Eur Arch Psychiatry Clin Neurosci (1996) 246:261–272

ORIGINAL PAPER

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The Zurich Study: XXII

Epidemiology of gastrointestinal complaints and comorbidity with anxiety and depression

Received: 21 January 1994 / Accepted: 18 April 1996

Abstract A representative cohort of Swiss adults recruited at age 20 years and interviewed at ages 23, 28 and 30 years was studied regarding the symptomatology, prevalence and longitudinal course of functional gastrointestinal symptoms and their association with psychiatric syndromes. A functional gastrointestinal complaint was identified if a proband reported symptoms at least eight times in the past year or for a duration of at least 2 weeks without medical explanation and with a moderate degree of distress. Of the population, 9.4–17.7% was found to suffer from functional stomach complaints and 4.9–16% from functional intestinal complaints. Women reported functional gastrointestinal complaints two to three times more often than men, and increasingly so with age. The overlap of stomach and intestinal complaints was modest with 2.0–6.7%. Cross sectionally, functional stomach complaints were significantly associated with major depression (DSM-III-R), recurrent brief depression (RBD), subthreshold RBD and dysthymia, and with subthreshold panic disorder, agoraphobia, social phobia and recurrent brief anxiety. Functional intestinal complaints showed a consistently significant association with RBD, dysthymia, major depression, subthreshold RBD, panic disorder, subthreshold panic disorder, agoraphobia, simple and social phobia and generalized anxiety disorder. Individuals who at younger ages suffered from functional gastrointestinal complaints did not show an increased risk for a subsequent development of an anxiety or depressive disorder. Functional gastrointestinal complaints reflect an unspecific concomitant vegetative disturbance common to depression and anxiety; they do not reflect a risk factor for the development of a specific anxiety or depressive disorder.

Key words Epidemiology · Prevalence · Functional gastrointestinal complaints · Depressive disorders · Anxiety disorders

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Introduction

Gastrointestinal (GI) symptoms considered to be of functional origin, such as stomach burning, nausea, bloating, constipation, diarrhoea or abdominal cramps, are experienced quite frequently, albeit intermittently, by a normal population. The hallmark of a functional symptom is the absence of structural or biochemical abnormalities, which could explain it adequately (Talley 1994). The pathogenesis of functional gastrointestinal symptoms still remains to be clarified. Visceral hypersensitivity, disturbances in gut motility and psychological factors have been implied (Zighelboim and Talley 1993). Although most functional symptoms are short lived and minimally distressing, more distressing and longer lasting gastrointestinal symptom complexes have been reported in clinical and population based samples. Yet, even these longer lasting gastrointestinal symptoms appear to come and go (Talley et al. 1992). The first description of a functional abdominal syndrome dates back to Da Costa (1871), when he reported on seven patients with a syndrome reminiscent of the irritable bowel syndrome. Recently, the concept of irritable bowel syndrome has been defined more clearly by establishing criteria (Manning and Rome criteria) for its diagnosis (Manning et al. 1978; Tohmpson 1983; Talley et al. 1990; Thompson et al. 1989).

Of patients reporting to a gastroenterologist 13–52% suffer from a functional abdominal syndrome (Hill and Blendis 1967; Fahrländer 1972; Almy 1973; Ferguson et al. 1977; Fielding 1977; Whitehead and Bosmjian 1982). In early (Bockus et al. 1929; Almy 1951) as well as in recent publications on functional GI syndromes (Chaudhary and Truelove 1961; Craig and Brown 1984; Kellow et al. 1992) it has been noted that psychosocial distress appeared to bring forth functional abdominal symptoms. For instance, Talley et al. (1995) reported that a history of self-reported sexual, physical, emotional or verbal abuse is more frequent in outpatients with irritable bowel syndrome than patients with organic gastroenterological disease.

It has also been contended that certain psychological characteristics increase an individual's likelihood to suffer from functional abdominal symptoms. Clinical observations suggest that patients with functional abdominal syndromes typically exhibit anxious and depressive symptoms, sleep disturbance, nervousness, concentration difficulties and fatigue (Uexküll and Köhle 1990). On psychological tests patients with functional distress primarily in the upper abdominal region were found to demonstrate high scores in neuroticism, depression and situational anxiety (Seward et al. 1965; Sklar 1970; Schüffel et al. 1971; Berman and Kirsner 1972; Palmer et al. 1974; Heerlein et al. 1984). Although there is considerable evidence to suggest that psychological factors are associated with functional abdominal syndromes, there is still controversy surrounding the nature and relative importance of this association (Ford et al. 1987; Drossmann et al. 1988; Thompson et al. 1989; Fossey and Lydiard 1990; Kumar et al. 1990; Laemmle 1991; Fowlie et al. 1992a, b; Folks and Kinney 1992).

Clinical samples of patients with functional abdominal syndromes were also found to suffer frequently from psychiatric disorders, especially anxiety and affective disorders (Young et al. 1976; McDonald and Bouchier 1980; Ford et al. 1987). Recent data from the ECA study, a large representative epidemiological study on psychiatric syndromes in the general population of the United States, has revealed a high prevalence of GI symptoms of between 6 and 25%, associated with an increased risk of lifetime episodes of depression, agoraphobia or panic disorder (Walker et al. 1992). With increasing numbers of GI symptoms there was an increase in the lifetime risk of any one of these psychiatric disorders.

Most studies concentrating on the relationship between functional abdominal symptoms and psychological factors or psychiatric disease are based on clinical and often tertiary care samples. Apart from the ECA data, there is little information on the distribution of functional GI complaints and their association with psychiatric syndromes in the general population.

The purpose of the present study was to describe the occurrence, symptomatology, prevalence and longitudinal course of functional GI symptoms in a representative cohort of young Swiss adults followed between the ages of 20–30 years. What percentage of a young adult population suffers from a functional abdominal syndrome? What is the symptom profile of GI functional complaints? Are these symptom profiles stable over time? Is the presentation of a functional GI syndrome an enduring trait or more of a fluctuating state? Do upper abdominal or stomach complaints follow a different pattern from lower abdominal complaints, or could they be treated as a uniform condition? Furthermore, our study investigates the relationship of functional GI complaints to depressive and anxiety syndromes. To what extent are they cross-sectionally and longitudinally associated with different anxiety and depressive disorders? Are functional GI complaints a potential risk factor for the development of later anxiety or depressive disorders?

