releasing hormone agonist has been used to produce reversible "medical ovariectomy" and relief of premenstrual distress but, as pointed out by the authors, the low levels of oestradiol release induced precludes its long term use.[20] Oestradiol implants are both well tolerated and also maintain plasma oestrogen concentrations in the normal to high follicular range.[11]

In conclusion we have shown that subcutaneous implants of oestradiol combined with cyclical oral norethisterone is of definite benefit for the premenstrual syndrome. Taken in conjunction with the degree of placebo responsiveness shown by these patients, we hypothesise that the primary event in this condition is ovarian activity with its associated physical, psychological, and behavioural changes, which, in this group of women, are amplified secondary to psychosocial factors or as yet undetermined central mechanisms. Despite arguments about the importance of "reproductive biology" in the genesis of psychiatric morbidity[21,22] there seems little doubt that the hormonal and other changes associated with the ovarian cycle have profound effects on both the soma and the psyche, effects that may logically be controlled by manipulating ovulation.

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Associations between symptoms of irritable colon and psychological and social conditions and lifestyle

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Abstract

In a survey of risk factors for coronary heart disease 14 102 middle aged men and women answered a questionnaire on lifestyle, diet, and health, including symptoms of functional abdominal disorders. The overall prevalence of reports of one or both of the abdominal symptoms of "bloating and rumbling" or "cramping abdominal pain" was 28% in men and 35% in women. Only a weak negative association between age and prevalence of reported pain was found in both sexes. Women reported abdominal symptoms, especially cramping abdominal pain, significantly more commonly than men. In a multiple regression analysis abdominal symptoms were much more strongly associated with symptoms of mental stress such as depression, sleeping difficulties, problems of coping, and the use of analgesics than with lifestyle, dietary, and social variables together. The association was stronger in subjects reporting both symptoms.

This strong and consistent association between functional abdominal disorders and psychological and social problems suggests that action other than prescribing drugs, diets, or radiography is required.

Introduction

Of the more common aches and pains, abdominal complaints make up a large share,[1,3] leading to more patients consulting their general practitioner and the use of costly high technology examinations. A quarter of those who report abdominal symptoms eventually consult a doctor,[1,2] and a third to a half of outpatients in gastroenterological departments are classified as having functional disorders.[4,5] Common symptoms of bowel disorders are bloating, rumbling, cramping pain, and obstipation or diarrhoea, or both, which, when occurring without signs of organic disorders, constitute the irritable bowel syndrome.

The aetiology of this syndrome remains obscure. Both psychological conditions and diet are considered to contribute, though they are not established as causal. The great variation in treatment regimens reflects the lack of consistent knowledge about provoking

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agents.[6] We examine which, if any, of the recorded background variables of lifestyle, diet, psychological factors, and social conditions were associated with these symptoms in a way that might give clues to their aetiology.

Subjects and methods

In a survey of risk factors for coronary heart disease in the municipality of Tromsø, Norway, in 1979-80 all men born from 1925 to 1959 and all women born from 1930 to 1959 were invited to participate, making a total of 21 329 subjects. Of these, 16 621 attended the screening and 14 667 answered a questionnaire on health and lifestyle; 14 102 answered the questions about abdominal symptoms. Details of the methods are given elsewhere.[7]

The questions on abdominal symptoms were as follows: "Do you often suffer from cramping abdominal pain? Yes/No" and "Are you often bothered by bloating and abdominal rumbling? Yes/No." The association between age and the prevalence of abdominal symptoms was tested by simple linear regression and sex differences by the χ^2 test. A symptom index, in which 0 represents no symptoms and 1 one or more symptoms, was constructed. The associations of this index with other variables were explored for each sex separately using forward stepwise multiple regression analysis.[8]

Several independent variables were introduced into the analysis, answers to the questionnaire having been graded: consumption of coffee, milk, and slices of bread (1-4); type of bread most commonly used (white or brown); frequency of alcohol intoxication (1-5); consumption of fruit and vegetables (1-6); consumption of fish or minced meat as a main dish (1-5); use of analgesics (1-3); physical activity at work (1-4) and at leisure (1-4); mental depression (1-4); problems of coping (1-4); years of education (1-4); financial state of family during childhood (from tables) (1-4); insomnia (1-4); number of cigarettes smoked/day; marital state; full time housewife (yes/no); ethnic origin (Norwegian, Finnish, or Lappish); age; and body mass index (weight/height^2).

In the final regression analysis only variables making a significant contribution ($p<0{\cdot}05$) to the explained variance in either sex, and age, were included. Because of missing values for some subjects 6032 men and 5897 women were included in the final multiple regression analysis.

Results

Table I shows the prevalence of reported abdominal symptoms by age. The prevalence of cramping pain decreased slightly with increasing age in both men and women ($p<0{\cdot}001$). For bloating and rumbling no age trend was observed in men while in women the trend was negligible ($p=0{\cdot}041$). Both symptoms were reported by 8% of the men and 13% of the women. Women reported both symptoms significantly ($p<0{\cdot}001$) more commonly than men.

