

# Risk factors of adverse cardiovascular events in patients with gastric cancer: A nationwide population-based study



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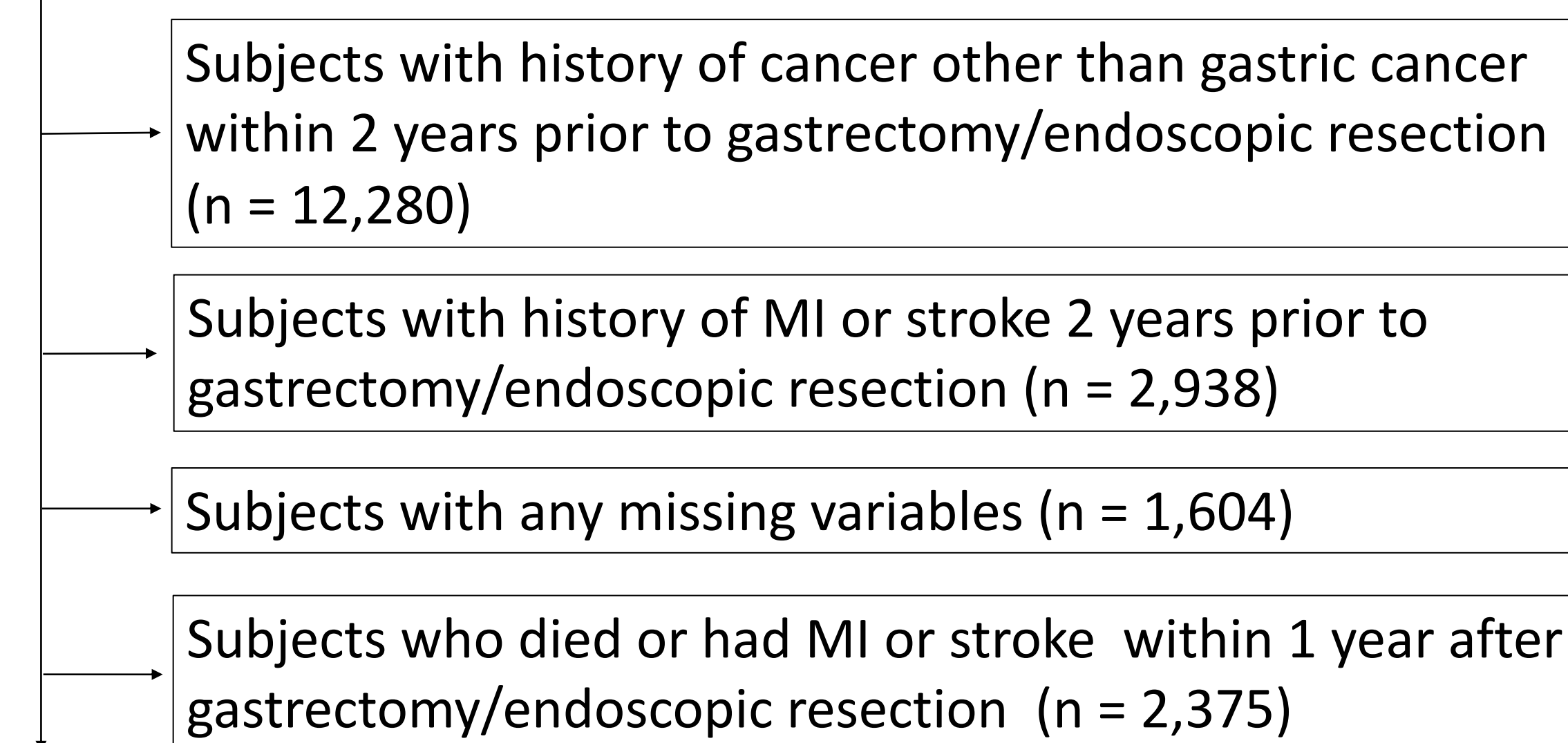
## Introduction

Long-term comorbidity care for gastric cancer survivors has been emphasized to decrease mortality as well as the development of metabolic disease and cardiovascular diseases. However, evidence is scarce on the risk factors affecting the risks of adverse cardiovascular events in patients with gastric cancer.

## Methods and Materials

A nationwide cohort by the National Health Insurance Service in Korea was utilized. Patients who received gastrectomy or endoscopic submucosal dissection (ESD) for gastric cancer between 2004 and 2013 were identified. An adverse cardiovascular event was defined as a composite of acute myocardial infarction, coronary revascularization, or ischemic stroke. The patients were followed up until the occurrence of an adverse cardiovascular event, death, or December 2017, whichever came first. The Fine and Gray method was used to evaluate the impacts of variables including treatment methods (subtotal or total gastrectomy, ESD) age, sex, body mass index (BMI), lifestyle, and comorbidities on the risk of incident adverse cardiovascular events.

