Epidemiological profile, risk factors, and types of treatment in patients who died from gastric carcinoma

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Highlights

• Death from gastric cancer was more prevalent among elderly family farmers.
• Weight loss, loss of appetite, and asthenia were associated with the occurrence of deaths.
• The time between symptom onset and gastric cancer diagnosis is crucial.
• There is an urgent need for public policies aimed at guidance and screening for gastric cancer.
• Prevention and early detection programs reduce gastric cancer mortality.

Graphical Abstract
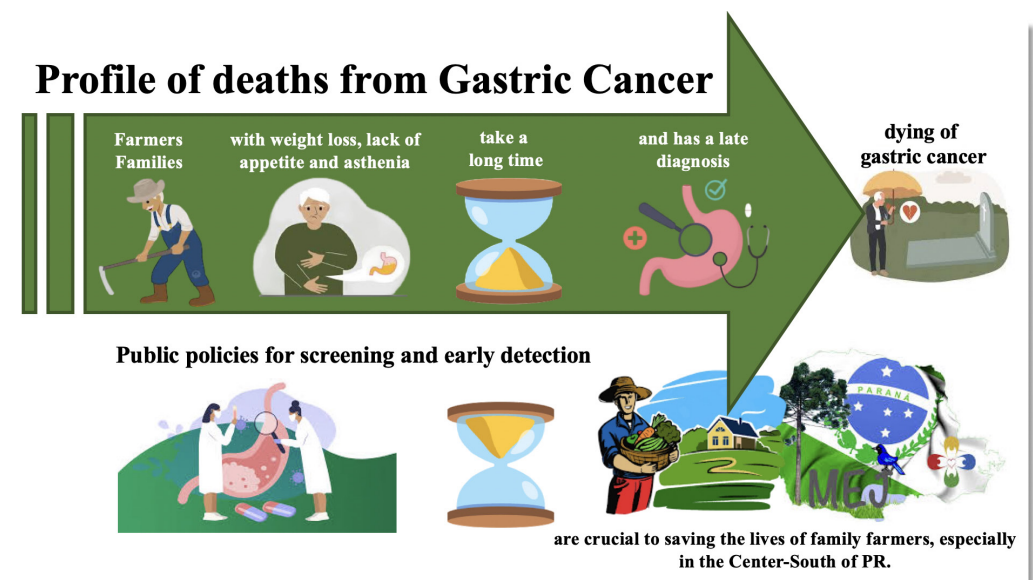
Abstract

Gastric cancer is a global health concern. In 2020, it ranked sixth in global incidence, with over one million new cases, and held the seventh highest mortality rate. This study aimed to analyze the epidemiological profile, clinical presentation, and treatments applied to patients diagnosed with gastric cancer who subsequently died. This is a retrospective study based on medical records, histological, and anatomopathological reports. Descriptive statistics, chi-square test, and Fisher's exact test were used for data analysis. Results showed a predominance of male patients (65.2%), with a mean age of 61.6 years (SD = 12.68), White race/skin color (91.3%), family farmers (37.7%), smokers (66%), histological type adenocarcinoma (94.2%), poorly differentiated histological grade (43.5%), and locally advanced disease (65.2%). It is concluded that the epidemiological profile of deceased patients included White male family farmers and smokers who presented symptoms such as weight loss, loss of appetite, and asthenia associated with death.

Keywords: Cancer. Stomach. Risk Factors. Gastric Neoplasms.

INTRODUCTION

Stomach cancer was the fifth most common malignant tumor in the world in 2020, with approximately 1.1 million new cases, and it ranks as the fourth leading cause of cancer-related death, with around 800,000 deaths[1,2]. In Brazil, according to data from the National Cancer Institute[3], more than 620,000 new cancer cases were estimated for the year 2020. For stomach cancer, 21,000 new cases per year were expected during the 2020–2022 triennium[2,4].

It is well known that among all regions of Brazil, the South region has the highest cancer mortality rates and exceeds the national average[5,6]. This condition may be associated with unhealthy lifestyle habits, such as the high consumption of preserved foods and a high prevalence of smoking[7].

In the South-Central region of Paraná, particularly in the city of Guarapuava, there is evidence of high mortality. Data from the INCA Mortality Atlas show that stomach cancer mortality rates have remained high throughout the years between 1979 and 2018[8,9]. Notably, stomach neoplasia was the leading cause of cancer-related deaths in that region, with peak mortality rates in the years 1981, 1987, 1988, 1993, 1999, and 2004[8]. These findings highlight the need to analyze the epidemiological landscape of stomach cancer in the South-Central region of Paraná through specific studies. In this context, research aiming to understand the epidemiological factors associated with death from gastric cancer, particularly in this region, is essential.

