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Gastrointestinal disorders and symptoms: does body mass index matter?

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ABSTRACT

Background: Recent studies have shown inconsistent results about the association between body mass index (BMI) and gastrointestinal disorders. The aim of this study was to assess the association between BMI and gastrointestinal disorders in patients referred for endoscopy.

Methods: Consecutive patients received a questionnaire about gastrointestinal symptoms prior to upper gastrointestinal endoscopy. The association between BMI and gastrointestinal disease and related symptoms was determined by adjusted logistic regression analyses.

Results: A total of 1023 subjects were included, 303 (35%) subjects were overweight (BMI 25 to 30 kg/m^2), an additional 118 (14%) subjects were obese (BMI >30 kg/m^2). Overall, 42% of the patients experienced symptoms of gastro-oesophageal reflux disease (GERD), 70% dyspepsia and 55% lower abdominal symptoms. In obese patients the prevalence of GERD was higher (52%) compared with normal weight (44%) and overweight (44%) (ns). Reflux oesophagitis was found in 13, 17 and 19% for normal weight, overweight and obese, hiatus hernia in 7, 9 and 11% and Barrett's oesophagus in 6, 7 and 8%, respectively.

Conclusion: More than half the patients undergoing upper gastrointestinal (GI) endoscopy were overweight or obese. In this patient population, no relation between BMI and GI disorders and symptoms was found. However, a small but statistically insignificant trend was observed toward obesity for patients with GERD-associated symptoms.

KEYWORDS

Body mass index, endoscopy, gastrointestinal disorders, gastrointestinal symptoms

INTRODUCTION

The prevalence of obesity is increasing worldwide. In the past 20 years, the prevalence of obesity has doubled to 12% in the Netherlands and has become a major threat to public and clinical health.[1,2] Obesity is clearly acknowledged as a risk factor for several chronic diseases, such as diabetes mellitus type 2 and cardiovascular diseases. Moreover, obesity has recently been associated with several forms of gastrointestinal cancer, such as colon cancer, oesophageal adenocarcinoma and gallbladder disease.[3-9]

A potential role of obesity in gastrointestinal symptoms is unclear. Reports from several health surveys show inconsistent results. Most recent studies show a relationship between obesity and the occurrence of gastrointestinal symptoms, especially of heartburn and regurgitation.[10-16] This relation might be explained by the fact that obese persons experience a higher intra-abdominal pressure, slower oesophageal transit and decreased acid clearance from the oesophagus due to hiatus hernia than persons with a normal body mass index (BMI).[17-19] Consequently, hiatus hernia can cause GERD symptoms. Additionally, data from two large studies show that dyspeptic symptoms decline if overweight patients lose weight.[20,21]

Besides upper gastrointestinal symptoms, data are also scarce on a possible relation between obesity and upper gastrointestinal pathology.[22] The patient population referred for upper gastrointestinal endoscopy is prone to organic diseases due to long-term persistent symptoms not reacting to acid inhibitors. The results of the present study, in a patient population referred for upper gastrointestinal endoscopy, could reveal new insights into the relation between patients BMI and gastrointestinal symptoms and disease. The outcome may help in differentiating between gastrointestinal diseases based on body mass index and gastrointestinal symptoms.

METHODS

Subjects

A total of 1103 consecutive patients consented to participate in this study. They were all referred to two experienced gastroenterologists at the Canisius Wilhelmina Municipal Hospital, Nijmegen, the Netherlands, by general practitioners or specialists for diagnostic upper gastrointestinal endoscopy between March 2002 and March 2004. All included patients were 18 years or older.

Two weeks prior to endoscopy, the patients received a questionnaire that included demographic information, body weight and height, history of smoking, amount of alcohol and coffee intake, medical history and present use of medication. We excluded patients with a history of gastrointestinal disease, such as cancer, inflammatory bowel disease, celiac disease and gastrointestinal resections. Patients who did not complete the questionnaire were excluded as well.

Definitions

BMI was calculated as body weight (kg) divided by the square of height (m) and categorised according to the World Health Organisation (WHO) classification of overweight and obesity: normal weight BMI <25 kg/m^2, overweight BMI 25 to 30 kg/m^2, obesity BMI ≥30 kg/m^2.[1] Acid inhibitors were defined as antacids, H_2-receptor antagonists and proton pump inhibitors. Coffee and alcohol intake were divided into user or non-user and smoking into current smoker or non-smoker/ex-smoker.

