Primary care

Married couples' risk of same disease: cross sectional study

Julia Hippisley-Cox, Carol Coupland, Mike Pringle, Nicola Crown, Vicky Hammersley

Division of General Practice, School of Community Health Sciences, University of Nottingham, Nottingham NG7 2RD
Julia Hippisley-Cox
senior lecturer in general practice
Mike Pringle
professor of general practice
Carol Coupland
senior lecturer in medical statistics
Vicky Hammersley
research network co-ordinator, Trent focus

Collingham Medical Centre, Collingham NG23 7LB
Nicola Crown
researcher

Correspondence to:
J Hippisley-Cox
julia.hippisley-cox@nottingham.ac.uk

Abstract

Objective To determine whether people whose marital partners have depression, diabetes, hypertension, ischaemic heart disease, stroke, hyperlipidaemia, peptic ulcer disease, or asthma or chronic obstructive pulmonary disease are at increased risk of the same disease.

Design Cross sectional study.

Setting 10 practices from the Trent Focus Collaborative Research Practice Network.

Participants 8386 married couples (16 772 individuals) from a population of 29 014 participants aged 30-74 years.

Outcomes Risk of disease in participants whose marital partner had that disease compared with those whose partner did not.

Results After both partners' age, smoking, and obesity and which general practice they attend were adjusted for, participants whose marital partner had asthma, depression, hypertension, hyperlipidaemia, and peptic ulcer disease were at increased risk of having the same disease. The adjusted odds ratios were 1.69 (95% confidence interval 1.43 to 2.98) for asthma, 2.08 (1.71 to 2.54) for depression, 1.32 (1.04 to 1.67) for hypertension, 1.44 (1.19 to 1.75) for hyperlipidaemia, and 2.01 (1.48 to 2.73) for peptic ulcer disease.

Conclusion Partners of people with specific diseases are at increased risk of the disease themselves—at least 70% increased risk for asthma, depression, and peptic ulcer disease. This implicates shared environmental causes in some diseases in addition to any genetic or distant exposure or shared behaviours with respect to seeking health care.

Introduction

Studies in twins have clarified the contributions of genetic and environmental factors to the development of diseases by identifying genetic factors.[1][2] The study of cohabiting couples can identify environmental factors. Shared environmental factors may put cohabiting partners at risk of the same diseases, and this could have implications for screening and other interventions. Interventions targeted at couples may be more effective than those targeted at individuals.[3]

In 1998, we published a study from a single practice that showed an association between having a spouse with hypertension and increased risk of hypertension.[4]

Apart from one large, population based study that showed statistically significant husband-wife associations for cancers of the tongue and stomach and for non-Hodgkin's lymphoma,[5] we found no adequate evidence for spouse concordance for many other common but important diseases, such as ischaemic heart disease, diabetes, peptic ulcer disease, asthma, and stroke. Some small studies showed concordance between married couples for psychological wellbeing,[6] dietary habits,[7] and warfarin dosage.[8] Results from studies of coronary risk factors have been inconsistent—some but not all found concordance, particularly when age, body weight, and smoking status were adjusted for.[9-14]

We aimed to determine whether people whose marital partners have a specific disease are at increased risk of the same disease. We studied common and important diseases in which plausible biological environmental mechanisms could have a role (asthma or chronic obstructive pulmonary disease, depression, diabetes, hypertension, ischaemic heart disease, stroke, hyperlipidaemia, or peptic ulcer disease).

Methods

We conducted a cross sectional study in 10 general practices with data of proved quality from the Trent Focus Collaborative Research Network. The study population consisted of all registered patients aged 30-74 years inclusive.

We used computerised records to identify participants with and without each of the eight diseases (see bmj.com). Records with a Read code or current related treatment, or both, identified participants with the disease. We extracted the first recorded date of onset of each of the eight diseases for all patients in the study population. For related drugs, we extracted dates and number of prescriptions. We defined the current use of a drug as more than one prescription within the previous 12 months.

We defined a married couple as "two individuals aged 30-74 years living at the same address; of different sex; and with the same surname, titles of Mr and Mrs, and a difference in age of less than 15 years." This definition identified married couples living together, but it excluded cohabiting or same sex couples.

Statistical analysis

We used an unconditional logistic regression analysis to calculate odds ratios and 95% confidence intervals for the risk of disease in participants whose marital partner had a particular disease compared with those whose marital partner did not. We used female disease status as the outcome variable and male disease status as the exposure variable. We adjusted for the possible confounding effects of age of both partners and, in further analyses, for the possible confounding effects of most recently recorded category for obesity and of most recently recorded smoking status in both partners. We allowed for clustering by general practice.

We used Pearson's correlation coefficient to determine the correlation between couples for body mass index. We calculated a partial correlation coefficient that adjusted for both partners' ages. We coded the most recent blood pressure reading into high (systolic $\geqslant 160$ mm Hg or diastolic $\geqslant 90$ mm Hg) or not high (this category included missing values), and we calculated odds ratios adjusted for the participants' and partners' ages, obesity, smoking status, and general practice. We calculated age adjusted odds ratios to quantify spouses' concordance for smoking. We used a two tailed significance level of 0.01 for the main outcome variables because of the number of outcomes under investigation.

