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Relationship between Gastric Cancer and Body Mass Index

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ABSTRACT

Objective: *Gastric cancer remains the fifth most common cancer in the world. More than 70% of the cases are seen in developing countries and East Asia Region is the region with the highest rate of cancer. Although the results of individual studies vary, obesity is a potential risk factor. We aimed to evaluate the relationship between body mass index (BMI) and risk of gastric cardia and non-cardia localized adenocarcinoma.*

Methods: *In this study, medical records of gastric cancer patients followed up in the Department of Oncology Antalya Training and Research Hospital between 1978 and 2017 were evaluated retrospectively. The remaining 274 patients were included in this study. Demographic data, tumor histopathology, tumor localization and final status of patients were recorded. BMI, patients' clinical information and final status were recorded.*

Results: *The mean age of the patients was 59.1 ± 11.8 years. The mean BMI was 23.9 ± 3.5. 189 (69%) of the patients were males and 85 (85%) were females. It was found that gastric cancer was more frequent in males than females (<0.001). The number of patients with gastric cardia adenocarcinoma (GCA) was 70 (25.5%). The number of patients with gastric non-cardia adenocarcinoma (GNCA) was 204 (74.5%). When BMI was evaluated, it was found that most of the patients were 18.5-24.9 (normal weight) (n: 159 (58%). However, body mass index was found significantly higher in females, especially in gastric carcinomas. cardia (p: 0.001).*

Conclusion: *Higher BMI was associated with an increased risk of GCA in this population, especially in women. Future studies are needed to confirm these findings.*

Keywords: *Gastric cardia adenocarcinoma, gastric non-cardia adenocarcinoma, obesity, body mass index*

INTRODUCTION

Cancer with uncontrolled division and proliferation of normal cells is a disease that occurs (1). Obesity is defined as abnormal or excessive fat accumulation in adipose tissue and is measured by Body Mass Index (BMI). In 2050, it is estimated that 60% of men, 40% of women and 25% of children will be obese (2,3). Various types of cancer are known to be particularly closely associated with obesity. Epidemiological and experimental studies reveal the relationship between nutrition and cancer (4). Obesity, which is accepted as a multifactorial disease, is the second most important cause of preventable deaths after smoking (5). In this study, we aimed to evaluate the relationship between BMI and tumor localization in patients with gastric cancer.

MATERIALS AND METHODS

Study Populations

In this study, medical records of gastric cancer patients followed up in Oncology Department of Antalya Training and Research Hospital between 1978 and 2017 were evaluated retrospectively. Patients with incomplete BMI data (n: 102) and who lost more than 10% of their body weight at the time of diagnosis (n: 204) were excluded. The remaining 274 patients were included in this study. Demographic data, tumor histopathology, tumor localization (cardia, non-cardia), lymphovascular invasion (LVI), perineural invasion (PNI), adjuvant chemotherapy, radiotherapy, and final status of the patients were recorded. BMI, patients' clinical information and final status were recorded. BMI <18.5 (BMI: 18.5-24.9), BMI:

25-29.9 (BMI), 30-34.9 (class I obesity), BMI: 35-39.9 (Class II obesity), BMI: ≥40 (class III obesity) (6).

Statistical Analysis

All statistical analyzes were performed using the "Social Sciences Statistical Package" version 22.0 for Windows (SPSS, Armonk, NY: IBM Corp.). P values less than or equal to 0.05 were considered significant. For descriptive analysis, categorical variables were defined as frequency. Distribution with percentage and quantitative variables was given as median, minimum and maximum values. Chi-square or Fisher's exact test was used for categorical variables.

RESULTS

In our study, the mean age of the patients was 59.1 ± 11.8 years. The mean BMI was 23.9 ± 3.5. 189 (69%) of the patients were males and 85 (85%) were females. It was found that gastric cancer was more frequent in males than females (<0.001). The number of patients with gastric cardia adenocarcinoma (GCA) was 70 (25.5%). The number of patients with gastric non-cardia adenocarcinoma (GNCA) was 204 (74.5%). When BMI was evaluated, it was found that most of the patients were 18.5-24.9 (normal weight) (n: 159 (58%). Besides, there was no class I obesity and class II obesity body mass index. 110 (40.1%) patients died due to gastric cancer. According to gastric cancer localization, gastric cardia adenocarcinoma and gastric non-cardia adenocarcinoma were evaluated. There was no difference between the patients in terms of alcohol use, smoking and family history of gastric cancer. However, body mass index was found to be significantly higher in females, especially in gastric carcinomas located in cardia (p: 0.001) (table 2).

Table1. *Clinic and histopathologic features of patients with gastric cancer*

Age (median)-years	All patients	59.1±11.8
BMI (Kg/m^2 mean±SD	All patients	23.9±3.5
Gender	Male (n,%)	189 (%69)
	Female (n,%)	85 (%31)
Tumorlocalization (n, %)	GCA*	70 (%25.5)
	GNCA*	204 (%74.5)
BMI classification (Kg/m^2, n, %)	<18.5 (underweight)	13 (%4.7)
	18.5-24.9 (normal weight)	159 (%58)
	25-29.9 (overweight)	81 (%29.6)
	30-34.9(class I obesity)	21 (%7.7)
	35-39.9(class II obesity)	0 (%0)
	≥40 (class III obesity)	0 (%0)
Stage (n, %)	Stage 1	60 (%21.9)
	Stage 2	53 (%19.3)
	Stage 3	92 (%33.6)
	Stage4	69 (%25.2)
Lymphovascular Invasion (n, %)	Positive	110 (%40.1)
	Negative	164 (%59.9)
Perineuralinvasion (n, %)	Positive	77 (%28.1)
	Negative	197 (%71.9)
Adjuvant Chemotherapy (n, %)	Yes	161 (%58.8)
	No	113 (%41.2)
Radiotherapy (n, %)	No	143 (%41.1)
	Yes	134 (%48.9)
Patients status	Disease-free survival	127 (%46.4)
	Under treatment	37 (%13.5)
	Death from gastric cancer	110 (%40.1)

