Causes of death in a teaching hospital of the Brazilian western Amazon

Causas de óbitos em hospital de ensino da Amazônia Ocidental brasileira

Causas de fallecimiento en hospital universitario de la Amazonía Occidental brasileña

André Ricardo Maia da Costa de Faro[1] https://orcid.org/0000-0003-0761-6070
Andréia Moreira de Andrade[1] https://orcid.org/0000-0003-2400-3794
Fernanda Paula de Faria Guimarães[2] https://orcid.org/0000-0001-9142-1625
Angélica Gonçalves Silva Belasco[3] https://orcid.org/0000-0002-0307-6225
Joao Luiz Grandi[4] https://orcid.org/0000-0002-6522-7754
Dulce Aparecida Barbosa[3] https://orcid.org/0000-0002-9912-4446

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Corresponding author
André Ricardo Maia da Costa de Faro
E-mail: enfermeiromaia@hotmail.com

Abstract

Objectives: To identify the epidemiological profile of patients who died, to characterize these deaths according to sociodemographic and clinical variables and to analyze the relation between the underlying cause and immediate cause of death in a teaching hospital.

Methods: Quantitative cross-sectional study, with descriptive components, using as the main source of data the death certificates of the Information System of the Brazilian Unified Health System and the death declarations that occurred in 2016 in the institution studied.

Results: Of the 634 deaths, most of the patients were male (56.9%), being 70% Afro-descendants; it was observed that almost half (48.8%) were 65 years of age or older; it affected 50.7% of men over 66 years and 53.8% of women under 66 years. The main immediate causes of death were associated with neoplasms (45.4%) and infectious and parasitic diseases (28.9%). Regarding death declarations, there is an underreporting in consequential causes 2 and 3, of 12.6% and 49.9%, respectively.

Conclusion: The occurrence of infectious and parasitic diseases, the signs/symptoms and altered clinical/laboratory tests had an important impact as immediate cause of the analyzed deaths. It is noteworthy that deaths from neoplasms remained constant in all categories (immediate cause, consequential cause 2, consequential cause 3, and underlying cause).

Resumo

Objetivo: Identificar o perfil epidemiológico dos pacientes que evoluíram para óbito, caracterizar essas mortes segundo variáveis sociodemográficas e clínicas e analisar a relação entre a causa básica e a causa imediata do óbito em um hospital de ensino.

Métodos: Estudo quantitativo, transversal retrospectivo, com componentes descritivos, utilizando como principal fonte de dados os atestados de óbitos do Sistema de Informações do Sistema Único de Saúde e das declarações de óbitos ocorridos em 2016 da instituição pesquisada.

Resultados: Dos 634 óbitos, a maioria dos pacientes era do sexo masculino (56,9%), sendo 70% de afrodescendentes, observou-se que quase metade (48,8%) tinha 65 anos ou mais de idade, acometeu 50,7% dos homens acima dos 66 anos e 53,8% das mulheres com menos de 66 anos. As principais causas imediatas de morte foram associadas às neoplasias (45,4%) e às doenças infecciosas e parasitárias (28,9%). Quanto as declarações de óbitos, existe uma subnotificação nas causas consequenciais 2 e 3, de 12,6% e 49,9%, respectivamente.

[1]Universidade Federal do Acre, Rio Branco, Acre, Brasil.
[2]Secretaria de Estado de Saúde de Goiás, Goiânia, GO, Brasil.
[3]Escola Paulista de Enfermagem, Universidade Federal de São Paulo, São Paulo, SP, Brasil.
[4]Hospital São Paulo, Universidade Federal de São Paulo, São Paulo, SP, Brasil.
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Conclusão: A ocorrência de doenças infecciosas e parasitárias, os sinais/sintomas e exames clínicos/laboratoriais alterados, exerceram impacto importante como causa imediata dos óbitos analisados. Destaca-se que os óbitos por neoplasias se mantiveram constantes em todas as categorias (causa imediata, causa consequencial 2, causa consequência 3, causa básica).