Results

Characteristics of the study population

In total, 29 014 people aged 30-74 living in households with only one or two adults in this age range were registered with the 10 practices. Of these, 8386 women (56.8% of 14 757 women aged 30-74) and 8386 men (58.8% of 14 257 men aged 30-74) were part of a married couple according to our definition. The baseline characteristics are presented on bmj.com.

Risk of disease in participants whose marital partner has disease

Participants whose marital partner had asthma, depression, hypertension, hyperlipidaemia, or peptic ulcer disease were at increased risk of having the disease themselves after we adjusted for age, obesity, and smoking status in both partners and for the general practice at which the participants were registered (table). The odds ratio for diabetes was higher in women whose partners had diabetes than in those whose partners did not, but the confidence intervals were wide because of the low prevalence of diabetes compared with most of the other diseases we studied. The odds ratios for ischaemic heart disease and stroke were higher in women whose spouses had these diseases, but this was not statistically significant (table).

On multivariate analysis, the adjusted odds ratio for high blood pressure in women whose partners had high blood pressure compared with those whose partners did not was 1.40 (95% confidence interval 1.19 to 1.64). The correlation between marital partners for body mass index was significant ($r=0.21$, $P<0.001$). When we adjusted for the age of both partners, the partial correlation was 0.20 ($P<0.001$). We found a significant association between married partners for smoking status ($P<0.001$)—the age adjusted odds ratio

Risk of disease in 8386 women aged 30-74 years whose partner had that disease compared with those whose partner did not

Disease	Odds ratio (95% CI)	
	Adjusted for age†	Adjusted for age, smoking, and body mass index‡
Asthma	1.68 (1.45 to 1.94)	1.69 (1.43 to 1.98)
Depression	2.18 (1.78 to 2.67)	2.08 (1.71 to 2.54)
Diabetes	1.70 (1.06 to 2.74)	1.41 (0.87 to 2.26)
Hypertension	1.39 (1.14 to 1.70)	1.32 (1.04 to 1.67)
Ischaemic heart disease	1.29 (0.81 to 2.06)	1.28 (0.78 to 2.11)
Hyperlipidaemia	1.51 (1.21 to 1.88)	1.44 (1.19 to 1.75)
Stroke	1.30 (0.76 to 2.24)	1.21 (0.71 to 2.07)
Peptic ulcer disease	2.08 (1.53 to 2.83)	2.01 (1.48 to 2.73)

†Adjusted for age group of both partners in bands of 10 years (<35, 35-44, 45-54, 55-64, and 65-74 years) and for clustering by general practice.
‡Also adjusted for smoking status (non-smoker, current smoker or former smoker, or not recorded) and body mass index (<20, 20-24.99, 25-29.99, $\geqslant 30$, or not recorded) of the woman and her spouse and for clustering by general practice.

for participants being smokers was 4.4 (3.8 to 5.1) for those whose partners were current smokers or former smokers compared with non-smokers. We repeated the analyses including only married couples for whom complete data on smoking and body mass index were available (2654 couples, 31.6%) and found no important differences in the odds ratios.

Discussion

Participants were significantly more likely to have asthma, depression, hypertension, hyperlipidaemia, or peptic ulcer disease if their marital partner had the same disease. The increased risks—at least 70% for asthma, depression, and peptic ulcer disease—could indicate shared environmental causes for diseases, which are distinct from any genetic or distant exposures. Another explanation for our findings is that couples may share healthcare seeking behaviours, although this would not explain the concordance for high blood pressure. The findings could have implications for targeting screening or disease prevention measures at partners of participants with one of these diseases.

Although the results were not surprising for some of these diseases, the findings for hypertension and hyperlipidaemia suggest that diet or the pattern of physical exercise shared by couples has an important role in the disease's cause. A consequent association for ischaemic heart disease and stroke might have been expected, but this was not found. The finding for asthma might be due to shared diet or shared exposure to allergens. The failure of diabetes to show a significant concordance for marital partners (although the adjusted odds ratio was 1.41) was unexpected, but it was probably because the prevalence of diabetes was lower than that for most of the other diseases we studied and our study was not sufficiently powered to taken into account this low prevalence.

Strength and weaknesses of the study

A limitation of our study is that we did not obtain consultation data; this means that we could not adjust for the different frequencies at which some groups of patients consult their general practitioner. This could affect patients' chances of being screened for a disease, being diagnosed with a disease, or having a diagnosis recorded on computer. Spouses of affected partici-

What is already known on this topic

People whose spouses have hypertension are at increased risk of hypertension

Little is known about the risks of disease for spouses of patients with diseases other than hypertension

What this study adds

People whose marital partner had asthma, depression, and peptic ulcer disease were at increased risk of having the same disease

Shared environmental factors contribute to the risk of diseases

The costs and benefits of screening people for diseases of their spouses needs to be considered

pants may be more aware of the early symptoms of a particular disease, and this may make them more likely to consult their general practitioner and be screened.

