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Clinicopathological characteristics and survival outcomes of gastric cancer: a retrospective study from Guatemala (2014–2017)

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Abstract

Background: Gastric cancer (GC) remains a leading cause of cancer-related mortality worldwide, with a disproportionate burden in low- and middle-income countries. Guatemala reports among the highest mortality rates in Central America, yet institutional data remain limited.

Methods: This retrospective cohort study included 307 patients with histologically confirmed gastric adenocarcinoma treated at the Guatemalan Social Security Institute between 2014 and 2017. Demographic, clinicopathological and treatment variables were analysed. Overall survival (OS) was estimated using Kaplan–Meier methods and compared using the log-rank test. Cox proportional hazards models identified independent prognostic factors.

Results: The median age at diagnosis was 63 years; 86% of patients were aged >40 years, and 66.4% were male. At presentation, 53.7% had stage IV disease. The median OS was 8.4 months overall. Survival differed significantly by stage ($p < 0.001$), with median OS of 61.7 months (stage I), 43.9 (stage II), 14.2 (stage III) and 4.6 (stage IV). In multivariate analysis, underweight status (HR 1.55; 95% CI 1.08–2.22; $p = 0.04$), gastroesophageal tumour location (HR 1.48; 95% CI 1.02–2.16; $p = 0.04$), poorly differentiated histology (HR 2.05; 95% CI 1.42–2.88; $p < 0.001$) and advanced stage (stage IV HR 9.47; $p < 0.001$) were independently associated with mortality.

Conclusion: GC in Guatemala is predominantly diagnosed at advanced stages and associated with poor survival. Strengthening early detection, nutritional assessment and access to multimodal treatment is urgently needed in resource-limited settings.

Keywords: *gastric cancer*, *adenocarcinoma*, *survival analysis*, *prognostic factors*, *HER2 status*, *low- and middle-income countries*, *Guatemala*

Introduction

Gastric cancer (GC) remains among the most common malignancies worldwide and a leading cause of cancer mortality, particularly in low- and middle-income countries [1, 2].

Review

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In Central America, Guatemala reports one of the highest mortality rates globally, and recent reviews have highlighted the persistent burden of GC across the region [3]. These disparities are driven by late diagnosis, limited access to specialised care and structural health system challenges [4, 5]. Few institutional studies have characterised the clinicopathological features and outcomes of patients in Guatemala. This study aims to describe survival outcomes and identify prognostic factors in a retrospective cohort.

Methods

Study design and setting

This retrospective cohort study was conducted at the Guatemalan Social Security Institute (IGSS) between January 2014 and December 2017.

Study population

Patients ≥18 years with histologically confirmed gastric adenocarcinoma and complete clinical records were included. Patients with incomplete data or non-adenocarcinoma histology were excluded.

Data collection

Demographic, clinicopathological and treatment variables were extracted from medical records. Tumours were staged according to the AJCC 7th edition tumor, node and metastasis classification [6].

Definitions

Overall survival (OS) was defined as the time from diagnosis to death or last follow-up. Patients alive at last contact were censored.

Statistical analysis

Survival was estimated using Kaplan–Meier curves and compared using the log-rank test. Cox proportional hazards models identified independent prognostic factors. Analyses were performed using SPSS version 25, with significance set at $p < 0.05$.

Ethics

The study was approved by the IGSS Institutional Review Board (Ref. 2014-ONC-012). Due to the retrospective design, informed consent was waived.

Results

A total of 307 patients were included. The median age was 63 years (range 23–95); patients aged >40 years represented 86% of the cohort, and 204 (66.4%) were male. Forty-three patients (14%) were younger than 40 years. By stage, 19.9% were stage I–II, 26.4% stage III and 53.7% stage IV. Most tumours arose in the gastric body (51.7%), followed by the antrum (24.7%), gastroesophageal junction (20.5%) and linitis plastica (3%). Histologically, 61.6% were poorly differentiated, 20.2% moderately differentiated and 18.3% well differentiated. Lauren's classification showed predominance of intestinal type (68.1%) over diffuse type (31.9%). Body Mass Index (BMI) distribution showed 16% underweight, 47.9% normal and 36.2% overweight/obese.

HER2 status was available in 139 patients; 17.3% were positive. HER2 expression was not significantly associated with OS. Among all patients, 34 received neoadjuvant chemotherapy, 72 received adjuvant chemotherapy, 83 received palliative chemotherapy, 47 received surgery alone and 71 received best supportive care. Median OS for the entire cohort was 8.4 months. OS by stage was 61.7 months (stage I), 43.9 (stage II), 14.2 (stage III) and 4.6 (stage IV) ($p < 0.001$).

The ethnic group showed a significant association with survival in univariate analysis ($p = 0.033$), but this was not retained in multivariate analysis.

