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REVIEW ARTICLE

DISEASE PATTERNS AMONG PATIENTS SEEKING EMERGENCY AND INTENSIVE CARE: A SINGLE-HOSPITAL STUDY IN NORTH CENTRAL VIETNAM IN 2020

Son Thai Dinh[1], Hai Thanh Phan[1], Sy Van Le[2], Cuong Van Le[2], Long Duy Le[2], Hoat Ngoc Luu[3], Hai Bui Hoang[1]*

1 Hanoi Medical University, Hanoi, Vietnam

2 Thanh Hoa General Hospital, Thanh Hoa, Vietnam

3 Phenikaa University, Hanoi, Vietnam

Correspondence: hoangbuihai@hmu.edu.vn

ABSTRACT

OBJECTIVE:

This retrospective study aims to describe the disease patterns among patients admitted to intensive care units (ICUs) in a public provincial hospital in North Central Vietnam in 2020.

DESIGN:

We conducted a retrospective descriptive study.

SETTING:

The study was conducted in the Thanh Hoa General Hospital, Thanh Hoa Province, Vietnam. The study included all emergency and critical care admissions hospitalized from January 1, 2020 to December 31, 2020.

MAIN OUTCOME MEASURES:

Data on age, gender, hospital admission, and discharge dates, length of hospital stays, illness chapters (based on ICD-10 codes), and treatment results determined at the hospital discharge of 27,152 episodes of ICU admission were collected.

RESULTS:

The three illness chapters of ICD-10 with the most patients were Chapter IX-Diseases of the Circulatory System, Chapter XI-Diseases of the Digestive System, and Chapter XIX-Injury, Poisoning, and Some Other Consequences of External Causes, with 21.6%, 21%, and 20.3% of patients, respectively. Most episodes (n = 21,999, 81.0%) showed improved health at the time of hospital discharge, with up to 87% of patients finding a cure.

CONCLUSIONS:

The insights gained from this study can inform healthcare strategies, resource planning, and policy decisions to enhance the delivery of critical care services in the region. Further research and ongoing surveillance will be essential to adapt healthcare systems to the evolving landscape of diseases and to ensure the continued improvement of patient outcomes in intensive care settings.

KEYWORDS

disease patterns, ICUs, ICD-10, morbidity, mortality.

INTRODUCTION

Knowing a community's illness and trends in mortality is critical for creating suitable healthcare strategies. These trends represent a community's living conditions, political and economic contexts, social culture, and societal habits. ICUs are critical care facilities where people with serious diseases receive expert medical treatment. Mortality is the most prevalent indicator of ICU results because it is readily quantifiable and patient-centered, making it an important sign for healthcare policies.[1] Disease patterns have been analyzed in both developed and developing countries to inform and enhance healthcare policies and services. Non-communicable diseases are common in developed countries, and the main causes of mortality are heart disease, malignancy, and stroke.[2] Meanwhile, in developing countries like Vietnam, the disease patterns are changing to include more chronic non-communicable and lifestyle-related conditions. The increasing prevalence of these illnesses places an extra strain on healthcare financing.[3]

The severity of disease patterns is useful for supporting clinical decisions and accurate evaluation of a patient's condition. This approach allows healthcare workers to assess the prognosis of patients in critical care, allowing them to distribute the resources needed to handle the diseases properly. Clinical decisions, on the other hand, eventually rest with doctors and should be based on various variables, including the seriousness of the disease.[4]

Given the importance of analyzing disease patterns, this study aims to demonstrate a pattern of severe diseases in the emergency department of a provincial hospital in Vietnam in 2020. By analyzing the disease patterns, the study identifies the most common and severe illnesses among patients and explores their progression and treatment outcomes. The findings of this study will inform healthcare policies, improve preventive treatments and training, and aid scientific research to improve patient outcomes.

METHODS

STUDY SETTING

Thanh Hoa is a province on the northern central coast of Vietnam. It is the region's fifth-largest province and the third largest of the 63 central government subdivisions. Its strategic location, where Thanh Hoa is a transitional area between North Vietnam and the Central North Coast, is characterized by geology, climate, administrative division, and local culture. The province is divided into two provincial cities, one district-level city, and 24 rural districts. There are 1,200 beds in Thanh Hoa Provincial General Hospital, 44 of which are in the ICU.