Patients who underwent gastrectomy or endoscopic resection for gastric cancer between 2004 and 2013 and received health check-ups between 2002 and 2003 (n=61,102)



41,905 eligible patients were evaluated for MI and stroke after gastrectomy/endoscopic resection

Figure 1. Study population

## Results

Table 1. Baseline characteristics

Characteristics	Total (n=41,905)
Age, years	60.9 ± 11.0
Female, n (%)	11,137 (26.6)
BMI, kg/m <sup>2</sup>	23.8 ± 3.0
Smoking status, n (%)	
Never smoker	22,153 (52.9)
Former smoker	7,362 (17.6)
Current smoker	12,390 (29.6)
Alcohol consumption, n (%)	
Non-drinker	23,578 (49.5)
Mild drinker	12,093 (28.9)
Heavy drinker	6,234 (14.9)
Regular exercise, n (%)	
None	17,810 (42.5)
1-4 days per week	12,935 (30.9)
≥5 days per week	11,160 (26.6)
Treatment modalities, n (%)	
Total gastrectomy	8,117 (19.4)
Subtotal gastrectomy	29,956 (71.5)
Endoscopic resection	3,832 (9.1)
Adjuvant chemotherapy, n(%)	469 (1.1)
Comorbidities, n(%)	
Hypertension	15,393 (36.7)
Diabetes	10,040 (24.0)
Chronic kidney disease	398 (0.95)
Heart failure	860 (2.05)

A total of 41,905 patients treated for gastric cancer (mean age, 60.9 ± 11.0 years; female, 26.6%) were included. The incidence of adverse cardiovascular events was 9.0 cases per 1000 person-years. In multivariable models, patients who received a total (hazard ratio [HR], 2.64; 95% confidence interval [CI]; 2.44 to 2.85; P <0.001) or subtotal gastrectomy (HR, 1.38; 95% CI, 1.28 to 1.48; P <0.001) had a higher risk of adverse cardiovascular events than those who received ESD. Adjuvant chemotherapy also increased the cardiovascular risk with an HR of 1.30 (95% CI, 1.12 to 1.51; P = 0.001). Current smokers had a higher risk of adverse cardiovascular events (HR, 1.25; 95% CI, 1.19 to 1.31; P <0.001),

## Results

Regular exercise was a preventive factor in a dose-dependent manner (14% decreased risk in patients with 1-4 days of exercise per week and 17% decreased risk in those with ≥5 days of exercise per week compared to those who do not exercise). Higher age, male, lower BMI, smoking, low income, and the presence of hypertension, diabetes, chronic kidney disease, and heart failure were independent predictors of adverse cardiovascular events.

Table 2. Multivariable analysis of associations between demographic characteristics, treatment methods, lifestyle variables, comorbidities, and the risk of adverse cardiovascular events in patients who are treated for gastric cancer

Risk factors	Hazard ratio (95% CI)	P-value
Age, years	1.05 (1.05-1.06)	<0.0001
Female (reference: male)	0.76 (0.72-0.80)	<0.0001
BMI ≤25 kg/m <sup>2</sup> (reference: ≥25 kg/m <sup>2</sup> )	0.87 (0.83-0.90)	<0.0001
Smoking status (reference: never smoker)		
Former smoker	0.98 (0.93-1.04)	0.512
Current smoker	1.25 (1.19-1.31)	<0.0001
Alcohol consumption (reference: non-drinker)		
Mild drinker	0.96 (0.93-1.04)	0.102
Heavy drinker	1.05 (1.01-1.11)	0.071
Regular exercise (reference: none)		
1-4 days per week	0.86 (0.83-0.90)	<0.001
≥5 days per week	0.83 (0.79-0.87)	<0.0001
Treatment modalities (reference: endoscopic resection)		
Total gastrectomy	2.64 (2.44-2.85)	<0.0001
Subtotal gastrectomy	1.38 (1.28-1.48)	<0.0001
Adjuvant chemotherapy (reference: no)	1.30 (1.12-1.51)	0.001
Hypertension (reference: no)	1.10 (1.06-1.15)	<0.0001
Diabetes (reference: no)	1.14 (1.09-1.19)	<0.0001
Chronic kidney disease	1.50 (1.30-1.73)	<0.0001
Heart failure	1.34 (1.20-1.48)	<0.0001

## Conclusions

We identified independent predictors of adverse cardiovascular events in patients who received treatment for gastric cancer. Experimental studies to improve modifiable risk factors are needed to confirm these findings and develop post-cancer treatment strategies to prevent adverse cardiovascular events.

## Contact

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