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Konstansa Lazarevic[1],
Aleksandar Nagorni[2],
Natasa Rancic[1]

[1]Public Health Institute Nis, Serbia
[2]Clinic of Gastroenterology, Clinical Center Nis

DIETARY INTAKE OF FAT AND RISK OF GASTRIC CANCER

SUMMARY

The study investigated whether intakes of fat and fatty acids are associated with the development of gastric cancer. A case-control study was conducted in the Clinical Centre Nis (Serbia) from 2005 to 2006. A total of 102 patients with histologically confirmed gastric cancer were compared with 204 controls chosen among the subjects admitted to the same hospital as cases of acute non-neoplastic diseases. A food-frequency questionnaire (FFQ) was used to assess information on the frequency of consumption of foods in the course of one year prior to cancer diagnosis or hospital admission (for controls). Nutrient values in food were obtained from the Food composition table.

We did not observe statistically significant association in frequency of consumption of visible fat (sunflower oil, olive oil, lard, margarine butter) between cases and controls (p>0.05). According to the univariate logistic regression analysis, total fat (OR for highest tertile 0.80, 95%CI: 0.28-2.25), saturated fatty acids (0.85, 95%CI: 0.31-2.35), monounsaturated fatty acids (0.57, 95%CI: 0.22-1.48) and cholesterol (0.79; 95%CI:0.37-2.28) intake were not associated, and polyunsaturated fatty acids were inversely associated with the risk of gastric cancer (0.32; 95%CI: 0.12-0.83). Our results suggest that dietary polyunsaturated fat intake may help to prevent gastric cancer. Further studies are needed to confirm these results.

Key words: **dietary fats, fatty acids, gastric cancer**

INTRODUCTION

Fats and oils are the most energy rich constituents of diet. Amount and quality of dietary fat are associated with cardiovascular diseases (1), some cancers (2) and diabetes (3). For this reason, the World Health Organization (WHO) recommends limiting average the total fat intake for humans, between 15 and 30 percent of daily energy intake (4).

The study „Burden of disease and injury in Serbia" conducted between October 2002 and September 2003 showed that national health priorities were cardiovascular disease, cancer and mental health (5). The results of the European Nutrition and Health Report indicated that the fat intake in the 14 participating countries of Europian Union was high (26-46% of total energy intake) in all population groups. In all participating countries, the leading causes of mortality were cardiovascular diseases followed by malignant neoplasms (6). On the basis of national data, it is obvious that Serbian population eats more fat than recommended (7).

In the literature to date, the relation between the intake of dietary fats and the risk of gastric cancer has been considered in several epidemiologic studies, but the results are unclear.

Corresponding author. Konstansa Lazarevic • Phone: 064/ 140 93 76 • E-mail: koni33@hotmail.com

The aim of this case-control study was to examine the role of dietary fat and fatty acid in the etiology of gastric cancer.

MATERIAL AND METHODS

A hospital based, case-control study was conducted in the Surgery Clinic, Clinical Center Nis between January, 2005 and December, 2006. A total of 102 patients with histologically confirmed gastric adenocarcinoma were compared with 204 controls. Age (±3y) -, gender-, and residence-matched controls were the subjects residing in the same geographical area and admitted to the same hospital as cases for acute non-neoplastic diseases. All interviews were conducted by a physician in a hospital setting. All cases and controls were recruited on a voluntary basis.

The questionnaire included information on age, education and other socio-demographic characteristics and history of selected diseases. A food-frequency questionnaire (FFQ) was used to assess subjects' habitual diet, including information on weekly frequency of consumption of specific foods (98 items) in the course of one year prior to cancer diagnosis or hospital admission (for controls). We also asked about the types of fat used for cooking. Nutrient values in food were obtained from USA Department of Agriculture Sources (8).

χ^2 tests were used to compare the distributions of categorical variables between patients with cancer and control subjects. Odds ratio (OR) and the corresponding 95% confidence intervals (CI) were computed by tertile of daily fats and intake using unconditional logistic regression models, including terms for age, sex, education, physical activity, smoking, history of cancer of the first degree and total energy intake. Analyses were carried out by the SPSS version 10.1 software.