Table II shows the *t* values for the coefficients of the independent variables that made a significant contribution ($p<0{\cdot}05$) to the explained variance in one or both sexes. In addition, age was included in the equation together with the other variables but did not make a significant contribution. Sleeping difficulties, mental depression, problems with coping, and use of analgesics showed the strongest associations with the reported symptoms in both sexes, and together these four variables explained two thirds of the explained variance. Problems with coping correlated highly with mental depression ($r=0{\cdot}7$), but both variables contributed independently and significantly ($p<0{\cdot}05$) to the explained variance. Longer education, good financial state of the family during childhood, high physical activity at work, and, in women, being of Norwegian ethnic origin and a full time housewife were all associated with a lower prevalence of reported symptoms. Of the variables of lifestyle and diet only intoxication by alcohol yielded a significant association in both sexes. In men low physical activity during leisure time and high consumption of minced meat and in women cigarette smoking and drinking few glasses of milk were associated with a high prevalence of reported symptoms.

The relative effects of the psychological and social factors, lifestyle, and diet remained virtually unchanged regardless of whether the dependent variable was cramping abdominal pain or bloating and rumbling, or as presented, one or both symptoms.

Table III shows the unadjusted prevalences of reported symptoms in both

TABLE I—*Prevalence (%) of reported abdominal symptoms by age and sex in Tromsø, Norway, 1979-80*

	No of subjects		Abdominal symptoms: Bloating and rumbling		Abdominal symptoms: Cramping pain	
Age	Men	Women	Men	Women	Men	Women
20-24	820	1198	23	30	12	18
25-29	1257	1507	26	29	12	19
30-34	1458	1548	23	29	10	18
35-39	1203	1166	25	31	9	17
40-44	862	842	25	35	10	18
45-49	757	716	31	31	11	12
50-54	768		26		9	
Total	7125	6977	25	30	11	17

TABLE II—*t Values* for independent variables included in multiple regression analysis describing associations between psychological and social factors, lifestyle, and diet and the symptom index*

Variable	Men	Women
Age	1·46	0·20
Use of analgesics	6·38	7·00
Insomnia during previous two weeks	5·40	5·82
Mental depression	4·13	4·58
Problems with coping	2·03	2·60
Years of education	−4·65	−5·58
Financial state of family in childhood	2·85	4·80
Full time housewife		−3·51
Physical activity:		
At work	−2·23	−2·82
At leisure	−3·45	−0·06
Norwegian ethnic origin	−1·64	−1·97
Intoxication by alcohol	2·49	3·20
No of cigarettes/day	1·68	5·10
Consumption of:		
Minced meat	3·01	0·93
Glasses of milk	0·40	−3·58

*t Values >1·96 correspond to $p<0{\cdot}05$.

TABLE III—*Prevalence of either or both reported abdominal symptoms according to some selected psychological, lifestyle, social, and dietary variables*

	No in sample*		% With one symptom		% With two symptoms	
	Men	Women	Men	Women	Men	Women
Use of analgesics:						
Seldom	5452	4294	25	30	7	11
1-3 times/month	1081	2052	36	39	10	15
1-3 times/week	256	483	43	55	17	28
Insomnia during previous two weeks:						
Not at all	4598	4178	23	27	6	9
Not more than usual	1830	1958	35	43	12	18
More than usual	279	425	42	51	14	26
Much more than usual	73	111	49	54	16	28
Depressed during previous two weeks:						
Not at all	3730	3057	21	26	5	8
Not more than usual	2566	2947	33	40	10	16
More than usual	465	627	43	49	17	22
Much more than usual	129	164	47	56	19	28
Years of education:						
≤7	1086	848	28	38	9	16
8-10	1927	2360	29	37	9	14
11-12	1113	1095	28	34	9	13
≥13	1988	1627	24	29	6	10
Financial state of family in childhood						
Very good	292	417	25	34	7	13
Good	4151	4151	26	31	7	12
Difficult	2318	1766	30	41	9	16
Very difficult	282	222	44	52	14	21
Intoxicated by alcohol						
Never	1270	2973	25	31	7	11
Few times/year	3497	2864	27	37	8	15
1-2 times/month	1639	501	30	43	10	17
1-2 times/week	408	76	37	53	9	22
Cigarettes/day						
0	3779	3760	25	30	7	10
1-10	1301	2028	28	37	8	15
11-20	1727	1111	29	43	9	20
21-30	255	71	39	61	14	27
·31	63	8	40	75	18	25
Consumption of minced meat:						
≤Twice a month	1210	1312	21	30	6	11
Once a week	2538	2864	27	35	8	13
Twice a week	2373	2111	27	36	8	13
>Twice a week	986	668	35	38	12	15

* Fluctuations reflect missing answers.

sexes classed by some psychological, social, lifestyle, and dietary variables selected from the multivariate analysis. In accordance with the results of the multivariate analyses sleeping difficulties, mental depression, and use of analgesics were most strongly associated with the abdominal symptoms. Twice as many women as men used analgesics, and weekly use increased the prevalence of symptoms considerably compared with monthly use. The prevalence of one reported symptom in subjects suffering from depression "much more than usual" was more than double that in those not suffering from depression at all. A similar association was observed for sleeping difficulties. Besides the observed differences between the sexes table III shows a stronger association when both symptoms were reported. In men education beyond secondary level was associated with a decrease in the prevalence of reported symptoms, but in women the decrease in prevalence was more linearly related to longer education. A very difficult financial state in childhood was associated with a high prevalence of reported symptoms.