The impact of personality and psychosocial factors on the prevalence of functional stomach and intestinal complaints has already been examined (Wicki 1991; Wicki and Angst 1992).

Subjects and methods

In 1978 a representative sample of 4567 young adults aged 19–20 years (males were 1 year younger than females) from the Canton of Zurich, Switzerland, was screened with the SCL-90-R (Derogatis 1977). A total of 591 subjects were chosen randomly for the longitudinal cohort study, two thirds from the high scorers and one third from the low scorers on the SCL-90-R (Angst et al. 1984a, b). In 1979, at ages 20–21 years, the cohort was interviewed for the first time in a semistructured psychiatric interview called SPIKE, which was developed by Angst et al. (1984b). The subjects were reinterviewed in 1981 ($n = 456$) at age 22–23 years, in 1986 ($n = 457$) at age 27–28 years and in 1988 ($n = 415$) at age 29–30 years. The overall dropout rate between 1979 and 1988 was 28%.

The instrument SPIKE was developed specifically for epidemiological investigations in a general population. It elicits information on psychological and psychosomatic symptoms, their duration and frequency, aetiological attribution by the subject, degree of subjective suffering and distress, work and leisure time impairment (on a visual analogue scale 1–100), consumption habits and help-seeking behaviour. It is structured into 24 syndromal sections on psychological or psychosomatic symptoms. In all four interviews, information on somatic symptoms within the following seven body regions was obtained: stomach, intestines, heart, respiration, circulation, back and head. Within each somatic syndrome an open question was posed to each subject to ascertain whether he/she had experienced any symptoms in the above-mentioned body area within the past 12 months, and followed by questions on the characteristics, duration, frequency and subjective distress caused by any complaint mentioned. Furthermore, information was obtained whether a medical diagnosis had been given to the symptoms, whether the proband had felt impaired at work or in his leisure activities by these symptoms, whether he had sought professional or other help and whether he attributed the symptoms to a psychological or physical problem. Information on age of onset of the symptom clusters within the seven body areas and on family history was obtained.

At each interview analogous information was obtained for psychological symptoms. On the basis of this information it was possible to make psychiatric diagnoses within the DSM-III and DSM-III-R diagnostic system, as well as to observe the occurrence and longterm course of subthreshold psychiatric disturbances. Furthermore, subjects were asked about major life changes with an interview modified after Tennant and Andrews (1976, 1977). All subjects were questioned about problems in their childhood up to age 16 years. After each interview, subjects again filled out the SCL-90-R. The interviews were all carried out by trained clinical psychologists or in a minority by trained psychiatric residents, generally at the home of the subject.

The instrument SPIKE was used for each interview wave of the Zurich Study (Angst and Dobler-Mikola 1985; Angst et al. 1984 a–c; Binder et al. 1981). In later interviews the instrument was revised to allow for DSM-III diagnoses, and DSM-III-R diagnoses. Each syndromal diagnosis, e.g. depression, was tested for its internal validity by establishing the amount of subjective suffering caused by the syndrome, the amount of associated treatment seeking and work- or leisure-time impairment (Angst and Dobler-Mikola 1984c).

The questionnnaire SPIKE was also validated against the charts of 30 psychiatric patients from an outpatient clinic (Illes 1982), taking the clinical diagnoses noted in the charts as the gold standard. Chart entries had been made by the treating physician without knowledge of the SPIKE data. Diagnoses were made according to ICD-9, or were noted as a syndrome, especially for psychosomatic symptoms. Although there were few cases, 80% of

stomach complaints noted in the charts were identified correctly by the SPIKE and 67% of chart-identified intestinal syndromes were also elicited by the SPIKE.

The validity of the depression rating in the SPIKE was examined by Meier (1985). He found excellent agreement between SPIKE diagnosis of major depression and medical records among subjects who had been treated for depression.

An interrater-reliability study of the SPIKE (version 1993) established a kappa value of 0.518 (SD 0.203) for the introductory question on anxiety disorders or depression, and a kappa of 0.895 (SD 0.193) for the diagnosis of either generalized anxiety disorder or major depression (current or lifetime; unpublished data).

Statistical analyses

All statistical analyses were performed using the SAS Version 6 statistical package. For comparison of categorical data statistical analyses were based on chi-square statistics. Two by two tables were compared with the chi-square test; in the case of analysis for association between ordinal categories (risk groups with diagnostic categories) the odds ratio (OR) was cumputed using the Mantel Haensel Statistic, and 95% confidence intervals (CI) were computed. Associations between individual functional syndromes were evaluated by computing Spearman rank correlations, the variables being on an ordinal scale (see below). Associations between individual symptoms were evaluated using phi coefficients; in most cases they were identical with Spearman rank correlation coefficients. The population estimates reported in the results section correspond to the sample frequencies weighted back to the screeing population in order to compensate for the initial oversampling of high scores on the SCL-90-R.

Case definition of a functional stomach or intestinal syndrome

Caseness was reached if a subject reported suffering from symptoms in either the stomach or intestinal area at least 8–11 times or for at least 2 weeks in the past year, with a subjective suffering visual analogue scale rating of at least 30, and if the subject could indicate no medical reason for the symptoms. A differentiation was made into recurrent brief complaints (with a maximal duration of less than 2 weeks but frequent occurrence) and long-lasting complaints (with a duration of 2 weeks or longer). This case definition was validated with rate of help-seeking and impairment in work and leisure activity.

Psychiatric diagnoses

In 1986 and 1988 psychiatric diagnoses were made according to DSM-III-R criteria. For the interview in 1979 and in 1981 DSM-III diagnoses were made and for some syndromes DSM-III-R cirteria were approximated. Within the spectrum of depressive syndromes, two new diagnoses were also applied: Criteria for a diagnosis of recurrent brief depression (RBD) are exactly analogous to the criteria for major depression, except that the symptom cluster occurs for less than 2 weeks and at least 12 times a year. This syndrome was found to occur in the cohort investigated with a 1-year prevalence of 3.7–7.8% (Angst 1992; Angst and Hochstrasser 1994).

