change in alcohol use over time lead to underestimation of an elevated relative risk.⁴ However, we found a clear association between level of alcohol use at conscription and risk of subsequent hospitalisation or death with a diagnosis of alcoholism, alcohol psychosis, or alcohol intoxication, with a significant relative risk of 5.71 for consumers of ≥ 15 g ethanol/day, indicating a stability over time. The results also indicate a cardioprotective effect of alcohol use in relatively young men, in whom myocardial infarction is rare. Possible biological mechanisms include an increase in high density lipoprotein cholesterol, a decrease in platelet coagulability, and a decrease in plasma fibrinogen associated with alcohol intake.¹

Calculation of the attributable proportions clearly indicated that alcohol consumption had a negative net effect on the subjects' health up to the age of 45. The results support a restrictive alcohol policy and recommendations for little or no alcohol consumption by young men.⁵

Contributors: AR formulated the study hypotheses, was responsible for all phases of the study except the statistical analyses, and wrote the paper. AL was responsible for the statistical analyses and participated in planning and designing the study, interpreting the results, and editing the paper. AR is guarantor for the paper.

Funding: This study was supported by grant 92-0300:3C from the Swedish Council for Social Research.

Competing interests: None declared.

- 1 Beaglehole R, Jackson R. Alcohol, cardiovascular disease and all causes of death: a review of the epidemiological evidence. *Drug Alcohol Rev* 1992;11:275-90.
- 2 Andréasson S, Allebeck P, Romelsjö A. Alcohol and mortality among young men. *BMJ* 1988;296:1021-5.
- 3 Rothman K, Greenland S. *Modern epidemiology*. 2nd ed. Philadelphia: Lippincott-Raven, 1998: 430-5.
- 4 Rehm J. Measuring quantity, frequency and volume of drinking. *Alcoholism Clin Exp Res* 1998;22(suppl):15-20. (Suppl: *Proceedings of international workshop on consumption measures and models for use in policy development and evaluation*.)
- 5 Edwards G, Anderson P, Babor T, Casswell S, Ferrence R, Giesbrecht N, et al. *Alcohol policy and the public good*. Oxford: Oxford University Press, 1994.

(Accepted 17 June 1999)

Helicobacter pylori and childhood recurrent abdominal pain: community based case-control study

Colin Macarthur, Norman Saunders, William Feldman, Moshe Ipp, Patricia Winders-Lee, Susan Roberts, Linda Best, Philip Sherman, Paul Pencharz, and Sander Veldhuyzen van Zanten

Department of
Community Health
Sciences, Health
Sciences Center,
Calgary, Alberta,
Canada T2N 4N1
Colin Macarthur
epidemiologist

Department of
Paediatrics, Hospital
for Sick Children,
Toronto, Ontario,
Canada M5G 1X8
Norman Saunders
paediatrician
William Feldman
paediatrician
Moshe Ipp
paediatrician
Patricia
Winders-Lee
research nurse
Susan Roberts
graduate student
Philip Sherman
paediatric
gastroenterologist
Paul Pencharz
paediatric
gastroenterologist
continued over

BMJ 1999;319:822-3

Recurrent abdominal pain (at least three discrete episodes of abdominal pain over a period of three or more months, and of sufficient severity to interrupt normal activities) is a common childhood complaint. We set out to determine the association, if any, between *Helicobacter pylori* infection and childhood recurrent abdominal pain.

Participants, methods, and results

Cases and controls were drawn consecutively from the practice populations of six primary care paediatricians in Toronto. (Convenience sampling was used to select paediatricians; they were chosen because of their interest in the study.) Cases were children aged 5-15 years presenting with recurrent abdominal pain; controls were healthy children undergoing a routine check-up or vaccination. Excluded were children with concurrent disease, suspected organic disease, aged under five years, or who had used bismuth in the previous month. All families approached consented to participate.