STUDY DESIGN AND DATA SOURCE

We conducted a retrospective descriptive study using emergency and intensive care unit patient data. Data were exported from the Hospital Management Software of the Emergency Department at Thanh Hoa General Hospital. The study included all emergency and critical care patient admissions hospitalized from January 1, 2020, to December 31, 2020 totaling 27,152 admissions.

SAMPLE AND VARIABLES

The research sample included 27,152 emergency and critical care admissions corresponding to 21,584 patients. The choice to specifically examine patients admitted to emergency and intensive care units allows for a detailed exploration of the disease patterns in these acute care environments. Data was gathered for each admission and included a variety of characteristics considered significant for the investigation. Age, gender, time of hospital admission, length of hospital stay, ICD-10 disease chapter, and treatment outcomes at the time of hospital discharge were among the variables collected for each admission. Each patient's age was computed by subtracting their birth year from 2022. The time of hospital admission was categorized as either morning or afternoon and year quarter (in the Vietnamese calendar, the Gregorian year is divided into four quarters, each spanning three months. Quarter 1 encompasses January 1 to March 31, Quarter 2 extends from April 1 to June 30, Quarter 3 covers July 1 to September 30, and Quarter 4 runs from October 1 to December 31). The length of hospital stay was estimated by subtracting the time of discharge from the time of entrance, which indicated the length of hospitalization, measured in days.

The International Classification of Diseases, Tenth Revision (ICD-10) codes were used to categorize the illnesses. The codes utilized in this research were divided into chapters according to the kind of disease or condition. In this study, the diagnosis according to the ICD at the time of patient discharge is utilized to ensure accuracy in describing the disease patterns within the hospital's emergency department. At discharge, treatment results were graded

as recovery, improvement, unchanged, worsened, or death. The treatment result is derived from the medical records, and the physician in charge determines this information. 'Recovery' denotes the comprehensive restoration of a patient's health to normalcy, while 'Improvement' means a positive change in the patient's health status, reflecting progress toward recovery, even if complete restoration has not yet been achieved. 'Unchanged' describes a situation where the patient's health remains stable, showing neither significant improvement nor deterioration. 'Worsened' indicates a negative shift in the patient's health, reflecting a decline or worsening of their medical condition.

DATA MANAGEMENT AND ANALYSIS

The exported data were imported into the RStudio (Posit PBC) program for analysis. Descriptive statistics were used to characterize the concentration and dispersion of quantitative data, such as mean or median and standard deviation or interquartile range, respectively. Meanwhile, qualitative variables were described using frequency and percentage. The Chi-squared test was used to compare death rates among independent factors. The statistical significance threshold was set at 0.05.

ETHICS STATEMENT

The study was approved by the Ethics Committee at Thanh Hoa General Hospital (Certificate No. 15/HĐKH-BV dated 06/09/2021).

RESULTS

The sociodemographic characteristics of the study participants provide insights into the disease burden among patients referred to the critical care units at Thanh Hoa General Hospital in 2020. This study included 27,152 admissions, with a median age of 56 years old and an interquartile range (IQR) of 38-70 years of age. Regarding gender distribution, 61.8% of the study subjects were male. The number of inpatients stayed relatively high over the four quarters of the year, ranging from 23.3% to 27.1%. Patients were more likely to be admitted to the hospital in the morning, accounting for over 62.8% of all admissions.

TABLE 1. SOCIO-DEMOGRAPHIC CHARACTERISTICS

Variables (n = 27,152)	*n*	%
Age*	56	38 - 70
Gender		
Male	16,773	61.8
Female	10,379	38.2
Hospitalization		
Q1	6,314	23.3
Q2	6,534	24.1
Q3	6,942	25.6
Q4	7,362	27.1
Hospitalization time		
AM	17,051	62.8
PM	10,101	37.2

* Median / IQR

Table 2 reveals the distribution of illness chapters among patients hospitalized at Thanh Hoa General Hospital's emergency department in 2020. ICD-10 Chapter XI (Diseases of the Digestive System), Chapter XIX (Injury, poisoning, and some other consequences of external sources), and Chapter IX (Diseases of the Circulatory System) had the highest number of episodes, accounting for 21.6%, 21%, and 20.3% of total admissions, respectively. Notably, these three chapters accounted for more than 60% of the total cases examined in this research, demonstrating the tremendous impact of these illnesses on Thanh Hoa's population.