Subthreshold RBD denotes a syndrome analogus to RBD, but without work impairment. Also, within the spectrum of anxiety disorders, three additional diagnostic categories were defined: Subthreshold panic denotes an infrequent panic syndrome with two or more attacks per year, whereas recurrent brief anxiety denotes a generalized anxiety syndrome occurring at irregular intervals with a duration of less than 1 week. On a syndromal level recurrent brief anxiety is identified if the symptom cluster occurs at least 12 times per year. On a subthreshold level the syndrome is required to be present four or more times per year (Angst and Wicki 1992). Because the sample frequencies were low, we collapsed threshold and subthreshold recurrent brief anxiety to one diagnostic category.

Results

Prevalence rates

Table 1 shows the 1-year prevalence rates of functional stomach and intestinal complaints, grouped according to duration and subjective distress (as indicated on the visual analogue scale) at the four interviews. Functional stomach complaints were found in 9.4% of a normal population of 20– to 21 year olds. Most functional complaints appear to be of short duration. Little difference was noted in the frequency of recurrent functional stomach complaints by differing levels of subjective distress. Functional stomach complaints lasting 2 weeks or longer are rare in young Swiss adults, with a combined prevalence rate of complaints of moderate and severe distress of 2.3%. With increasing age an increasing prevalence of functional stomach complaints is noted, particularly for the brief, recurrent type. At age 29–30 years a prevalence rate of 17.7% for functional stomach complaints was observed. There also appeared to be a slight trend towards an increase in long-lasting, significantly distressing stomach complaints with age. Functional intestinal complaints show a preva-

Table 1 One-year prevalence rates of functional stomach and intestinal complaints at ages 20–21, 22–23, 27–28 and 29–30 years

	20–21 years		22–23 years		27–28 years		29–30 years	
	Functional stomach complaints (%)	Functional intestinal complaints (%)	Functional stomach complaints (%)	Functional intestinal complaints (%)	Functional stomach complaints (%)	Functional intestinal complaints (%)	Functional stomach complaints (%)	Functional intestinal complaints (%)
Total	9.4	4.9	14.1	7.2	16.4	11.3	17.7	16.0
Recurrent brief, moderate distress[b]	4.2	2.5	5.5	2.5	6.8	4.1	6.2	7.2
Recurrent brief, severe distress[c]	3.0	0.9	5.7	3.7	4.1	2.6	7.0	4.3
Long duration, moderate distress[b]	1.2	0.9	1.5	0.2	1.3	0.8	1.7	0.5
Long duration, severe distress[c]	1.1	0.6	1.5	0.8	4.2	3.7	2.8	4.1

[a] Weighted back to the normal population
[b] Moderate distress: visual analouge scale 30–59
[c] Severe distress: visual analouge scale ≤ 60

Table 2 One-year prevalence of functional stomach and intestinal complaints in men and women aged 20–30 years (unweighted)

		Men		Women		χ^2	p
		n	%	n	%		
20–21 years (n = 591)	Stomach complaints	33	11.3	58	19.4	7.4	0.006
	Intestinal complaints	11	3.8	34	11.4	12.2	0.000
22–23 years (n = 458)	Stomach complaints	15	5.1	46	15.4	16.8	0.000
	Intestinal complaints	7	2.4	31	10.4	15.6	0.000
26–27 years (n = 457)	Stomach complaints	22	7.5	46	15.4	8.9	0.003
	Intestinal complaints	15	5.1	33	11.0	6.9	0.009
29–30 years (n = 414)	Stomach complaints	17	5.8	50	16.7	17.5	0.000
	Intestinal complaints	11	3.8	47	15.7	23.8	0.000

Table 3 One-year prevalence rates[a] of combined functional gastrointestinal (GI) complaints in 20–30-year-old adults

	20–21 years (1979)		22–23 years (1981)		27–28 years (1986)		29–30 years (1988)	
	Males (%)	Females (%)	Males (%)	Females (%)	Males (%)	Females (%)	Males (%)	Females (%)
One functional GI syndrome (either stomach or intestinal)	8.6	12.2	3.1	16.0	14.0	18.6	19.1	20.8
Two functional GI syndromes (stomach and intestinal)	0.2	3.6	4.1	5.0	5.9	5.0	2.9	8.3

[a] Weighted back to the normal population

lence rate of 7.6% in the 20– to 21 year olds, with a slight increase with age, resulting in a prevalence rate of 14.0% in the 29- to 30-year olds. The brief, recurrent intestinal symptoms occur considerably more frequently than long-lasting ones, with prevalences ranging from 3.9 to 5.8% with moderate distress, and prevalences ranging from 2.2 to 3.6% with severe distress. Long-lasting intestinal complaints show combined prevalences ranging from 1.4 to 4.6%. The increase in prevalence rates with age is due primarily to an increase in recurrent intestinal symptoms; a trend towards an increase in long-lasting, severely distressing symptoms with longer duration is also notable.

Gender

Table 2 shows the 1-year sample frequencies of functional stomach and intestinal complaints (long- and short-lasting combined) in men and women between the ages of 20–21 and 29-30 years. Women show significantly higher rates of functional stomach complaints varying between 15.4 and 19.4% than men, whose rates range from 5.1 to 11.3%. Men showed a decreasing frequency of stomach symptoms with increasing age, whereas women demonstrated a fairly stable rate. For intestinal complaints women show again significantly higher rates of 10.4–15.7% than men, who demonstrate rates ranging from 2.4 to 5.1%. Men have fairly stable rates throughout the 10 years observed, whereas women showed a trend to increasing rates with increasing age.