Patients were asked to score gastrointestinal symptoms over the past four weeks by a validated gastrointestinal symptom rating scale (GSRS).[23] This included specific questions about the type of symptoms and severity on a seven-point Likert scale. Symptoms were categorised into three groups: 'GERD' (gastro-oesophageal reflux disease), 'dyspepsia' and 'lower abdominal'. 'GERD' was defined as heartburn and regurgitation. Epigastric pain, abdominal bloating and nausea were categorised as 'dyspepsia'. 'Lower abdominal' comprised pain in the lower abdomen (general, after a meal, when hungry, after defecation, diarrhoea and constipation). Severity of gastrointestinal symptoms was described as no symptoms, mild, moderate, quite a lot, severe, very severe and unbearable symptoms. None and mild symptoms were combined as 'no symptoms' and compared with the others.

All gastric and duodenal diagnosis found at endoscopy were confirmed by pathology reports. Barrett's oesophagus was defined by endoscopic 'Barrett's oesophagus' or 'metaplasia' in the pathology report. In this way, gastritis and duodenitis diagnosed by endoscopy were confirmed by pathology reports. Also, endoscopic 'suspicious for oesophagus or gastric malignancies' were confirmed to pathologically proven malignancies. Active *Helicobacter pylori* infection was proven by histological investigations of antral biopsy specimens.

Statistical analysis

Primary analysis investigated the association between BMI and the prevalence of gastrointestinal symptoms. In addition, we assessed whether overweight and obese patients differ in gastrointestinal pathology compared with the group with normal weight. For this purpose, we initially studied the three BMI groups for basic demographics and use of nonsteriodal anti-inflammatory drugs (NSAIDs) or acid inhibitors.

Also the frequencies of the (categorised) gastrointestinal symptoms in the study population were assessed. The relations between BMI and both gastrointestinal symptoms and diseases were analysed using Pearson χ^2 test. The evaluation of BMI as a risk factor for gastrointestinal symptoms and disease was determined by adjusted logistic regression. Factors used for adjustment (age, gender, *Helicobacter pylori* infection, alcohol and coffee consumption, current smoking and use of NSAIDs or acid suppressive medication) were made explicit by literature. An additional analysis was performed to assess whether BMI influences the relation between hiatus hernia and GERD symptoms. Analyses were performed using SAS statistical software, version 8.0.

Results

A total of 1103 patients were included in this study. We excluded four patients because they were younger than 18 years, 33 patients who had a history of gastrointestinal cancer, 14 patients with a history of chronic gastrointestinal disease and 29 patients with a gastrointestinal resection in the past. In total, 1023 patients were eligible for analysis in this study, 49% were male and the mean age of the population was 55.4 years (SD 15.4). Mean BMI was 25.5 (SD 4.5) kg/m^2. Half of the patient population was overweight (35%) or obese (14%) (*table 1*). Statistically significantly more women were obese (p<0.01). In the study population, prevalence of acid suppressive medication was high as expected (total of 5.5% were taking H_2-receptor antagonists, and 47.6% were on proton pump inhibitors), but not different between normal weight (53%), overweight (58%) and obese (51%) patients (p=0.50).

In the previous four weeks, GERD symptoms were reported by 45%, dyspepsia by 67% and lower abdominal symptoms by 59% of the total study population. These percentages did not differ significantly between the three BMI groups (*table 2*). Half of the patients in the obese group (52%) experienced a GERD symptom in the four weeks prior to upper gastrointestinal endoscopy compared with 44% in both normal and overweight groups. This finding was largely contributable to heartburn, but even this difference was not found to be statistically significant.

Table 1. *Demographics and body mass index*

Demographics (%)	Body mass index (kg/m²)			P value
	<25 (n=437)	25-30 (n=303)	≥30 (n=118)	
Mean age (SD)	53.5 (16)	57.5 (15)	54.4 (14)	0.78
Older than 50	268 (61%)	218 (72%)	79 (67%)	<0.05
Male gender	209 (48%)	171 (56%)	44 (37%)	<0.01
Western European origin	356 (91%)	267 (95%)	97 (91%)	0.09
Current alcohol users	221 (51%)	199 (66%)	56 (48%)	<0.01
Coffee users	372 (86%)	268 (90%)	100 (87%)	0.27
Current smoker	157 (36%)	77 (25%)	30 (25%)	<0.01
NSAID use	7 (3%)	3 (2%)	5 (7%)	0.12
Antacids	2 (1%)	2 (1%)	0 (0.0%)	0.67
H_2-receptor antagonists	17 (6%)	9 (5%)	4 (5%)	0.79
Proton pump inhibitors	120 (46%)	85 (51%)	35 (46%)	0.89

Table 2. *Gastrointestinal symptoms and body mass index*

Symptoms (%)	Body mass index (kg/m²)			P value*
	<25	25-30	≥30	
GERD	194 (44%)	134 (44%)	61 (52%)	0.33
Heartburn	138 (33%)	101 (35%)	51 (44%)	0.07
Regurgitation	157 (38 %)	116 (41%)	49 (44%)	0.49
Dyspepsia	299 (68%)	198 (65%)	83 (70%)	0.54
Lower abdominal	268 (61%)	173 (57%)	67 (57%)	0.44

*Adjusted for gender, age, origin, smoking, use of alcohol, coffee, gastric acid suppressive medication and NSAIDs, infection with *Helicobacter pylori*. GERD = gastro-oesophageal reflux disease.

