: To determine the prevalence of health care-associated infections (HAI) in the Intensive Care Unit (ICU) of a hospital in northern Peru and to analyze the factors associated with their occurrence. **Material and methods:** An observational, descriptive and cross-sectional study was carried out with 348 records of patients hospitalized in the ICU of the EsSalud Tumbes Hospital between 2020 and 2022. Epidemiological surveillance records with complete information were included and cases with a history of HCAI prior to admission or with stays of less than 48 hours were excluded. Descriptive statistics were applied to calculate frequencies and the chi-square test was used to analyze associations, with a significance level of 5%. **Results:** The prevalence of HAIs was 7.2 %. No significant association was found with sex ($p=0.918$), but there was a significant association with advanced age, where the group older than 60 years presented the highest prevalence ($p<0.001$). In addition, the presence of comorbidities showed a significant association with the development of HAIs ($p<0.001$), highlighting chronic pathologies as predisposing factors. **Conclusions:** The prevalence of HAIs in the ICU studied is within the range reported in the literature, although below previous studies in Peru. Advanced age and comorbidities are key factors in its occurrence, which highlights the need to reinforce prevention strategies in these risk groups. It is recommended to continue with prospective studies that include detailed microbiological analyses for a better characterization of the pathogens involved. **Keywords:** Hospital infection; Intensive care units; Epidemiology; Risk factors; Comorbidity.

INTRODUCTION

Healthcare-associated infections (HAIs) are a global public health problem, especially in intensive care units (ICUs), where patients are highly vulnerable due to the severity of their pathologies and the need for invasive procedures (1, 2). These infections have a negative impact on clinical outcome, prolong hospital stay, and increase mortality and healthcare costs (3, 4).

Worldwide, the prevalence of HCAI in ICUs varies according to the region and hospital characteristics and is reported in values ranging from 3% to 7.7% (5, 6). In , a study in 2021 found values of 12.2% during the pandemic (7). In 2020, an analysis in emergencies in two hospitals in Lima found a prevalence of 8.1%, with a predominance of nosocomial pneumonia and urinary tract infection (8). Similarly, in Cusco in 2017, a prevalence of 10.5% was reported, with pneumonia and urinary tract infection as the most common (9).

The increase in HAIs is linked to intrinsic and extrinsic factors. The former include advanced age, comorbidities such as chronic diseases and immunosuppression, and impaired nutritional status. Extrinsic factors include prolonged hospital stay, the use of invasive devices such as venous catheters, urinary catheters and mechanical ventilation, as well as previous use of broad-spectrum antibiotics (10-13). A study in the *Revista Cubana de Pediatría* identified catheterization and prolonged hospitalization as determinant factors in pediatric ICUs (14).

The prevalence of HAIs varies according to age, sex and comorbidities. In a hospital in Colombia, the median age of patients with HAIs was 5 years in children and 56 in adults, with a predominance of the male sex (57%). In addition, 75% had comorbidities, suggesting the influence of these in their development (15). In hospitals in northern Peru, epidemiological and structural factors may

influence the incidence of HAIs. It is essential to have updated studies to characterize their prevalence and etiological agents, facilitating prevention and control strategies to improve patient safety and quality of care. This study aims to determine the prevalence of HAIs in the ICU of a hospital in northern Peru through a descriptive analysis of clinical data collected between 2020 and 2022.

MATERIAL AND METHODS

The study was observational, descriptive and cross-sectional. The study included all the data collection forms used epidemiological surveillance of patients admitted to the hospital's ICU during the period analyzed, totaling 348 forms. The records were included according to the following criteria: only those of patients who remained in the ICU for more than 48 hours and who had complete epidemiological information were considered. The records of patients not assigned to the were excluded, as well as those with a history of infection related to health care prior to admission to the ICU or whose stay was less than 48 hours.

This study was approved by the Ethics Committee for the Analysis of Research Projects of Hospital EsSalud Carlos Cortez Jiménez. No informed consents were required, since the study was based on the review of epidemiological surveillance instruments without the direct participation of the patients.

A deductive approach was applied, using observation and documentary review techniques for the collection of relevant information. The instrument used was the epidemiological surveillance data collection form, an official document of the Peruvian State. This instrument has been validated and standardized in accordance with the Technical Health Standard for the Surveillance of Health Infections, NTS 163-MINSA/2020/CDC, thus guaranteeing its reliability and consistency (16). The HCAIs analyzed included bloodstream

(primary bacteremia and clinical sepsis), urinary tract infection and pneumonia. The prevalence was also determined according to sex and age group (under 40 years, 40 to 60 years and over 60 years), and the frequency of these infections was analyzed according to the presence or absence of comorbidities.

The data collected through the instrument were recorded in an Excel spreadsheet. Prevalence was calculated as the proportion of cases with HCAI with respect to the total number of cases, both with and without the condition. Descriptive statistics were applied to obtain the absolute and relative frequency, and the chi-square test was used to analyze the association between sex, age group and comorbidities, considering a significance level of $p < 0.05$.

RESULTS

This study examined the prevalence of healthcare-associated infections in an intensive care unit in Tumbes, Peru, during the period 2020-2022.