Prevalences of combined GI symptoms

Table 3 shows the 1-year prevalence rates of combined GI functional syndromes, weighted back to the general population. At age 20–21 years 10.4% suffered from either stomach or intestinal distress symptoms, whereas 2.0% indicated problems in both areas. Prevalence rates were found to increase with age; at age 29–30 years 20.3% reported either stomach or intestinal troubles, whereas 6.7% suffered from both conditions. A comparison of the genders (not shown) highlighted a significant preponderance of women suffering from either stomach or intestinal conditions, and from both conditions, except at ages 27–28 years.

Longitudinally, no subgroup of individuals with a recurrent or consistent course of functional GI complaints was identified, thus supporting the hypothesis that these symptoms are functional, with an intermittent pattern of occurrence.

Symptom profiles of GI functional syndromes

Table 4 demonstrates the individual symptom profiles of probands suffering from a functional stomach syndrome. When younger (interview age 20 and 23 years) most probands endorsed several individual items concomitantly, thus reflecting a syndrome similar to the clinical description of the functional upper abdominal syndrome (Schüffel et al. 1971). No significant gender differences in the overall symptom profile were noted. Of the women,

Table 4 Symptom profile in probands with a functional stomach syndrome at age 20–21 and 29–30 years

	Age 20–21 years				Age 29–30 years			
	Male		Female		Male		Female	
	n	%	*n*	%	*n*	%	*n*	%
Stomach burning	19	57.6	41	70.7	9	52.9	24	48.0
Stomach pressure	22	66.7	37	63.8	1	41.2	23	46.0
Stomach pain	10	30.3	21	36.2	8	47.1	29	58.0
Nausea	22	66.7	28	48.3	7	41.2	32	64.0*
Vomiting	28	84.8	47	81.0	4	23.5	12	24.0
Belching	24	72.7	47	81.0	6	35.6	19	38.0
Feeling of fullness	27	81.8	42	72.4				
Keeping a diet	25	75.8	46	79.3				

*$p = 0.05$

Table 5 Symptom profile in probands with a functional intestinal syndrome at ages 20–21 and 29–30 years

	Age 20–21 years				Age 29–30 years			
	Male		Female		Male		Female	
	n	%	*n*	%	*n*	%	*n*	%
Abdominal pain	7	63.6	20	58.8	5	45.5	23	48.9
Obstipation	6	54.6*	10	29.4	5	45.5	30	63.8
Diarrhoea	4	36.4	22	64.7*	6	54.6	21	44.7
Feelings of pressure/fullness	7	63.6	17	50.0	6	54.6	32	68.1
Bloating	7	63.6	17	50.0	7	63.6	30	63.8
Abdominal cramps	8	72.7	18	52.9				
Keeping a diet	11	100.0	28	82.8				

*$p = 0.05$

79.3%, and 75.8% of the men, with stomach trouble, kept to a diet. At later interviews (1986 and 1988) less individual items were elicited; more general questions on feelings of fullness were posed in the intestinal section, and the question of diet was dropped as a complaint item.

At both ages 26–27 years and 29–30 years, the symptom profiles were less uniform. Although the symptom of nausea was significantly more frequently reported by women than by men, the overall symptom profile showed no significant gender difference. Belching and vomiting, complaints reported with high frequency at ages 20–23 years, appeared much less common with increasing age. They gave way to more distinct stomach-related complaints of a more burning, pressuring and painful nature.

Table 5 demonstrates the symptom profiles in probands with a functional intestinal syndrome. At ages 20–21 years women reported diarrhoea significantly more often than men; men, on the other hand, reported obstipation significantly more often. The overall symptom profile, nevertheless, highlighted no significant gender differences. Most probands with intestinal complaints kept to a diet. A similar symptom pattern was found for the 22- to 23 year olds. With increasing age fewer concomitant individual complaints were voiced. Men still suffered from constipation more often than women, who reported diarrhoea more often; yet, these differences were no longer significant. There was no significant gender differences in the overall symptom profile.

Although, with the slight changes in the items elicited at the interviews in 1979 and 1981 as compared with 1986 and 1988, a direct comparison of symptom profiles is limited, our data confirm that with increasing age, probands with functional GI symptoms tended to report more individual complaints, whereas at ages 20–23 years they reported more of a cluster of complaints. This trend may indeed be an expression of change in the experience of functional complaints, reflect a fluctuating nature of functional GI complaints or reflect a better ability of the probands to both observe and report their individual physical complaints.

The most consistent association between individual complaints within the functional stomach syndrome was found between nausea and vomiting, with phi coefficients ranging from 0.31 to 0.52. Stomach pain and stomach burning showed slight negative associations, keeping a diet associated with nausea, vomiting and belching.

Within the functional intestinal syndrome constipation and diarrhoea were consistently negatively associated with phi coefficients ranging from –0.25 to –0.46. Bloating as well as feelings of pressure and of fullness showed

faily consistent positive associations, ranging between phi = 0.26 and phi = 0.47, and appeared to designate the same physiological phenomenon. Similarly, abdominal cramps and pains were positively associated, notably in 1981 with a phi coefficient of 0.59; thus, at later interviews, they were elicited together. Abdominal pain also showed a slight positive association with feelings of pressure (phi = 0.30), fullness (phi = 0.22) or bloating (phi = 0.20). In 1986 bloating was highly associated with constipation (phi = 0.52). The cross-sectional correlation between stomach and intestinal complaints for men was quite small in 1979, yet quite high in 1981 with a Spearman rank correlation coefficient of 0.66, and appeared to stabilize at correlation of $r = 0.35$ in 1988. The correlations for women were generally smaller, but more consistent over the four interviews with Spearman rank correlation coefficients ranging between 0.20 and 0.30. The correlation between functional stomach complaints and functional intestinal complaints at each interview wave measured approximately $r = 0.32$ for the whole sample.

Consequences of functional GI complaints

Table 6 presents the treatment rates for probands suffering from functional GI complaints at ages 29–30 years. Similar rates were found at previous interviews. Of males, 17.7% and 32% of females, sought professional help for stomach problems. The treatment rates for probands with intestinal problems showed no significant gender differences: 27.3% for males and 21.3% for females at ages 29–30 years. In 1981, at ages 22–23 years, approximately half of the probands with GI problems took some form of medication; prescription drugs and traditional home remidies were used with comparable frequency. In 1986, when the cohort was 26–27 years old, a detailed treatment history was elicited. Two thirds of probands seeking professinal help for either stomach or intestinal distress symptoms consulted a general practitioner; less than one third consulted a gastroenterologist. For intestinal complaints probands reported to have been prescribed either "laxatives" or "stool softeners", whereas the medication prescribed to counteract stomach distress symptoms was almost exclusively "antacids". Of those suffering from GI distress symptoms, 50% exercised some form of self-treatment.

