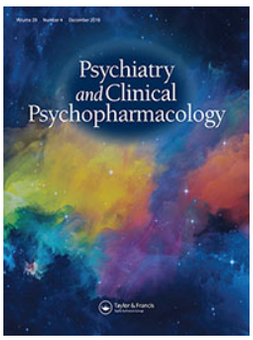

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Depression and anxiety have unique contributions to somatic complaints in depression, irritable bowel syndrome and inflammatory bowel diseases

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ABSTRACT

OBJECTIVE: In this study we aim to investigate the effects of somatic and related symptoms (SARS), alexithymia, hypochondriasis, anxiety and depression on patients with major depressive disorder, irritable bowel syndrome, inflammatory bowel disease which are the representative diseases of brain gut axis (BGA).

METHOD: Sex and age similar groups of participants with major depressive disorder (MDD) ($n = 102$), irritable bowel syndrome (IBS) ($n = 51$), inflammatory bowel diseases (IBDs) ($n = 54$), and control group ($n = 67$) were included into this study. Depression and IBS were diagnosed according to DSM-5 and ROME 4 criteria, respectively. IBDs were established according to endoscopic, histological, and radiographic investigations. In all participants, somatic and related symptoms were evaluated by self-report scales including Bradford Somatic Inventory (BSI), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Whiteley Index (WI), The 20-item Toronto Alexithymia Scale (TAS-20), Somatosensory Amplification Scale (SAS).

RESULTS: BSI, BDI, BAI, WI, TAS-20 and SAS scores were found to be highest in patients with MDD; scores of patients with IBS and IBDs were similar but higher than the control group. Gastrointestinal somatic symptoms including nausea, stomach burning, abdominal ache and stomach swelling were observed in more than half of the patients with MDD. The most common extra-intestinal somatic symptoms were, headache and neck pain and/or tension, and leg pain in IBS patients. However leg pain, weakness and lack of energy, and neck pain/tension were highest in IBDs patients. While the strongest correlation determined was between the BSI and anxiety scores in MDD ($p < .001$, $r = .688$) and IBS group; ($p < .001$, $r = .51$), in IBDs patients, BSI scores were more significantly correlated with depressive scores instead of anxiety ($p < .001$, $r = .712$ vs. $r = .705$, $p < .001$).

CONCLUSION: Our study demonstrates that SARS are commonly observed in the representative diseases of BGA. Extra-intestinal somatic symptoms are common in IBS, and IBDs, and also gastrointestinal somatic symptoms are common in patients with MDD. Assessment of somatic and related symptoms is quite important in the context of BGA.

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Depression; anxiety; somatic symptoms; brain gut axis; inflammatory bowel diseases; irritable bowel syndrome

Introduction

There are an intimate relationship and a bidirectional communication between brain and gut, which occur continuously through the brain gut axis (BGA). BGA is a circuitous communication and supplies biological construct to underpin the bio-psychosocial concept of gastrointestinal disorders [1]. Thus, psychiatric disorders are commonly seen in gastrointestinal diseases and *vice versa* [2,3].

Somatization is the expression of emotional dysphoria related to somatic symptoms such as; bodily pain, weakness and fatigue [4]. Somatic symptoms are associated with a number of factors; genetic vulnerability, traumatic experiences, cultural/social norms, and learning [5]. Although somatic symptoms are commonly related to depression and anxiety [6], the presence of medical diagnosis does not exclude the possibility of a comorbid mental disorder including somatic symptom and related disorders according to DSM 5 [5]. In medical practice, researchers have evaluated somatization in a broader context such as "medically unexplained" or "disproportionate" to the severity of an underlying medical disorder [7].

Somatic symptoms i.e headache, back pain are quite common in patients with MDD [8–10]. According to World Health Organization (WHO), most of the patients with depression are primarily seeking medical care with somatic symptoms [11]. Somatic symptoms in depression cause to a more severe and long lasting clinical picture with a greater functional impairment and poorer outcome leading to higher healthcare costs [12–14]. Simon et al. have reported that 69% of patients with depression are presented with somatic symptoms in primary care settings [11]. Despite the burden of somatic symptoms in depression, there is a lack of the diagnostic criteria for somatic symptoms literature [8–10].

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Moreover two important concepts including hypochondriasis and alexithymia may contribute to somatic symptoms [15,16]. Patients presenting symptoms of alexithymia and/or hypochondriasis may prone to misinterpret their emotional arousals and ordinary sensations as symptoms of physical illness [15,16]. Since depression and anxiety may lead to bodily symptoms, higher levels of hypochondriasis and alexithymia may increase levels of somatic symptoms in patients with depression and anxiety.