The objective of this study was to analyze the epidemiological profile, risk factors, and types of treatment administered to patients who, despite medical care, progressed to death due to gastric cancer.

METHODOLOGICAL RIGOR

This is an observational, analytical, retrospective study using aggregated data based on the analysis of medical records from the Oncology Department of Hospital São Vicente de Paulo (HSVP-GP) and histological and anatomopathological reports from the Guarapuava Pathology Support Center (CAPG). Both institutions are recognized as regional references for the treatment and diagnosis of gastric adenocarcinoma, respectively, and are located in Guarapuava, in the South-Central region of Paraná.

An exemption from the Informed Consent Form (ICF) was requested, as this is an ex post facto study and no participant contact was involved at any stage of the research, in accordance with the ethical principles established in Resolution No. 196/96 of the National Health Council[10].

The sample size was calculated using data from the Paraná State Department of Health (SESA/PR), based on a population of 442,229 inhabitants[11]. This yielded a minimum required sample of 69 participants, with a confidence level of 90% (z-score = 1.65), a sampling error of 10%, and a standard deviation of 50%[12].
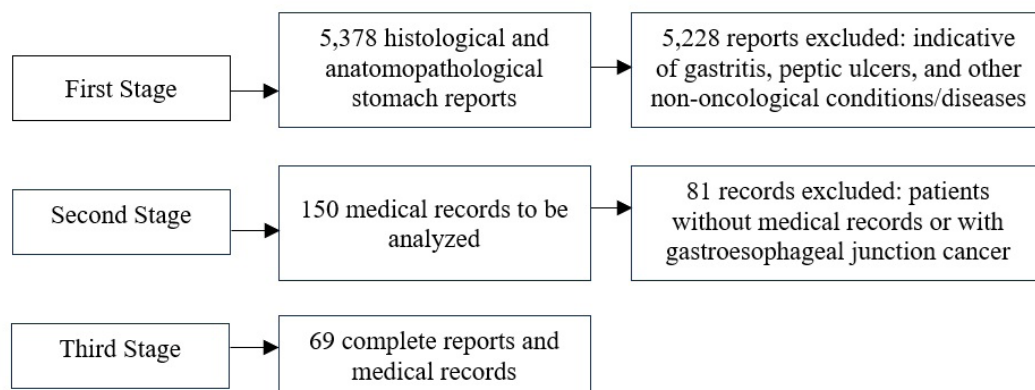
Inclusion criteria for this study consisted of patients from the southern region of the state of Paraná diagnosed with malignant neoplasm of the stomach (ICD C16), who were admitted to the oncology service of HSVP-GP, diagnosed at CAPG, and who began treatment from January 2015 onward, remaining under follow-up or discharged by December 2020. Participants were selected in reverse chronological order—from the most recent year to the earliest—based on CAPG's internal data system and subsequently reviewed at HSVP-GP.

Exclusion criteria included participants with missing medical record data relevant to the study. Additionally, patients diagnosed before January 2015 or after December 2020 were excluded.

Data collection occurred in distinct stages, as illustrated in Figure 1. In the first stage, at CAPG, data were obtained from reports on all diseases, and then filtered for patients diagnosed with gastric carcinoma. The information gathered included age, sex, biopsy number, diagnosis date (biopsy date), type and subtype of carcinoma, histological differentiation grade, Laurén classification, and predominance of "signet ring" cells.

In the second stage, at HSVP-GP, additional data were collected from medical records: race/skin color, occupation, clinical profile, risk factors, and type of treatment received. In the third stage, after reviewing 69 reports and medical records, these were selected for final analysis in the study. The research project was approved by the Research Ethics Committee of Faculdade Campo Real (CEP-Campo Real/8947) under opinion number 4.821.973.

First Stage → 5,378 histological and anatomopathological stomach reports → 5,228 reports excluded: indicative of gastritis, peptic ulcers, and other non-oncological conditions/diseases

Second Stage → 150 medical records to be analyzed → 81 records excluded: patients without medical records or with gastroesophageal junction cancer

Third Stage → 69 complete reports and medical records

Figure 1 - Data Collection Flowchart.

