

# Relationship between age and survival after surgery with curative intent for gastric cancer in adults: A single-center observational study

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## Abstract

**Introduction:** Gastric cancer is one of the diseases with the highest morbidity and mortality worldwide; however, early interventions can reduce mortality. This study aimed to determine the relationship between age and survival after surgery with curative intent for gastric cancer in patients treated at the SOLCA Cancer Institute, Cuenca, from 2012-2017.

**Methods:** The present analytical, retrospective study was carried out with the database of the SOLCA-Cuenca Cancer Institute. Data are presented in frequency and percentage tables. Chi-square ( $\chi^2$ ), Kaplan–Meier analysis, and Cox regression were applied to relate the variables age and years of survival, which were considered statistically significant when  $P < 0.05$ .

**Results:** Of the 603 patients with gastric cancer registered during the evaluation period, 35.3% underwent surgery, achieving a follow-up of 45.1%. A total of 96 patients were included; 70.8% underwent surgery with curative intent. The sample was dominated by men (52.9%) and the age group of 70 to 79 (30.2%). The 5-year survival rate was 69.1%, with a median survival time of  $7.24 \pm 0.49$  years. Age was not significantly related to patient survival ( $\chi^2 = 3.15$ ;  $P = 0.667$ ).

**Conclusion:** There is a high 5-year survival rate in patients with gastric cancer who underwent surgery with curative intent, which was not associated with age.

**Keywords:**

**MESH:** Gastric neoplasms, Gastrectomy, Mortality records, Survival, Survival analysis.

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## Introduction

Gastric cancer causes 5.7% of new cases and 8.2% of cancer deaths worldwide. Its mild and nonspecific symptoms make early diagnosis difficult and condition a rapid progression of the disease, so survival, that is, the time elapsed in which patients remain alive from the diagnosis or treatment of the disease, is inversely related to staging [1], showing that at five years, the

relative survival rate for localized cancers is 70%, 32% for those with regional progression, 6% for those with distant localization, and 32% for the combined states, such data supported in the American Cancer Society in the period 2011-2017 [2].

The treatment that maintains a curative intention for the present pathology includes resection of large and vital affected areas, as well as their margins and nodules with probable neoplastic commitment, which makes this a highly complex procedure, whose evolution may depend on different factors such as the stage at which the surgery is performed, level of distance commitment, age of the patient, current health conditions, among others [3, 4], which is why it is essential to have updated data in what is still a question at SOLCA at its headquarters in Cuenca. The aim is to verify from what age the risk of influencing the survival of patients undergoing surgery with curative intent for gastric cancer is more significant.

Panduro et al. studied 463 patients with a mean age of  $66.62 \pm 12$  years who underwent gastrectomy at the Luis N. Sáenz National Police Hospital in Peru, where the general survival at five years was 62.4%. In the analysis, they found that the variables related to determinants were the presence of metastasis, ascites, clinical stage III and IV, type of surgery (open or laparoscopic), initiation of the oral route, and advanced age [5].

Studies carried out in Quito-Ecuador found that age-related survival oscillates in the following data: patients belonging to the first adulthood (20 - 29 years) 91% at one year of diagnosis and 47% at five years. Young adults (30 - 44 years) 70% per year and 50% at five years. Average adults (45 - 59 years) 72% at one year and 57% at five years. Later adulthood (60 - 74 years), 70% at one year and 54% at five years. Old age (over 75 years), 76% at one year, and 39% at five years [6].

This study aimed to determine the relationship between age and survival after surgery with curative intent for gastric cancer in patients treated at the SOLCA Cuenca Cancer Institute between January 2012 and December 2017.

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## Materials and methods

### Study design

The present study is longitudinal. The source is retrospective.

### Scenery

The study was carried out in the surgical department of the SOLCA-Cuenca Cancer Institute. The study period was from January 1, 2012, to December 31, 2017.

### Participants

Older patients with a diagnosis of gastric cancer, which required surgery, were included. Clinical records with the ICD-10 codes C16 from C16.0 to C16.9 were included. Cases with incomplete data were removed for analysis, and patients without histopathological reports were excluded.

