Annals of Oncology 13: 1688–1689, 2002

Letters to the Editor

Glycaemic index, breast and colorectal cancer

Glycaemic index (GI) is an extension of the fibre hypothesis [1] and a ranking of carbohydrates based on their post-prandial blood glucose response [2]. The basic concept is that a higher rate of carbohydrate absorption leads to higher blood glucose and insulin rise, and hence a higher GI index. GI has been linked to non-insulin-dependent diabetes mellitus [3, 4], coronary heart disease, and also to excess risk of colorectal [5] and breast [6] cancer. Refined cereal intake has also been related to elevated risk of oral, oesophageal and laryngeal [7], and other digestive tract neoplasms [8]. The possible link is related to mutagenic and perhaps promotional effects of insulin and insulin-like growth factor (IGF) on the process of carcinogenesis [9–11]. Available data on GI and cancer risk are, however, extremely scanty. A multicentre case–control study from Italy found an odds ratio (OR) of 1.7 for colorectal cancer [5] and 1.4 for breast cancer [6] in the highest GI quintile, with significant trends in risk.

To provide further information on the issue, we considered data from two case–control studies on colorectal and breast cancer conducted between 1992 and 2001 in the Swiss Canton of Vaud [12, 13]. Cases were 323 patients (192 males, 131 females) with incident, histologically confirmed colon ($n = 169$) or rectal ($n = 154$) cancer (median age 65 years), and 331 women with breast cancer (median age 58 years) admitted to the University Hospital of Lausanne, Switzerland.

Controls were 1145 subjects (330 males, 815 females) aged <75 years (median age 59 years) residing in the same geographical area and admitted to the same hospital as cases for acute, non-neoplastic diseases (33% traumas, 31% non-traumatic orthopaedic conditions, 19% surgical conditions and 17% miscellaneous other disorders). Sixteen percent of subjects (17% of cases, 15% of controls) who were approached for interview refused. The structured questionnaire included information on socio-demographic characteristics and life-style habits, and menstrual and hormonal factors for women. A food-frequency questionnaire (FFQ) was used to assess subjects' habitual diet, including information on weekly frequency of consumption of specific foods, as well as complex recipes (79 items) during the 2 years prior to cancer diagnosis or hospital admission (for controls).

GI was expressed as a percentage of the glycaemic response elicited using white bread as a standard food. For each subject, average daily GI was calculated by summing the products of the carbohydrate content per serving, for each food or recipe, times the average number of servings per week, times its GI, all divided by the total amount of available weekly carbohydrate intake. A score of the daily average glycaemic load (GL) was computed as the GI, but without dividing by the total amount of carbohydrates [14, 15]. ORs and the corresponding 95% confidence intervals (CI) were computed by tertile (of the control distribution) of daily GI and GL score, using

Table 1. ORs and 95% CIs[a] of colorectal (323 cases, 611 controls) and breast cancer (331 cases, 534 controls) by tertile of energy-adjusted daily GI (Vaud, Switzerland, 1992–2001)

Cancer sites	GI, tertile/OR (95% CI)			$\chi^2_{1\ (trend)}$	*P* value
	1[b]	2	3		
Colorectum					
Upper limit (controls)	74.4	85.7			
Colon	1	2.85 (1.64–4.93)	2.35 (1.35–4.07)	6.63	0.01
Rectum	1	1.83 (1.09–3.07)	1.31 (0.76–2.25)	0.55	0.46
Colorectum	1	2.19 (1.45–3.31)	1.82 (1.19–2.78)	4.54	0.03
Breast					
Upper limit (controls)	73.0	111.8			
	1	1.60 (1.05–2.43)	1.25 (0.83–1.87)	0.75	0.39

[a]Adjusted for age, sex, education, physical activity, number of daily meals, alcohol consumption, fibre and energy intake (colorectum), plus parity, menopausal status and oral contraceptive use (for breast cancer).
[b]Reference category.

unconditional multiple logistic regression models, including terms for age, sex, education, occupational physical activity, number of daily meals, alcohol and fibre intake, and total energy intake according to the residual model [16] plus, for breast cancer, parity, menopausal status and oral contraceptive use.

Table 1 gives the distribution of cases of colorectal and breast cancer, and the corresponding controls, according to dietary GI. Significantly elevated ORs were observed in the second (OR 2.2) and third (OR 1.8) tertiles for colorectal cancer. The association was apparently stronger for colon than for rectal cancer, and the trends in risk were significant for colon only and colorectum combined. For breast cancer, the ORs for subsequent levels of GI were 1.6 and 1.3, and the trend in risk was non-significant. No consistent relation was observed between GL and colorectal or breast cancer risk.

Therefore, the results of this study, based on a validated FFQ [12] and on large datasets, offer limited evidence for an association between dietary GI and increased colorectal cancer risk in Switzerland, in the absence, however, of a linear trend in risk for both colorectal and breast cancer. They are consequently only partly supportive of the findings of case–control studies of colorectal [5] and breast [6] cancer conducted in Italy.

The less consistent association observed in this Swiss population, if not due to chance or bias, can be attributed to the different composition of the Swiss diet, which includes a lower proportion of energy from carbohydrates, and a greater proportion of wholegrain cereals as compared with the Italian diet [7, 17]. The comparatively high proportion of wholegrain cereals [12, 13], which may have a favourable effect on colon and breast cancer [8], may also explain the absence of association with GL, which is a combination of quantity as well as quality of carbohydrates consumed [2].

Acknowledgements

This work was partly supported by the Swiss National Science Foundation (grant no. 32-31330.91) and by the Swiss Cancer Research Fund (KFS; contract AKT no. 72 and 700-8).

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DOI: 10.1093/annonc/mdf261