Table 3. *Body mass index and gastrointestinal disease*

Gastrointestinal disease	Body mass index (kg/m²)			P value*
	<25	25-30	≥30	
Normal	219 (50%)	148 (49%)	57 (48%)	0.91
Oesophagitis	56 (13%)	50 (17%)	23 (19%)	0.13
Gastritis	85 (20%	44 (15%)	24 (21%)	0.16
Duodenitis	23 (5%)	12 (4%)	5 (4%)	0.68
Peptic ulcer	18 (4%)	10 (3%)	6 (5%)	0.68
Hiatus hernia	29 (7%)	27 (9%)	13 (11%)	0.24
Barrett's oesophagus	27 (6%)	20 (7%)	10 (8%)	0.67
Oesophagus carcinoma	3 (1%)	0 (0%)	0 (0%)	0.23
Gastric carcinoma	0 (0%)	1 (0.3%)	0 (0%)	0.40
Helicobacter pylori infection	60 (14%)	34 (11%)	17 (14%)	0.53

*Adjusted for gender, age, origin, smoking, use of alcohol, coffee, acid inhibitors and NSAIDs, infection with *Helicobacter pylori*.

Table 4. *Association between hiatus hernia and GERD symptoms*

BMI*	Hiatus hernia	GERD (%)	P value
Normal (<25 kg/m²)	Yes	18 (62.1%)	0.05
	No	174 (43.1%)	
Overweight (25-30 kg/m²)	Yes	17 (63.0%)	0.04
	No	116 (42.2%)	
Obese (≥30 kg/m²)	Yes	7 (53.9%)	0.84
	No	53 (51.0%)	

*Trend over BMI subgroups, p=0.55. GERD = gastro-oesophageal reflux disease.

In approximately half of the population, endoscopy did not reveal any abnormalities (*table 3*). Regarding gastrointestinal pathology, no differences were found between the three BMI groups. A small but insignificant trend could be observed for oesophageal diseases. For the normal weight, overweight and obese patients we found oesophagitis in 13, 17 and 19%, hiatus hernia in 7, 9 and 11% and Barrett's oesophagus in 6, 7 and 8%, respectively.
Table 4 describes the association between hiatus hernia and GERD symptoms, subdivided for the BMI classes. The normal and overweight patients with hiatus hernia are more prone to GERD symptoms, in obese patients this association was not present.

DISCUSSION

We studied the association between BMI and prevalence of gastrointestinal symptoms and upper gastrointestinal abnormalities in patients referred for endoscopy. Half of our population was overweight or obese and again in half endoscopy did not reveal any abnormalities. With an increase in BMI, there was a small but not statistically significant increase in prevalence of diseases and symptoms related to the oesophagus.
Obesity is becoming more and more prevalent. Obese patients are not only at risk for cardiovascular diseases and diabetes mellitus, but also have a decreased health-related quality of life.[24,25] Medical consumption of this specific population is higher and in the near future the health system will need investments to cover this.
The association between BMI and upper gastrointestinal diseases has been studied before. The population-based study by Locke *et al*. aimed at assessing risk factors for reflux oesophagitis.[12] Patients defined as obese conform the WHO guidelines (>30 kg/m^2) had a three times higher risk of oesophagitis (OR 2.8, 95% CI 1.7 to 4.5). In our study we did find a small trend for the association between obesity and oesophagitis, but not as firm as Locke and colleagues. We did, however, find not only reflux oesophagitis but also other oesophagus-related diseases (Barrett's oesophagus and hiatus hernia) to be slightly more prevalent in the higher BMI classes. A recent study by El-Serag *et al*. also showed more frequent hiatus hernia and reflux oesophagitis among the overweight and obese.[10] They suggested that obesity could be the cause of hiatus hernia, which could be followed by GERD and reflux oesophagitis. Hiatus hernia was also related to GERD symptoms in our study, but not in the obese patients, which implicates involvement of other factors than body mass index for the occurrence of hiatus hernia.
The literature is inconsistent about the association between BMI and gastrointestinal symptoms. This inconsistency could be explained by several factors: the choices for certain cut-offs, the study population and the absence of the association. Study protocols found in literature used different cut-off points for BMI, some were based on statistical reasons (e.g. quartiles), others adopted cut-offs from other publications. For better comparison we used the most common definition, described by the WHO.[1] In contrast to our study the association was previously studied in the general population and in outpatients, whereas we studied patients referred for upper gastrointestinal endoscopy, which is a population with a higher occurrence of upper gastrointestinal diseases and related symptoms. Moreover, in our population both symptoms and diagnosis could be studied.