In multivariate Cox regression analysis, underweight status (HR 1.55; 95% CI 1.08–2.22; $p = 0.04$), gastroesophageal tumour location (HR 1.48; 95% CI 1.02–2.16; $p = 0.04$), poorly differentiated histology (HR 2.05; 95% CI 1.42–2.88; $p < 0.001$), and stage IV disease (HR 9.47; 95% $p < 0.001$) were independently associated with increased mortality.

Baseline characteristics and univariate analysis are shown in Table 1. Multivariate analysis is shown in Table 2. The Kaplan–Meier OS curves according to clinical stage are shown in Figure 1.

Table 1. Baseline demographic and clinicopathological characteristics and univariate survival analysis of patients with GC ($n = 307$).

Variable	Frequency (%)	Number of events	Median survival time months	X^2	p value
Gender					
Male	204 (66.4)	182	7.85	1.36	0.243
Female	103 (33.6)	87	8.51		
Age					
<40	43 (14)	41	5.94	1.84	0.17
>40	264 (86)	228	8.91		
Residence					
Urban	141 (45.9)	123	9.46		
Rural	166 (54.1)	146	6.81	0.95	0.32
Ethnic group					
Mestizo	267 (87.0)	238	7.78	4.55	0.033*
Indigenous	40 (13.0)	31	11.66		
BMI (kg/m^2)					
Overweight and obesity	111 (36.2)	94	13.07		
Normal	147 (47.9)	128	8.96	15.80	0.001*
Underweight	49 (16.0)	47	4.61		
Albumin (g/dL)					
<3.5	54 (17)	48	6.51	1.95	0.756
>3.5	253 (83)	221	8.98		
Tumour location					
Pyloric + antrum	76 (24.80)	63	14.29		
Large and small curvature	163 (51.30)	143	7.16	11.32	0.01*
Linitis plastica	5 (1.6)	5	6.34		
Gastroesophageal junction	63 (20.50)	58	6.47		
Lauren's classification					
Intestinal type	209 (68.07)	74	6.40		
Diffuse type	98 (31.93)	195	9.23	0.05	0.81
Histopathological grade					
Well differentiated	65 (18.25)	38	19.45		
Moderately differentiated	62 (20.19)	56	9.65	16.28	0.001*
Poorly differentiated	189 (61.56)	175	5.81		

Continued

Table 1. Baseline demographic and clinicopathological characteristics and univariate survival analysis of patients with GC (*n* = 307). *Continued*

HER2 immunochemistry Positive Negative Missing	24 (17.26) 115 (82.73) 168	22 94	4.96 8.47	1.79	0.81
Type of surgery No resection Resection	202 (65.8) 105 (34.20)	184 85	6.41 14.12	49.64	0.001*
Treatment Chemo-neoadjuvant Chemo-adjuvant Chemo-palliative Only surgery Palliative	34 (11.07) 72 (23.45) 83 (27.03) 47 (15.30) 71 (23.12)	33 56 82 27 71	10.54 22.01 6.89 47.60 2.92	16.31	0.001*
Clinical stage Stage I–II Stage III Stage IV	61 (19.9) 81 (26.4) 165 (53.7)	32 73 164	61.76 14.19 4.60	129.22	0.001*

*p-value<0.05

Abbreviations: BMI, body mass index; HER2, human epidermal growth factor receptor 2.

Table 2. Multivariate Cox proportional hazards analysis of prognostic factors for OS.

Variables	*B*	SE	HR	95.0 %CI	*p*
BMI (kg/m^2) Overweight/obesity (reference) Normal Underweight	- 0.41 0.44	- 0.13 0.18	1 1.15 1.55	- 0.87–1.51 1.08–2.22	0.04*
Tumour location Pyloric + antrum (reference) Large and small curvature Linitis plastic Gastroesophageal union	- 0.01 0.28 0.39	- 0.16 0.47 0.19	1 1.01 1.33 1.48	- 0.73–1.39 0.52–3.39 1.02–2.16	0.09 0.04*
Histopathological grade Well/moderately differentiated (reference) Poorly differentiated	- 0.63	- 0.23	1 2.05	- 1.42–2.88	0.001*
Clinical stage Stage I–II (reference) Stage III Stage IV	- 1.11 2.01	- 0.14 0.22	1 3.56 9.47	- 1.98–4.69 8.81–11.61	0.001*

