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LEADING ARTICLE

Functional gastrointestinal disorders among healthcare professionals at a tertiary Australian hospital

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Abstract

Background and Aim: The aim of this study was to determine the frequency, characteristics, and associations of functional gastrointestinal disorders (FGIDs) among healthcare professionals.

Methods: A qualitative survey was conducted among the staff at a tertiary Australian hospital between January 2017 and June 2018. Rome III criteria (excluding endoscopic) were used to define FGID. Multivariable logistic regression was used to explore associations.

Results: Of the 274 respondents (17% doctors, 66% nurses, 17% others; 77% female), 54% had experienced GI symptoms ≥3 times per week and 23% were diagnosed with FGIDs (2% IBS, 19% FD, 2% both). GI symptoms were more common in females (58% vs. 38%), Caucasians versus Asians (59% vs. 35%), respondents who were easily (67% vs. 40%) or often stressed (58% vs. 37%), and had irregular working hours (62% vs. 46%, each $P < 0.05$). Independent predictors of GI symptoms included being easily stressed (OR 2.7) and female sex (OR 2.4), while Asian ethnicity was protective (OR 0.42, each $P < 0.05$). FGIDs were more prevalent in respondents who often felt stressed (27% vs. 10%), felt easily stressed (29% vs. 17%), and in nurses compared to others (27% vs. 16%; each $P < 0.05$). The only independent predictor of FGID was being often stressed (OR 4.1, $P = 0.011$).

Conclusions: FGIDs and GI symptoms are prevalent among hospital workers. Stress, female sex, irregular working hours, and non-Asian ethnicity appeared to be associated with GI symptoms and FGIDs.

Introduction

Functional gastrointestinal disorders (FGIDs) refer to a group of medical conditions involving various combinations of chronic or recurrent gastrointestinal (GI) symptoms – without an established biochemical, structural, or physical cause.[1,2] These disorders tend to occur in association with motility disturbance, visceral hypersensitivity, and physiological changes relating to gut microbiota and the host immune response.[3] Functional dyspepsia (FD) and irritable bowel syndrome (IBS) are two of the most common FGID subtypes, with a prevalence of approximately 3.6%–10.1% in Western countries.[4,5] FD, which is characterized by a predominance of epigastric pain as well as early satiety and postprandial fullness, is often misdiagnosed as gastroesophageal reflux disease (GERD) due to the overlap of symptoms.[6,7] IBS can also include some of these upper GI symptoms but is predominantly defined as abdominal pain associated with a change in bowel habit including diarrhea, constipation, or both.[8] Additionally, FGIDs are often associated with psychiatric comorbidities such as anxiety and depression.[8]

A predisposition to FGIDs has been postulated to begin in early life with genetic, cultural, and environmental factors.[3,9] The subsequent complex interaction between psychosocial factors, such as stress, coping ability, and peer supports, and the central and enteric nervous systems leads to an array of potential presenting complaints.[3,7,8] These complaints extend beyond just GI symptoms however, and have the potential to severely affect patients' quality of life (QOL) by inducing anxiety, social withdrawal, and work absenteeism.[10,11] This combination of physical and psychological effects from FGIDs has been well demonstrated to affect healthcare workers, including nurses and doctors.[12–14] International studies have suggested an increased risk of FGIDs in medical professionals compared to the general population,[15,16] which has been hypothesized to be due to an increased disruption of circadian rhythm from shift work, on-call shifts, poor quality sleep, and psychological stress.[14,15]

The aim of this study was to determine the frequency, characteristics, and risk factors of FGIDs among healthcare workers in the Australian setting. Further data was also obtained to examine the effect on the QOL of individuals with FGIDs and explore associations between occupational role and lifestyle risk factors.

Methods

Study design. An anonymous, standardized, qualitative survey was distributed to all staff members of a large tertiary Australian hospital between January 2017 and June 2018 with written consent obtained from all participants. Participation was voluntary and not incentivized. The study was approved by the Eastern Health Human Research Ethics Committee (Approval Number LR34/2016).

Survey. The first part of the of the survey included questions regarding demographics, details of medical role and job title, work hours (i.e., shift work vs. regular hours), sleep habits, stress levels, and dietary factors. The latter included questions on water intake, frequency of meals, appetite, red and processed meat, and daily servings of fruit and vegetables. Stress levels were assessed by asking both "how often" and "how easily" stressed in order to assess both the frequency and severity. The second part of the survey asked about risk factors for FGID, and the FGID self-report questionnaire (FGID-Q) symptoms, which were based on the Rome III criteria.[2] QOL was also assessed using questions about the effect of symptoms on work, leisure, relationships, and avoidance of social activities.