Data were analyzed using SPSS software version 25.0. Descriptive and inferential statistics were employed. Frequency and percentage were used as descriptive measures for categorical variables. The Chi-square test and Fisher's Exact test were applied to analyze the association of symptoms, risk factors, and treatment types with the prevalence of deaths among cancer patients. A significance level of $p < 0.05$ was considered.

RESULTS

This study utilized medical records from 69 patients diagnosed with gastric cancer (24 women and 45 men), aged between 31 and 87 years (M = 61.62; SD = 12.69). Table 1 lists the main signs, symptoms, and their frequency distribution among patients with gastric cancer.

Table 1 - Symptom Frequency in Patients with Gastric Cancer in South-Central Paraná between 2015 and 2020 (n = 69).

Variables	f	%
Epigastric Pain		
No	29	42.0
Yes	40	58.0
Weight Loss		
No	33	47.8
Yes	36	52.2
Loss of Appetite		
No	52	75.4
Yes	17	24.6
Vomiting		
No	53	76.8
Yes	16	23.2
Dysphagia		
No	58	84.1
Yes	11	15.9

to be continued...

Variables	*f*	%
Dyspepsia		
No	58	84.1
Yes	11	15.9
Asthenia		
No	59	85.5
Yes	10	14.5
Nausea		
No	63	91.3
Yes	6	8.7
Melena		
No	63	91.3
Yes	6	8.7
Hematemesis		
No	64	92.8
Yes	5	7.2
Gastric Burning		
No	67	97.1
Yes	2	2.9
Early Satiety		
No	68	98.6
Yes	1	1.4
Abdominal Distension		
No	69	100.0
Yes	0	0.0

The most prevalent symptoms were epigastric pain (58%), weight loss (52.2%), loss of appetite (24.6%), and vomiting (23.2%).

Table 2 aims to present the types of treatment administered to patients with gastric cancer.

Table 2 - Frequency of treatment types administered to patients with gastric cancer.

Variables	*f*	%
Staging		
Localized	7	10.6%
Locally advanced	45	68.2%
Metastatic	14	21.2%
Neoadjuvant chemotherapy		
No	34	49.3%
Yes	35	50.7%
Surgery		
No	25	36.2%
Yes	44	63.8%

to be continued...

Variables	*f*	%
Palliative treatment		
No	45	65.2%
Yes	24	34.8%
Histological grade		
Well differentiated	44	63.8%
Moderately differentiated	24	34.8%
Undifferentiated	1	1.4%

Note: *f* = frequency; % = percentage.

The data in Table 2 revealed that among patients who presented risk factors (68.1%), 50.7% underwent neoadjuvant chemotherapy and 63.8% underwent surgery, while 65.2% did not receive palliative care. It is also noteworthy that 68.2% of the patients were clinically staged as locally advanced, and 63.8% showed well-differentiated histological grades. Table 3 presents the association between gastric cancer symptoms and patient mortality rates.

Table 3 - Association between gastric cancer symptoms and the prevalence of deaths.

Váriables	Death		X^2	p-vaue
	No (n=28)	Yes (n=41)		
	f (%)	*f* (%)		
Weight loss				
No	18 (64.3)	15 (36.6)	5.116	**0.024***
Yes	10 (35.7)	26 (63.4)		
Dysphagia				
No	24 (85.7)	34 (82.9)	0.096	1.000
Yes	4 (14.3)	7 (17.1)		
Loss of appetite				
No	25 (89.3)	27 (65.9)	4.920	**0.027***
Yes	3 (10.7)	14 (34.1)		
Epigastric pain				
No	9 (32.1)	20 (48.8)	1.890	0,169
Yes	19 (67.9)	21 (51.2)		
Dyspepsia				
No	24 (85.7)	34 (82.9)	0.096	1.000
Yes	4 (14.3)	7 (17.1)		
Early satiety				
No	27 (96.4)	41 (100.0)	1.486	0.406
Yes	1 (3.6)	0 (0.0)		
Heartburn				
No	27 (96.4)	40 (97.6)	0.076	1.000
Yes	1 (3.6)	1 (2.4)		

to be continued...