### variables

Study variables included sociodemographic and surgical characteristics. The dependent variable was represented by the survival time of patients undergoing surgery for gastric cancer. In addition, the independent variable was determined by the age of the patients.

### Data sources/measurements

The source was indirect; reviews of medical records were carried out in the statistics department and the institutional electronic file. The information was treated confidentially; no personal data were included to identify the study subjects.

### Biases

To avoid possible interviewer, information, and memory biases, the principal investigator always kept the data with a guide and records approved in the research protocol. Observation and selection bias was avoided by applying the participant selection criteria. All the clinical and paraclinical variables of the period above were recorded. Two researchers independently analyzed each record in duplicate, and the variables were recorded in the database once their concordance was verified.

### Study size

The sample was nonprobabilistic, census type, where all possible cases of the study period were included. Two groups were established: Group 1: patients operated on with palliative surgical intent, and Group 2: patients operated on with curative surgical intent.

### Quantitative variables

Descriptive and inferential statistics were used. The results were expressed on a scale of means and standard deviation. Categorical data are presented in proportions.

### Statistical analysis

Noninferential and inferential statistics are used. For the descriptive analysis, measures of central tendency and dispersion were calculated according to the measurement scale of each variable. Qualitative variables are presented as absolute numbers and percentages; quantitative variables are presented as medians and standard deviations.

Inferential analysis: a survival analysis using the Kaplan–Meier method is presented, and the survival graphs will be compared using the log-rank test. The statistical significance level was  $P < 0.05$ . The statistical package used was SPSS 23.0 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp).

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## Results

### Participants

A total of 96 patients participated in the study, 28 in Group 1 (palliative surgery) and 68 in Group 2 (curative surgery).

### General characteristics of the sample

The general descriptions of the study groups are presented in Table 1. Of all individuals included in the study, 56.3% (n=54) were male, and the remaining 43.8% (n=42) were female. The most predominant age group was that of 70-79 years, with a representation of 30.2% (n=29), followed by the group of 80-89 years with 25% (n=24). Similar behavior was observed in the group of patients who underwent surgery with curative intent, where the male gender

also predominated (52.9%; n=36) and the age groups of 70-79 years (32.3%; n=22) and that of 80-89 years (22.1%; n=15) (Table 1).

**Table 1.** Distribution by sex and age of patients diagnosed with gastric cancer.

	Surgical intention				Total	
	Palliative		Curative		Count	%
	N=28	%	N=68	%		
Sex						
Female	10	35.7%	32	47.1%	42	43.8%
Male	18	64.3%	36	52.9%	54	56.3%
Age groups						
< 50 years	0	0.0%	eleven	16.2%	eleven	11.5%
50 - 59 years	5	17.9%	8	11.8%	13	13.5%
60 - 69 years	3	10.7%	9	13.2%	12	12.5%
70 - 79 years	7	25.0%	22	32.4%	29	30.2%
80 - 89 years	9	32.1%	fifteen	22.1%	24	25.0%
≥ 90 years	4	14.3%	3	4.4%	7	7.3%

### Survival

When analyzing the survival of patients who underwent a surgical procedure with curative intent, it was found that their overall survival rate at five years was 69.1%, with an average survival time of  $7.24 \pm 0.49$  years and a mortality rate of 32.4% at the end of the study follow-up period. For their part, the participants who underwent palliative intervention had an overall survival rate of 5 years of only 10.7%, with an average estimate of  $1.70 \pm 0.49$  years of survival time and a mortality rate of 92.8% (Table 2). The difference in the curves in Figure 1 for survival with the Kaplan–Meier method was statistically significant ( $P < 0.001$ ).

