

Association of clinicopathological features and gastric cancer incidence in a single institution

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Original Article

Association of clinicopathological features and gastric cancer incidence in a single institution



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ABSTRACT

Background: Stomach cancer is the fifth most common malignancy. In 2012, 952,000 cancers were diagnosed worldwide, which led to 723,000 deaths. Elderly men are the most frequently observed category of gastric cancer patients, mostly affecting the antrum. The objective of this study was to analyze the association of age with sex, tumor sites, types of surgical intervention, and diagnosed anatomical pathologies in cases of gastric cancer.

Methods: This cross-sectional descriptive study analyzed the associations between age, sex, tumor sites, types of surgical intervention, and diagnosed anatomical pathologies among the total gastric cancer incidences during medical treatments from January 2016 to May 2019. The study samples were collected from the total gastric cancer respondents who met the inclusion criteria during medical treatments within the study period.

Results: Gastric cancer was most frequently observed among females (56%) and those aged 50–70 years old (47%). Most respondents had advanced stages of gastric cancer at first enrollment at our institution. The most frequently found tumor site was the corpus (43%). The most frequently performed type of surgical intervention was jejunostomy feeding (26%), and the most frequently diagnosed anatomical pathology was adenocarcinoma with poorly differentiation (39%). Overall, age had statistically significant correlations with sex ($p < 0.001$), tumor sites ($p < 0.001$), types of surgical intervention ($p < 0.001$), and diagnosed anatomical pathologies ($p < 0.001$).

Conclusion: Gastric cancer was more common in males than females. In the older age group (>50 years old), gastric cancer was more prevalent in women than men, and the gastric tumor tended to be more distal. Non-cardia gastric cancers were more prevalent than cardia gastric cancers.

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1. Introduction

Stomach cancer is the fifth most common malignancy in the world after cancers of the lung, breast, colorectum, and prostate. Almost one million new cases of stomach cancer (952,000 cases) were estimated to have occurred in 2012.^{1,2} More than 70% of

gastric incidences occur in developing countries, and half of the world's total occurs in East Asia, particularly in China. Stomach cancer is the third leading cause of cancer death and is responsible for 723,000 deaths yearly.³ The highest estimated mortality rates were found in East Asia, and the lowest occurred in North America.⁴

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High mortality rates are also seen in Central and East Europe, as well as Central America and South America.³

Stomach cancer is relatively common in developing countries. The incidence rate for high-middle Human Development Index (HDI) nations is 20 per 100,000 for males, and the average rate among low-middle HDI nations is 6.6 per 100,000 males. In East Asia, the incidence rates of gastric cancer are 32.1 and 13.2 per 100,000 for males and females, respectively. The Republic of Korea has the highest national incidence, with almost 60 per 100,000 new cases annually for males, but the female incidence rates are relatively lower (approximately 25 per 100,000 in Korea).⁵

In Southeast Asia, gastric cancer has the fourth-highest incidence and the fifth highest mortality rate among cancers. This type of cancer is one of the five most common cancers among men. In 2020, 90,598 new cases were reported in the South-East-Asia Region (SEARO), with 78,823 deaths and a 5-year prevalence of all ages of 122,780 cases.³ In Indonesia, 3484 new cases have been reported, with 2946 deaths.⁶

Gastric cancer constitutes an enormous burden on society in economically developed and developing countries. The occurrence of gastric cancer is increasing because of increased exposure to risk factors, such as smoking, overweight, physical inactivity, and changing reproductive patterns.⁷ Furthermore, genetic variations in proinflammatory and anti-inflammatory cytokine genes also influence the individual response to carcinogenic exposures.⁸

Host genetic factors are emerging as key determinants of disease risk for many cancers. Recent studies reported that functional polymorphisms in the genes for interleukin 1 β (IL-1 β) and its endogenous receptor antagonist (IL-1RN) are associated with an increased risk of gastric cancer and its precursors. This genetic mechanism reveals how mutations of genes lead to gastric cancer. Another important determinant of gastric cancer risk is the mechanism of Hypochlorhydria (reduced acid secretion) related to cytotoxin-associated gene A (Cag A) as a causal factor of virulence of *Helicobacter pylori*. In early life, Cag A enters into normal gastric epithelial cells, which elicits an apoptosis reaction. As a consequence, a reduced number of acid-secreting cells and a subsequent increase in gastric pH provide direct benefits for colonization by *H. pylori*.⁹

The objective of this study was to analyze the association of age with sex, tumor sites, types of surgical intervention, and diagnosed anatomical pathologies in cases of gastric cancer in the period of 2016–2019.

2. Methods

This study was conducted in a referral hospital in eastern Indonesia. This study analyzed the association of demographic, tumor sites, management, and histopathology examination. The study design was a cross-sectional descriptive study. The study subjects were all gastric cancer respondents who met the inclusion criteria.

2.1. Population and samples

The sampling method was total population sampling by collecting medical treatment data for patients with a diagnosis of malignant neoplasm of the stomach and gastrointestinal stromal tumor of the stomach, with International Classification of Diseases [ICD]-10 codes of C16.1, C16.2, C16.3, C16.4, C16.5, C16.6, C16.8, C16.9, C49.A2, and D00.2 determined from January 2016 to December 2019.