Serum IgG antibodies to *H pylori* were measured by using a flow microsphere immunofluorescent assay (FMIA) and a commercial immunoassay kit (Bio-Rad Laboratories, Hercules, CA). The FMIA method has been validated in children (100% sensitivity, 97% specificity) against a gold standard of culture and histology.¹ Infection was also diagnosed by using a ¹³C-urea breath test (99% sensitivity, 98% specificity).² A standardised questionnaire was used to gather social, demographic, and clinical information on each participant.

One hundred children with recurrent abdominal pain and 100 healthy controls participated in the study. The groups did not differ in age, height, weight, history of colic, previous admissions to hospital, seasonal allergies, or antibiotic use in the previous month (table). The two groups were also similar with respect to socioeconomic status, country of birth of the parents, number of siblings, smokers in the home, household pets, and family history of recurrent abdominal pain, peptic ulcer, and migraine. Children with recurrent abdominal pain, however, were more likely to be girls, to have symptoms of chronic headache or chronic limb pain, and to have more frequent school absences than control children.

Results of serology were available for 174 children (87%). Only five had positive results (3/93 cases v 2/81 controls). Breath test results were available for 193 children (97%). Nine were positive (4/97 (4%) cases v 5/96 (5%) controls; crude odds ratio 0.78 (95% confidence interval 0.20 to 3.01); odds ratio adjusted by logistic regression 0.65 (0.08 to 2.56)).

Comment

This community based case-control study found no association between *H pylori* infection and recurrent abdominal pain in childhood. Strengths of the study included the primary care setting, the use of incident cases of recurrent abdominal pain, and the use of healthy children as controls. Information bias was minimised by using a standardised questionnaire, with the research nurse blind to the serology and breath test results. *H pylori* infection was measured by two

Comparison of children with recurrent abdominal pain (cases) and healthy children (controls) on social, demographic, and clinical factors. Values are numbers unless otherwise specified

Variable	Cases (n=100)	Controls (n=100)	P value
Mean (SD) age (years)	9 (2.7)	10 (3.2)	0.09
Mean (SD) height (cm)	136 (18.1)	140 (19.1)	0.15
Mean (SD) weight (kg)	35 (14.4)	38 (15.9)	0.18
Median (interquartile range) No of siblings	1 (1-2)	1 (1-2)	0.10
Median (interquartile range) No of school absences/year	8 (4-14)	5 (3-9)	<0.01
No of girls	63	43	0.01
Maternal education <12 years	26	29	0.64
Country of birth of mother (high risk)*	9	13	0.38
Country of birth of father (high risk)*	13	14	0.86
History of colic	39	33	0.38
Chronic headache	50	18	<0.01
Chronic limb pain	14	1	<0.01
Seasonal allergies	22	25	0.62
Previous admission to hospital	38	29	0.18
Antibiotic use in previous month	19	12	0.17
Smoker in home (either or both parents)	21	29	0.21
Pets in the home (dog/cat)	38	42	0.56
Family history of recurrent abdominal pain	28	25	0.60
Family history of peptic ulcer	11	13	0.68
Family history of migraine	39	28	0.10

*Published seroprevalence data were used to divide country of birth into high risk countries (those in South America, south east Asia, eastern Europe, and Africa) and low risk countries (those in North America and western Europe).

independent serology tests and a urea breath test. As the families involved were of a high socioeconomic status (which could explain the low prevalence of infection among control children), the findings should be generalised with caution.

One hospital based case-control study found that *H pylori* infection could be a risk factor for recurrent abdominal pain.⁵ The case children, however, had a higher prevalence of organic disease than in previous reports. Also, the control group included children with concurrent gastrointestinal disease. Other community based case-control studies have found no association between *H pylori* infection and recurrent abdominal pain.^{4 5}

On the basis of our findings and other published evidence, *H pylori* is not a causal factor for childhood recurrent abdominal pain. Therefore, primary care doctors should not routinely investigate for *H pylori* infection in children who present with classic symptoms of recurrent abdominal pain.

We thank Drs M Gans, M Goldbach, and J Hilton for their contributions.