Chapter XIV (Diseases of the genitourinary system) and Chapter X (Diseases of the respiratory system) ranked fourth and fifth with a percentage of 9.7% and 6.9%, respectively. The remaining chapters accounted for less than 5% of total admissions. In particular, Chapter II - Neoplasms, which encompassed all types of cancer, accounted for only 2.6% of total admissions, notwithstanding the high incidence of

cancer globally. However, this finding may be attributed to the fact that Thanh Hoa General Hospital is a tertiary care facility, and cancer patients may be referred to specialized centers for treatment.

Table 3 shows the duration of hospital stay and treatment outcomes of patients. Half of the patients were in the hospital for fewer than six days, and just a quarter stayed for more than 9 days. The majority of patients (n = 21,999, 81.0%) had improved their medical status at the time of hospital discharge, and up to 87% were cured. Nevertheless, a small number of patients (4.7%) showed no improvement in their medical status, and 5.2% were discharged in worse health than when they arrived, given that 12.5% of patients were released from the hospital at the request of the patient's family. Among the 3,397 patients discharged upon family request, approximately 19.3% showed improvement and recovery, while 41% experienced a more severe progression in their condition.

TABLE 2. ICD-10 DISEASE CHAPTERS

No	Chapter (n = 27,152)	*n*	%
1	Chapter XI - Diseases of the digestive system	5,863	21.6
2	Chapter XIX - Injury, poisoning, and certain other consequences of external causes	5,686	21.0
3	Chapter IX - Diseases of the circulatory system	5,512	20.3
4	Chapter XIV - Diseases of the genitourinary system	1,997	7.4
5	Chapter X - Diseases of the respiratory system	1,736	6.4
6	Chapter XVIII - Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified	1,331	4.9
7	Chapter I - Certain infectious and parasitic diseases	1,010	3.7
8	Chapter VI - Diseases of the nervous system	791	2.9
9	Chapter XIII - Diseases of the musculoskeletal system and connective tissue	781	2.9
10	Chapter II - Neoplasms	702	2.6
11	Chapter III - Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	424	1.6
12	Chapter XXI - Factors influencing health status and contact with health services	398	1.5
13	Chapter IV - Endocrine, nutritional and metabolic diseases	369	1.4
14	Chapter VIII - Diseases of the ear and mastoid process	286	1.1
15	Chapter XII - Diseases of the skin and subcutaneous tissue	73	0.3
16	Chapter V - Mental and behavioural disorders	64	0.2
17	Chapter XVII - Congenital malformations, deformations, and chromosomal abnormalities	39	0.1
18	Chapter VII - Diseases of the eye and adnexa	35	0.1
19	Chapter XV - Pregnancy, childbirth and the puerperium	32	0.1
20	Chapter XX - External causes of morbidity and mortality	15	0.1
21	Chapter XVI - Certain conditions originating in the perinatal period	1	0.0

TABLE 3. LENGTH OF HOSPITAL STAY AND TREATMENT OUTCOME

Variables (n = 27,152)	n	%
Number of days in hospital*	6	(3 – 9)
Treatment outcome		
Improvement	21999	81.0
Recover	2,354	8.7
Unchanged	1,280	4.7
Worsened	1,399	5.2
Death	120	0.4
Discharge		
Hospital allows discharge	23,752	87.5
Requested to be discharged by family's patient	3,397	12.5

* median / IRQ

Table 4 presents the association between the length of hospital stay in hours and treatment outcomes. The results indicate that 50% of deaths were patients hospitalized for less than one hour, and 75% of them were hospitalized for less than two hours. Patients with an unchanged condition at discharge had a median hospital stay of 24 hours, while those with a worsened condition had a median stay of 21 hours. The Mann-Whitney test revealed a statistically significant difference in the length of hospital stay between patients with different treatment outcomes ($p<0.001$).