We categorized our samples into two groups: High-risk group and non-risk group. The high-risk group was characterized by older age (>50 years old), male, obesity, smoking habit, and *Helicobacter*

pylori infection. On the other hand, the non-risk group consisted of those without any characteristics of the high-risk group.

2.2. Analysis of data

The collected medical data of gastric cancer respondents in this study were processed and analyzed using SPSS V.24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.) to analyze results of the association of the dependent variable (age) and the independent variables (sex, tumor sites, types of the surgical intervention, and the diagnosed anatomical pathologies).

3. Results

Table 1 shows the frequency distributions of gastric cancer incidences from 64 gastric cancer respondents. The most frequently observed age range was 50–69 years old, which represented 30 cases (46.9%), and the most frequent gender group was female, which accounted for 36 cases (56.3%).

The most frequent tumor site was the corpus at 28 cases (43.8%). Feeding jejunostomy was the most common surgical procedure (19 cases or 29.7%). The poorly differentiated adenocarcinoma was the most common, which amounted to 26 cases or 40.6%.

Table 2 shows the results of the cross-tabulation using the chi-squared test with age as the dependent variable and the various independent variables. The most frequently found gender in the non-risk age group was male, with 24 cases or 85.7% of the cases in this age group, while the most common gender in the high-risk age group was female, which accounted for 36 cases or 100% of cases in this age group.

The p-value from the chi-squared test for the correlation of age and sex was $p < 0.001$. Therefore, it was inferred that there were statistically significant correlations between age and sex in gastric cancer. The most common tumor site in the high-risk age group was the antrum, with 20 cases. The most common tumor site in the non-

30
Table 1
Characteristics of patients.

Variables	n	%
Age (years)		
30-49	24	37.5
50-69	30	46.9
>70	10	15.6
Sex		
Male	28	43.8
Female	36	56.3
Tumor Sites		
GEJ	3	4.7
Cardia	10	15.6
Fundus	3	4.7
Corpus	28	43.8
Antrum	20	31.3
Management		
Total gastrectomy	4	6.3
Proximal gastrectomy	6	9.4
Subtotal gastrectomy	8	12.5
Jejunostomy feeding	19	29.7
Partial gastrectomy	12	18.8
Bypass esophagojejunostomy	1	1.6
Distal gastrectomy	14	21.9
Histopathology examination		
Adenocarcinoma (well differentiation)	10	15.6
Adenocarcinoma (moderately differentiation)	16	25.0
Adenocarcinoma (poorly differentiation)	26	40.6
Gastrointestinal stromal tumor	9	14.1
Signet ring cell carcinoma	3	4.7

GEJ: Gastroesophageal junction.

Table 2
Cross-tabulation of the dependent variable and the independent variables.

Independent variables	Age		Total (%)	P-value
	Risk (%)	Non-risk (%)		
Sex				
Male	4 (14.3)	24 (85.7)	28 (100)	7 p=<0.001
Female	36 (100)	0 (0)	36 (100)	
Tumor sites				
GEJ	1 (33.3)	2 (66.7)	3 (100)	p=<0.001
Cardia	0 (0)	10 (100)	10 (100)	
Fundus	0 (0)	3 (100)	3 (100)	
Corpus	19 (67.9)	9 (32.1)	28 (100)	
Antrum	20 (100)	0 (0)	20 (100)	
Types of surgical intervention				
Total gastrectomy	1 (25)	3 (75)	4 (100)	p=<0.001
Proximal gastrectomy	4 (66.7)	2 (33.3)	6 (100)	
Subtotal gastrectomy	0 (0)	8 (100)	8 (100)	
Jejunostomy Feeding	18 (94.7)	1 (5.3)	19 (100)	
Partial gastrectomy	3 (25)	9 (75)	12 (100)	
Bypass oesophagojejunostomy	1 (100)	0 (0)	1 (100)	
Distal gastrectomy	13 (92.9)	1 (7.1)	14 (100)	
Diagnosed anatomical pathologies				
Adenocarcinoma (well differentiation)	1 (10)	9 (90)	10 (100)	p=<0.001
Adenocarcinoma (moderately differentiation)	2 (12.5)	14 (87.5)	16 (100)	
Adenocarcinoma (poorly differentiation)	25 (96.2)	1 (3.8)	26 (100)	
Gastrointestinal stromal tumor	9 (100)	0 (0)	9 (100)	
Signet ring cell carcinoma	3 (100)	0 (0)	3 (100)	

risk age group was the cardia, with 10 cases. There was a statistically significant correlation between age and tumor sites during medical treatments of gastric cancer respondents ($p < 0.001$).

The most frequent surgical intervention in the high-risk age range was jejunostomy feeding (18 cases), while in the non-risk age range was partial gastrectomy (nine cases). There was a statistically significant correlation between age and types of surgical intervention in gastric cancer ($p < 0.001$).