The large community-based randomised controlled trial by Murray *et al*. in the United Kingdom showed a positive correlation between BMI and prevalence of gastrointestinal symptoms.[11] In their study, 21% of the patients were obese and 41% overweight according to WHO guidelines, which is quite similar to our results with 14 and 35% obese and overweight patients, respectively. Their results showed adjusted odds ratios for frequency of symptoms occurring at least once a week in overweight patients compared with those of normal weight of 1.8 (95% CI 1.33-2.50) for heartburn and 1.5 (95% CI 1.13-1.99) for regurgitation. Corresponding odds ratios relating to obese patients were 2.9 (95% CI 2.07 to 4.08) and 2.2 (95% CI 1.44 to 3.45), respectively. This British study was conducted in the general population, while we studied the association between BMI and GERD symptoms in a population referred for upper gastrointestinal endoscopy.
All studies have their limitations. In our study, body weight and height were obtained on a self-report form, rather than measured by a physician. Especially obese patients are more likely to underreport their body weight, which may have lead to an underestimation of our obese population. It is unclear whether underreporting of body weight plays an important role in gastrointestinal patients. These patients may be well aware of their body weight, as it is usually measured during their visits to the gastroenterologist. Moreover, the majority of our study population were taking or had been taking acid suppressive medication, which might contribute to the lower prevalence of peptic ulcer disease and reflux oesophagitis, compared with other study results handling the relation between BMI and reflux oesophagitis. However, our patient population was a better reflection of common practice, where many patients had already experienced pretreatment with any acid suppressive medicament.
The observational setting of this study introduces physician behaviour as confounding. All patients in our study were referred by their general practitioner. Patients with a higher BMI can be referred to secondary care at an earlier stage than others, because of the referring doctor's knowledge of the current literature. This confounding-by-indication could have interfered with our results, but more

importantly, it introduces a poor comparison with other (endoscopic) study results.

In conclusion, more than half of the patients undergoing endoscopy were overweight or obese. In this patient population, no relation between BMI and GI disorders and symptoms was found, although a small but statistically insignificant trend was observed toward obesity for patients with GERD associated symptoms.

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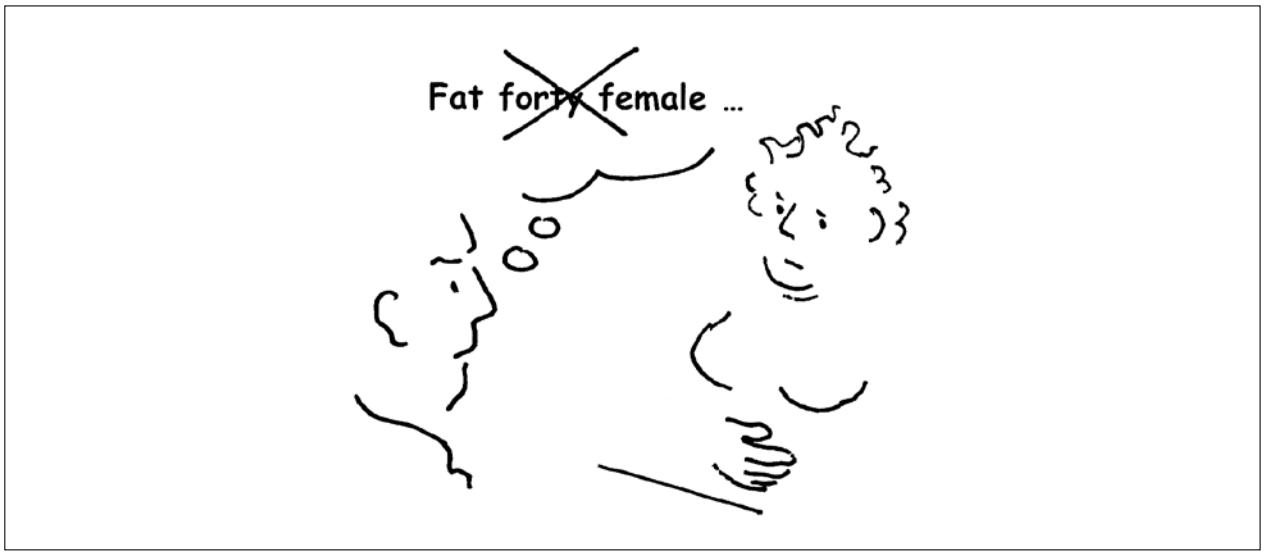

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