ORIGINAL ARTICLE

Epidemiological changes among patients hospitalized in an internal medicine unit at Hospital Nacional Edgardo Rebagliati Martins in 2008 vs. 2018

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ABSTRACT

Objective: To determine whether epidemiological changes occurred among patients hospitalized in an internal medicine unit at Hospital Nacional Edgardo Rebagliati Martins by comparing data from 2008 and 2018. **Materials and methods:** An observational, retrospective and cross-sectional study was conducted using an analytical-descriptive approach and a non-experimental design. The study utilized nursing records from 1,640 patients over 18 years of age who were hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins (Jesús María, Lima, Peru) during 2008 and 2018. Sociodemographic variables (sex and age) and clinical variables (unit of origin, type of disease, hospital stay and discharge condition) were analyzed. Data entry and database creation were carried out using Microsoft Excel, while data processing was performed with Microsoft R Open 4.0.2, and Stata 17 was used for data analysis. A descriptive analysis was conducted, presenting the variables as absolute and relative frequencies in tables. The McNemar test was applied to assess the differences in clinical characteristics, and logistic regression models were employed to identify factors associated with mortality. A p value < 0.05 was considered statistically significant. **Results:** When comparing the two periods, differences were found in the variables *sex* (OR = 0.60; 95 % CI: 0.50-0.74; $p < 0.01$), *hospital stay* (OR = 1.9; 95 % CI: 1.50-2.40; $p < 0.01$), *unit of origin* (OR = 0.65; 95 % CI: 0.50-0.85; $p < 0.01$), *mortality* (OR = 1.90; 95 % CI: 1.40-2.60; $p < 0.01$) and *type of disease* (OR = 0.76; 95 % CI: 0.59-0.97; $p = 0.03$). No differences were found in the age groups between the two periods. **Conclusions:** Statistically significant differences suggest an epidemiological transition between the two periods. Therefore, a comprehensive, multidisciplinary and innovative approach is required to improve care for patients with chronic diseases.

Keywords: Health Transition; Epidemiology; Patients; Internal Medicine; Hospitalization; Communicable Diseases; Noncommunicable Diseases; Mortality (Source: MeSH NLM).

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INTRODUCTION

Diseases are commonly classified as communicable and noncommunicable based on their mode of transmission and associated risk factors. Communicable diseases result from infectious agents—including bacteria, viruses, fungi and parasites—that can be transmitted from person to person or from animals to animals, either through direct contact or via vectors such as air, water or insects. Prominent examples of communicable diseases include tuberculosis, syphilis, influenza and acquired immunodeficiency syndrome (AIDS). In contrast, noncommunicable diseases are not transmissible and are generally linked to genetic, environmental or lifestyle factors. Cardiovascular diseases, cancer, diabetes and respiratory diseases rank among the most prevalent noncommunicable diseases [(1)].

The development of a communicable disease requires the infectious agent—or a portion thereof—to enter the host, multiply or reach a threshold sufficient to cause harm. This process is influenced by several factors, including the pathogen's ability to adhere to host cells, replicate, evade defenses, disseminate, and trigger both innate and adaptive immune responses [(2)]. Noncommunicable or chronic diseases affect multiple systems, such as the cardiovascular, endocrine, renal, nervous,

respiratory, among others. These conditions may manifest at any age due to disruptions in normal physiological functions, which can serve as risk factors or contribute to the onset of other diseases over time [3].

The key distinction between communicable and noncommunicable diseases lies in their etiology: communicable diseases are caused by external infectious agents, whereas noncommunicable diseases originate from multiple factors, including genetic ones, which may be either inherited or the result of mutations. It should be noted that communicable diseases can be acute or subacute but may also become chronic, so this criterion alone is not sufficient to distinguish them. Both types of diseases can have variable outcomes, potentially causing permanent damage or even death [4].

Currently, global epidemiological trends reveal a rising burden of noncommunicable diseases—such as cancer and metabolic disorders and their complications—while infectious diseases are decreasing in epidemiological reports [5-7]. According to the Pan American Health Organization (PAHO), noncommunicable diseases account for approximately 71.00 % of all deaths worldwide [3].

This shift is largely attributable to scientific advancements that have introduced more effective treatments, including antibiotics, and enhanced public health measures to control infectious diseases. However, these conditions remain a significant burden in countries with low human development index (HDI) scores [6,7]. Meanwhile, the prevalence of lifestyle-related diseases is increasing due to urbanization [8]. Data from the *Encuesta Demográfica y de Salud Familiar* (ENDES – Demographic and Family Health Survey) indicate that an estimated 39.90 % of individuals aged 15 years and older in Peru are affected by obesity, diabetes mellitus or hypertension [9].