The most frequent histopathological finding in the high-risk age group was poorly differentiated adenocarcinoma (25 cases) and in the non-risk age group was moderately differentiated adenocarcinoma (14 cases). The p-value from the chi-squared test for the correlation between age and the diagnosed anatomical pathologies was $p < 0.001$, suggesting that the correlations were statistically significant.

4. Discussion

Gastric cancer remains the most common and most deadly malignancy.¹ Gastric cancer is an outcome of environmental factors and the accumulation of specific genetic alterations. Gastric cancer is difficult to diagnose in early-stage because of a time lag between the onset of growth and the appearance of clinical presentation. Early symptoms of gastric cancer are not specific; as a result, most patients with early gastric cancer present with symptoms indistinguishable from benign peptic ulcer disease and, subsequently, these patients have been diagnosed at an advanced stage gastric cancer.⁵

Gastric cancer mostly affects older people. The average age of people when they are diagnosed with gastric cancer is 68 years. About six of every ten people diagnosed with stomach cancer each year are 65 years old or older. The risk that a man will develop stomach cancer in his lifetime is about 1 in 95. For women, the chance is about 1 in 154. But each person's risk can be affected by certain other factors.¹⁰ In our study, the most common gender in the non-risk age group was male (24 cases, 85.7%). This finding could indicate that males are more prevalent in the younger age group.

It was discovered in this study that most patients aged 50–60

years were included in 46.9% (30) of cases. Furthermore, the patient's age and gender had a significant relationship ($p = 0.000$). This condition shows that gastric cancer affects women more than men, with a significant correlation between age and sex in gastric cancer. This finding was different from globally accepted statistics, which inferred that gastric cancer was more prevalent in males. This condition appeared because most of our male patients were in the younger age group than that of the female group. Most of the male patients with gastric cancer probably did not survive until reaching an older age (>50 years old). However, we would need a larger sample size and a longer observation period to arrive at this conclusion.

The women in our group were mostly in the older age group. This condition is associated with a post-menopausal state. The association between menopause and gastric cancer risk might be related to the decrease of endogenous sex hormone levels in postmenopausal women. According to the literature, exposure to estrogen reduces the risk of gastric cancer.¹¹

Based on the anatomical location, gastric cancer consists of two types, which include cardia gastric cancer and non-cardia gastric. Several studies showed that non-cardia gastric cancer is more common in cardia gastric cancer.¹³ These research findings also show the same thing.²⁵ This is related to several risk factors, such as obesity and GERD, *H. pylori* infection, low socioeconomic status, and dietary factors.¹² In this study, there was a significant correlation between the location of gastric cancer and the age of the patient ($p < 0.001$). This condition showed that the older the age, the more distal the tumor location. Therefore, this result differs from other studies that did not detect such a relationship.^{12,13}

This research discovered that most patients underwent jejunal feeding procedures, which was designed to overcome problems caused after gastrectomy, such as malnutrition. This is important to optimize the patient's postoperative nutrition as well as maintaining the continuity of enteral access (ensuring calorie adequacy) during adjuvant therapy.¹⁴ It was discovered that 94.7% of patients in the jejunal feeding procedure were those of at-risk ages and showed a statistically significant relationship ($p = 0.00$). A different discovery was made by Sun et al that there is no significant relationship between the use of the jejunostomy feeding procedure

and the patient's age ($p = 0.47$). This might be due to the age of their homogeneous research sample.¹⁵ The feeding jejunostomy was the most commonly performed procedure in our study (especially in the high-risk group) because a lot of patients in our study had been diagnosed at an advanced stage, so that most of them had unresectable tumor burden. The jejunostomy feeding served as palliative surgery for maintaining nutrition.

Histologically, gastric cancer is divided into three subtypes, which include intestinal (well differentiation), moderate, and poor differentiation. Well and moderate differentiation types are more common, especially in older men, but has a better prognosis. However, poor differentiation types are more common at a young age (less than 60 years), especially among women. This theory is contrary to this research that the most common type of gastric cancer is poor differentiation histologically. Therefore, this finding might be influenced by a large sample of women in this study. Feng et al found that differentiation status was significantly associated with age, gender, tumor location, tumor size, tumor depth, lymph node metastasis, and tumor stage, but not the prognosis of gastric cancer ($p < 0.001$).¹⁴ The research also showed a significant relationship ($p < 0.001$) between the risk age and the diagnosis of the patient's anatomic pathology. It was also discovered that 96.2% of poorly differentiation diagnoses in patients proceeded at a risk age.

5. Conclusion

In this study, in the younger group age (<50 years old), gastric cancer was more common in males than females. But in the older age group (>50 years old), the women with gastric cancer were more prevalent due to decreased estrogen levels. There was also a correlation between age and tumor location, indicating that the gastric tumor location was more distal in older age. According to the location, non-cardia gastric cancer was more prevalent than cardia gastric cancer. Further work is now needed, involving a larger sample size with longer observation periods.

17 Declaration of competing interest

All authors declare that they have no conflict of interest to

disclose.

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