Responses were scored using a combination of 5-point Likert scales, numerical scales, and open text questions. Participants were also asked if they ever had a gastroscopy, colonoscopy, or both, and if so, what the results were. It was distributed in hard copy paper form, which was then returned to the investigators. The full survey can be accessed in Data S1.

For this study, participants were considered to have FGID if they met Rome III criteria. Although FGID encompasses a range of conditions, only functional dyspepsia and IBS were looked at in this study. Participants who had FGID symptoms were further asked multiple choice questions regarding their impact on their daily lives and open questions regarding previous diagnoses.

Statistical analysis. Nonparametric continuous variables were expressed as medians with interquartile range (IQR) and compared using the Mann–Whitney U-test. Fischer's exact test was used to compare categorical variables. Univariable and multivariable logistic regression were used to explore associations with GI symptoms and associations with a diagnosis of FGID. All variables with $P < 0.1$ on univariable regression as well as age and sex a priori were included in the final multivariable models. A two-sided $P < 0.05$ was used as the threshold to indicate statistical significance. All analyses were conducted in Stata/IC 14.2 (StataCorp LLC, 2016).

Results

Demographics. There were 274 respondents (median age 35 years, 77% female) (Table 1). Nurses represented 66% of respondents, followed by doctors (17%) and allied health professionals (10%). Most (73%) were Caucasian, followed by Asian (26%) and African ethnicity (2%). A majority (72%) were non-smokers. Forty-four per cent were non-drinkers, while 22% consumed at least four standard drinks a week. Half (55%) reported irregular working hours.

Table 1 Baseline demographic data for survey respondents

Parameter	*n* (%)
Age (years), median, IQR	35, 27–52
Female	210 (76.6)
Occupation	
Doctor	47 (17.2)
Nurse	181 (66.3)
Allied health	27 (9.9)
Other	18 (6.6)
Regular working hours	107 (45.3)
Ethnicity	
Caucasian	163 (72.8)
Asian	57 (25.5)
African	4 (1.8)
Smoking	
Current	49 (18.2)
Past	26 (9.6)
Non-smoker	195 (72.2)
Alcohol consumption	
Non-drinker	118 (44.0)
1–3 STD per week	85 (31.7)
≥4 STD per week	60 (22.4)
Gastrointestinal symptoms	
Early satiety	114 (41.6)
Epigastric pain	60 (21.9)
Other abdominal pain	84 (30.7)
Any of the above	184 (54.0)
Symptoms of FGID[†]	
IBS	6 (2.2)
Functional dyspepsia	52 (19.0)
Both IBS and functional dyspepsia	6 (2.2)
Any of the above	64 (23.4)
Previous gastroscopy	51 (19.0)
Previous colonoscopy	66 (24.5)

[†]Using Rome III criteria for diagnosis, not including endoscopic criteria.

Frequency of GI symptoms and FGIDs. The most common GI symptom experienced at least three times a week within the last 3 months was early satiety, which occurred in 42% of respondents, followed by non-epigastric/lower abdominal pain (31%) and epigastric pain (22%) (Fig. 1). Half (54%) had experienced some GI symptom. Of these, 46% had a concurrent change to stool frequency and/or stool consistency.

In total, FGIDs were identified in 64 (23%) respondents. The most common FGID was functional dyspepsia, with 19% of respondents meeting ROME III clinical criteria; 2% of respondents met criteria for IBS, while a further 2% met criteria for both functional dyspepsia and IBS (Table 1).

Impact on quality of life. Nearly a third (83 of 274, 30%) of all respondents experienced an adverse impact on their QOL from GI symptoms (Table 2). Of these, 82% were troubled by abdominal pain, 32% were afraid to eat out, 31% experienced interruptions to sporting or leisure, and 17% had missed work or schooling commitments due to GI symptoms at least some of the

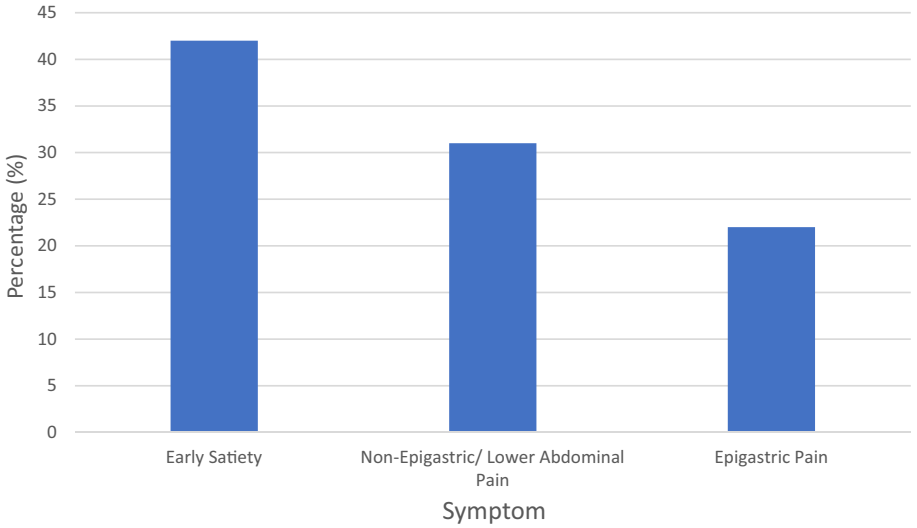

Figure 1 Gastrointestinal symptoms experienced at least three times per week for the last 3 months.