In Peru, this epidemiological transition was observed between 2003 and 2016, during which approximately 80.00 % of deaths were attributable to noncommunicable diseases such as cerebrovascular disease, acute myocardial infarction, chronic lung disease, type 2 diabetes mellitus, cancer, among others. Notably, infectious diseases remained prevalent in the Amazon rainforest region [10].

Several studies have documented this epidemiological transition. Cinza et al. conducted a descriptive cross-sectional study in 2006 involving 770 patients with a mean age of 78.8 years admitted to the Internal Medicine Unit at Hospital Clínico Universitario de Santiago de Compostela, Spain, to examine their epidemiological and clinical characteristics. The most frequent diagnoses were heart failure (20.60 %), chronic obstructive pulmonary disease (COPD) (18.60 %) and pneumonia (14.40 %). The average hospital stay was 13.7 days [11]. In 2017, Singer et al. conducted a retrospective study of nonagenarian patients admitted over four years to the Internal Medicine Unit at Hospital Universitario de Gran Canaria Doctor Negrín, Spain, aiming to identify mortality predictors. The principal diagnoses were acute infections (61.00 %), heart failure (43.00 %) and respiratory failure (11.60 %). The median hospital stay was 10 days (6–15.5). They concluded that mortality was associated with age, infectious diseases and respiratory failure [12].

In 1992, Gástelo conducted a retrospective study to identify the main causes of morbidity among older adults at Hospital Nacional Edgardo Rebagliati Martins. Data were collected from 300 patients aged over 65 hospitalized in the Internal Medicine Unit No. 5 (floor 7C) between 1991 and 1992, representing 43.50 % of all patients admitted to that unit. Among them, 57.70 % were male and 42.30 % female, with a mean hospital stay of 15.35 days. Regarding morbidity, the most common conditions were hypertension (29.20 %), diabetes mellitus (15.70 %) and heart failure (8.70 %) [13]. In 2010, Rojas sought to identify differences in morbidity and mortality between two groups of older adults: one comprising patients aged 60 to 79 years, and the other, patients over 80. To this end, a cross-sectional, retrospective study was conducted at Hospital Nacional Edgardo Rebagliati Martins. Data were collected from the discharge summaries of 697 older adult patients hospitalized in the Internal Medicine Unit on floor 11C during 2007. The results showed that the majority of patients were male (67.10 %) and that the average age was 75.6 years. When conditions were grouped, a higher incidence of infectious diseases (25.80 %) and neoplastic diseases (21.00 %) was observed. In contrast, among patients over 80, the most prevalent conditions were infectious diseases (30.10 %) and chronic noncommunicable diseases (14.80 %) [14].

Numerous studies have shown an increasing prevalence of noncommunicable diseases relative to infectious diseases due to advances in medical technology and the development of more effective treatments for infectious conditions. Consequently, this research aims to gather epidemiological data on patients hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins during 2008 and 2018. The purpose is to strengthen the scientific evidence regarding the epidemiological transition in the Peruvian population. The study seeks to determine whether there has been an increase in degenerative and chronic diseases by comparing these two periods, with the ultimate goal of informing public health strategies.

MATERIALS AND METHODS

Study design and population

This is an observational, retrospective and cross-sectional study with an analytical-descriptive approach and a non-experimental design. Data were obtained from nursing records of the Internal Medicine Unit at Hospital Nacional Edgardo Rebagliati Martins (Jesús María, Lima, Peru) for the years 2008 and 2018. The total study population comprised 2,070 patients. From this population, a sample of 1,640 patients was selected based on predefined inclusion and exclusion criteria. Inclusion criteria encompassed patients aged 18 years and older who received inpatient care in the Internal Medicine

Unit No. 5 (floor 7C) during the aforementioned years. Exclusion criteria included minors, patients with incomplete information in admission or discharge records, and those whose data were unavailable due to medical-legal or other reasons. The sample size was calculated based on an expected event rate of 26 % a priori and 20 % a posteriori, assuming an 80 % statistical power and a 95 % confidence interval. The calculation yielded a minimum required sample size of 1,544 participants, with 772 allocated to each group based on a 1:1 sampling ratio. After applying all eligibility criteria, 820 patients were included for each study period.