IBS is diagnosed according to the Rome criteria and it is characterized by recurrent abdominal pain [17,18]. IBS can occur with diarrhoea, constipation or both of them [17,18]. It is the most common functional gastrointestinal disorder and there is no certain aetiology identified [19,20]. Although headaches, fibromyalgia, chronic fatigue syndrome, chronic pelvic pain have been found as extra-intestinal symptoms in IBS, it should not be considered as only a somatization disorder [21]. Lifetime prevalence of somatic and related disorders, which was previously called somatoform disorders, have been reported as 15% in IBS population according to DSM IV-TR; however, the prevalence of somatic and related disorders commonly observed in our country i.e conversion disorder and hypochondriasis are not well known [7].

Inflammatory bowel diseases (IBDs), including Crohn's disease (CD) and ulcerative colitis (UC), are chronic, idiopathic, inflammatory diseases of the gastrointestinal tract. Depression, anxiety and impaired quality of life are seen more commonly in patients with IBDs compared to healthy population [22,23]. Although IBDs and IBS are distinct disorders they may occur with similar symptoms. Moreover, IBS occur in 35% of patients with IBDs during the remission period of the disease and the aetiology is not clear [24]. Both brain gut activation and subclinical inflammation in colonic mucosa have been proposed for this association. Thus, somatization may be evaluated as a part of IBS comorbidity especially in the remission period of the IBDs [25].

As stated above bio-psycho-social factors are quite important in the context of BGA. Psychogenic distress, such as; depression and anxiety has been recurrently studied in inflammatory bowel diseases [23–25] and functional gastrointestinal disorders [17–19]. Moreover, psychosomatic symptoms including headache, fatigue have been widely reported in patients with depression [9,10]. However somatic symptoms, alexithymia, hypochondriasis have not been sufficiently evaluated and recognized among clinicians [26]. Thus, we studied detailed somatic and related symptoms (SARS); alexithymia, hypochondriasis, depression and anxiety in these disorders. Firstly, we evaluated these SARS in patients with depression; which is the most common psychiatric disease, in IBS, the most common functional bowel disease and in IBDs, a typical inflammatory disease of the gastrointestinal tract. Secondly, we compared these groups with each other and with the healthy control group. Our hypotheses were; (i) Somatic symptoms and alexithymia would be highest in depressive disorder patients, (ii) Somatic symptoms and alexithymia would be significantly higher in IBS patients than IBDs patients (iii) Somatic symptoms would be correlated with depression, anxiety, alexithymia and hypochondriasis in all groups.

Methods

Participants

We enrolled the patients diagnosed with depressive disorder from our psychiatry out-patient clinic and enrolled the IBS and IBDs patients from our gastroenterology and internal medicine outpatient clinic from March 2017 to September 2018. MDD was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders (DSM 5). IBS was diagnosed according to ROME 4 criteria [5,27] and IBDs was diagnosed according to the European Crohn's and Colitis Organization (ECCO) guideline at the time of diagnosis with clinical, endoscopic, histological and biochemical results [28,29]. Sex and age similar control group was also included in the study. Inclusion criteria were defined as follows; patients diagnosed as MDD, IBS or IBDs, willingness to participate in the study, and ability to sign an informed consent. Exclusion criteria were; aged below 18 years, illiteracy, physical handicaps (i.e blinding), ongoing psychiatric treatment, in flare of IBDs and extra-intestinal comorbidity of IBDs, comorbid any medical diagnosis (rheumatoid arthritis, and mental retardation). This study was approved by the Local Ethics Committee (IRB date/number: 03.03.2017/09.2017.238). All participants gave written informed consent and this study was conducted according to principles of the Declaration of Helsinki.

(1) **Sociodemographic form:** A brief socio-demographic form was created by the researchers for this study and we recorded age, education level, income, marital status, alcohol and substance use, previous psychiatric history of participant and family, physical disease history, history of suicide attempt.
(2) **Bradford Somatic Inventory (BSI):** BSI is a multiethnic inventory of functional somatic complaints related to anxiety and depression [3]. BSI has 44 items and measures a wide range of somatic symptoms during the previous month. Validity and reliability study has been established in Turkish language [30]. In Turkish clinical sample; BSI somatization scores were categorized as; high (above 40 points), middle (between 26 and 40 points), low (between 0 and 25 points) [31].