*p-value <0.05

BMI: body mass index, HR, hazard ratio; CI, confidence interval

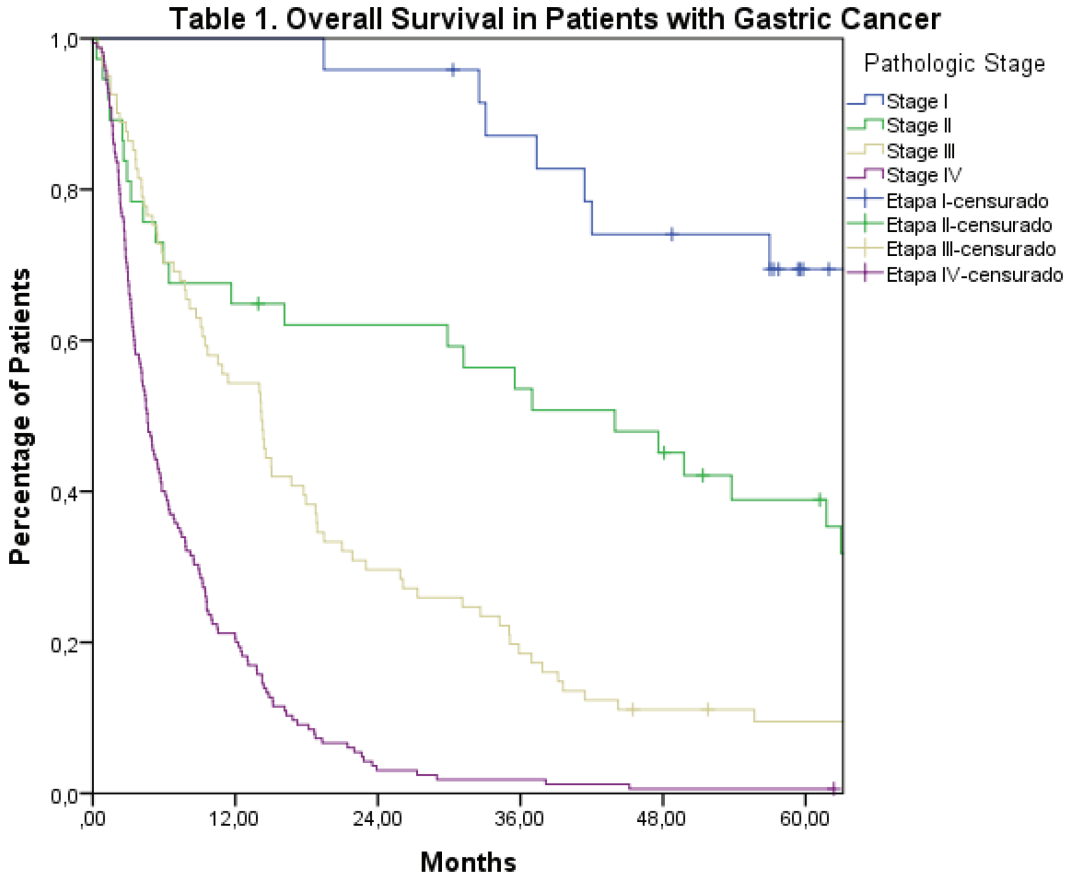

Figure 1. OS in patients with GC.

Discussion

This study demonstrates a high burden of advanced GC and poor survival outcomes in Guatemala. Over half of patients presented with stage IV disease, reflecting delays in diagnosis and limited access to early detection strategies. These findings are consistent with previous epidemiological studies from Central America [5].

Survival outcomes were markedly lower than those reported in high-income countries. Recent advances in systemic therapy with fluorouracil, leucovorin, oxaliplatin and docetaxel, [7] including immune checkpoint inhibitors, have improved outcomes globally. CheckMate 649 demonstrated improved OS with nivolumab plus chemotherapy in advanced GC, [8], while KEYNOTE-859 confirmed a survival benefit with pembrolizumab combined with chemotherapy [9]. However, access to these therapies remains limited in low-resource settings, contributing to persistent disparities.

HER2 expression was not significantly associated with OS. Trastuzumab-based therapy has demonstrated survival benefit in HER2-positive disease, although access remains limited in low-resource settings [10].

Poorly differentiated histology also predicted worse survival. Similar prognostic differences between histological grades have been previously reported [11].

Underweight status was associated with worse survival, consistent with previous reports linking cachexia and hypermetabolism with adverse outcomes in advanced cancer patients [12].

Although ethnicity appeared to be associated with survival in univariate analysis, this effect was not independent after adjustment, suggesting that observed differences may be mediated by socioeconomic or healthcare access factors.

These findings underscore the need for national strategies focused on early detection, improved surgical standards, nutritional support and expanded access to systemic therapy.

Conclusion

GC in Guatemala is characterised by late-stage presentation and poor survival. Addressing structural health system barriers and improving access to early diagnosis and modern oncologic care are critical priorities.

Conflicts of interest

The authors declare no conflicts of interest.

Funding

This study received no external funding.

Ethical approval

Ethics approval: IGSS IRB (Ref. 2014-ONC-012), dated: 24/April/2014.

Data availability

Available upon request.

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