Variables and measurements

The data were provided by the nursing unit and included admission and discharge records for 2008 and 2018. These records detailed medical history number, date of admission, age, sex, type of disease, point of origin and destination. Study variables were obtained from the nursing records and entered into a data collection form designed by the research team. Variables were categorized into sociodemographic and clinical variables for each year. Sociodemographic variables included sex and age group: young adults (18–29 years), adults (30–59 years) and older adults (≥ 60 years). Clinical variables comprised unit of origin, type of disease, hospital stay and discharge condition. Diagnoses were further classified by etiopathogenesis as either infectious or non-infectious.

Statistical analysis

Data entry and database creation were carried out using Microsoft Excel, while data processing and analysis was performed with Microsoft R Open 4.0.2. (The R Project for Statistical Computing, Austria; http://www.rproject.org), and Stata 17 was used for data analysis. All variables were coded and analyzed as categorical. A descriptive analysis was conducted, presenting the variables as absolute and relative frequencies in tables. The McNemar test was applied to assess the differences in clinical characteristics between 2008 and 2018. Odds ratios (ORs) with corresponding 95 % confidence intervals (CIs) were calculated. Finally, logistic regression models were employed to identify factors associated with mortality in both years, producing unadjusted as well as age- and sex-adjusted ORs, with corresponding 95 % CIs. A p value < 0.05 was considered statistically significant.

Ethical considerations

The study protocol was reviewed and approved by the General Directorate and the Institutional Research Ethics Committee at Hospital Nacional Edgardo Rebagliati Martins. Key ethical considerations included the use of sensitive patient data, which was handled with strict confidentiality and anonymized to ensure patient privacy. The study adhered to established bioethical principles.

RESULTS

A total of 1,640 patients were included in the study, evenly distributed between 2008 and 2018, all admitted to Internal Medicine Unit No. 5 (floor 7C). In both years, the majority of patients were female and over 60 years of age. More than 75.00 % of the patients had been referred from the Emergency Department, and over 50 % experienced prolonged hospital stays. Non-infectious diseases predominated, with an approximate ratio of 4:1 compared to infectious diseases. Regarding discharge condition, most patients were discharged with medical approval (Table 1).

Table 1. Clinical characteristics of patients hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins in 2008 and 2018

Variable	Year	
	2008 (n = 820)	2018 (n = 820)
Age (%)		
18–29 years	36 (4.39 %)	22 (2.68 %)
30–59 years	193 (23.50 %)	225 (27.40 %)
≥ 60 years	591 (72.10 %)	573 (69.90 %)
Sex (%)		
Male	326 (39.80 %)	219 (26.70 %)
Female	494 (60.20 %)	601 (73.30 %)
Hospital stay (%)		
Not prolonged	356 (43.40 %)	241 (29.40 %)
Prolonged	464 (56.60 %)	579 (70.60 %)
Origin (%)		
Emergency	629 (76.70 %)	691 (84.30 %)
Hospitalization	191 (23.30 %)	129 (15.70 %)

Variable	Year	
	2008 (*n* = 820)	2018 (*n* = 820)
Disease (%)		
Infectious	633 (77.20 %)	669 (81.60 %)
Non-infectious	187 (22.80 %)	151 (18.40 %)
Discharge condition (%)		
Discharge	629 (76.00 %)	534 (65.10 %)
Mortality	55 (6.71 %)	127 (15.50 %)
Hospitalization	136 (16.60 %)	159 (19.40 %)
Mortality (%)		
No	765 (93.30 %)	693 (84.50 %)
Yes	55 (6.71 %)	127 (15.50 %)

Data are presented as absolute and relative frequencies (%).

Differences in clinical characteristics between 2008 and 2018 were assessed using the McNemar test, and the corresponding *p* values were reported. Statistically significant differences were observed in sex, hospital stay, unit of origin, mortality and type of disease. No significant differences were found between the two periods with respect to age group (Table 2).

Table 2. Comparison of clinical characteristics of patients hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins in 2008 and 2018

Variable	Year		*p* value[1]
	2008 (*n* = 820)	2018 (*n* = 820)	
Age (%)			
< 60 years	229 (27.90 %)	247 (30.10 %)	NS
≥ 60 years	591 (72.10 %)	573 (69.90 %)	NS
Sex (%)			
Female	509 (62.10 %)	601 (73.30 %)	< 0.01
Male	311 (37.90 %)	219 (26.70 %)	
Hospital stay (%)			
Not prolonged	366 (44.60 %)	241 (29.40 %)	< 0.01
Prolonged	454 (55.40 %)	579 (70.60 %)	
Origin (%)			
Emergency	637 (77.70 %)	691 (84.30 %)	< 0.01
Hospitalization	183 (22.30 %)	129 (15.70 %)	
Mortality (%)			
No	750 (91.50 %)	693 (84.50 %)	< 0.01
Yes	70 (8.54 %)	127 (15.50 %)	
Disease (%)			
Infectious	633 (77.20 %)	669 (81.60 %)	0.03
Non-infectious	187 (22.80 %)	151 (18.40 %)	

NS: not significant; OR: odds ratio; 95 % CI: 95 % confidence interval. [1]McNemar test.