(3) **Beck Depression Inventory (BDI):** BDI evaluates emotional, cognitive and motivational symptoms of depression with 21 items [32]. BDI, Likert type, self-report, screening test for the assessment of depression severity. Validity and reliability of Turkish form was studied [33].
(4) **Beck Anxiety Inventory (BAI):** BAI was developed by Beck et al. [34] for the assessment of anxiety severity. It is a likert type; self-report screening tool and the validity and reliability of BAI was performed in Turkish language [35].
(5) **Whiteley Index (WI):** WI is a self-report screening scale for the hypochondriac worries and beliefs. Three factors including disease phobia, disease conviction and bodily preoccupation were demonstrated according to validity and reliability study of WI [36]. Seven-item version of WI was used which has good psychometric properties in Turkish version [37].
(6) **The 20-item Toronto Alexithymia Scale (TAS-20):** TAS-20 was developed for the assessment of alexithymia and validated for the Turkish language [38–40]. It is a Likert scale and consists of three factors including difficulty-identifying feelings, difficulty describing feelings, externally oriented thinking.
(7) **Somatosensory Amplification Scale (SAS):** SAS is a Likert scale, which evaluates the sensitivity to a range of normal bodily sensations and neutral and noxious stimuli. It consists of 10 items and this scale applicable to the patients with psychiatric or medical conditions [41]. The validity and reliability study was performed in Turkish clinical and non-clinical samples [42].
(8) **Assessment of gastrointestinal disease:** Disease activities assessed with Crohn Disease Activity Index (CDAI) and Modified Mayo Score (MMS) for CD and UC respectively [43,44].

Statistical analyses

Descriptive data were computed using mean and standard deviation with range for continuous variables and frequency with percentage for ordinal and nominal variables. The normality of distribution of all variables was examined with Kolmogorov–Smirnov/Shapiro-Wilk's tests by taking into account the values of skewness and kurtosis. Groups were compared using one-way ANOVA for continuous variables and Chi-square tests for categorical variables (Fisher's Exact was applied when expected counts less than 5 were in more than 20% of cells). Post-hoc analysis was performed considering whether equal variances assumed or not. Correlation of continuous variables was conducted using Pearson's correlation coefficient. Binary logistic regression was used for prediction on the severity of somatic symptoms. Variance inflation factors and correlations were examined to check for multicollinearity among the variables. Statistical tests were performed at 2-sided 5% significance level ($\alpha = 0.05$).

Results

Our sample consisted of 274 participants divided in four groups, which comprise of patients with depression ($n = 102$), IBS ($n = 51$), IBDs ($n = 54$) and healthy controls (HCs) ($n = 67$) (Table 1). The mean age of all participants was 35.09 ± 10.71 years and 198 (72.2%) of the participants were female. There was no significant difference between the IBS, IBDs, depression and HC groups in terms of age, gender, marital status, income, alcohol and substance use. Patients with IBDs and HCs were more likely to be well educated than depression and IBS patients ($p = .001$) and the rate of unemployment was significantly higher in patient groups ($p < .001$). The socio-demographic and baseline characteristics are shown in Table 1.

Severity of somatization, depression, anxiety, alexithymia, hypochondriasis, and somatosensory amplification between the groups

BSI-44, BDI, BAI, SSAS, TAS and WI-7 were used to examine the differences among the groups with respect to SARS. All the variables were significantly different among the groups (in all groups $p < .001$). Post-hoc tests revealed that the ranking of BDI, BAI and BSI-44 total mean scores were as follow: Depression $_{\text{total mean}}$> IBS $_{\text{total mean}} \approx$ IBDs $_{\text{total mean}}$> Control $_{\text{total mean}}$.

BDI, BAI, SSAS, TAS, and BSI scores were significantly higher in patients with MDD than those with IBS, and IBDs only except for SSAS between MDD and IBDs. However, WI scores were similar between MDD and IBS, and IBDs according to results of ANOVA (Table 2).

Frequency of the somatic symptoms

Table 3 presents the frequency of the somatic symptoms in each group, which was calculated whether any symptom was reported at least once in the past month regardless of presentation on less or more than 15 days.

Correlation analysis

Nearly all variables were correlated significantly to each other in total sample of the study. At the bivariate levels, the somatic symptoms were correlated strongly with the levels of depression ($r = .712$, $p < .001$) and anxiety ($r = .705$, $p < .001$) in the patients with IBDs. Anxiety levels were more likely to be related with somatic symptoms compared to depression in MDD, IBS, and control groups. There was no significant correlation between hypochondriacal worry and

Table 1. Socio-demographic characteristics of the study population.