Váriables	Death		X²	p-valor
	No (n=28)	Yes (n=41)		
	f (%)	*f* (%)		
Nausea				
No	24 (85.7)	39 (95.1)	1.855	0.214
Yes	4 (14.3)	2 (4.9)		
Vomiting				
No	24 (85.7)	29 (70.7)	2.097	0.148
Yes	4 (14.3)	12 (29.3)		
Hematemesis				
No	26 (92.9)	38 (92.7)	0.001	1.000
Yes	2 (7.1)	3 (7.3)		
Melena				
No	27 (96.4)	36 (87.8)	1.558	0.389
Yes	1 (3.6)	5 (12.2)		
Asthenia				
No	27 (96.4)	32 (78.0)	4.535	**0.041***
Yes	1 (3.6)	9 (22.0)		

*Note: Significant association – $p < 0.05$: Chi-Square Test and Fisher's Exact Test.

In the association between cancer-related symptoms and the prevalence of deaths (Table 3), a significant association was found only for weight loss (p = 0.024), loss of appetite (p = 0.027), and asthenia (p = 0.041). This association indicates a higher proportion of deaths among patients who experienced weight loss (63.4%) and who did not present loss of appetite (65.9%) or asthenia (78.0%). Table 4 presents the association between the presence of risk factors and types of treatment with the occurrence of death among patients with gastric cancer.

Table 4 - Association between the presence of risk factors and types of treatment with mortality prevalence.

Váriables	Death		X²	p-valor
	No (n=28)	Yes (n=41)		
	f (%)	*f* (%)		
Risk factor				
No	6 (21.4)	16 (39.0)	2.372	0.124
Yes	22 (78.6)	25 (61.0)		
Clinical staging[a]				
Localized	7 (25.9)	0 (0.0)	6.915	**0.009***
Locally advanced	16 (59.3)	29 (74.4)		
Metastatic	4 (14.8)	10 (25.6)		
Neoadjuvant chemotherapy				
No	12 (42.9)	22 (53.7)	0.777	0.378
Yes	16 (57.1)	19 (46.3)		

Váriables	Death		X²	p-valor
	No (n=28)	Yes (n=41)		
	ƒ (%)	ƒ (%)		
Surgery				
No	6 (21.4)	19 (46.3)	4.469	**0.035***
Yes	22 (78.6)	22 (53.7)		
Palliative treatment				
No	26 (92.9)	19 (46.3)	15.870	**<0.001***
Yes	2 (7.1)	22 (53.7)		
Histological grade				
Well differentiated	20 (71.4)	24 (58.5)	1.592	0.207
Moderately differentiated	8 (28.6)	16 (39.0)		
Undifferentiated	0 (0.0)	1 (2.4)		

Note: a = Variable with missing cases. *Significant association – p < 0.05: Chi-square and Fisher's exact test.

According to the data in Table 4, a significant association was found between mortality and clinical staging (p = 0.009), undergoing surgery (p = 0.035), and receiving palliative treatment (p < 0.001). This association indicates a higher proportion of deaths among patients who underwent surgery (53.7%) and palliative treatment (53.7%), as well as a tendency toward mortality in patients with locally advanced (74.4%) and metastatic staging (25.6%).

DISCUSSION

The data collected identified that the epidemiological profile of patients diagnosed with stomach cancer was characterized by a higher prevalence of men aged between 60 and 70 years, of white race/skin color, and family farmers, a finding similar to that reported in the literature[13,14,15]. In addition to being exposed to agrochemical agents, these agricultural workers handle fertilizers that contain nitrates in their chemical composition, which are considered a significant risk factor for the development of gastric cancer[16]. In rural areas, the consumption of salt-preserved foods and infection with *H. pylori* are notably more frequent than in urban areas[15], which may increase exposure for this group of professionals.

Risk factors such as smoking and *H. pylori* infection have been identified as the first and second most frequent factors related to mortality in patients with gastric cancer[17]. In this study, other factors such as weight loss, loss of appetite, and asthenia were statistically associated with the prevalence of deaths due to gastric cancer. Although gastric cancer does not present specific (pathognomonic) symptoms for clinical diagnosis[18], these signs may indicate both benign and malignant conditions and, in this context, guide healthcare professionals toward more appropriate and timely interventions[19]. Given the nonspecific nature of symptoms in the early stages of gastric cancer, the disease is often detected only in terminal phases, when more severe symptoms such as loss of appetite, weight loss, and asthenia are present. Unfortunately, this delay in diagnosis significantly compromises the chances of cure and increases the rate of late-stage detection[20].

Once risk factors are identified, the selection of treatment type becomes fundamental in preventing the worst outcome, patient death. In this sense, clinical staging, surgery, and palliative care were the treatment modalities statistically associated with the patients who died. This finding confirms that staging should be considered a key prognostic factor[21], especially in cases of locally advanced or metastatic disease, where mortality rates are higher[22,23]. Following a temporal progression, this study showed a mortality trend among patients with lo-

cally advanced (74.4%) and metastatic staging (25.6%), underscoring the need for early detection of gastric cancer, given the significantly reduced five-year survival in stages III and IV[24].