Resumen

Objetivo: Identificar el perfil epidemiológico de los pacientes que fallecieron, caracterizar esas muertes de acuerdo con variables sociodemográficas y clínicas y analizar la relación entre la causa básica y la causa directa del fallecimiento en un hospital universitario.

Métodos: Estudio cuantitativo, transversal retrospectivo, con componentes descriptivos, utilizando como principal fuente de datos los certificados de defunción del Sistema de Información del Sistema Único de Salud y las declaraciones de las defunciones ocurridas en 2016 en la institución estudiada.

Resultados: De los 634 fallecimientos, la mayoría de los pacientes era de sexo masculino (56,9 %), el 70 % era afrodescendiente. Se observó que casi la mitad (48,8 %) tenía 65 años o más, el 50,7 % de los hombres tenía más de 66 años y el 53,8 % de las mujeres, menos de 66 años. Las principales causas directas de muerte se asociaron con neoplasias (45,4 %) y enfermedades infecciosas y parasitarias (28,9 %). Respecto a las declaraciones de defunción, existe una subnotificación en la causa antecedente 2 del 12,6 % y en la 3 del 49,9 %.

Conclusión: Los casos de enfermedades infecciosas y parasitarias, los signos/síntomas y estudios clínicos/de laboratorio alterados ejercieron un importante impacto como causa directa de los fallecimientos analizados. Se observa que los fallecimientos por neoplasias se mantuvieron constantes en todas las categorías (causa directa, causa antecedente 2, causa antecedente 3, causa básica).

Introduction

Hospitals emerged based on care and were run by religious people and, in the Middle Ages, served only to segregate the sick and prevent the spread of diseases. With the transformation of hospitals as a therapeutic instrument at the end of the 18th century, the medical professional emerges, with powers over human life and death, leaving aside the authority of religious people who ran the hospital of the time over living and dying.[1]

It was only in the 20th century that medicalization models were installed in hospitals, which would serve not only for healing, but also to maintain hospital discipline.[2] Thus, hospitals marked by the complexity of care were destined to promote care with the health of society from birth, sickness and death, and no longer a place to shelter people who would die. It is in this context that the figure of the doctor becomes a mandatory presence, to establish the rules of hospital practices.[3]

The end of World War II brought technological advances for healing and prolonging life, such as invention of mechanical ventilators, dialysis machines and intensive care units.[1] But it was only in recent decades that an increase in technologies aimed at health care is observed, providing a greater access to new therapies and diagnostic methods, improving people's conditions and the quality of the service; on the other hand, the risk of severe adverse events increased, resulting in preventable deaths in hospital environments.[4]

In Brazil, public and private hospitals record six deaths each hour due to severe adverse events, of which four are estimated to be preventable deaths.[5] Among the main causes of preventable deaths are those related to medical errors, infections related to health care (IRHC), such as pneumonia, surgical site infections and urinary infections, and those caused by vascular devices, hemorrhagic complications and errors in the use of medications.[6]

Studies report that preventable causes of death in residents in Brazil have been falling by 1.6% each year, while the non-preventable ones, by 1.4% each year. However, the same authors evidence an increase in deaths for specific causes such as pneumonia (1.9% per year) and non-communicable diseases with a reduction of 2.2% per year, which were higher in the age group of 60-69 years in 2013 (209.9/100,000hab).[7] However, it is possible that more deaths occur from adverse events than reported, due to the quality of information and the underreporting of cases.[6]

Preventable or reducible deaths are all deaths that could have been prevented by health service actions. A high number of preventable deaths may be associated with failures in care and are considered sentinel events.[6] The analyses of deaths and preventable deaths have been considered in literature as indicators that comprehensive care is not working properly.[7,8]

Few studies are concerned with assessing causes of death in different group ages, restricting data to infant death or to specific causes.[7] In this sense, analyzing the data that may identify the number of deaths in a reference hospital and the reasons that contributed to the occurrence of deaths may be a strategy to evaluate the efficacy of the health system of the region, allowing to assist the local health authority for the creation of public health policies.[8]

Modern nursing, in turn, plays an important role in the conduct of care and technological activities of health institutions and, consequently, of hospitals, as well as in the performance and functioning of hospitalization units, assuming responsibility for care 24/7 throughout the 365 days of the year, in addition to ensuring the therapeutic environment and the supply of necessary materials. Due to their professional training, the role of the nurse goes beyond administrating the hospitalization unit, and this administration becomes a fundamental item that may contribute with the performance of this professional in managing epidemiological data (a system to verify death, for example) and even in maintaining order in the different categories offered at a higher level, as long as it does not overload or hinder the care work of this professional.