	Depression ($n = 102$)	IBS ($n = 51$)	IBDs ($n = 54$)	Control ($n = 67$)	χ^2 /z	p
Age (mean ± SD)	35.63 ± 10.58	36.02 ± 12.76	36.46 ± 10.48	32.10 ± 8.95	2.271	.081*
Sex *n* (%)						
Female	77 (75.5)	39 (76.5)	35 (64.8)	47 (70.1)	2.624	.453**
Male	25 (24.5)	12 (23.5)	19 (35.2)	20 (29.9)		
Education *n* (%)						
Primary	31 (30.4)	14 (27.5)	10 (18.5)	12 (17.9)	33.009	.001**
Secondary	20 (19.6)	9 (17.6)	4 (7.4)	8 (11.9)		
High school	29 (28.4)	9 (17.6)	20 (37)	9 (13.4)		
Precollage	9 (8.8)	3 (5.9)	7 (13)	12 (17.9)		
University +	13 (12.7)	16 (31.4)	13 (24.1)	26 (38.8)		
Marital Status *n* (%)						
Single	27 (26.5)	15 (29.4)	11 (20.4)	28 (41.8)	12.520	.135ᵞ
Married	67 (65.7)	33 (64.7)	38 (70.4)	38 (56.7)		
Divorced	2 (2)	2 (3.9)	3 (5.6)	1 (1.5)		
Widow	6 (25.9)	1 (2)	2 (3.7)	0 (0)		
Working Status *n* (%)					20.819	
Employed	30 (29.4)	17 (33.3)	26 (48.1)	42 (62.7)		<.001**
Unemployed	72 (70.6)	34 (66.7)	28 (51.9)	25 (37.3)		
Income *n* (%)						
<1300 TL	43 (42.2)	21 (41.2)	12 (22.2)	20 (29.9)	11.606	.236**
1300-2500 TL	31 (30.4)	14 (27.5)	24 (44.4)	23 (34.3)		
2500-3500 TL	20 (19.6)	8 (15.7)	12 (22.2)	13 (19.4)		
>3500 TL	18 (7.8)	8 (15.7)	6 (11.1)	11 (16.4)		
Alcohol Use *n* (%)						
Never used	77 (75.5)	41 (80.4)	37 (68.5)	58 (86.6)	9.129	.139ᵞ
Used before and stopped	13 (12.7)	4 (7.8)	10 (18.5)	2 (3)		
Still using	12 (11.8)	6 (11.8)	7 (13)	7 (10.4)		
Substance Use *n* (%)						
Never used	96 (94.1)	50 (98)	54 (100)	66 (98.5)	4.119	.167¥
Used before and stopped	6 (5.9)	1 (2)	0 (0)	1 (1.5)		
Still using	0 (0)	0 (0)	0 (0)	0 (0)		

Note: IBS: Irritabl Bowel Syndrome IBDs: Inflammatory Bowel Diseases SD: Standart Deviation.
*One way ANOVA.
**Chi-square γFisher's Exact ¥Fisher's Exact (applied for 2 × 4 contingency table).

depression levels in MDD patients; somatosensory amplification and alexithymia levels in patients with IBS; somatosensory amplification and hypochondriacal worry in patients with IBDs; somatic symptoms and hypochondriacal worry in depressive patients ($p > .05$). The correlations of the variables are shown in Table 4.

Logistic regression analysis

We performed binary logistic regression analysis to determine the psychological factors related with the somatization which predict the membership of bowel disease group, using the BDI, BAI, SSAS, TAS-20, WI-7, BSI-44 as independent variables. Multicollinearity was shown for the pairs of BDI-BAI and SASS-WI-7. The models did not reach to the significance level (not shown). The second model was constructed to predict severe somatization in which dependent variable was determined as severity group ("severe" and "not severe") of somatic symptom calculating the two groups with cut-off value "40 points." Two models were performed. The covariates were BDI, SASS, BSI-

Table 2. Comparison of groups in terms of total mean score of the scales and post-hoc analysis.