### Disease stage and survival

For patients undergoing surgery with curative intent, the 5-year survival decreases due to the clinical stage. It was higher in stage IA patients (94.7%) and lower in stage IIIC patients (33.3%) (Table 3). The average survival time presented a decreasing behavior as the cancer staging progressed, with the individuals in stage IA having a longer survival time ( $9.53 \pm 0.46$  years). In contrast, the patients in stage IIIC had the shortest survival time ( $1.33 \pm 0.21$ ). These differences between the survival rates of the different stages of the cancer were statistically significant ( $X^2 = 30.62$ ;  $P < 0.001$ ), just as it was evidenced that the staging represented a critical prognostic factor for the estimation of the survival of the patients with gastric cancer (HR=1.363; 95% CI= 1.138 – 1.632;  $P=0.001$ ).

**Table 2.** Overall survival of patients by study group

	Group 1: Palliative surgery n=28	Group 2: Curative surgery n=68	P
Mortality	26 (92.8%)	22 (32.4%)	<0.001
5-year survival	10.7%	69.1%	<0.001
Overall survival (Years)	$1.7 \pm 0.49$	$7.24 \pm 0.49$	<0.001
Survival 95% CI (Years)	0.74 – 2.66	6.28 – 8.20	

The survival of patients of group 2 at five years was higher in patients under 50 years of age (81.8%), followed by those between 60 and 69 years of age (77.8%), while the lowest survival rate was observed in the age group of 80-89 years (60%). The average survival time presented a decreasing behavior as the age groups progressed, with individuals <50 years of age having the longest survival time (8.36 ± 1.05 years), while patients ≥ 90 years of age had the longest survival time (8.36 ± 1.05 years) and a shorter survival time (6.00 ± 1.63 years) (Table 4). However, the differences between the overall survival rates of the different age groups were not statistically significant ( $X^2=3.15$ ;  $P=0.667$ ;  $HR=1.241$ ; 95% CI= 0.918 - 1.677;  $P=0.160$ ).

Figure 1 . Survival curves in patients with gastric cancer

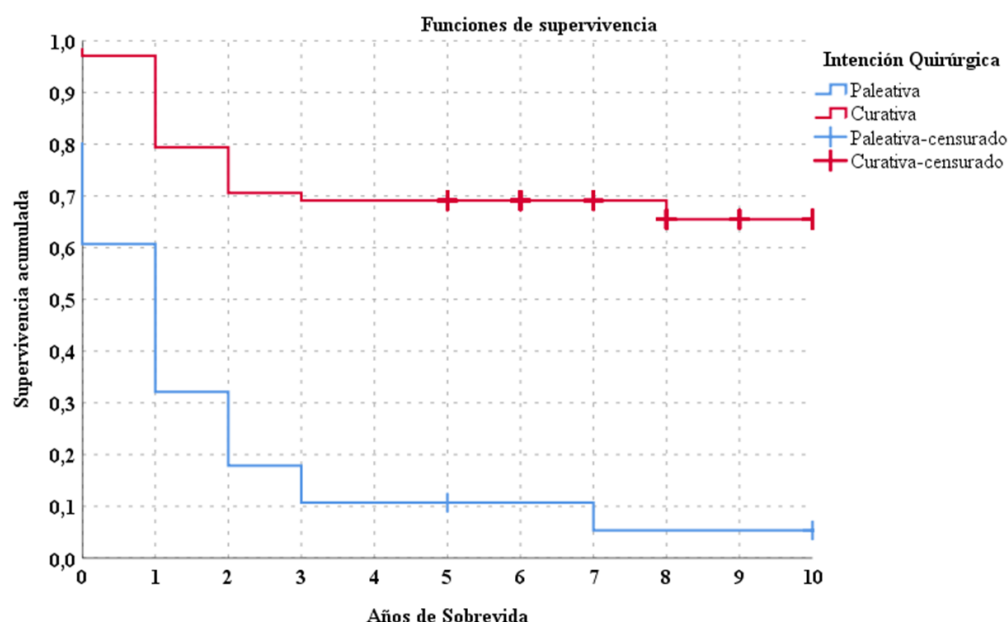


Table 3. Survival of patients undergoing surgery with curative intent according to the clinical stage of cancer