The objectives of this study are to identify the epidemiological profile of patients who died, to characterize these deaths according to sociodemographic and clinical variables, and to analyze the relation between underlying and immediate causes of death in a teaching hospital, located in de capital of the Brazilian western Amazon.

Methods

Study design, period and location: This is a quantitative, observational, retrospective study, using as main source of data death certificates from January to December 2016, recorded in the nominal banks of the *Sistema de Informações sobre Mortalidade* (SIM - Mortality Information System) and *Sistemas de Informações Hospitalares* (SHI – Hospital Information System) of the Unified Health System (SUS), which contains information from a number of copies of deaths certificates of the epidemiological surveillance service in the hospital. The collected data were classified according to sociodemographic characteristics and causes of death. The study was performed in a state public hospital, linked to the federal system, in the municipality of Rio Branco, state of Acre, located southeast of the North Region, and considered the capital of the Brazilian western Amazon. It operates at secondary and tertiary care levels, offers services in an outpatient and hospital setting and is constituted as the main reference unit of care to medium and high complexity for SUS throughout the State, such as the *Serviço de Atendimento Móvel de Urgência* (SAMU - Mobile Emergency Medical Service), hospitals and mixed units of municipalities in Acre, in addition to meeting the spontaneous demands of its surroundings, such as municipalities in the states of Amazonas and Rondônia and neighboring countries such as Peru and Bolivia..

Population and Sample: The study sample was obtained by all death declarations registered in the epidemiological surveillance service of the hospital and entered in the *Sistema de Informações sobre Mortalidade do SUS* (SIM-SUS – SUS Mortality Information System) of all patients who had registration of hospitalization in the *Sistema de Informações Hospitalates do SUS* (SIH-SUS - SUS Hospital Information System). Death certificates were grouped and analyzed according to the causes and to the International Classification of Diseases - ICD-10.[9]

Study Protocol: The data on deaths were analyzed using the "linkage" technique. This technique is based on the connection (unification) of two or more databases, obtained from existing information between bases, building from a single information system, without duplicity, with greater fidelity of information of the same individual in different systems and, later, in a single record generated. Instruments for data collection were coded and validated by the researchers, then stored in a single database, using the Microsoft

Excel 2013 tool, containing the following variables extracted from death certificates in the SIM-SUS: sex, date of birth, ethnicity, marital status, date, time and unit of hospitalization, date of death, origin, immediate causes and underlying causes of death. "Immediate cause" is considered the disease or morbid state that directly caused death. "Underlying cause" is considered the disease or injure that initiated the succession of morbid events that led directly to death and motivated hospitalization.

The quality control was through double typing, using different typists; at the end of the typing, data consistency was analyzed, in which it was ensured that inconsistent data were checked and corrected in the sample, when applicable.

Since the SIM-SUS records did not provide data regarding the contributing cause of death, in the final categorization, deaths were classified in four groups: 1) immediate cause; 2) consequential cause 1; 3) consequential cause 2 and 4) underlying cause, described as follows:

- **Group 1: Immediate cause –** As immediate cause, we grouped diseases classified in the ICD-10 chapters, being: certain infectious and parasitic diseases (INF1), symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (ANO1), diseases of the respiratory system (RES1), neoplasms (NEO1), diseases of the circulatory system (CIR1), endocrine, nutritional and metabolic diseases (ENM1), diseases of the genitourinary system (GEN1) and others (OTH1);
- **Group 2: Consequential cause 1** – For this group, we defined diseases of the respiratory system (RES2), neoplasms (NEO2), certain infectious and parasitic diseases (INF2), diseases of the genitourinary system (GEN2), diseases of the circulatory system (CIR2), diseases of the digestive system (DIG2), endocrine, nutritional and metabolic diseases (ENM2), symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified, diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism (IMU2), external causes of morbidity and mortality (EXT2) and others (OTH2);
- **Group 3: Consequential cause 2** – In this group, we defined the following diseases: neoplasms (NEO3), diseases of the respiratory system (RES3), diseases of the digestive system (DIG3); diseases of the circulatory system (CIR3), diseases of the genitourinary system (GEN3), certain infectious and parasitic diseases (INF3), endocrine, nutritional and metabolic disorders (ENM3), and others (OTH3);
- **Group 4: Underlying cause** – In this group, there are neoplasms (NEO4), diseases of the respiratory system (RES4), diseases of the circulatory system (CIR4), certain infectious and parasitic diseases (INF4), diseases of the digestive system (DIG4), endocrine, nutritional and metabolic disorders (ENM4), diseases of the genitourinary system (GEN4), external causes of morbidity and mortality (EXT4) and the others (OTH4).

Result Analysis and Statistics: From the Excel spreadsheet, data were exported to the IBM SPSS 14.0 software, adapted to the selected variables and aiming to analyze them in a descriptive and exploratory way, with results shown as tables. The categorical variables were described by absolute and relative frequency. Numerical variables were described by central trends measures (mean and median) and dispersion measures (variance and standard deviation).

Ethical aspects: After being inserted in Plataforma Brasil, this study was assessed and approved under Certificado de Apresentação de Apreciação Ética (CAAE) No. 55573416.2.0000.5505, issued by the Research Ethics Committee of the Federal University of São Paulo (UNIFESP). This investigation meets the ethical precepts based on the standardization of Resolution 466/2012 of the National Health Council.[10]

We ensured secrecy and confidentiality of the information from all collected data. Since these are secondary data, collected from death declarations of patients already deceased, the use of the Informed Consent Form (ICF) was dismissed, according to the opinion of the REC.

Results

During 2016, the municipality of Rio Branco recorded a total of 1,824 deaths, of these, 73.5% (2,076) occurred within health institutions of the municipality. In the surveyed institution, there were 634 deaths, which correspond to 22.5% of the recorded total in the municipality, and to a mortality prevalence of 8.54% in this hospital. The highest number of deaths in the institution occurred in April, with 72 deaths (11.0%), and the lowest in November, with 36 (5.7%). The monthly mean was 52.8 deaths.

Table 1 analyzes the sociodemographic variables of patients who died in the institution in 2016. In relation to sex, deaths occurred more among men, with 361 incidences (56.9%), than among women, with 273 (43.1%). As for age, 50.7% of deaths occurred among men over 66 years of age, while 53.8% were recorded among women aged less than 66 years.

As for the ethnicity recorded in death certificates, it was verified that 70% were Afro-descendants, with a normal distribution between men and women. Interestingly, among the other ethnic groups, only 6 deaths (0.9%) were among indigenous people. When analyzing the marital status of the deceased, it was observed that about 25.7% of the women were widows, against 46.3% of men married or living in a stable union. When analyzing the record of stable partners in the death declarations separately, it was found that 46.0% of men, against 60.1% of women, had no partner when they died.

Interestingly, about 30% of the analyzed deaths occurred among women in up to three days of hospitalization, while, for men, 52.3% of the occurrences were from eleven to 23 days or more of hospitalization. (Table 1).

Most deaths occurred in critical units, and 24.9% of men and 20.8% of women died in intensive care units, followed by deaths in the geriatric unit. The units with the lowest number of deaths during the study period were the nephrology (hemodialysis and dialysis) and surgical clinics, with 0.6% and 2.1% of the total deaths, respectively. (Table 1).

