Key messages

- The incidence of coronary mortality is higher among populations with low dietary intake of flavonoids
- The protective effect of flavonoids was associated with a diet high in intake of apples and onions
- The effect may be mediated through prevention of oxidation of low density lipoproteins but other mechanisms could be involved
- Flavonoids offer an explanation for the suggested beneficial effect of fruits and vegetables in coronary heart disease
- Further studies should concentrate on the effects of various flavonoid compounds and on populations with different intakes

significantly to intake of the antioxidant vitamins C or E or β carotene the association observed for flavonoids was probably not due to these antioxidants.

With the exception of berries in men, foods representing sources of flavonoids were inversely associated with coronary mortality risk. In contrast with fruits and vegetables some berries also contain considerable amounts of flavonoids (for example, myricetin), which, according to in vitro studies, modify low density lipoprotein to increase its uptake by macrophages, thus possibly having an opposite effect on the risk of coronary heart disease.[24] This and the low accuracy of our estimates of flavonoid concentration in berries may explain the absence of an association.

In summary, the results of the present study suggest that people with very low dietary intakes of flavonoids have increased risks of coronary heart disease. This could not, however, be fully distinguished from the possible effects of other dietary substances or lifestyle. Further longitudinal studies of other populations are needed to confirm the importance of flavonoids in the prevention of coronary heart disease.

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Prescribing and hospital admissions for asthma in east London

Chris Griffiths, Jeannette Naish, Patricia Sturdy, Filomena Pereira

City and East London General Practice Database Project, Department of General Practice and Primary Care, St Bartholomew's and the Royal London School of Medicine and Dentistry, Queen Mary and Westfield College, London E1 4NS
Chris Griffiths, *general practitioner, senior lecturer*
Jeannette Naish, *general practitioner, senior lecturer*
Patricia Sturdy, *research officer*

Department of Epidemiology and Medical Statistics, Queen Mary and Westfield College
Filomena Pereira, *lecturer in medical statistics*

Correspondence to:
Dr Griffiths.

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Admission rates for asthma in 1991-2 were 80-100% above national averages for all age groups in east London.[1] We have shown in east London general practices that a higher ratio of prophylaxis to bronchodilator prescribing occurs in training practices and those approved for health promotion band 3 and asthma surveillance.[2] We have also explored the relation of appropriate prescribing for asthma to other local practice characteristics.[3] We investigated excessive asthma admission rates in patients from these practices by studying the relation between asthma prescribing and admissions.

Methods and results

Data on asthma admissions by age for east London residents in 134 out of 163 practices covered two years from April 1992 and included some 1602 patients (800 in 1992-3 and 802 in 1993-4). Ninety eight per cent of admissions for asthma were acute and only 3% of all patients admitted were not allocated to a practice. Data were obtained from the integrated district and regional information system with the international classification of disease code 493. Rates per thousand patients per practice were calculated from the average number of patients admitted per year; this excluded readmissions within the same year. The denominators were the resident population of east London in each practice at June 1993 and June 1994. We also investigated admission rates in the age groups under 5, 5-64, and 65 and over.

Our asthma prescribing data have been described elsewhere.[2] While only one year's prescribing data were available (April 1992 to March 1993), our experience from a parallel study in 24 local practices is that the prescribing ratios remained almost constant during our two year study period.

Table 1 presents the mean (SD) asthma admission rates for different categories of the prophylaxis to bronchodilator ratios. These ratios have been divided into four groups by the 25th and 75th percentiles and the median. Statistical significance was determined by Cuszick's test for trend. Table 1 shows that practices prescribing higher ratios of prophylaxis to broncho-

Table 1—*Asthma admission rates (per 1000 patients per practice) by age group and the ratio of prophylaxis to bronchodilator prescribing in east London practices*