The unit of origin was a statistically significant factor associated with mortality in both years, according to the unadjusted as well as the age- and sex-adjusted models. In 2018, age was also significantly associated with mortality in these models; however, the type of disease was associated with mortality only in the unadjusted model (Table 3).

Table 3. Factors associated with mortality among patients hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins in 2008 and 2018

Variable	Mortality in 2008		Mortality in 2018	
	OR (95 % CI)	*p* value	OR (95 % CI)	*p* value
Age (%)				
model 1	NS	NS	1.92 (1.23-3.12)[1]	0.006
model 2	NS	NS	1.93 (1.23-3.13)[2]	0.006
Origin (%)				
model 1	0.42 (0.18-0.85)[1]	0.026	0.46 (0.23-0.85)[1]	0.020
model 2	0.44 (0.19-0.88)[2]	0.033	0.47 (0.23-0.88)[2]	0.027
Disease (%)				
model 1	NS	NS	1.62 (1.03-2.52)[1]	0.033
model 2	NS	NS	1.55 (0.97-2.40)[2]	0.58

NS: not significant; OR: odds ratio; 95 % CI: 95 % confidence interval. [1]Unadjusted model; [2]age- and sex-adjusted model.

In 2008, the unit of origin was significantly associated with infectious diseases. In 2018, age, hospital stay and mortality were associated with infectious diseases (Table 4).

Table 4. Factors associated with infectious diseases among patients hospitalized in Internal Medicine Unit No. 5 (floor 7C) at Hospital Nacional Edgardo Rebagliati Martins in 2008 and 2018

Variable	Infectious diseases in 2008		*p* value	Infectious diseases in 2018		*p* value
	No (*n* = 633)	Yes (*n* = 187)		No (*n* = 669)	Yes (*n* = 151)	
Age (%)			0.673			**0.019***
< 60 years	174 (76.00 %)	55 (24.00 %)		214 (86.60 %)	33 (13.40 %)	
≥ 60 years	459 (77.70 %)	132 (22.30 %)		455 (79.40 %)	118 (20.60 %)	
Sex (%)			0.807			0.710
Female	391 (76.80 %)	118 (23.20 %)		488 (81.20 %)	113 (18.80 %)	
Male	242 (77.80 %)	69 (22.20 %)		181 (82.60 %)	38 (17.40 %)	
Hospital stay (%)			0.065			**0.028***
Not prolonged	271 (74.00 %)	95 (26.00 %)		185 (76.80 %)	56 (23.20 %)	
Prolonged	362 (79.70 %)	92 (20.30 %)		484 (83.60 %)	95 (16.40 %)	
Origin (%)			**0.019***			0.854
Emergency	504 (79.10 %)	133 (20.90 %)		565 (81.80 %)	126 (18.20 %)	
Hospitalization	129 (70.50 %)	54 (29.50 %)		104 (80.60 %)	25 (19.40 %)	
Mortality (%)			0.302			**0.043***
No	575 (76.70 %)	175 (23.30 %)		574 (82.80 %)	119 (17.20 %)	
Yes	58 (82.90 %)	12 (17.10 %)		95 (74.80 %)	32 (25.20 %)	

*Statistically significant at $p < 0.05$.

DISCUSSION

Epidemiological transition refers to the shift in disease patterns—and consequently, in causes of death—observed across countries. Understanding and evaluating this transition may have important implications for the design of public health policies and interventions. In this context, infectious diseases as leading causes of mortality have been replaced by noncommunicable diseases, which now represent the primary drivers of the global burden of disease [15,16].

The increasing prevalence of noncommunicable diseases has led to greater use of health services and higher healthcare costs, as these conditions are chronic, have more complications and often lead to the development of additional comorbidities. This trend is particularly relevant, as the prevalence of these diseases tends to rise in response to increasing life expectancy and the ongoing processes of modernization and urbanization [17].

The present study confirms that the majority of hospital admissions involved older adults with decompensated noncommunicable conditions. In both periods analyzed, female patients predominated, consistent with findings reported by Camerino-Hernández et al., who noted that 60.40 % of patients hospitalized by the geriatrics department between 2006 and 2009 for multiple comorbidities were women [18]. In this context, Kaplan et al. reported that women, who have a life expectancy 2.9 years longer than men, also exhibit a higher incidence of diseases [19]. Furthermore, our data show that the emergency department was the main source of admissions to the internal medicine unit, with patient volume increasing in the 2018 period. This aligns with the findings of Vásquez-Alva et al., who observed a rise of up to 49.00 % in emergency department visits in Peru [20].