Table 1. Distribution of deaths occurred in a teaching hospital according to sociodemographic variables, length of stay and unit of occurrence (n=634)

Variables	Male n(%)	Female n(%)	Total n(%)
Age Group			
Up to 53 years	84(23.3)	78(28.6)	162(25.5)
From 54 to 65 years old	94(26.0)	69(25.2)	163(25.7)
From 66 to 76 years old	103(28.5)	63(23.1)	166(26.2)
76 years or older	80(22.2)	63(23.1)	143(22.6)
Total	361(100.0)	273(100.0)	634(100.0)
Ethnicity			
Afro-descendants	261(67.7)	203(20.7)	464(68.9)
White	84(23.3)	58(21.3)	142(22.4)
Other (Asian/Indigenous)	4(1.0)	3(1.1)	7(0.2)
Ignored	12(3.4)	9(3.3)	21(3.3)
Total	361(100.0)	273(100.0)	634(100.0)
Marital status			
Single	115(31.9)	81(29.7)	196(30.9)
Married or in a stable union	167(46.3)	88(32.3)	255(40.2)
Widow/Widower	31(8.6)	70(25.7)	101(16.0)
Divorced	20(5.5)	13(4.7)	33(5.2)
Ignored	28(7.7)	21(7.7)	49(7.7)
Total	361(100.0)	273(100.0)	634(100.0)
Length of stay (days)			
Up to 3	92(25.5)	84(30.8)	176(27.8)
From 4 to 10	80(22.2)	66(24.2)	146(23.0)
From 11 to 23	94(26.0)	63(23.0)	157(24.8)
23 or more	95(26.3)	60(22.0)	155(24.4)
Total	361(100.0)	273(100.0)	634(100.0)
Unit in the verification of death			
Oncological Clinic	47(13.1)	43(15.8)	90(14.2)
Infectious Diseases	34(9.5)	15(5.5)	49(7.7)
Surgical Clinic	7(1.9)	6(2.2)	13(2.1)
Medical Clinic	16(4.5)	9(3.3)	25(3.9)
Geriatrics	78(21.6)	72(26.3)	150(23.7)
Nephrology/Hemodialysis	2(0.5)	2(0.7)	4(0.6)
Oncological Emergency	44(12.2)	38(13.9)	82(12.9)
Intensive Care Unit	90(24.9)	57(20.8)	147(23.2)
Semi-intensive therapy	17(4.6)	7(2.6)	24(3.8)
No Information	26(7.2)	24(8.9)	50(7.9)
Total	361(100.0)	273(100.0)	634(100.0)

Table 2 shows the immediate and underlying cause of death according to the classification of ICD-10 Chapters.

When analyzing the immediate causes of death, we verified that 183 (28.9%) were among those related in Chapter I of the ICD-10, which addresses certain infectious and parasitic diseases, followed by chapter XVIII, which addresses symptoms, signs and abnormal findings of clinical and laboratory tests, not elsewhere classified, with 137 (21.6%) deaths. However, when we analyzed the underlying cause, we verified that 288 (15.4%) were deaths from neoplasms/tumors (Chapter II of the ICD-10). The subgroups of diseases that did not register

Table 2. Distribution of the immediate and underlying cause of death classified according to the ICD-10 Chapters reported in the death certificates of the SIM-SUS (n=634)

ICD-10 chapters	Subgroups of diseases and systems	Immediate n(%)	Underlying n(%)
I	Certain infectious and parasitic diseases	183(28.9)	45(7.1)
II	Neoplasms (tumors)	102(16.1)	288(15.4)
III	Diseases of the blood and blood-forming organs	5(0.8)	4(0.6)
IV	Endocrine, nutritional and metabolic diseases	20(3.2)	35(5.5)
V	Mental and behavioral disorders	-	2(0.3)
VI	Diseases of the nervous system	3(0.5)	5(0.8)
IX	Diseases of the circulatory system	34(5.4)	85(13.4)
X	Diseases of the respiratory system	111(17.5)	92(14.5)
XI	Diseases of the digestive system	17(2.7)	36(5.7)
XII	Diseases of the skin and subcutaneous tissue	-	6(0.9)
XIII	Diseases of the musculoskeletal and connective system	-	4(0.6)
XIV	Diseases of the genitourinary system	12(1.9)	18(2.8)
XV	Pregnancy, childbirth and puerperium	1(0.2)	1(0.2)
XVI	Certain conditions originating in the perinatal period	2(0.3)	1(0.2)
XVIII	Symptoms, signs and abnormal findings	137(21.6)	2(0.3)
XIX	Injury, poisoning and other consequences of external causes.	4(0.6)	-
XX	External causes of morbidity and mortality	3(0.5)	10(1.6)