Contributors: CM discussed core ideas, designed the study protocol, analysed the data, and wrote the manuscript; he is guarantor for the paper. NS initiated the primary study hypothesis, discussed core ideas, helped design the study protocol, participated in data collection, and edited the paper. WF helped formulate the primary study hypothesis, discussed core ideas, helped design and write the study protocol, and edited the paper. MI participated in data collection, discussed core ideas, and edited the paper. PW-L participated in the design and execution of the study, particularly data collection and quality control, and edited the paper. SR participated in the design and execution of the study, particularly outcome measurement (urea breath test) and quality control, and edited the paper. LB participated in the design and execution of the study, particularly outcome measurement (serological tests) and quality control, and edited the paper. PS discussed core ideas, helped design the study protocol, helped interpret the data, and edited the paper. PP participated in the design and execution of the study, particularly outcome measurement (urea breath test), helped interpret the data, and edited the paper. SVZ participated in the design and execution of the study, particularly outcome measurement (serological tests), helped interpret the data, and edited the paper.

Funding: Health and Welfare Canada, National Health and Research Program grant No 6606-5282.

Competing interests: None declared.

- 1 Best LM, Veldhuyzen van Zanten SJ, Sherman PM, Bezanson GS. Serological detection of *Helicobacter pylori* antibodies in children and their parents. *J Clin Microbiol* 1994;32:1193-6.
- 2 Klein PD, Graham DY. Minimum analysis requirements for the detection of *Helicobacter pylori* infection by the 13C-urea breath test. *Am J Gastroenterol* 1993;88:1865-9.
- 3 Chong SK, Lou Q, Asnicar MA, Zimmerman SE, Croffie JM, Lee CH, et al. *Helicobacter pylori* infection in recurrent abdominal pain in childhood: comparison of diagnostic tests and therapy. *Pediatrics* 1995;96:211-5.
- 4 Hardikar W, Feekery C, Smith A, Oberklaid F, Grimwood K. *Helicobacter pylori* and recurrent abdominal pain in children. *J Pediatr Gastroenterol Nutr* 1996;22:148-52.
- 5 O'Donohoe JM, Sullivan PB, Scott R, Rogers T, Brueton MJ, Barltrop D. Recurrent abdominal pain and *Helicobacter pylori* in a community-based sample of London children. *Acta Paediatr* 1996;85:961-4.

(Accepted 20 May 1999)

Correction

Ethnic and sex differences in selection for admission to Nottingham University Medical School

The wrong table was published for this paper by James and Driver (7 August 1999, pp 351-2). The correct table is published below. The results in the text of the paper, as well as the conclusions, remain unchanged.

Decision by ethnic group and sex. Values are numbers of applicants (percentages of each decision category; percentages of group)

Decision category	Ethnic group			P value of white v non-white	Sex			P value of male v female
	White	Non-white*	Total		Male	Female	Total	
Total No of applicants	1954 (76.8)	591 (23.2)	2545†		1279 (47.3)	1422 (52.7)	2701	
Rejection at:								
Academic stage	400 (69.4; 20.5)	176 (30.6; 29.8)	576 (22.6)	<0.0001	346 (55.6; 27.1)	276 (44.4; 19.4)	622 (23.0)	<0.0001
Questionnaire stage	826 (73.1; 42.2)	304 (26.9; 51.4)	1130 (44.4)	<0.0005	611 (51.5; 47.8)	576 (48.5; 40.5)	1187 (44.0)	<0.0005
Statement review	341 (87.7; 17.5)	48 (12.3; 8.1)	389 (15.3)	<0.0001	155 (37.4; 12.1)	259 (62.6; 18.2)	414 (15.3)	<0.0005
Interview	163 (83.2; 8.3)	33 (16.8; 5.6)	196 (7.7)	<0.05	76 (36.2; 5.9)	134 (63.8; 9.4)	210 (7.8)	<0.005
Offered a place	224 (88.2; 11.5)	30 (11.8; 5.1)	254 (10.0)	<0.0005	91 (34.0; 7.1)	177 (66.0; 12.5)	268 (9.9)	<0.0005

*Asian (Bangladeshi, Chinese, Indian, Pakistani, other Asian) and black (African, Caribbean, other black).

†Does not include 156 candidates whose ethnic group was not supplied to Universities and Colleges Admission Service.