	Prophylaxis to bronchodilator ratio for number of items					Prophylaxis to bronchodilator ratio for net ingredient cost				
Quartile:	Lower	Second	Third	Upper	Test for trend (P value)	Lower	Second	Third	Upper	Test for trend (P value)
Upper limit of quartile	0·275	0·33	0·395	0·65		0·85	1·08	1·37	2·53	
Mean (SD) admission rate:										
All ages	1·61*	1·53*	1·25*	1·33	0·04	1·68	1·47*	1·36	1·23*	0·01
	(0·61)	(0·56)	(0·49)	(0·52)		(0·58)	(0·61)	(0·50)	(0·47)	
<5	6·78	4·98	5·54	5·81	0·47	7·00	4·70	5·99	5·49	0·75
	(5·79)	(3·57)	(3·41)	(2·92)		(6·09)	(2·90)	(3·21)	(3·52)	
5-64	0·12	0·12	0·10	0·09	0·03	0·12	0·12	0·10	0·09	0·01
	(0·05)	(0·07)	(0·05)	(0·05)		(0·07)	(0·05)	(0·05)	(0·05)	
≥65	1·42	1·99	0·97	1·19	0·60	1·99	1·43	1·05	1·14	0·28
	(1·78)	(2·46)	(1·12)	(1·37)		(2·70)	(1·63)	(0·97)	(1·45)	
No practices	29 and 30*	30 and 31*	37* and 38	36		26	35 and 37*	37	34* and 35	

Admission rate for all ages: mean=1·43, SE=0·05, median=1·3, minimum=0·4, maximum=3·1, 25th percentile=1·0, 75th percentile=1·8; based on 1602 patients.
Admission rate age <5: mean=6·07, SE=0·42, median=5·3, minimum=0·0, maximum=33·7, 25th percentile=3·2, 75th percentile=7·5; based on 484 patients.
Admission rate 5-64: mean=1·08, SE=0·05, median=1·0, minimum=0·0, maximum=3·6, 25th percentile=0·7, 75th percentile=1·3; based on 958 patients.
Admission rate ≥ 65 years: mean=1·34, SE=0·15, median=1·0, minimum=0·0, maximum=12·6, 25th percentile=0·0, 75th percentile=1·9; based on 160 patients.

dilator medication had on average lower admission rates for asthma. Significant trends were observed in those aged 5-64. For young children and the elderly, however, we found neither significant trends nor differences in admission rates between categories of the prescribing ratios (prescribing items ratios: for under 5s P=0·61; for the elderly P=0·17; prescribing cost ratios: for under 5s P=0·38; for the elderly P=0·62).

Comment

We have shown an association between asthma prescribing and morbidity experienced by patients with asthma, as reflected in admissions to hospital. Practices with higher prescribing ratios had lower admission rates to hospital. This relation has been reported by other workers.[4] The diagnostic coding for asthma is probably most secure in the middle age band: the lack of association in those aged under 5 and in the elderly may reflect the presence of other conditions such as chronic cough and chronic obstructive pulmonary disease, possibly classified under the asthma code.

Prescribing studies are often crude and may be complicated by problems such as indication and compliance[5]; ours is no exception. Nevertheless, that we can relate this marker to a patient outcome such as admission rate is encouraging. While this relation is not necessarily causal (higher prescribing ratios may simply be a marker for other aspects of good asthma care), it seems sensible to promote more appropriate prescribing for asthma, particularly in practices with low prophylaxis to bronchodilator ratios. Methods might include facilitating local asthma guidelines, practice based medical education, and financial incentives. Further studies should address other patient and practice factors that may be associated with asthma admission rates and investigate the relation between prescribing patterns and a wider range of patient outcomes.

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Case-control analysis of bone resorption markers, disability, and hip fracture risk: the Rotterdam study

Paulus L A van Daele, Markus J Seibel, Huibert Burger, Albert Hofman, Diederick E Grobbee, Johannes P T M van Leeuwen, Jan C Birkenhäger, Huibert A P Pols

Several factors besides bone mineral mass have been related to the risk of hip fracture. Bone quality, the rate of bone loss, and non-skeletal factors have been identified as important.[1,2] High rates of bone resorption may be associated with disruption of the trabecular network as well as with an increased rate of bone loss. Furthermore, immobility associated with disability induces bone resorption not followed by increased bone formation.[3]

Urinary pyridinium crosslinks are markers of bone resorption. We investigated whether these were associated with the risk of hip fracture and also whether such an association was attributable to disability.

Correspondence to:
Dr Pols.

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Subjects, methods, and results

This nested case-control analysis was conducted as part of the Rotterdam study, a prospective cohort study of the incidence of and risk factors for chronic disabling diseases.[4] Briefly, all 10 275 residents of a district of Rotterdam aged 55 or over were invited to participate. The study consisted of an initial home interview followed by a series of medical examinations