any deaths with immediate cause are in Chapters XII - diseases of the skin and subcutaneous tissue (dermatological causes), and XIII, which addresses diseases of the musculoskeletal system and connective tissue (orthopedic or muscular causes). As for underlying cause, Chapter XIX, which addressed injury, poisoning and certain other consequences of external causes, also did not have any records of death.

Table 3 shows the distributions of deaths according to the causes of occurrence. Thus, the main immediate cause of death was infectious and parasitic diseases, with 183 (28.9%) deaths, followed by abnormal signs and symptoms, with 137 (21.6%). However, when analyzing consequential causes, it was found that respiratory diseases were responsible for 161 (25.4%) of the total cases in Group 2, and neoplasms represented 13.6% of the total deaths in Group 3. Nevertheless, when verifying the underlying cause, the mortality rate of the hospital is concentrated in neoplasms, with 45.5% of the totals deaths in the institution. The frequency of losses related to consequential causes 2 and 3, of 12.6% and 49.9%, respectively, draws attention in our study.

Table 3. Distribution of causes of deaths according to ICD-10 Chapters, related to immediate, consequential and underlying causes, occurred in a teaching hospital (n=634)

ICD-10chapters	Immediate Cause (1) n(%)	Consequential Cause (2) n(%)	Consequential Cause (3) n(%)	Underlying Cause (4) n(%)
Infectious	183(28.9)	62(9.8)	22(3.5)	45(7.1)
Abnormal	137 (21.6)	19(3.0)	-	-
Respiratory	111(17.5)	161(25.4)	81(12.8)	92(14.5)
Neoplasms	102(16.1)	114(18.0)	86(13.6)	288(45.4)
Circulatory	34(5.4)	45(7.1)	38(6.0)	85(13.4)
Endocrine	20(3.2)	23(3.6)	17(2.7)	35(5.5)
Digestive	17(2.7)	37(5.8)	40(6.3)	36(5.7)
Genitourinary	12(1.9)	57(9.0)	25(3.9)	18(2.8)
Immunological	-	11(1.7)	-	-
External		10(1.6)	-	10(1.6)
Other causes	18(2.8)	15(2.4)	15(2.4)	25(3.9)
Losses	-	80(12.6)	310(49.9)	-
Total	634(100.0)	554(87.4)	324(51.1)	634(100.0)

In Table 4, we may observe the relative and absolute frequency of causes of death according to the ICD-10 subgroups, at the time of hospitalization, compared to the outcome (underlying cause versus immediate cause of death).

Infectious and parasitic diseases were the main immediate cause of death, with 183 (28.9%) of the total cases, followed by Chapter XVIII of ICD-10, which addresses abnormal symptoms, signs and findings, with 137 deaths (21.6%) of the total cases.

As for the consequential cause of deaths, respiratory diseases accounted for 161 (25.4%) of deaths in this category. When analyzing separately the deaths from neoplasms, we found that 288 (45.4%) were due to the underlying cause. However, we cannot fail to observe that deaths from neoplasms were constant in all categories, with an average of only 15.9% for other causes: immediate and consequential (Table 4), which means that 31.6% of patients with tumors died due to other causes arising from the disease, and not exactly from the disease that motivated hospitalization.