The relationship between disease chapter, gender, and mortality status of patients is presented in Table 5. The majority of patient deaths (n = 116, 96.7%) were caused by diseases of the circulatory system (Chapter IX). Specifically, the ICD codes for these 116 cases included I21 - Acute myocardial infarction (n = 1), I46 - Cardiac arrest (n = 114), and I77.2 - Stricture of artery (n = 1). The remaining four deaths were caused by codes T07 - Unspecified multiple injuries (n = 2), R57.1 - Hypovolemic shock (n = 1), and S06 - Intracranial injury (n = 1). Mortality rates were higher in males than in females, and the difference was statistically significant with the Chi-squared test ($p < 0.001$). The age of the group that died was lower than that of the group that survived. Additionally, 50% of the survivors had a hospital stay of six days, while 75% of the patients who died had a hospital stay of only one day.

TABLE 4. RELATIONSHIP BETWEEN TREATMENT OUTCOME AND LENGTH OF HOSPITAL STAY (HOURS)

(n = 27,152)	Median	IQR	*p*
Improvement	142	73 – 220	
Recover	162	102 – 235	
Unchanged	24	4 – 103	< 0.001
Worsened	21	7 – 84	
Death	1	0 - 2	

TABLE 5. FACTORS ASSOCIATED WITH MORTALITY STATUS

	Survival (n = 27,032)		Dead (n = 120)		
(n = 27,152)	***n***	**%**	***n***	**%**	***p***
Disease chapter					<0.001
Chapter IX - diseases of the circulatory system	5,396	20.0	116	96.7	
Chapter XIX - Injury, poisoning and certain other consequences of external causes	5,683	21.0	3	2.5	
Chapter XVIII - Congenital malformations, deformations and chromosomal abnormalities	1,330	4.9	1	0.8	
Others	14,623	54.1	0	0.0	
Gender					<0.001
Male	16,679	99.4	94	0.6	
Female	10,353	99.7	26	0.3	
Age	56[38 - 70]		51[35- 64]		0.019
Number of days in hospital	6[3 – 9]		0 [0- 0]		<0.001

DISCUSSION

The current study explains the condition of patients brought to the emergency section of the Thanh Hoa general hospital, an important spot in the health system of Vietnam's North Central region. Investigating disease patterns assists the health system in better delivering services and handling public health holistically. The findings of this research can be used to plan and implement interventions to improve the capability of emergency rooms in province general hospitals to gradually decrease the community's mortality rate and enhance health care.

According to our results, the median age of patients admitted to intensive care at the Thanh Hoa General Hospital in 2020 was 56 years, with an interquartile range of 38 to 70 years. With over 50% of patients aged over 56 and 25% over 70, the study results indicate a high prevalence of severe illnesses, aligning with previous research findings. Patients over the age of 65 made up 60% of all critical care unit entries in the United States, with a fatality rate of 34.8%.[5] Physical recovery was strongly related to being younger.[6] This emphasizes the significance of creating customized care plans for elderly patients and ensuring that healthcare workers are educated to meet the specific requirements of this group.

When analyzing the prevalence of illness and patient results, the gap between men and women of patients in the ICU is a crucial aspect to consider. Over 60% of the research subjects were males, which aligns with previous studies, showing a greater percentage of men as patients in ICUs.[7] Gender was pointed out to be a major component in forecasting ICU deaths. In this research, the mortality rate in men (0.6%) was higher compared to women (0.3%), and the difference is statistically significant. However, in previous studies, the gender differences in ICU mortality were unclear.[8] There are various biological, behavioral, and societal reasons for this difference, such as variations in immunological and endocrine reactions in men and women, biological and behavioral explanations, and lifestyle and healthcare-seeking differences.[9] Further research is required to fully comprehend the fundamental roots of this issue and create efficient strategies to tackle the issues.

Based on our study, there was a slight increase in the number of people admitted to intensive care for treatment in the fourth quarter, and the lowest rate was observed in the first quarter. One possible explanation for this finding is the New Year's holiday in Vietnam that occurs during the first quarter. Patients usually delay their medical consultation during this period, resulting in reduced admissions. Furthermore, the fourth quarter coincides with winter in the northern region of Vietnam, which may explain the largest number of entries. This result is consistent with other studies that suggest a spike in intensive care

admissions during the winter months.[10] The increase in admissions during this time is often attributed to the higher prevalence of viral diseases, such as influenza, which can significantly impact people with chronic diseases. [11, 12] The relationship between seasonality and ICU admissions should be examined in more detail.