Clinical Stage	Total (%)	Mortality (%)	5-year survival (%)	Estimate ± SD (years)	95% CI
AI	19 (27.9%)	1 (4.5%)	94.7%	9.53 ± 0.46	8.62 – 10.43
IB	7 (10.3%)	0 (0%)	NA	NA	NA
IIA	2 (2.9%)	0 (0%)	NA	NA	NA
IIB	12 (17.6%)	5 (22.7%)	58.3%	6.33 ± 1.26	3.86 – 8.80
IIIA	10 (14.7%)	5 (22.7%)	50%	3.90 ± 0.98	1.97 – 5.83
IIIB	8 (11.8%)	4 (18.2%)	50%	6.00 ± 1.43	3.21 – 8.79
IIIC	6 (8.8%)	6 (27.3%)	33.3%	1.33 ± 0.21	0.92 – 1.75
IV.	3 (4.4%)	1 (4.5%)	100%	9.00 ± 0.71	7.61- 10.39
EITHER	1 (1.5%)	0 (0%)	NA	NA	NA
Global	68 (100)	22 (32.35%)	69.1%	7.24 ± 0.49	6.28 – 8.20

SD: standard deviation. NA: Not Applicable. CI: confidence interval. X2: chi square. HR: Hazard Ratio  
 \*Log Rang (Mantel-Cox) \*\* Cox regression.  $X^2$  30.62, HR 1.363 (95% CI 1.138-1.632),  $P<0.001$ .

**Table 4.** Survival of patients undergoing surgery according to age groups.

	Total (%)	Mortality (%)	5-year survival (%)	Estimate ± SD (years)	95% CI
< 50 years	11 (16.2)	2 (18.2)	81.8	8.36 ± 1.05	6.31 – 10.42
50 - 59 years	8 (11.8)	2 (25.0)	75.0	7.88 ± 1.30	5.32 – 10.43
60 - 69 years	9 (13.2)	2 (22.2)	77.8	6.67 ± 0.83	5.04 - 8.30
70 - 79 years	22 (32.4)	8 (36.4)	63.6	6.77 ± 0.92	4.97 – 8.57
80 - 89 years	15 (22.1)	7 (46.7)	60.0	6.23 ± 1.09	4.09 – 8.36
≥ 90 years	3 (4.4)	1 (33.3)	66.7	6.00 ± 1.63	2.80 – 9.20

## Discussion

Gastric cancer represents a vital neoplasm globally, positioning itself as the fifth most diagnosed cancer and the third most deadly cancer in the world, reaching higher rates in men than in women [7]. In this regard, the 5-year survival rate varies from 25% in European countries and the United States to 70% in Asian countries such as Japan [8]. As in other types of cancer, it has been observed that the prevalence of this pathology increases with age, reaching its maximum peak in the seventh decade of life [9]. From what has been described, it is presumed that analyzing the relationship between age and the survival rate of gastric cancer would make it possible to know the actual prognostic value of age and thus improve the efficacy of treatment [9].

Although there are data available on the epidemiology of this pathology in Ecuador, it is necessary to remember that, in the Cuenca canton, despite having a high incidence of this disease, studies have yet to be carried out to determine the survival of patients undergoing treatment. Surgery is about its age, so the purpose of this research was to determine the relationship between age and survival after surgery with curative intent for gastric cancer in patients treated at the SOLCA Cancer Institute (Sociedad de Lucha contra el Cancer of Ecuador) Cuenca in the period between January 2012 and December 2017.