RESULTS

Table 1 shows the distribution of gastric cancer cases and control subjects according to age, residence, education, and other selected variables.

Cases and controls had similar age distribution and education level. Gastric cancer cases were more likely to be smokers who also reported more frequent family history of cancer in the first-degree relative.

The frequency of consumption of sunflower oil, olive oil, margarine, lard and butter was similar among gastric cancer patents compared to the controls (Table 2).

Table 1. Baseline characteristics of subjects

Parameter	Cases n(%)	Controls n(%)	χ^2	p
Age <65y >65y	 40(39.2) 62(60.8)	 75 (36.8) 129 (63.2)	 0.17	 p>0.05
Education 0-8 9-14 >14	 6 (5.9) 37 (36.3) 59 (57.8)	 5 (2.5) 98 (48.0) 101(49.5)	 5.26	 p>0.05
Smoking habits Yes No	 38 (37.3) 64 (62.7)	 45 (22.1) 159 (77.9)	 7.94	 p<0.05
Physical activity Yes No	 38 (37.3) 64 (62.7)	 71 (34.8) 133 (65.2)	 0.18	 p>0.05
History of cancer in the first degree Yes No	 41(40.2) 61 (59.8)	 44 (21.6) 160 (78.4)	 13.12	 p<0.001

Table 2. Distribution of subjects in consumption of visible oils

Food	Cases versus. controls (n)			χ^2	p
	Never or rarely	Usually	Frequently		
Sunflower oil	18/ 35	72/142	12/27	0.13	p>0.05
Olive oil	89/172	13/26	0/4	3.07	p>0.05
Lard	28/71	52/104	22/29	3.34	p>0.05
Margarine	47/115	55/86	0/3	4.90	p>0.05
Butter	69/153	32/49	1/2	1.90	p>0.05

Odss ratios of gastric cancer according to various type of fats and fatty acids are shown in Table 3.

Table 3. Univariate odss ratios and 95% confidence intervals (95%CI) for gastric cancer according to various types of fats[1]

Food	I tercil OR	II tercil OR (95%CI)	III tercil OR (95%CI)	p for trend
Total fat	1.0	1.28(0.60-2,74)	0.80(0.28-2.25)	0.669
Saturated fat	1.0	1.55(0.73-3,30)	0.85(0.31-2.35)	0.762
Monounsaturated fat	1.0	0.98(0.48-2.00)	0.57(0.22-1.48)	0.244
Polyunsaturated fat	1.0	0.97(0.48-1.95)	0.32(0.12-0.83)	0.019
Cholesterol	1.0	0.92(0.86-3.59)	0.79(0.37-2.28)	0.457

1 Estimates from univariate logistic regression analysis including terms for age, sex, residence, education, physical activity, total energy intake, tobacco smoking, and history of cancer in the first degree

Total fat, saturated fats, monounsaturated fat and cholesterol were not associated with the risk of gastric cancer. On the other hand, polyunsaturated fat was inversely associated with risk of gastric cancer (OR for highest tertile 0.32; 95%CI, 0.12-0.83).

DISUSSION

More than two decades ago, in vitro study by Miwa et al. (9) hypothesized that dietary fats may be the risk factor for gastric cancerogenesis. Most of case control studies (10-13) have not observed the association between total dietary fat intake and gastric cancer. The inverse association between total fat and gastric cancer that Palli et al. reported in their study was attributed to high consumption of monounsaturated fats -rich olive oil, which is typical of the Mediterranean diet (14). The type of fat and not the total amount seemed to be most important.

Vegetable oils intake (15-18), especially olive oil intake (19), have been inversely associated with the risk of gastric cancer in several case-control studies**.** The favorable effect of olive oil has been proposed on the basis of its fatty acid composition (mainly monounsaturated fatty acid) or of the content of specific antioxidants. We did not confirm the possible protective effect of olive oil, as few subjects in our study consumed olive oil in diet. Therefore, the main sources of monounsaturated fatty acid (olive oil) and polyunsaturated fatty acids, especially omega 3 (fish) in our national nutrition are rare (20). n-3 fatty acids, especially the long-chain polyunsaturated fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) present in fatty fish have been shown to inhibit carcinogenesis by inhibiting COX-2 (21).