In gastric cancer, surgery and palliative care are complementary strategies employed alongside adjuvant and neoadjuvant therapies to increase cure rates, disease-free survival, or five-year overall survival, which occurs in approximately 10.0–15.0% of patients[18]. Morbidity and mortality remain intervening factors, as data revealed that 58.8% of patients die due to the delay observed between the onset of symptoms, the search for medical assistance, and the initiation of treatment in stomach cancer patients[20]. Regarding the utility of palliative care, studies indicate that it alleviates symptoms and improves the quality of life in patients with advanced cancer[25,26].

It is crucial to emphasize that the incidence of gastric cancer has been decreasing[27,28]. For example, the study by Pham *et al.* (2020)[29] demonstrated declining trends in premature mortality from stomach cancer in Japan over a 35-year period. Nevertheless, it remains one of the neoplasms with the highest morbidity and mortality, especially in proximal tumors originating in the cardia or fundus, which tend to have a worse prognosis[21]. Given the associated risk factors, specific preventive measures must be taken, such as *H. pylori* eradication and the implementation of gastric cancer screening programs, to better prevent and reduce the burden of this disease[30].

As for limitations, the results are subject to bias due to the retrospective study design and the absence of data in some histopathological reports or medical records. It is suggested that patients be followed over a longer period to increase the sample size and obtain more reliable information regarding the reality of the disease and patients' lifestyles. Additionally, there is a need for better standardization in patient data collection systems, as some important information was missing or unverifiable in the records. Finally, a significant limitation concerns the reports and records, which often fail to provide detailed information about *H. pylori*, highlighting the need for improvement to avoid bias when consistent data are required.

The practical implications of this study highlight the urgent need for gastric cancer screening programs to be implemented at both regional and national levels. It is essential to raise public awareness regarding exposure to risk factors for stomach cancer, such as *H. pylori* infection, and to promote the adoption of a protective diet (including fiber, whole milk, and citrus fruits) while avoiding a high-risk diet (characterized by excessive intake of salt, smoked and processed foods, etc.). Screening for *H. pylori* is recommended in high-risk groups, as well as smoking cessation programs targeting farmers.

For future research, prospective and longitudinal studies are suggested to monitor the onset of symptoms, delays in diagnosis, and treatment outcomes. Qualitative research using interviews with patients and their families could help explore barriers to early diagnosis (e.g., healthcare access, symptom awareness).

CONCLUSION

The epidemiological profile of patients who died from gastric cancer was predominantly composed of white male family farmers over the age of 60. Factors such as weight loss, loss of appetite, and asthenia were associated with the occurrence of deaths. Furthermore, clinical staging, surgical procedures, and palliative treatment were medical approaches employed and were also associated with mortality cases from gastric cancer.

Time, represented by the interval between symptom onset, diagnosis, and death, proved to be a crucial factor, both for the type of treatment and for the effectiveness in prolonging patients' lives.

Therefore, early diagnosis stands out as a fundamental factor for either curing the disease or extending patient survival. It was observed that, due to advanced age and the locally advanced staging of gastric cancer, most deaths occurred in the late stages of the disease.

These findings reinforce the urgency of implementing public policies aimed at the guidance and screening of gastric cancer, especially among rural workers in the Center-South region of Paraná. Thus, expanding access to prevention and early detection programs may significantly contribute to reducing mortality and improving the quality of life of these patients.

CRediT author statement

Conceptualization: Carneiro, YSB; Poliseli, FLV. Methodology: Vieira, IF; Carneiro, YSB; Pedron, J. Validation: Silva, LM; Pedron,J. Statistical analysis: Vieira, JLL; Silva, LM; Pedron J. Formal analysis: Carneiro, YSB; Vieira, JLL; Silva, LM. Investigation: Vieira, IF; Poliseli, FLV. Writing-original draft preparation: Carneiro, YSB; Vieira, IF; Pedron, J. Writing-review and editing: Vieira, IF; Carneiro, YSB; Vieira, JLL; Poliseli, FLV. Visualization: Silva, LM; Carneiro, YSB. Supervision: Vieira, IF; Poliseli, FLV; Vieira, JLL. Project administration: IF, Carneiro; Carneiro, YSB, Poliseli, FLV.

All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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