The present study found that during the evaluation period (5 years), 603 patients were diagnosed with gastric cancer, one-third of whom underwent surgery as a therapeutic measure. Of these patients, only 96 subjects were followed up, of whom 70% underwent surgery with curative intent. In addition, the sample consisted mainly of male subjects and those aged 70-79. Similarly, in the retrospective study by Alshehri et al. (2020) [10], where 2005 patients who underwent curative gastrectomy were evaluated, the sample comprised mainly male subjects. However, the predominant age groups were those ≤60 years, with a mean age of 58. Cormedi et al. [11] carried out a retrospective study of 294 patients with gastric cancer, where it was observed that the majority of the sample was male and comprised individuals between 41 and 65 years of age. Kirmayr-Zamorano et al. (2021) [12] conducted a retrospective study of 69 patients with gastrectomy (total=52%; partial=48%) for gastric adenocarcinoma and reported that the majority of the subjects were male, with a mean age of 70 years and a range from 43 to 86 years. Montiel-Roa et al. (2019) (42), in their retrospective study that included 71 patients, 61 (87%) of whom underwent total gastrectomy, observed that the sample was also made up mainly of male subjects, with a predominance of males. Age groups from 60 to 69 years accounted for 36.6%, and from 70 to 79 years

accounted for 23.9%. In the report by Panduro (2019) [5], a retrospective investigation that included 463 patients with a mean age of 66 years, it was also observed that the sample was mainly made up of male subjects and that 83% underwent total gastrectomy. Therefore, the results presented coincide with what has been reported in the literature, where it is established that gastric cancer is more frequent in males due to greater exposure to certain risk factors such as smoking and alcohol consumption than, added to the aspects of aging, they predispose this group of subjects to a higher incidence of this neoplasia [7].

With the present investigation, it was demonstrated that in the subjects operated on surgically with curative intent, the overall survival rate at five years was 69%, while the mortality rate was 32%, with an average life of approximately seven years; these data differed significantly when compared with patients operated on with palliative intent. Less encouraging figures were reported by Alshehri et al. (2020) [10], who observed an overall survival rate of 56.4% in their sample, a mortality rate of 43.6%, and an average lifetime of  $4.6 \pm 2.7$  years. Another author, Cormedi et al. [11], reported that the overall survival rate and median life in patients  $\leq 40$  years was 31% and two years, respectively; in patients 41-65 years old, it was 45.9% and 2.6 years, and in subjects  $> 65$  years it was 35.15% and 2.1 years. Kirmayr-Zamorano et al. (2021) [12] reported that the overall survival at the end of the follow-up period in their study was 49.7% and that the average survival time was 2.6 years in a range of 0 to 5 years. Montiel-Roa et al. (2019) [13] reported that in their study, a survival rate of 54.9% was recorded three years after the surgical approach, while the overall mortality rate was 43.8%. Panduro (2019) [5] reported an incidence of mortality of 37.6% at ten years, while the overall survival rate at five years was approximately 70%, a figure that was more in line with what was observed in this investigation. Based on the findings of this study, it can be deduced that the epidemiology of gastric cancer in the locality was favorably compared to that of other latitudes because the survival rate and median survival time were higher than other reports.

In addition, this report found that younger patients had up to an 18% higher 5-year overall survival rate than subjects older than 70. Similarly, it was observed that the mortality rate was up to 20% higher in this last group. However, none of these findings were statistically significant. Similarly, Kirmayr-Zamorano et al. (2021) [12] reported that in their sample, age was not a prognostic factor for 5-year survival, as it was only associated with the degree of lymph node involvement. In contrast, Alshehri et al. (2020) [10] reported that in their study, age was significantly associated with cancer survival, with higher survival rates being observed in patients  $< 60$  years. However, Cormedi et al. [11] reported that although the survival rate was higher in middle-aged adults than in elderly adults, the lowest survival rate was observed in young patients, which is probably because cancer is diagnosed in more advanced stages in these patients. These findings suggest that there must be other more influential factors than age in the survival of patients with gastric cancer treated with curative surgery. Hence, studies that take these variables into account are necessary.