	Depression[1] ($n = 102$)	IBS[2] ($n = 51$)	IBDs[3] ($n = 54$)	Control[4] ($n = 67$)	F	p*
BDI	28.43 ± 9.39	13.55 ± 9.52	11.25 ± 7.45	6.32 ± 5.22	115.538	<.001
BAI	28.44 ± 12.97	16.21 ± 12.64	13.47 ± 11.27	7.04 ± 6.41	53.421	<.001
SSAS	29.93 ± 6.92	25.87 ± 8.38	27.88 ± 8.34	24.38 ± 7.68	7.874	<.001
TAS	61.52 ± 9.28	50.92 ± 11.82	49.51 ± 11.41	44.23 ± 10.63	40.197	<.001
WI-7	3.66 ± 1.92	3.37 ± 2.33	3.07 ± 2.24	1.53 ± 1.78	15.676	<.001
BSI-44	39.55 ± 18.47	27.51 ± 18.01	24.73 ± 17.49	14.41 ± 11.05	31.875	<.001
Post-hoc						
	p_{1-2}	p_{1-3}	p_{1-4}	p_{2-3}	p_{2-4}	p_{3-4}
BDI[a]	<.001	<.001	<.001	.517	<.001	<.001
BAI[a]	<.001	<.001	<.001	.648	<.001	.002
SASS[b]	.025	.473	<.001	.616	.782	.106
TAS[b]	<.001	<.001	<.001	.926	.010	.061
WI-7[a]	.864	.359	<.001	.910	<.001	<.001
BSI-44[a]	.001	<.001	<.001	.854	<.001	.002

*One way ANOVA
[a]Games-Howell
[b]Scheffe
IBS: Irritabl Bowel Syndrome IBDs: Inflammatory Bowel Diseases SD: Standart Deviation

Table 3. Frequencies of symptom presentation in BSI-44.

BSI items	Depression ($n = 102$) n (%)	IBS ($n = 51$) n (%)	IBDs ($n = 54$) n (%)	Control ($n = 67$) n (%)
1.Severe headaches	70 (68.6)	32 (62.7)	33 (61.1)	29 (43.3)
2.Feeling of something moving in stomach	55 (53.9)	24 (47.1)	26 (48.1)	16 (23.9)
3.Pain or tension in neck and shoulders	84 (82.4)	35 (68.6)	37 (68.5)	41 (61.2)
4. Burning or itching on skin	53 (52.0)	14 (27.5)	23 (42.6)	17 (25.4)
5.Feeling of head constriction	53 (52)	15 (29.4)	14 (25.9)	6 (9.0)
6. Pain in the chest or heart	68 (66.7)	25 (49.0)	17 (31.5)	22 (32.8)
7. Feeling dry in mouth or throat	85 (83.3)	31 (60.8)	23 (42.6)	24 (35.8)
8. Darkness or mist in front of your eyes	70 (68.6)	22 (43.1)	21 (38.9)	13 (19.4)
9. Burning sensation in stomach	59 (57.8)	37 (72.5)	32 (59.3)	31 (46.3)
10. Feeling lack of energy	98 (96.1)	36 (70.6)	38 (70.4)	46 (68.7)
11. Feeling hot or burning in head	52 (51.0)	16 (31.4)	16 (29.6)	9 (13.4)
12. Sweating a lot	66 (64.7)	18 (35.3)	29 (53.7)	32 (47.8)
13. Feeling pressure or tightness on chest or hearth	66 (64.7)	20 (39.2)	15 (27.8)	17 (25.4)
14. Suffering ache or discomfort in the abdomen	53 (52.0)	37 (72.5)	33 (61.1)	23 (34.3)
15. Choking sensation in throat	60 (58.8)	14 (27.5)	7 (13.0)	7 (10.4)
16. Having pins and needles or numbs on hands or feet	78 (76.5)	24 (47.1)	27 (50.0)	13 (19.4)
17. Feeling aches or pains all over the body	71 (69.6)	24 (47.1)	27 (50.0)	21 (31.3)
18. Feeling of heat inside body	70 (68.6)	25 (49.0)	24 (44.4)	25 (37.3)
19. Awareness of palpitation	61 (59.0)	22 (43.1)	14 (25.9)	17 (25.4)
20. Feeling pain or burning in your eyes	66 (64.7)	20 (39.2)	19 (35.2)	17 (25.4)
21. Suffering from indigestion?	67 (65.7)	36 (70.6)	26 (48.1)	22 (32.8)
22. Trembling or shaking	50 (49.0)	14 (27.5)	15 (27.8)	5 (7.5)
23. Passing urine more frequently	70 (68.6)	27 (52.9)	25 (46.3)	23 (34.3)
24. Having low back trouble?	58 (56.9)	20 (39.2)	24 (44.4)	26 (38.8)
25. Feeling swallon or bloated on stomach	61 (59.8)	40 (78.4)	28 (51.9)	28 (41.8)
26. Feeling head heavy	75 (73.5)	27 (52.9)	25 (46.3)	21 (31.3)
27. Feeling tired even when not working	94 (92.2)	33 (64.7)	33 (61.1)	39 (58.2)
28. Getting pain in legs	82 (80.4)	31 (60.8)	42 (77.8)	34 (50.7)
29. Feeling sick in stomach (nausea)	70 (68.6)	30 (58.8)	23 (42.6)	23 (34.3)
30. Feeling of pressure inside head	56 (54.9)	17 (33.3)	15 (27.8)	8 (11.9)
31. Having difficulty in breathing,even when resting	52 (51)	10 (19.6)	12 (22.2)	7 (10.4)
32. Feeling tingling all over the body	42 (41.2)	12 (23.5)	15 (27.8)	4 (6.0)
33. Being troubled by constipation	46 (45.1)	26 (51)	20 (37.0)	20 (29.9)
34.Opening bowels more often than usual	52 (51)	36 (70.6)	31 (57.4)	24 (35.8)
35. Sweating a lot in palms	40 (39.2)	8 (15.7)	9 (16.7)	6 (9.0)
36. Having difficulty in swallowing	57 (55.9)	18 (35.3)	10 (18.5)	8 (11.9)
37. Feeling giddy or dizzy	69 (67.6)	22 (43.1)	13 (24.1)	17 (25.4)
38. Having bitter taste in mouth	55 (53.9)	24 (47.1)	20 (37.0)	19 (28.4)
39. Feeling heavy in the whole body	75 (73.5)	31 (60.8)	24 (44.4)	17 (25.4)
40. Having a burning sensation when passing urine	41 (40.2)	20 (39.2)	11 (20.4)	21 (31.3)
41. Hearing a buzzing noise in ears or head	60 (58.8)	13 (25.5)	15 (27.8)	12 (17.9)
42. Feeling heart to be weak or sinking	53 (52.0)	11 (21.6)	15 (27.8)	13 (19.4)
43. Suffering from excessive wind (gas) or belching	63 (61.8)	35 (68.6)	33 (61.1)	19 (28.4)
44. Feeling cold in hands or feet	62 (60.8)	20 (39.2)	17 (31.5)	12 (17.9)