The study population included 348 records of patients admitted to the ICU, whom 7.2%, corresponding to 25 records, developed HAIs during their hospital stay (Table 1).

		n	%
IAAS	Presence	25	7,2%
	Absence	323	92,8%
Total		348	100,0%

Table 1. Prevalence of HCAI in ICU patients - EsSalud Tumbes, 2020 - 2022.

HCAI: Healthcare-associated infections.

The prevalence with respect to sex was slightly higher in males with 4.6%, but did not reach a statistical significance of $p=0.918$ (Table 2).

Sex	Absence		Presence		Total		p*
	n	%	n	%	n	%	
Male	210	60,3	16	4,60	226	64,9	0,918
Female	113	32,5	9	2,59	122	35,1	
Total	323	92,8	25	7,18	348	100,0	

Table 2. Prevalence of HCAI according to sex

*Chi-square test. Significance level 5%.

The prevalence by age was higher in the group over 60 years of age with 4.6% and an association of $p<0.001$ (Table 3).

Age	Absence		Presence		Total		p*
	n	%	n	%	n	%	
Under 40	47	13,5	1	0,29	48	13,8	<0,001*
40 a 60	209	60,1	8	2,30	217	62,4	
Over 60	67	19,3	16	4,60	83	23,9	
Total	323	92,8	25	7,18	348	100,0	

Table 3. Prevalence of HCAI according to ages

*Chi-square test. Significance level 5%.

Table 4 shows the prevalence of healthcare-associated infections (HAIs) in Intensive Care Unit (ICU) patients according to the presence of comorbidities. It shows that 5.2 % of the patients had comorbidities, and of these, 3.4 % developed HAIs. In contrast, 94.8 % had no comorbidities, and within this group, 3.7 % developed HAIs. Statistical analysis using the chi-square test showed a significant association ($p<0.001$).

Comorbidity	Absence		Presence		Total		p*
	n	%	n	%	n	%	
No	317	91,1	13	3,7	330	94,8	<0,001
Yes	6	1,7	12	3,4	18	5,2	
Total	323	92,8	25	7,2	348	100,0	

Table 4. Prevalence of HCAI according to presence of comorbidity

*Chi-square test. Significance level 5%.

DISCUSSION

The analysis of the prevalence of healthcare-associated infections (HAI) in the Intensive Care Unit (ICU) of Hospital EsSalud Tumbes reveals a picture that, although consistent with some previous research, also presents nuances that challenge certain findings established in the literature. The prevalence of HCAI was 7.2%, which is within the range reported in international studies, where prevalence varies between 3% and 7.7% (5, 6). However, this figure is lower than that reported in other Peruvian studies, such as the one conducted by Huamani and Prudencio (7) during the COVID-19 pandemic, which indicated a prevalence of 12.2%, or the study by Roque-Roque and Pereira-Victorio (9), which found a prevalence of 10.5% in a hospital in Cusco. The lower prevalence found in the present study could be attributed to differences in population characteristics, the prevention strategies implemented in the study hospital, or to lower ICU overcrowding.

Regarding the distribution by sex, the study found a slight preponderance of HAIs in male patients (4.6%), although without statistical significance ($p=0.918$). This trend has been reported in other studies, such as that of Wintaco et al. (15), where 57% of the cases of HAIs corresponded to males. Although the reasons for this distribution are not completely understood, it is postulated that they may be related to hormonal and immune response differences between both sexes, as well as to the greater presence of comorbidities in hospitalized males (11).

Analysis by age revealed a higher prevalence of HAIs in patients older than 60 years (4.6%), with a statistically significant association ($p<0.001$). This finding is in agreement with the reports of Bucataru et al. (10) and Stewart et al. (13), who identified advanced age as a relevant risk factor due to greater immunological fragility, increased use of in-

vative devices and the presence of comorbidities. Likewise, in a study carried out in Colombia, the median age of patients with HAIs in adults was 56 years, which reinforces the relationship between aging and greater susceptibility to nosocomial infections (15).

The presence of comorbidities also showed a significant association with the occurrence of HAIs ($p<0.001$), which is consistent with previous studies (1, 2). In particular, conditions such as diabetes mellitus, renal failure and chronic lung diseases have been identified as predisposing factors due to altered immune response and increased use of invasive devices (3). In this sense, epidemiological surveillance and infection control strategies should focus on this group of patients with greater vulnerability.

The differences found between the studies can be explained by variations in hospital infrastructure, implementation of biosafety measures, ICU occupancy density and sociodemographic characteristics of the populations studied. In addition, the COVID-19 pandemic may have influenced the prevalence of HAIs, since an increase in the use of invasive devices and broad-spectrum antibiotics has been documented during this period (4).

This study has some limitations. First, since it is an observational and retrospective design, the quality of the data depends on the accuracy of the recording in the epidemiological surveillance files. Secondly, the absence of microbiological analysis limits the identification of the etiologic agents responsible for the infections. In addition, the sample was restricted to a single hospital, which may affect the generalizability of the results to other health institutions.

In conclusion, the prevalence of HCAI in the ICU of the hospital studied was 7.2%, within the ranges reported in the international literature, although below previous studies carried out in Peru. A higher prevalence was identified in older adults and in patients with comorbidities, which underscores the importance of implementing prevention strategies aimed at these risk groups. Future studies could include a detailed microbiological analysis and evaluate the impact of infection prevention and control strategies to reduce the burden of HAIs in hospital settings.

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