Our analysis revealed statistically significant epidemiological differences between 2008 and 2018. Previous research indicates that Peru is currently in the post-epidemiological transition stage, with more than 80.00 % of deaths attributable to noncommunicable diseases. This trend is consistent for both sexes and across all 25 regions of the country, where noncommunicable diseases are the leading cause of mortality. Nevertheless, infectious diseases remain a relevant secondary cause of death in certain rainforest regions such as Loreto and Ucayali, while in Madre de Dios, accidents and injuries rank second [21]. Additionally, a 2018 study conducted by Iquiapaza Mamani at Hospital Vitarte examined the main causes of morbidity and mortality among patients aged over 60 admitted to the Internal Medicine Unit between 2016 and 2017. The most frequently reported conditions were pneumonia, cerebrovascular disease, urinary tract infection, pancreatitis and sepsis [22].

The data indicate that advanced age—after adjustment to control for confounding variables—was a risk factor for in-hospital mortality in 2018. This finding aligns with a retrospective analytical study conducted by Dülger, Albuz at a national hospital in Turkey between 2015 and 2020. The study considered various factors, including chronic diseases, sex, age, reason for admission, among others. Notably, two variables demonstrated ORs greater than 1: age ≥ 65 years and hospital stay ≥ 4 days, with the latter showing a stronger association with in-hospital mortality than age (OR: 2.49 vs. 1.92) [23]. In contrast, the present study found that referrals from other hospital units/departments were not associated with increased mortality; rather, a decrease was observed—potentially due to acute stabilization prior to the transfer. This interpretation is supported by studies such as that by Lama et al., who examined various admission diagnoses as potential predictors of mortality. The top three diagnoses associated with mortality were pneumonia, stroke and decompensated diabetes mellitus, all emergency conditions accounting for over 40.00 % of hospitalizations in their study, although this variable was not included in a multivariate analysis [24]. Regarding disease type, findings from a 2012 study by Zeña et al. corroborate the predominance of infectious diseases over noncommunicable diseases in mortality outcomes, showing a strong association with an OR > 10. However, the present study was unable to rule out confounding variables in this association due to the smaller sample size [25].

Additionally, our study demonstrates that both prolonged hospital stays and advanced age are associated with infectious diseases. The impact of these diseases is more severe in populations living in poverty, due to systemic barriers to accessing specialized care, delays in diagnosis, reduced quality of life and diminished productivity, all of which contribute to a cycle of worsening poverty [26].

Based on our findings, it is evident that the healthcare system requires a comprehensive reform and reengineering process aimed at strengthening primary, secondary and tertiary levels of care. Such efforts should seek to deliver integrated patient care through a multidisciplinary approach, while simultaneously improving hospital capacity in terms of human resources, equipment and operational processes. This would enable the provision of highly specialized care within reasonable and cost-effective hospital stay. Otherwise, internal medicine units risk becoming long-stay units for older adults with complex medical conditions, high levels of disability and significant social and family-related challenges. There is an urgent need to establish geriatric and palliative care units, day hospitals and outpatient clinics capable of delivering comprehensive, multidisciplinary and innovative care to patients with chronic conditions.

This study is limited by its reliance on data extracted from nursing records, which included cases of illegible or incomplete entries. Moreover, the findings pertain to a single healthcare facility and therefore may not be generalizable. The COVID-19 pandemic also posed challenges, delaying data collection and disrupting the planned research activities.

In conclusion, statistically significant differences were observed between the two study periods in variables such as sex, hospital stay, unit of origin, mortality and type of disease, highlighting the

ongoing epidemiological transition. These findings offer additional evidence of the growing predominance of noncommunicable diseases in an aging population, driven by lifestyle factors and sedentary behaviors. These conditions have become increasingly common worldwide and are closely associated with the progressive industrialization of societies [27,28].

In developing countries such as Peru, the rising prevalence of chronic diseases places increasing demands on health system investments—not only through laws and regulations at the political level but also via health programs and campaigns aimed at mitigating the impact of these conditions. Hospitalizations resulting from complications of noncommunicable diseases generally require longer stays and greater human and clinical resources than those caused by infectious or surgical conditions, among others. Continued research on this topic is essential to provide deeper insight into public health concerns and to prepare for the challenges that the ongoing epidemiological transition will pose for health systems worldwide [28,29].

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