In vitro studies have indicateds that unrefined vegetable olive oil (22) and also omega-3 polyunsaturated fats (23) can inhibit proliferation and stimulate apoptosis of gastric cells. The totality of evidence from epidemiologic studies (10, 12, 13, 24, 25) supports the hypothesis that a high intake of polyunsaturated fat reduces the risk of gastric cancer.

We found that polyunsaturated fat and not monounsaturated fat might decrease this risk. Lopez et al. (25) observed a statistically significant increase in the risk for gastric cancer, and Munoz et al. (13) a decrease in risk for gastric cancer with increased monounsaturated fat intake. Two other case control studies (12, 24) have not found the association between monounsaturated fat and gastric cancer risk.

Results of several studies on visible animal fat consumption in relation to the risk of gastric cancer have been inconsistent (18, 26, 27). Saturated fats and cholesterol are mainly animal fats. In most of the previous studies (10, 15, 23, 25, 28, 29) but not in all (12, 13), the risk of gastric cancer has been linked to high saturated fat diet. However, when analyzed separately in respect to cancer site, saturated fats were associated with an increased risk of distal type of gastric cancer, but not gastric cardia cancer as described in two previous studies (10, 29).

We did not find evidence to support the hypothesis that diet high in fats increases the risk of gastric cancer. Our findings suggest that reductions in total fat intake recommended by WHO to prevent chronic diseases did not have influence on reductions in incidence of gastric cancer. In summary, our data suggest that polyunsaturated fat intake may be associated with decreased risk of gastric cancer. However, these relations require further investigations.

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NUTRITIVNI UNOS MASTI I RIZIK OD NASTANKA RAKA ŽELUCA

Konstansa Lazarević[1], Aleksandar Nagorni[2], Natasa Rančić[1]

[1]Institut za javno zdravlje Niš
[2]Klinika za gastroenterologiju, Klinički centar Niš

SAŽETAK

Cilj ovog rada bio je da ispita uticaj unosa masti i masnih kiselina putem hrane na nastanak raka želuca. Istraživanje je sprovedeno u periodu od januara 2005. do decembra 2006. godine. U studiju su uključena 102 pacijenta sa patohistološki potvrđenom dijagnozom raka želuca i 204 ispitanika hospitalizovana na klinikama KC Niš u istom periodu zbog akutnih nemalignih bolesti. Za ispitivanje ishrane ispitanika korišćen je Upitnik o učestalosti unosa namirnica (FFQ) - godinu dana pre postavljanja dijagnoze ili prijema u bolnicu (za kontrole). Vrednosti unosa masti i masnih kiselina izračunate su pomoću Tablica hemijskog sastava prehrambenih proizvoda.

Nije utvrđena statistički značajna razlika u učestalosti unosa vidljivih masti (suncokretovo i maslinovo ulje, svinjska mast, margarin, buter) između obolelih osoba i kontrolne grupe (p>0,05). Prema rezultatima univarijantne logističke regresione analize, unos ukupnih masti (OR za najviši tercil 0,80; 95%CI,0,28-2,25), zasićenih (0,85, 95%CI: 0,31-2,35), mononezasićenih masnih kiselina (0,57, 95%CI: 0,22-1,48) i holesterola (0,79; 95%CI:0,37-2,28) nije povezan, a unos polinezasićenih masnih kiselina je u negativnoj vezi sa nastankom raka želuca (0.32; 95%CI: 0.12-0.83).

Prema rezultatima naše studije, unos polinezasićenih masnih kiselina hranom može pomoći prevenciji raka želuca. Neophodna su dalja istraživanja koja bi potvrdila ove rezultate.

***Ključne reči*: masti, masne kiseline, rak želuca**