Both men and women considered primarily psychological factors, such as worries or stress, as being responsible for their GI symptoms. Women, however, felt more frequently than men that somatic factors might also have a major contribution. Women experienced subjective work impairment, due primarily to stomach complaints, more frequently than men, whereas men indicated leisure-time impairment due to GI distress symptoms more frequently than women. Work impairment was also studied in more detail in 1986. Probands viewed themselves primarily to work slower than usual; only a few cases reported having been absent from work due to GI complaints.

Potential risk factors for functional GI complaints

Having a first-degree relative who suffered from GI complaints was associated with a higher rate of functional intestinal problems in 1986 (age 29–30 years); no similar association was found in 1979 (age 21–22 years). Functional stomach complaints were not more frequent in probands with a positive family history for stomach trouble. The relative contribution of personality characteristics and life events to the occurrence of functional GI complaints have been discussed in a previous publication on these data (Wicki and Angst 1992). They found that probands with stomach complaints had significantly higher scores of nervousness, irritability, depressivity, aggressivity, openness, dominance and neuroticism on the FPI personality test (Fahrenberg and Selg 1970). Probands with intestinal symptoms were found to score higher only in nervousness, depressivity and irritability. When examining the item "nervousness" in more detail, probands with stomach problems clearly endorsed items suggesting vegetative irritability more frequently (heart pounding, respiratory difficulty, etc.) than controls. Probands with intestinal symptoms endorsed primarily the items easy fatigue, exhaustion, low appetite and obstipation. Life events were associated clearly with the occurrence of stomach symptoms; an association of life events with intestinal symptoms was only found in some interviews.

Correlation of GI symptoms with the SCL-90-R

We analyzed the correlation (Spearman rank) of GI complaints with SCL-90-R data of the same interview year (cross sectional) and of earlier and later years. An analysis of the structural characteristics of the SCL-90-R

Table 6 Consequences reported by probands with functional GI complaints (ages 29–30, 1988)

	Treatment rate		Work impairment		Leisure-time impairment	
	Males ($n = 28$) %	Females ($n = 39$) %	Males ($n = 28$) %	Females ($n = 39$) %	Males ($n = 28$) %	Females ($n = 39$) %
Stomach complaints	17.7	32.0*	29.4	46.0	23.5	10.0*
Intestinal complaints	27.3	21.3	27.3	38.3	63.6	55.3

*$p < 0.05$

(Scheidegger 1992) yielded a three-factor solution: a factor representing emotional lability, a factor representing vegetative lability and a hostility factor. Cross sectionally, both stomach and intestinal complaints correlated consistently with vegetative lability ($0.16 \geq r \geq 0.39$, $P = 0.0001$) at all interviews. Smaller and less-consistent cross-sectional correlations were found for emotional lability ($0.10 \geq r \geq 0.20$, $P = 0.04$) and the hostility factor ($0.09 \geq r \geq 0.21$, $P = 0.05$). The correlations of both stomach and intestinal complaints with SCL-90-R data of earlier and later interviews again were most consistently significant, albeit small for vegetative lability, whereas emotional lability and the hostility factor showed even smaller and only occasional positive correlations. It appeared that both stomach and intestinal complaints were an expression of a vegetative vulnerability, which may at times also be associated with emotional symptoms.

Association of functional GI complaints with psychiatric syndromes

We investigated the cross-sectional association of functional GI complaints with depressive and anxiety syndromes. Table 7 shows the associations of functional GI complaints with depressive syndroms. Functional stomach complaints were found to be significantly associated with major depression (DSM-III) at age 20–21 and 26–27 years, with RBD at ages 26–27 and 29–30 years, with subthreshold RBD at ages 20–21 and 29–30 years and with dysthymia at ages 26–27 29–30 years. No association was significant in all interviews and some of the confidence intervals were large.

Functional intestinal complaints were not significantly associated with major depression (DSM-III-R), except at age 20–21 years, when the diagnosis of major depression was approximated. Thus, this finding must be evaluated with caution. On the other hand, functional intestinal complaints were consistently significantly associated with RBD at all interviews, and with subthreshold RBD at all but one interview. There is also a consistent association between functional intestinal complaints and dysthymia for the two interviews when dysthymia was assessed; yet, the confidence intervals are large.

Functional GI complaints, particularly intestinal complaints, appear to point to a depressive syndrome, which may not always reach caseness for major depression according to DSM-III-R, but which is primarly of the brief, recurrent type or of a low-grade chronic course.

Table 8 shows the cross-sectional associations of functional GI complaints with anxiety syndromes. Functional stomach complaints were significantly associated with agoraphobia at age 22–23 years and with recurrent brief anxiety at age 26–27 years. At age 29–30 years functional stomach complaints showed a significant association with subthreshold panic (Zurich criteria), with agoraphobia, social phobia and with recurrent brief anxiety. The confidence intervals were generally large, pointing to a fairly unreliable point estimate of any observed association.