When analyzing the survival of patients undergoing surgery with curative intent according to the clinical stage of cancer, it was found that the 5-year survival decreased as the cancer staging progressed, observing that the stage of cancer represented a significant prognostic factor for estimating the survival of patients with gastric cancer. This finding coincides with what has been reported in other countries, such as the United States, where it has been shown that the 5-year relative survival rate in localized gastric cancer is 68%, in regional cancer, it is 31%, and in cases where there is metastasis, it is 5% [14]. Similarly, in the study by Cormedi et

al. [11], it was reported that stage II or III gastric cancer increased the risk of death up to 3 times. In contrast, the odds of dying increased up to 20 times in stage IV. Likewise, Kirmayr-Zamorano et al. (2021) [12] reported that the survival of subjects in clinical stage I was greater than that of the other stages, observing that at five years, patients with this clinical classification were the only ones with a higher survival rate. at 50%

Finally, it is essential to highlight that the results obtained in this study must be interpreted in light of some limitations. Thus, the type and design of the investigation and the regulations that govern it did not allow the evaluation of other clinical, therapeutic, or surgical factors that could influence survival and mortality rates. In addition, during the follow-up period, there was a loss of contact in a significant percentage (55%) of the patients. Likewise, the selection of individuals for convenience increases the selection bias. However, despite these limitations, thanks to this research, it was possible to demonstrate that age is not related to survival in patients receiving curative surgical treatment at the SOLCA Cuenca institution.

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## Conclusions

A high 5-year survival rate was found in the gastric cancer patients included in the study. At the same time, the mortality rate was observed to be relatively low compared to other countries. Age did not represent a predictor of survival at five years in the patients evaluated. However, it was shown that the survival rate was higher in patients  $\leq 70$  years.

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## Abbreviations

**SD:** standard deviation.

**NA:** Not applicable.

**CI:** Confidence interval.

**X<sup>2</sup>:** chi-square.

**HR:** Hazard Ratio.

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## Administrative information

### Additional Files

None declared by the authors.

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#### Author contributions

Verónica Elizabeth Gallegos Maldonado: Conceptualization, formal analysis, research, project administration, writing of the original draft.

Karla Daly Guerrero Barrera: Conceptualization, formal analysis, research, project administration, writing of the original draft.

Marx Ítalo Bravo Muñoz: Conceptualization, methodology, validation, visualization, writing - review and edition.

All authors read and approved the final version of the manuscript.

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The studies, images, chemotherapy, and surgeries constituted the regular activity of the service and were not an additional cost for the patients. The authors financed the administrative costs of the research.

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#### Availability of data and materials

Data are available upon request to the corresponding author. No other materials are reported.

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## Statements

#### Ethics committee approval

The bioethics committee approved the study for studies in human beings of the University of Cuenca CEISH-2022.

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#### Consent for publication

It is not required when images, resonances, or tomographic studies of specific patients are not published.

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#### Conflicts of interest

The authors declare that they have no conflicts of competence or interest.

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## References

1. Manterola C, Claros N. The results of Surgical Treatment of Advanced Gastric Cancer. Case Series with Follow-Up. *Int. J. Morphol.* 2020 Oct;38(5):1479-1484. [http://www.scielo.cl/scielo.php?script=sci\\_arttext&pid=S0717-95022020000501479&lng=en](http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0717-95022020000501479&lng=en). <http://dx.doi.org/10.4067/S0717-95022020000501479>. <https://doi.org/10.4067/S0717-95022020000501479>