Note: IBS: Irritabl Bowel Syndrome IBDs: Inflammatory Bowel Diseases BSI: Bradford Somatic Inventory.

44, age, marital status and patient groups for the first model. The only significant variable was BDI total score [OR (95% CI): 1.130 (1.095–1.166), $p < .001$] remained in last step (Negelkerke R^2=403, $p < .001$). The second model contained same variables with those in first model except BAI instead of BDI. Similarly, the only significant variable was BAI total score [OR (95% CI): 1.127 (1.095–1.161), $p < .001$] remained in last step (Negelkerke R^2=465, $p < .001$). No model significantly demonstrated the prediction of membership of patient groups for severe somatization.

Discussion

In this study, we aimed to investigate the somatic and related symptoms in the context of BGA. Thus, we included patients with MDD, which is the most common psychiatric disorder, IBS as functional gastrointestinal disease, and IBDs, which is the prototype of inflammatory disease of the gastrointestinal tract. Patients with MDD had the highest score on BSI and SARS and differentiated than the other groups. However, none of the SARS differentiated between IBS and IBDs (Table 2). Moreover, statistically significant correlations have been determined between somatic symptoms, alexithymia, depression, anxiety, hypochondriasis, and somatosensory amplifications, in all patient groups. Thus, while the results of the present study confirmed our first and third hypothesis, our second hypothesis was not confirmed.

According to our results, sex and age similar groups were included into study. Income status was not different, however education level and working status differed between the groups (Table 1). Socio-demographic features including being mid-thirties and female, having lower education and income levels were similar to previous studies [2,9,45]. In previous findings, although some correlations have been determined related to socio-demographic features and somatic complaints, none of the socio-demographic

Table 4. Correlation coefficients of the scales by groups.