Functional intestinal complaints were more consistently associated with anxiety syndromes than functional stomach complaints. A significant association between functional intestinal complaints and panic disorder was observed at ages 22–23, 26–27 and 29–30 years. Functional intestinal complaints were also significantly associated with subthreshold panic at ages 20–21, 22–23 and 29–30 years, with generalized anxiety disorder at ages 20–21 and 22–23, with recurrent brief anxiety at ages 22–23, 26–27 and 20–30 years and with agoraphobia at ages 20–21 and 29–30 years, with large confidence intervals. An association between functional intestinal complaints and simple phobia was observed at

Table 7 Association functional GI complaints with depressive syndromes

	Major depression	Recurrent brief depression[a] (DSM-III-R)	Subthreshold recurrent brief depression[a]	Dysthymia (DSM-III-R)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
20 y Stomach complaints ($n = 91$)	2.52 (1.29–4.92)	NS	3.38 (1.365–8.42)	
22 y Stomach complaints ($n = 61$)	NS	NS	NS	
26 y Stomach complaints ($n = 68$)	2.80 (1.44–5.44)	2.82 (1.54–5.17)	NS	2.80 (1.06–7.36)
29 y Stomach complaints ($n = 67$)	NS	2.78 (1.32–5.86)	2.49 (1.01–6.14)	4.36 (1.26–15.02)
20 y Intestinal complaints ($n = 45$)	3.06 (1.38–6.81)	4.52 (2.34–8.77)	4.75 (1.79–12.64)	
22 y Intestinal complaints ($n = 38$)	NS	2.64 (1.11–6.26)	NS	
26 y Intestinal complaints ($n = 48$)	NS	2.73 (1.38–5.39)	3.85 (1.38–10.67)	4.35 (1.70–11.17)
29 y Intestinal complaints ($n = 58$)	1.06 (1.0–1.17)	2.43 (1.10–5.40)	3.00 (1.22–7.36)	13.58 (4.46–41.29)

[a] Zurich criteria

Table 8 Association of functional GI complaints with anxiety syndromes

	Panic (DSM-III) OR (95% CI)	Infrequent panic[a] OR (95% CI)	Agoraphobia (DSM-III) OR (95% CI)	Simple phobia (DSM-III) OR (95% CI)	Social phobia (DSM-III) OR (95% CI)	Generalized anxiety (DSM-III) OR (95% CI)	Recurrent brief anxiety[a] OR (95% CI)
20 y Stomach complaints ($n = 91$)	NS	NS	NS	NS	NS	NS	NS
22 y Stomach complaints ($n = 61$)	NS	NS	3.12 (1.10–8.85)	NS	NS	NS	NS
26 y Stomach complaints ($n = 68$)	NS	NS	NS	NS	NS	NS	2.32 (1.10–5.14)
28 y Stomach complaints ($n = 67$)	NS	5.65 (2.58–12.38)	4.37 (1.26–15.02)	NS	3.71 (1.36–10.12)	NS	3.93 (2.26–6.84)
20 y Intestinal complaints ($n = 45$)	NS	3.89 (1.31–8.31)	6.70 (2.51–17.87)	NS	4.80 (1.40–16.61)	3.06 (1.31–7.12)	NS
22 y Intestinal complaints ($n = 38$)	7.08 (1.98–25.36)	3.40 (1.13–10.22)	NS	5.69 (2.66–12.13)	2.77 (0.90–8.48)	3.67 (1.22–11.10)	2.73 (1.01–7.40)
26 y Intestinal complaints ($n = 48$)	4.48 (1.22–16.50)	NS	NS	NS	NS	NS	3.70 (1.69–8.14)
29 y Intestinal complaints ($n = 58$)	3.69 (1.13–12.07)	3.00 (1.22–7.36)	5.20 (1.54–17.55)	NS	NS	NS	3.57 (2.0–6.30)

[a] Zurich criteria

age 22–23 years and with social phobia at age 20–21 years.

Overall, functional intestinal complaints showed more consistent associations with psychopathological syndromes than functional stomach complaints. It is noteworthy that the most stable associations over time are the ones between functional intestinal complaints and RBD, and between functional intestinal complaints and panic disorder, subthreshold panic and recurrent brief anxiety.

Certainly, none of the functional GI complaints analyzed (stomach or intestinal) may be considered specific indicators of any particular psychopathological syndrome. Syndromes within the anxiety spectrum and the depression spectrum both showed associations particularly with intestinal complaints. The syndromes most associated were notably of a subthreshold or recurrent nature. These findings seem to point out that functional GI complaints reflect a general syndrome of psychovegetative arousal with anxiety symptoms which may exist without reaching caseness according to DSM-III-R, or which is concomitant to a DSM-III-R depressive or anxiety disorder.

The presence of a functional GI syndrome was not associated significantly with alcoholism or drug abuse. The combined use of either drugs or alcohol on a daily basis, however, reached a significant association with functional stomach complaints at age 29–30 years (OR: 1.91; 95% CI: 1.19–3.60). There was a trend towards increased frequency of tobacco dependence in probands with a functional stomach complaint at age 29–30 years, but it did not reach significance. No such association for functional intestinal complaints could be found.

Discussion

The purpose of this study was to observe the frequency and longitudinal course of functional GI complaints distressing enough to warrant their conceptualization as a functional GI syndrome. Therefore, the case definition was not only based on an analysis of the distributional characteristics of reported complaints in terms of frequency and duration, but also on levels of subjective suffering and distress as indicated on a visual analogue scale. The exclusion of organic pathology, although not completely reliable in interview data of this kind, was accomplished by excluding individuals who reported somatic diagnoses for their GI symptoms. Although this may be quite arbitrary, our case definition was validated in part by a clear increase in treatment rates and reported work- and leisure-time impairment when reaching caseness.

Based on clinical notions of an upper and lower functional GI syndrome, questions regarding symptoms in the stomach and intestinal area were asked separately. At the time of the conceptualization of the SPIKE questionnaire, operationalized criteria for the identification of functional bowel disturbances, and specifically for irritable bowel syndrome, had not yet been established. Therefore, any comparison of our data with data obtained using operationalized criteria must be made with caution, taking into account the different modes of questioning and of case definition.

A 1-year prevalence rate of 9.4–17.7% was obtained for functional stomach complaints and 4.9–16% for functional intestinal complaints. Most functional GI complaints are short lived, whether of moderate or severe distress. The 1-year prevalence rates reported in the earlier publication of Wicki and Angst (1992) were slightly

lower, and may be explained by the fact that different frequency and duration criteria were utilized for case definition.