The study's strengths are its large sample size, the quality of data from the general practices, the selection of community participants, and the use of multivariate analysis to adjust for potential confounders. Our method of data collection means that the study is unlikely to be susceptible to selection and recall bias.

The data could be at risk of misclassification bias because disease status may have been falsely classified as negative or falsely classified as positive. Misclassification would have reduced the odds ratio of the factor under investigation.[15] Bias due to missing data is unlikely to have affected our results substantially because our findings were similar when we analysed only patients with complete data. We also reduced the effect of selection bias by including categories for patients with missing data about smoking and obesity.[15]

Previous studies suggested that concordance for some conditions (for example, hypertension) could be due to positive "assortive mating."[9] For example, if obese people are more likely to have obese marital partners, they could share an increased risk of disease due to their obesity or factors related to its development (such as lack of physical activity). If positive assortive mating was present, the association between exposure to a marital partner with a disease and the risk of that disease would have been reduced

by the inclusion of body mass index in the multivariate analysis. This was not the case.

Another limitation is that we have no information on the length of time that participants had been couples or on the sequence of events. Our study design allowed us to show associations rather than causality.

Conclusion

The high increased risks of disease within married couples support the idea that shared environmental factors in addition to genetic or distant exposures contribute to the development of diseases. Screening spouses for some diseases should be considered.

1 Spector T, Cicuttini F, Baker J, Loughlin J, Hart D. Genetic influences on osteoarthritis in women: a twin study. *BMJ* 1996;312:940-4.
2 Rose R, Miller J, Grim CE, Christian JC. Aggregation of blood pressure in the families of identical twins. *Am J Epidem* 1979;109:503-11.
3 Sexton M, Bross D, Hebel R, Schumann BC, Gerace TA, Lasser N, et al. Risk-factor changes in wives with husbands at high risk of coronary heart disease: the spin off effect. *J Behav Med* 1987;10:3.
4 Hippisley-Cox J, Pringle M. Are spouses of patients with hypertension at increased risk of hypertension? A population based case-control study. *Br J Gen Pract* 1998;46:1580-4.
5 Friedman GD, Quesenberry CP, Jr. Spousal concordance for cancer incidence: a cohort study. *Cancer* 1999;86:2413-9.
6 Galbaud Du Fort G, Kovess V, Boivin JF. Spouse similarity for psychological distress and well-being: a population study. *Psychol Med* 1994;24:431-47.
7 Davis M, Murphy S, Neuhaus J, Gee L, Quiroga S. Living arrangements affect dietary quality for US adults aged 50 years and older: NHANES III 1998-1994. *J Nutrition* 2000;130:2256-64.
8 Van Haeften T, de Vries J, Sixma J. Concordance of phenprocoumon dosage in married couples. *BMJ* 1997;314:1386.
9 Sackett DL, Anderson GD, Milner R, Feinleib M, Kannel WB. Concordance for coronary risk factors among spouses. *Circulation* 1975;52:589-95.
10 An P, Rice T, Gagnon J, Borecki IB, Perusse L, Leon AS, et al. Familial aggregation of resting blood pressure and heart rate in a sedentary population: the heritage family study. Health, risk factors, exercise training, and genetics. *Am J Hypertens* 1999;12:264-70.
11 Brenn T. Adult family members and their resemblance of coronary heart disease risk factors: the cardiovascular disease study in Finnmark. *Eur J Epidemiol* 1997;13:623-30.
12 Kolonel LN, Lee J. Husband-wife correspondence in smoking, drinking, and dietary habits. *Am J Clin Nutr* 1981;1:99-104.
13 Rissanen AM, Nikkila EA. Aggregation of coronary risk factors in families of men with fatal and non-fatal coronary heart disease. *Br Heart J* 1979;42:373-80.
14 Garrison RJ, Castelli WP, Feinleib M, Kannel WB, Havlik RJ, Padgett SJ, et al. The association of total cholesterol, triglycerides and plasma lipoprotein cholesterol levels in first degree relatives and spouse pairs. *Am J Epidemiol* 1979;110:313-21.
15 Breslow NE, Day NE. *Statistical methods in cancer research.* Lyon: IARC Scientific Publications, 1987.

(Accepted 1 May 2002)

Submitting articles to the *BMJ*

We are now inviting all authors who want to submit a paper to the *BMJ* to do so via the web (http://submit.bmj.com).

Benchpress is a website where authors deposit their manuscripts and editors go to read them and record their decisions. Reviewers' details are also held on the system, and when asked to review a paper reviewers will be invited to access the site to see the relevant paper. The system is secure, protected by passwords, so that authors see only their own papers and reviewers see only those they are meant to.

Anyone with an internet connection and a web browser can use the system.

The system provides all our guidance and forms and allows authors to suggest reviewers for their paper. Authors get an immediate acknowledgement that their submission has been received, and they can watch the progress of their manuscript. The record of their submission, including editors' and reviewers' reports, remains on the system for future reference.

The system itself offers extensive help, and the *BMJ*'s editorial office will help authors and reviewers if they get stuck.

Benchpress is accessed via http://submit.bmj.com or via a link from bmj.com