		BDI				BAI				SSAS				TAS-20				WI-7				BSI-44			
		Dep	IBS	IBDs	Cont	Dep	IBS	IBDs	Cont	Dep	IBS	IBDs	Cont	Dep	IBS	IBDs	Cont	Dep	IBS	IBDs	Cont	Dep	IBS	IBDs	Cont
BDI	Dep					.564*				.383*				.429*				.107				.420*			
	IBS						.727*				.350γ				.483*				.609*				.489*		
	IBDs							.584*				.284¥				.394¥				.498*				.712*	
	Cont								.624*				.291¥				.505*				.381γ				.477*
BAI	Dep	.564*								.439*				.318*				.264γ				.688*			
	IBS		.727*								.486*				.552*				.599*				.517*		
	IBDs			.584*								.408¥				.516*				.492*				.705*	
	Cont				.624*								.284¥				.545*				.432*				.661*
SSAS	Dep	.383*				.439*								.246*				.255γ				.387*			
	IBS		.350γ				.486*								.210				.317¥				.406γ		
	IBDs			.284¥				.408¥								.308¥				.267				.322¥	
	Cont				.291¥				.284¥								.245¥				.447*				.444*
TAS-20	Dep	.429*				.318γ				.246¥								.208¥				.324γ			
	IBS		.483*				.552*				.210								.564*				.427γ		
	IBDs			.394¥				.516*				.308¥								.345¥				.463*	
	Cont				.505*				.545*				.245¥								.281¥				.402γ
WI-7	Dep	.107				.264γ				.255γ				.208¥								.189			
	IBS		.609*				.599*				.317¥				.564*								.525*		
	IBDs			.498*				.492*				.267				.345¥								.490*	
	Cont				.381γ				.432*				.447*				.281¥								.547*
BSI-44	Dep	.420*				.688*				.387*				.324γ				.189							
	IBS		.489*				.517*				.406γ				.427γ				.525*						
	IBDs			.712*				.705*				.322¥				.463*				.490*					
	Cont				.477*				.661*				.444*				.402γ				.547*				

Notes: IBS: Irritabl Bowel Syndrome IBDs: Inflammatory Bowel Diseases SD: Standart Deviation Dep: Depression Cont: Control BDI: Beck Depression Scale BAI: Beck Anxiety Scale SASS: Somatosensory Amplification Scale TAS-20: Toronto Alexithymia Scale-20 WI-7: Whiteley Index-7 BSI-44: Bradford Somatic Inventory-44. The values presented in the table show Pearson correlation coefficients. The unmarked values are not statistically significant ($p > .05$).

*$p < .001$

γ$p < .01$

¥$p < .05$

features have been identified as a predictive factor for somatic complaints [2,45,46]. Thus, the differences between groups in terms of education level and working status may have limited effect in our study.

SARS in patients with MDD

In our study, all parameters of SARS were found to be highest in MDD patients. Although numerous studies have evaluated the comorbidity and burden of somatic symptoms in patients with MDD, IBS, and IBDs; to best of our knowledge, this is the first study, which compare the severity of detailed somatic and related factors between these groups. Moreover, somatic symptoms were correlated with depression, anxiety, alexithymia, hypochondriasis and somatosensory amplification, consistent with previous findings [9]. Somatic symptoms in MDD patients are very important because, they are considered to be more decisive even than anxiety and depression severity in predicting the outcome of depression [47].

According to results of BSI; weakness (feeling lack of energy) (96.1%), tired all the time (92.2%), and dry mouth (82.4%) are determined as the highest somatic symptoms (Table 3). Our results are similar to those of Chakraborty et al. in terms of BSI scores [46]. However, gastrointestinal symptoms nausea (68.6%), stomach burning (57.8%), abdominal ache (52.0%), stomach swelling or bloating (59.8%) are observed in more than half of the patients. In the current study, the frequency of gastrointestinal symptoms in patients with depression is higher than both of the Indian (nausea 18%, stomach swollen 26%) and China population studies (gastrointestinal system complaints were determined 29.6%) [2,46]. Moreover, these complaints were even found to be more frequent in healthy controls (Table 3) than those of previous studies conducted with MDD patients in other countries (nausea 34.3%, stomach burning 46.3%, abdominal ache 34.3%, stomach swollen or bloated 41.8%). Cognitive and interpretive process of somatic symptoms was related to cultural models of symptoms [48], thus increased level of somatic complaints may result from the transcultural factors in our country. Moreover, in healthy control group; the prevalence of Helicobacter pylori infection was found to be higher in our country (82.5%) than many other countries (less than 40%) [49]. Helicobacter pylori may cause dyspeptic symptoms and gastrointestinal symptoms in healthy control group, despite lack of any information.