Agréus et al. (1994) identified 54.2% of a representative sample of a Swedish adult population suffering at least one abdominal symptom over the past 3 months. Of reponders, 14.9% reported one symptom, 7.9% reported two symptoms, 6.0% reported three symptoms and 2.9% reported 11 or more symptoms. We employed a more rigid case definition (see above) in our analyses, which meant that our prevalence rates were lower than those obtained when any one GI symptom is used to identify functional distress. The same argument explains in part the difference between our prevalence rates and the prevalence rate of 69% for at least one abdominal symptom found in the United States household survey by Drossmann et al. (1993). This study included questions about different and more individual GI symptoms than our investigation.

Thompson and Heaton (1980) identified 30.2% of a sample of healthy adults who qualified for a functional bowel disorder, the majority (20.6% of the examined population) suffering at least six times a year from abdominal pain. Of the sample, 13.6% reported symptoms compatible with irritable bowel syndrome. Although this study was not based on a representative sample of the general population, it enables an approximation of the magnitude of the problem in an otherwise healthy adult population. Case definition also included a criterion of frequency, less stringent than our case definition, requiring not only a higher frequency, but also at least a moderate amount of subjective suffering. Our data yielded slightly lower prevalence rates of functional GI syndromes.

Jones and Lydeard (1992) found a prevalence rate of 25% of self-reported abdominal pain at least six times in the preceding year and 22% of irritable bowel syndrome in a representative adult population of Great Britain.

Using operationalized criteria (Talley et al. 1990), Talley and collaborators (1992) studied the prevalence, onset and disappearance of functional GI disorders in a representative sample of Olmsted County Minnesota (USA), whom they interviewed 12–20 months subsequent to the first examination. At the second interview the age- and gender-adjusted prevalence rate for irritable bowel syndrome was 18.1%, for chronic constipation 14.7%, for chronic diarrhea 7.3% and for frequent dyspepsia 14.7%. The prevalence rates had remained fairly stable, yet significant turnover had occurred: 9% of originally healthy probands developed irritable bowel syndrome over 146 observed person-years, whereas 38% of initially symptomatic probands lost their irritable bowel syndrome. Similar turnover rates were obtained for the other syndromes. Again, owing to the different criteria for case definition and the different disorder categories used, our data cannot be compared directly with data of Talley et al. (1992) or Jones and Lydeard (1992). Nevertheless, it is notable that the estimated magnitude of functional GI problems in different populations and using different criteria is fairly similar and ranges between 15 and 30%.

The ECA data (Walker et al. 1992) report lifetime prevalences for unexplained GI symptoms ranging from 6.3% (vomiting) to 25% (abdominal pain). Information both on psychiatric syndromes and somatic symptoms were obtained by the Diagnostic Interview Schedule (DIS; Regier et al. 1984; Robins et al. 1981), a structured psychiatric interview. Although the DIS elicits the same, but fewer, GI symptoms as our study, a direct comparison is complicated by the fact that the observation period reported in the aforementioned study was the whole lifetime, whereas our study observed just 1 year. Of course, lifetime prevalences are higher than 1-year prevalences. Our criteria for a functional GI syndrome were based on frequency or duration and subjective distress ratings, and the absence of a medical diagnosis as reported by the proband. Walker et al. (1992) chose to group GI symptoms reported under code 4 (medically explained) with symptoms reported under code 5 (medically unexplained). This may inflate the prevalence rate and include other than purely functional disorders. Furthermore, the ECA data observed the age range of subjects over 18 years old, whereas we observed 20- to 30-year-old subjects.

Our data show a consistent preponderance of women suffering from both functional stomach and intestinal complaints. The same trend was observed in the ECA data (1992) by Agréus et al. (1994) and Jones and Lydeard (1992). This is at variance with the clinical impression voiced by Uexküll et al. (1990), who maintained that both genders are affected at equal rates and the difference may be due to the different characteristics of clinical and epidemiological samples. Yet, any gender difference observed in interview data may also be due to gender-specific reporting behaviour. Clinical diagnoses are generally made after considerable prompting by the examining physician, and therefore higher rates of positive diagnoses may be obtained than if just spontaneous complaints are considered. On the other hand, in our cohort women suffer twice to three times as frequently from functional stomach complaints, and three to four times as frequently from functional abdominal complaints, than men. The notion of a true gender difference is further supported by the varying longitudinal trends for men and women: With increasing age, women have stable rates of functional stomach complaints and increasing rates of functional intestinal complaints, whereas men show decreasing rates of functional stomach complaints and stable rates of functional intestinal complaints, further augmenting differences in prevalence rates between the genders.

The symptom profiles as a whole of both functional stomach and intestinal complaints, on the other hand, do not differ significantly between the genders. Three individual complaints, however, appear consistently with different frequencies in men and women: Women report nausea and diarrhoea significantly more often than men, whereas men report significantly more constipation. In the ECA data women demonstrated higher rates than men for all these individual complaints.

In our data the cross-sectional 1-year prevalence rates of functional stomach and particularly functional intesti-

nal complaints increased with increasing age. As has been noted above, this increase is due primarily to the increasing rates in women. According to Uexküll et al. (1990) a peak in frequency of functional GI syndromes can be found between ages 20–40 years. Our probands were 30 years old when last interviewed; further interview waves might clarify the extent to which the prevalence of functional GI complaints peaks in the fourth decade of life or whether the increasing trend observed thus far continues with advancing age. Our data are also at variance with Talley et al.'s (1992) finding that the prevalence rate remains fairly stable over 12–29 months in an adult population. Besides the fact that their study used different criteria for functional bowel disorder, they also observed a sample of adults of initially 30–64 years old on two occasions. Our sample was a cohort of 19- to 20-year olds observed over 10 years. In this life span the development of functional syndromes may be different than later in life. Their sample spanning different age strata may lead to an evening out of different trends in different age groups. On the other hand, similar to Talley et al.'s (1992) findings, we also found a high degree of turnover of symptomatic and non-symptomatic probands.