The association between abdominal symptoms and intoxication by alcohol was stronger in women than in men, especially when both symptoms were reported. The effect of smoking was hardly seen in men who smoked fewer than 20 cigarettes/day, but in women the decreased prevalence of symptoms was more linearly related to fewer cigarettes. In men consumption of minced meat more than twice a week was related to a higher prevalence of symptoms; the association was weaker in women.

Of the subjects who reported symptoms, 24% of the men and 20% of the women had had an *x* ray examination of the bowel. The corresponding figures for subjects who did not report symptoms were 8% and 6%.

Discussion

This study supports the clinical impression that abdominal symptoms are a common group of disorders that represent a considerable problem for both the public and the health care system.

Whether subjects who report symptoms in a questionnaire (reporters) and those who complain about abdominal discomfort during a consultation (complainers) represent different degrees of disease or just different behaviour in illness is a matter for debate. We assume that at least a quarter of the reporters should be considered to be complainers because they stated that they had had an *x* ray examination of the bowel. When we reanalysed the data taking as the dependent variable whether the subject had symptoms and had undergone radiography of the bowel we found the same associations as described above. We therefore believe that the differences between reporters and complainers do not affect our findings.

This survey included information on two of the three main symptoms of the irritable bowel syndrome. No information was available on disturbances of defecation, or the frequency of the symptoms, but the study deserves attention because of its size and the fact that we could explore the association with several background variables simultaneously. To our knowledge no other study has been able to compare the relative importance of psychological and social factors, lifestyle, and diet.

In three different questionnaire surveys among apparently healthy men and women the prevalence of reported symptoms of bowel dysfunction ranged from 19% to 30%, abdominal pain from 7% to 24%, and symptoms consistent with the irritable bowel syndrome from 8% to 17%.[1-3] These figures are comparable with the prevalence of one or both abdominal symptoms in our study, despite our lack of information on bowel habits. The fact that only a weak association with age was found corresponds with findings in Norway, where the prevalence of consultations with general practitioners because of bowel disorders was almost constant after the age of 20 in both sexes.[9] This was also confirmed by Whitehead *et al*, who did not find any association between age and the irritable bowel syndrome.[3]

A major finding in our study was the strong and consistent association between abdominal symptoms and psychological and social conditions. In both sexes the psychological factors accounted for two thirds of the observed variance, social conditions and lifestyle roughly 30%, and diet only 3-4%. The association between abdominal symptoms and the use of analgesics may be due to analgesics having a harmful influence on bowel function or being taken to relieve symptoms. Alternatively, the presence of symptoms and the taking of drugs could be a sign of emotional stress. The correlation with psychological variables and the similar associations seen with both rumbling and bloating and abdominal pain make the last explanation most likely.

The association between psychological and emotional conditions and the irritable bowel syndrome has been observed by several authors.[10-14] Whitehead *et al* observed that patients with the irritable bowel syndrome reported multiple somatic complaints and even consulted a doctor for minor illnesses more often than patients with a peptic ulcer.[3] Whether the association depends on the effect of an irritable mind on the bowel or vice versa is still speculative, but the correlation even with social factors such as the financial state of the family during childhood and duration of education may indicate that sufferers are less capable of coping with problems, and that these difficulties at least enhance the symptoms. Syme and Beckman suggested that the association between psychological factors and diseases may be influenced by differences in the way people cope with their problems.[15]

The associations between bowel disorders, intoxication by alcohol, and cigarette smoking, which were especially strong in women, are hardly mentioned in reports. Cigarette smoking and alcoholic beverages may affect bowel motility in some way, or their consumption may reflect psychological or social problems. Physical activity may have a positive effect on the bowel motor activity,[11] but caution should be shown in interpreting the weaker associations between some of the social, lifestyle, and dietary factors and bowel disorders.

The associations with diet were weak and inconsistent. The relations seen were in accordance with previous reports, with some exceptions—for example, the association with consumption of milk in women.[10 11 16] In several clinical trials Jones *et al* found that wheat, corn, dairy products, coffee, tea, and citrus fruits provoked symptoms in patients with the irritable bowel syndrome.[16]

Exploring patients' psychological and social problems is often seen as an insurmountable task. Our findings, however, indicate that greater attention should be paid to the lifestyles of patients with functional bowel disorders. Patients themselves seem to consider lifestyle important in both the recurrence and course of bowel disorders.[17] From this cross sectional study we cannot conclude that a change in lifestyle will change people's susceptibility to bowel symptoms. That must be left to clinical trials. In our opinion, however, our study supports those who claim that, in the absence of effective treatment of functional bowel disorders, we ought to direct our attention not only to the bowel but also to the "irritable mind."[10 11]

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