Discussion

With the data shown in this study, it was possible to analyze the deaths occurred in 2016 in a state hospital, linked to the federal education sys-

Table 4. Distribution of absolute and relative frequency of the relation between Immediate Cause (1) and Underlying Cause (4) of deaths occurred in a teaching hospital (n=634)

	Cause 1									
Cause 4	INF1	ANO1	RES1	NEO1	CIR1	ENM1	DIG1	GEN1	OTH1	Total
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
NEO4	43(14.9)	56(19.4)	44(15.3)	102(35.4)	14(4.9)	13(4.5)	6(2.1)	4(1.4)	6(2.1)	288(45.4)
RES4	42(45.7)	15(16.3)	31(33.7)	-	2(2.2)	1(1.1)	-	1(1.1)	-	92(14.5)
CIR4	30(35.3)	24(28.2)	16(18.8)	-	10(11.8)	-	1(1.2)	2(2.4)	2(2.4)	85(13.4)
INF4	20(44.4)	14(31.1)	6(13.3)	-	-	1(1.2)	3(6.7)	-	1(1.2)	45(7.1)
DIG4	14(38.9)	13(36.1)	2(5.6)	-	1(2.8)	1(2.8)	5(13.9)	-	-	36(5.7)
ENM4	12(34.3)	4(11.4)	7(20.0)	-	3(8.6)	3(8.6)	1(2.9)	4(11.4)	1(2.9)	35(5.5)
GEN4	8(44.4)	3(16.7)	1(5.6)	-	2(11.1)	1(5.6)	1(5.6)	-	2(11.1)	18(2.8)
EXT4	2(20.0)	1(10.0)	2(20.0)	-	1(10.0)	-	-	-	4(40.0)	10(1.6)
OTH4	12(48.0)	7(28.0)	2(8.0)	-	1(4.0)	-	-	1(4.0)	2(8.0)	25(3.0)
TOTAL	183(28.9)	137(21.6)	111(17.5)	102(16,1)	34(5.4)	20(3.2)	17(2.7)	12(1.9)	18(2.8)	634(100.0)

[1]INF - certain infectious and parasitic diseases; NEO - neoplasms (tumors); ENM - endocrine, nutritional and metabolic diseases; CIR - diseases of the circulatory system; RES - diseases of the respiratory system; DIG - diseases of the digestive system; GEN - diseases of the genitourinary system; ANO - symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; EXT - external causes of morbidity and mortality; OTH – outher.

tem, located in the capital of the Brazilian western Amazon. Hospital mortality is a traditional indicator of institutional performance and corresponds to a very useful tool in conditions in which death is not a rare event, to indicate services with possible quality problems.[11,12]

Regarding the sex declared in the death certificates, it was verified that mortality was higher among male patients than among females, which corroborates other studies, which also refer to a higher mortality among men.[13-15]

In relation to the age group of the patients and following the statistics of aging in the Brazilian population, we observed that almost half of this study sample (48.8%) was 65 years or older at the time of death. It should be noted that, in Brazil, the number of individuals over 60 years old has more than doubled in the last six decades.[16,17]

In most countries, population aging is one of the most significant social transformations of the 21st century due to the progressive decline in their mortality and fertility rates, reflecting the increased life expectancy with an increase in older populations.[18,19]

Because it is an institution considered a state reference in the oncology area, which may impact the mortality rate of the study, the main cause of deaths were neoplasms (45.4%), which are usually in second place both in developed and developing countries.[8]

It was also observed that the number of deaths in patients with chronic diseases was high, especially those of the respiratory (14.5%) and circulatory (13.4%) systems and infectious and parasitic diseases (7.1%). Such data are compared with those found in an emergency hospital in Sergipe, which points infectious and parasitic diseases as the main cause of death.[8] However, such data do not corroborate those found in Rio Grande do Sul, which point out a mortality rate of 32% from diseases of the circulatory system, around 25% from neoplasms and tumors, and 4.7% from certain infectious and parasitic diseases, of the total deaths in 2013.[8]

It is worth mentioning the high rate of deaths associated with infectious diseases; 28.9% of deaths were associated with this group of diseases as immediate cause of death, a value that is above the world average of 23%.[20] Such data do not corroborate the data shown by the Ministry of Health, which did not evidence infectious and parasitic diseases as any of the three main causes of death in Brazil in 2012.[21] However, the data are similar with those found in two other studies, one conducted in Sergipe, another in a hospital in the state of São Paulo, where 30.8% and 15.4% of deaths were associated with IRHC, respectively.[5,8]