A trend towards changing characteristics of functional GI complaints over time has been observed. The symptom profiles appear fairly uniform at younger ages (20–23 years), because many individual complaints are described together, whereas there is more specific symptom reporting with increasing age. This trend may reflect a true age-related change in the experience of functional GI complaints, because individuation of specific functional GI complaints may increase with age. On the other hand, it may reflect an increasing ability of young adults with increasing age to observe physical symptoms, thus leading to more specific reporting, or it may reflect a fluctuating nature of functional GI complaints, thus giving rise to varying symptom patterns. However, one must consider that slight changes in the items elicited at subsequent interviews were made; thus, some of the differences in symptom profiles may be due to an interviewing artefact.

Clinicians differentiate between an upper functional GI syndrome, characterized by pain or a sensation of fullness in the upper abdominal or stomach area, associated with nausea, vomiting, bloating, belching, stomach burning and appetite disturbance, and a lower functional GI syndrome, characterized by abdominal pain, pressure or cramps associated with diarrhoea or constipation (Uexküll 1990). The correlation of approximately $r = 0.32$ between stomach and intestinal complaints is consistent with the clinical impression of an upper and lower functional GI syndrome as two related, but separate, conditions. Yet, to support the notion of a clearly coherent upper and lower GI syndrome, one would expect higher correlations between the individual items elicited within the stomach section and intestinal section, respectively; even more so because the questionnaire was structured into these two sections: stomach and intestines. The symptom profiles appear to be fluctuating too much over time to derive two distinct and clearly circumscribed syndromes.

Of 25 patients with irritable bowel syndrome examined by Liss et al. (1973), 93% were found to be psychiatrically ill, suffering primarily from anxiety neurosis, undiagnosed psychiatric illness, hysteria and affective disorder, depressed type, according to specified diagnostic criteria. Walker et al. (1990), comparing 28 patients with irritable bowel syndrome with 19 patients with inflammatory bowel syndrome, and using structured psychiatric interviews, found significantly higher lifetime rates for major depression, somatization disorder, generalized anxiety disorder, panic disorder and phobic disorders in patients with irritable bowel syndrome. A large percentage of them had suffered from an anxiety disorder prior to the onset of the irritable bowel symptoms. In a 5-year follow-up of 75 patients with irritable bowel syndrome, Fowlie et al. (1992b) reported that patients with high anxiety scores on initial assessment showed less improvements after 5 years than those with low anxiety scores, whereas depression levels did not differ between different outcome groups. In a previous study on the treatment response of patients with irritable bowel syndrome to fibre supplementation (Fowlie et al. 1992a), the same authors had found lower initial depression scores in those individuals who showed improvement than in those who remained unchanged. They concluded that anxiety was important in maintaining the functional abdominal symptom complex, whereas levels of depression appeared to function as an effect modifier for treatment response. Probands with functional GI complaints at previous interviews were not found to have higher rates of depressive or anxiety disorders at later interviews.

In accordance with these studies on clinical samples, Walker et al. (1992), in analysing the ECA data, reported an association of GI symptoms with major depression, panic disorder and agoraphobia: Compared with subjects with no GI symptom, probands who reported at least one symptom had a significantly higher lifetime prevalence rate of major depression (7.5% vs 2.9%), panic disorder (2.5% vs 0.7%) and agoraphobia (10.0 vs 3.6%).

Subjects with two symptoms had even higher prevalence rates for depression (13.4%), panic disorder (5.2%) and agoraphobia (17.8%). A second analysis of these data by Lydiard et al. (1994) looked at the percentage of probands with panic disorder who suffered also from unexplained GI symptoms in comparison with probands without panic disorder. They found a significant association of panic disorder with all elicited GI symptoms except "sickness from certain foods" and a symptom complex comparable to irritable bowel syndrome. The odds ratios, when controlling for age, gender, marital status, site, comorbid somatization disorder, depression and phobia, ranged between 2.1 and 4.7. It is particularly interesting that probands with panic attacks, but without panic disorder, showed very similar percentages of GI symptoms than probands with panic disorder. Panic disorder and GI symptoms occurred predominantly in the same year, rather than at different points in time over lifetime.

We assessed the cross-sectional associations between functional stomach and GI complaints and were able to

confirm an association between GI complaints and depressive syndromes. The association with RBD and dysthymia (diagnosed in 1986 and 1988) were quite consistent for both stomach and intestinal functional complaints and of similar magnitude. In addition, consistent positive associations between subthreshold RBD and intestinal functional complaints were observed. The association with major depression (DSM-III-R) was less consistent, due probably to the small number of cases. We interpret these findings as the expression of a common core of functional GI complaints with depressive syndromes, related possibly to alterations in psychovegetative arousal.

This view is supported by the fact that functional GI complaints also associate fairly consistently cross sectionally with panic disorder, subthreshold panic, recurrent brief anxiety, and at some interview waves, also agoraphobia, simple phobia, social phobia and generalized anxiety disorder. Again, this seems to reflect that functional GI complaints point less to a specific anxiety disorder than to a more general anxiety syndrome or state of psychovegetative arousability, common to all anxiety disorders. Given the similar trends for depressive syndromes and anxiety syndromes, functional GI complaints may be indicators of a vegetative vulnerability equally expressed in depression and anxiety states.

We were not able to observe an increased risk for anxiety or depressive disorder in probands who at younger ages suffered from either a functional intestinal or stomach complaint. Likewise, no subgroup of probands with a consistent longitudinal pattern of functional GI complaints could be found. The associations of functional GI complaints with anxiety and depression were only cross sectional.

Conclusion

Functional GI complaints are quite frequent in young Swiss adults aged 20–30 years. They occur more often in women than in men and with increasing frequency in the lifespan between age 20 and 30 years. They are of a fluctuating nature in both symptom pattern and occurrence. No subgroup of individuals suffering consistently from GI symptoms over the course of 10 years was observed. Cross sectionally an association between depressive syndromes and anxiety was noted, although the presence of functional GI complaints does not represent a risk factor for the later development of an anxiety or depressive disorder. Several diagnostic categories and subsyndromal expression of a depressive or an anxiety disorder are cross-sectionally associated with functional GI complaints. We can conclude that functional GI complaints exist concomittantly alongside anxiety syndromes or depressive syndromes and may thus represent the expression of a common psychovegetative disturbance.

Acknowledgement This project was supported by grant no. 3.813.0.88 from the Swiss National Science Foundation

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