SARS in patients with IBS

In this study, somatic and related symptoms were not significantly differentiated between IBS and IBDs populations. This was inconsistent with our hypothesis. In a previous study, higher scores of alexithymia were determined in patients with IBS compared to IBDs [50]. In our study, level of alexithymia was determined highest in MDD patients than IBS, and IBDs, however there was not any statistically significant difference between IBDs and IBS (Table 2). Moreover, results of alexithymia were higher in IBS than the control group ($p = 0.010$), but IBDs and the control group was similar ($p = 0.06$). Thus, alexithymia may be an important symptom for the differentiation of functional gastrointestinal disease and inflammatory bowel disease.

The most prevalent somatic symptoms were defined as stomach burning, abdominal ache, and stomach swelling or bloating in our IBS sample. Moreover, extra-intestinal system symptoms including headache, neck pain and/or tension, and leg pain were also highly observed above half of the IBS population (62.7%, 68.6%, 60.8% respectively). This result is in accordance with previous findings, which suggest that patients with IBS have common extra-intestinal symptoms [7]. Comorbidity of somatization disorder was found as high as 25% of IBS population according to DSM IV-TR [51]. In order to classify and understand somatization and IBS, researchers described IBS symptoms as "medically unexplained or disproportionate." Chronic headaches, fibromyalgia, chronic fatigue syndrome, chronic pelvic pain are often observed in IBS population. Since determined biological factors i.e increased intestinal permeability and minimum intestinal inflammation in IBS [47], somatic and related disorders do not fully explain overlapping somatic conditions [7].

SARS in patients with IBDs

In IBDs group, highest somatic symptoms determined as; leg pain, weakness and lack of energy, neck pain tension (Table 3). All these symptoms were related to musculoskeletal systems but not to gastrointestinal tract. We excluded patients with IBDs having extra-intestinal complications and active disease, thus these results may be prominent. Because these extra-intestinal symptoms considered as somatic symptoms may have an impact on the quality of life of these patients.

Somatic symptoms are not well known in IBDs as depression and anxiety. In previous studies there is not any somatization disorder determined in IBDs population according to the results of clinical interview [23,52]. Despite the lack of any somatic and related disorders in IBDs population, this may not demonstrate that there is not any somatic symptom in IBDs population. Thus, somatic symptoms in IBDs were associated with two factors. First, medically unexplained physical symptoms were determined in patients with IBDs comorbid current psychiatric disorder [53]. Second; somatic symptoms were defined as; IBS type gastrointestinal symptoms during the remission of the IBDs [25]. IBS type somatic symptoms and their effects on IBDs

have been studied and they are related to poorer quality of life and higher psychogenic stress however did not correlate with the IBDs disease score [25].

Somatic symptoms lesser extent known for IBDs than IBS, and related symptoms alexithymia, hypochondriasis, somatosensory amplification, depression, and anxiety are well described in our study and literature related to this correlation is insufficient. Evaluation of somatic symptoms may be useful especially during the quiescent phase of the IBDs.

Limitation

In this study we have several limitations. First, our study has a cross-sectional design, permitting conclusions related to associations/correlations, however does not give any information about causality. Second, depressive disorder was diagnosed according to the DSM 5 criteria but not with a structured clinical interview. Third psychiatric symptom evaluation was performed according to self-report questionnaire. Recall bias may affect our study. Fourth, the absence of the medical comorbidity in depression and control groups was based on the participant's expressions. Thus, recall bias may be important for this study population. Fifth, although we included drug free patients for excluding psychosomatic effects of antidepressant agents, we do not have any data related to duration of diseases, which may be an important factor for the somatic and related symptoms. Sixth, small sample size in IBS and IBDs group of patients were included to this study. Seventh, both Ulcerative colitis and Chron's disease were included to this study. Thus, we could not demonstrate any disease specific factors of the subgroups in IBDs population. Eighth; we do not know the duration of quiescent phase of the IBDs, this may be associated with psychosomatic symptoms in the context of BGA. Ninth, most of the study population was female and gender did not equally distribute. Tenth, our study population was consisted of tertiary care clinic. Thus, the results cannot be generalized to the all disease population.

Conclusion

To the best of our knowledge, this is the first study, which demonstrates the detailed SARS in the representative diseases of BGA in a Turkish clinical sample. Both gastrointestinal symptoms and other somatic symptoms are common in drug free MDD patients and extra-intestinal somatic symptoms are common in IBS and quiescent phase of IBDs. Thus, during the assessment of the patients with BGA diseases, psychosomatic factors especially gastrointestinal symptoms may be important for MDD patients and, extra-intestinal somatic symptoms may also be prominent in IBS and IBDs.

Disclosure statement

No potential conflict of interest was reported by the authors.

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