Data referring to the chain of infectious and parasitic diseases that ended in the death of this population showed that 7.1% were related as the underlying cause of death, 9.8% and 3.5% as consequential cause 2 and 3, respectively, and

28.9% as immediate cause of death. This shows that infectious diseases entered the chain of events responsible for the death of these patients, deducing that this finding originated from hospitalization. It is worth noting that IRHCs constitute a relevant cause of morbidity with high lethality, currently considered a serious public health problem.[22-24]

We noticed that, in addition to the severity of the clinical condition and the increased hospitalization time, it was also possible to highlight the immeasurable costs to which patients and family members are subjected, in addition to the pain and suffering that greatly affect their quality of life, which may produce physical and/or psychological sequels and even death related to the occurrence of IRHC.[22] It is evident that teaching hospitals are the most vulnerable to the occurrence of this type of disease.[25]

When evaluating the relation between immediate and underlying causes of death, it was verified that patients with RES4, INF4 and GEN4 showed INF1 as immediate cause in more than 40% of the deaths (RES4 45.7%, INF4 44.4% and GEN4 44.4%). We emphasize that, in diseases of the respiratory system, it is common to use invasive devices such as orotracheal intubation and mechanical ventilation. Similarly, in diseases of the genitourinary system, it is also routine to use a delay urinary catheter as an invasive device. In both cases, the association between the use of invasive devices and the occurrence of IRHC, pneumonia and urinary tract infections is already known.[26-29]

When comparing in isolation the main causes of death in 2016 in the state of Acre, and in 2013 in Rio Grande do Sul, there is a slight change in the pattern of diseases. For deaths in the South region, the main causes are diseases typical of industrialized countries, that is, cardiovascular diseases and neoplasms, with 32% and 25% respectively, while in the northern state, the opposity occurs, with diseases typical of developing countries, such as infectious diseases, with 28.9% against only 4.7% for this group in the south.[8] It is interesting to note that, in both Brazilian regions, the diseases caused by environmental contamination are very similar, with 15.4% of the main deaths occurring from respiratory diseases in the south and 17.5% in the north.[8,13]

Finally, it was observed that the active search carried out by SUS professionals to fill the existing gaps in the death declarations were extremely important to ensure the record of immediate and underlying causes of death, meeting the desirable indicator of losses and inconsistencies recommended by the Ministry of Health, that is, less than 10%.[29]

Given the scarcity of regional, and even national studies of this magnitude, we suggest more investigations, descriptive and analytical, in order to know more clearly not only the possible problems that led to this profile of mortality, but also possible interventions, thinking of improved quality of care and the impact of Primary Care in the prevention of these cases, which inevitably lead to death in high complexity. These results will contribute to decision-making and to reduce the harm caused to patients who seek care in hospitals.

Conclusion

Most of the deaths in a teaching hospital in the Brazilian western Amazon were among males (56.9%), and, of the total sample, 70% were Afrodescendants and almost half (48.8%) were 65 years or older. Death affected 50.7% of men aged over 66 years and 53.8% of women aged less than 66 years; 25.7% of widowed women died, against 46.3% of men who were married or living in a stable union. The main immediate causes of death were associated with neoplasms (45.4%) and infectious and parasitic diseases (28.9%). The main immediate cause of death were infectious and parasitic diseases, with 183 (18.9%) deaths, followed by abnormal signs and symptoms, with 137 (21.6%). It is noteworthy that deaths from neoplasms remained constant in all categories (immediate cause, consequential cause 2, consequential cause 3, and underlying cause). Regarding death declarations, there is an underreporting in consequential causes 2 and 3, of 12.6% and 49.9%, respectively.

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Collaborations

Faro ARMC, Andrade AM, Guimarães FPF, Belasco AGS, Grandi JL e Barbosa DA contributed to the design of the project, analysis and interpretation of data, drafting the manuscript, provided critical review relevant to intellectual content, and approval of the final version to be published.

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