In this research, we found that diseases of the digestive system, injury, poisoning, and certain other consequences of external causes, and circulatory system diseases had the three illness segments with the greatest rates in ICUs. The frequency of digestive disorders in critical care units is congruent with findings from other nations where digestive disorders most frequently cause on emergency room appointments. There were roughly 104 million emergency visits in the US in 2004 with a full diagnosis of digestive disease, compared to about 72 million visits with an initial diagnosis, for an incidence of 35,684 visits per 100,000 US residents.[13] Similarly, studies in Portugal between 2000 and 2010 revealed a rise in the number of emergency hospital admissions for digestive illnesses, especially among older patients, who were treated at higher expenses and had higher mortality rates.[14]

Non-infectious chronic diseases and accidents have increased in Vietnam's provincial hospitals, which is possibly caused by industrialization, contamination of the ecosystem, and population aging.[15] More accidents, especially transportation accidents, result from growing development. Additionally, the prevalence of cancer, chemical toxicity, and food-borne illnesses has been influenced by environmental pollution.[16]

Besides that, serious public health issues include harm, toxicity, and a few other outcomes of external causes, which occupy a significant percentage of ICU patients in our research. The frequency of severe injuries, including those caused by accidents and other injuries, as well as the fast modernization and urbanization, has significantly risen. With about 22.5 fatalities per 100,000 people in 2019,[17] transportation accidents are one of the main sources of injury-related mortality in Vietnam.

In addition, the study shows that the high prevalence of non-communicable diseases, such as cardiovascular disease, made a significant contribution to ICU admissions. This tendency is especially noticeable in elderly groups, where the load of chronic illnesses is greater. According to the World Health Organization, non-communicable illnesses are responsible for more than 70% of all fatalities worldwide.[18] The prevalence of non-communicable diseases has risen quickly in Vietnam over the last few decades, owing to such factors as the elderly population, industrialization, and shifting behaviors. [3, 19]

The decision to analyze emergency department admissions rather than individual patients brings several advantages. This approach allows for a detailed exploration of temporal patterns, peak admission periods, and potential bottlenecks in service utilization. It provides insights into the frequency and distribution of acute cases, enabling a more nuanced understanding of the hospital's response to varying demand levels.

Despite these valuable findings, the research has several limitations. This research was performed in a single location, which may restrict the results' applicability to other contexts. Future research involving numerous locations and employing a prospective strategy may aid in overcoming this constraint. Furthermore, the research did not investigate the effect of co-morbidities on ICU episodes and deaths. Upcoming research should look into the effect of conditions on critical care admission.

Additionally, it's crucial to acknowledge potential limitations, as this method may overemphasize recurrent admissions by certain individuals, potentially skewing the representation of disease prevalence. Furthermore, analyzing admissions alone might not fully capture variations in individual patient experiences, such as differences in severity, comorbidities, or the overall impact of their health conditions. Therefore, a comprehensive understanding of disease patterns and healthcare utilization in the emergency department requires a complementary analysis of individual patient characteristics.

CONCLUSIONS

In summary, this study's analysis provides insight into the illness burden among patients sent to Thanh Hoa General Hospital's critical care units in 2020. The distribution of illness chapters highlighted the prevalence of diseases related to the digestive system, injuries, and circulatory system, collectively constituting over 60% of total admissions. Notably, diseases of the genitourinary and respiratory systems ranked lower, while neoplasms accounted for a modest 2.6%, possibly due to referrals to specialized cancer centers.

This research clarified the connection between mortality, gender, and illness chapter. The main causes of death were circulatory system disorders, including acute myocardial infarction and cardiac arrest. Males had greater mortality rates, and there were discernible age disparities between patients who died and those who survived. The results highlight the need for ongoing monitoring and focused treatments, particularly for illnesses with substantial mortality consequences, to enhance patient outcomes in critical care settings at Thanh Hoa General Hospital.

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