2. American Cancer Society. Stomach (Gastric) Cancer Survival Rates. 2022. <https://www.cancer.org/cancer/stomach-cancer/detection-diagnosis-staging/survival-rates.html>.
3. Joshi SS, Badgwell BD. Current treatment and recent progress in gastric cancer. *CA Cancer J Clin*. 2021 May;71(3):264-279. doi: 10.3322/caac.21657. Epub 2021 Feb 16. PMID: 33592120; PMCID: PMC927927. <https://doi.org/10.3322/caac.21657>
4. Charalampakis N, Economopoulou P, Kotsantis I, Tolia M, Schizas D, Liakakos T, Elimova E, Ajani JA, Psyrri A. Medical management of gastric cancer: a 2017 update. *Cancer Med*. 2018 Jan;7(1):123-133. doi: 10.1002/cam4.1274. Epub 2017 Dec 13. PMID: 29239137; PMCID: PMC5773977. <https://doi.org/10.1002/cam4.1274>
5. Panduro Correa VJ. Survival in Patients with Gastric Cancer Undergoing Surgical Treatment. [Internet]. Peruvian University Cayetano Heredia; 2019. Available at: [https://repositorio.upch.edu.pe/bitstream/handle/20.500.12866/7733/Sobrevida\\_PanduroCorrea\\_Vicky.pdf?sequence=1&isAllowed=y](https://repositorio.upch.edu.pe/bitstream/handle/20.500.12866/7733/Sobrevida_PanduroCorrea_Vicky.pdf?sequence=1&isAllowed=y)
6. Villamarín Y, Alexander R. Survival study of stomach cancer in patients treated at the Oncology Unit of the SOLCA Hospital in the period 2010 to 2016. 2018 <http://repositorio.puce.edu.ec/80/xmlui/handle/22000/15405>
7. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018 Nov;68(6):394-424. doi: 10.3322/caac.21492. Epub 2018 Sep 12. Erratum in: *CA Cancer J Clin*. 2020 Jul;70(4):313. PMID: 30207593. <https://doi.org/10.3322/caac.21492>
8. Karimi P, Islami F, Anandasabapathy S, Freedman ND, Kamangar F. Gastric cancer: descriptive epidemiology, risk factors, screening, and prevention. *Cancer Epidemiol Biomarkers Prev*. 2014 May;23(5):700-13. doi: 10.1158/1055-9965.EPI-13-1057. Epub 2014 Mar 11. PMID: 24618998; PMCID: PMC4019373. <https://doi.org/10.1158/1055-9965.EPI-13-1057>
9. Song P, Wu L, Jiang B, Liu Z, Cao K, Guan W. Age-specific effects on the prognosis after surgery for gastric cancer: A SEER population-based analysis. *Oncotarget*. 2016 Jul 26;7(30):48614-48624. doi: 10.18632/oncotarget.9548. PMID: 27224925; PMCID: PMC5217043. <https://doi.org/10.18632/oncotarget.9548>
10. Alshehri A, Alanezi H, Kim BS. Prognosis factors of advanced gastric cancer according to sex and age. *World J Clin Cases*. 2020 May 6;8(9):1608-1619. doi: 10.12998/wjcc.v8.i9.1608. PMID: 32432139; PMCID: PMC7211541. <https://doi.org/10.12998/wjcc.v8.i9.1608>
11. Cormedi MCV, Katayama MLH, Guindalini RSC, Faraj SF, Folgueira MAAK. Survival and prognosis of young adults with gastric cancer. *Clinics (Sao Paulo)*. 2018 Sep 21;73(suppl 1):e 651 s. doi : 10.6061/clinics/2018/e651s. PMID: 30281703; PMCID: PMC6131359. <https://doi.org/10.6061/clinics/2018/e651s>
12. Kirmayr-Zamorano P, Kirmayr-Zamorano M, Vergara-Merino L, Retamal-Narbona C, Slako-Martínez M, Rojas-Luca Á. 5-year survival of patients undergoing gastrectomy for gastric adenocarcinoma at the Almirante Nef Naval Hospital between 2010-2015. *Rev. ci r*. 2021;73(1):66-72. <https://doi.org/10.35687/s2452-45492021004907>
13. Montiel A, Quevedo R, Fernández A, Dragotto A. Survival and quality of life in patients gastrectomized for gastric cancer. *cir. Parag* . 2019;43(1):20-26. <http://scielo.iics.una.py/pdf/sopaci/v43n1/2307-0420-sopaci-43-01->

20.pdf

<https://doi.org/10.18004/sopaci.2019.abril.20-26>

14. Nanthanangkul S, Suwanrungruang K, Wiangnon S, Promthet S. Survival of Stomach Cancer Cases in Khon Kaen , Thailand 2000-2012. Asian Pac J Cancer Prev. 2016;17(4):2125-9. doi : 10.7314/apjcp.2016.17.4.2125. PMID: 27221906.

<https://doi.org/10.7314/APJCP.2016.17.4.2125>