** Gastric cardia adenocarcinoma(GCA), gastric non-cardia adenocarcinoma (GNCA)*

Table2. *Evaluation of clinical and demographic data by BMI according to tumor localization in patients with gastric cancer*

		BMI (kg/m^2) (n)				
		<18.5 (underweight)	18.5-24.9 (normal weight)	25-29.9 (overweight)	30-34.9 (class I obesity)	*P*

Gastric cardia adenocarcinoma	Number of patients	n,%	5 (%7.1)	37 (%52.9)	18 (%25.7)	10 (%14.3)	
	Age	years, mean ± SD	55.6±15.6	59.8±11.3	62.1±11.2	57.8±11.7	0.323
	Gender	Male	1 (%1.8)	33 (%58.9)	16 (%28.6)	6 (%10.7)	**0.001**
		Female	4 (%28.6)	4 (%28.6)	2 (%14.3)	4 (%28.6)	
	Family history of cancer, n (%)	Yes	0 (%0)	6 (%60)	3 (%30)	1 (%10)	0.758
		No	5 (%8.3)	31 (%51.7)	15 (%25)	9 (%15)	
	Alcohol drinking, n (%)	Yes	0 (%0)	1 (%33.3)	2 (%66.7)	0 (%0)	0.401
		No	5 (%7.5)	36 (%53.7)	16 (%23.9)	10 (%14.9)	
	Smoking, n (%)	Yes	1 (%3.7)	16 (%59.3)	9 (%33.3)	1 (%3.7)	0.138
		No	4 (%9.3)	21 (%48.8)	9 (%20.9)	9 (%20.9)	
Gastric non-cardia adenocarcinoma	Number of patients	n,%	8 (%3.9)	122(%59.8)	63 (%30.9)	11 (%5.4)	
	Age	years, mean ± SD	49.5±17.9	58.7±11.8	60.3±11.3	60.7±9.9	0.065
	Gender	Male	4 (%3)	85 (%63.9)	37 (%27.8)	7 (%5.3)	0.382
		Female	4 (%5.6)	37 (%52.1)	26 (%36.6)	4 (%5.6)	
	Family history of cancer, n (%)	Yes	0 (%0)	24 (%70.6)	9 (%26.5)	1 (%2.9)	0.376
		No	8 (%4.7)	98 (%57.6)	54 (%31.8)	10 (%5.9)	
	Alcohol drinking, n (%)	Yes	0 (%0)	4 (%100)	0 (%0)	0 (%0)	0.433
		No	8 (%4)	118(%59)	63 (%31.5)	11 (%5.5)	
	Smoking, n (%)	Yes	4 (%6.3)	41 (%65.1)	15 (%23.8)	3 (%4.8)	0.342
		No	4 (%2.8)	81 (%57.4)	48 (%34)	8 (%5.7)	

DISCUSSION

Obesity increases the incidence in many types of cancer. Increased gall bladder and bile duct cancer, breast cancer, endometrial cancer, cervical cancer, ovarian cancer and colorectal cancers have been reported in obese women. Esophageal cancer, colorectal cancer, pancreatic cancer, hepatocellular cancer, prostate cancer, gall bladder and choledochal cancer have been reported to increase in obese men (7). The effect of obesity on cancer is thought to be multifactorial. Mechanisms proposed to increase cancer incidence and mortality; increase in insulin and insulin-like growth factor (IGF), increase in leptin level, aromatization of androgens to estrogen in peripheral adipose tissue, increased adrenal and ovarian androgen release, decreased sex hormone binding globulin (SHBG) levels, and consequently increased free steroid hormone levels, plasminogen activator. inhibitor (PAI) level, increased tumor necrosis factor-α (TNF-α) level, anovulation and low progesterone level, increased complement levels and increased peroxisome proliferated activated receptor gamma (PPAR-γ) activity (7). The relationship between overweight and obesity with the risk of gastric cancer is still unclear. A number of meta-analyzes have shown a positive association between BMI and gastric cancer (8-10). In a recent meta-analysis, 24 prospective studies were evaluated. As a result of this meta-analysis (11), neither overweight nor obesity was associated with the risk of gastric cancer. Excess weight and obesity have been reported to be borderline risky for gastric cancer in analyzes limited to the Asian population. However, when gastric cancer was examined with anatomic subcategory, increased BMI was found to be positively associated with cardia localized gastric cancer (GCA), whereas no relationship was found with non-cardia localized gastric tumors (GNCA). Prospective cohort studies have shown no association between BMI and gastric cancer in terms of risk (12,13). In a study conducted with 73 133 participants in Norway, no relationship was found between BMI and gastric cancer risk (13). However, the NIH-AARP study (12) found a strong positive correlation with a sample size of 218 854 participants in terms of obesity and cardia-associated gastric cancer risk (3.67; 95% CI, 2.00–6.71). In our study, alcohol use, smoking and family history, which are at risk for cancer development, were evaluated among the groups. There was no difference between the groups in terms of alcohol use, smoking and family history. In addition, we found that the risk of cardia-located gastric cancer increased significantly as the body mass index increased especially in female patients (p: 0.001). We did not detect such a risk in non-cardia gastric tumor (p: 0.382).

CONCLUSION

There is uncertainty between the risk of gastric cancer and obesity in the literature. In our study, we found a positive correlation between the risk of gastric cancer located in Cardia and obesity.

Prospective studies are needed to investigate the current situation.

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