Table 2 Effect of gastrointestinal symptoms on participants' quality of life ($n = 83$)

Parameter, *n* (%)	Rarely	Sometimes	Most of the time
Afraid to eat out ($n = 80$)	55 (68.8)	17 (21.2)	8 (10.0)
Interferes with relationships	57 (68.7)	24 (28.9)	2 (2.4)
Interfered with sporting or leisure	57 (68.7)	25 (30.1)	1 (1.2)
Missed work/school/usual activities	69 (83.1)	14 (16.9)	0 (0.0)
Interfered with planning activities	68 (81.9)	13 (15.7)	2 (2.4)
Tired in the morning due to bowels	53 (63.9)	27 (32.5)	3 (3.6)
Troubled by pain	15 (18.1)	51 (61.5)	17 (20.5)
Increase in bowel motions ($n = 82$)	33 (40.2)	30 (36.6)	19 (23.2)
Decrease in bowel motions ($n = 82$)	52 (63.4)	22 (26.8)	8 (9.8)

time. Respondents indicated that most adverse effects occurred only "sometimes"; however, a third of respondents who had pain and were afraid to eat out experienced the respective adverse effect "most of the time or always."

Risk factors for GI symptoms and FGIDs. GI symptoms were more common in the following; females (58% vs. 38%, OR 2.3, $P = 0.006$), Caucasians compared to Asians (59% vs. 35%, OR 2.7, $P = 0.002$), respondents who were easily stressed (67% vs. 40%, OR 3.1, $P < 0.001$) or often stressed (58% vs. 37%, OR 2.4, $P = 0.006$), and respondents with irregular working hours (62% vs. 46%, OR 1.9, $P = 0.019$) (Table 3 and 4). Doctors with regular working hours reported fewer GI symptoms as compared to those who did not have regular working hours (30% vs. 52%, OR 0.39, $P = 0.044$). Predictors of GI symptoms on multivariable analysis included being easily stressed (OR 2.7, $P = 0.001$) and female sex (OR 2.4, $P = 0.037$) whereas Asian ethnicity was protective (OR 0.42, $P = 0.027$).

FGIDs were more prevalent in respondents who often felt stressed (27% vs. 10%, OR 3.4, $P = 0.013$), who felt easily stressed (29% vs. 17%, OR 2.1, $P = 0.015$), and in nurses compared to others (27% vs. 16%, OR 1.9, $P = 0.049$) (Table 5). FGID rates were similar between males (23%) and females (23%). On multivariate modeling, associations with FGID included being often stressed (OR 4.1, $P = 0.011$) with working as a nurse tending toward significance (OR 2.0, $P = 0.057$). GI symptoms and FGIDs were not associated with age, smoking, alcohol intake, sleep deprivation, or dietary factors (including red meat and fruit/vegetable intake).

Investigation and management. Respondents with FGIDs had similar rates of endoscopy compared to those without (gastroscopy 21% vs. 18%, $P = 0.72$; colonoscopy 25% vs. 24%, $P = 0.87$). However, respondents with GI symptoms who did not meet criteria for an FGID had the highest rate of gastroscopy compared to both asymptomatic patients and FGID patients (33% vs. 13%, $P = 0.001$), but similar rates of colonoscopy (30% vs. 22%, $P = 0.22$). It appears that symptoms related to functional dyspepsia led to more healthcare utilization including endoscopic investigation.[36]

Table 3 Gastrointestinal symptoms experienced categorized by occupation. Comparisons made against doctors as the reference category

Parameter, *n* (%)	Doctors ($n = 47$)	Nurses ($n = 181$)	Allied health and others ($n = 45$)
Gastrointestinal symptoms[†]			
Early satiety	14 (29.8)	80 (44.2)	19 (42.2)
P-value	-	0.10	0.28
Epigastric pain	7 (14.9)	41 (22.7)	11 (24.4)
P-value	-	0.32	0.30
Characteristic abdominal pain[‡]	13 (27.6)	55 (30.4)	16 (35.6)
P-value	-	0.86	0.50
Any of the above	19 (40.4)	103 (56.9)	25 (55.6)
P-value	-	0.050	0.21
Functional gut disorder			
Total functional dyspepsia	9 (19.2)	43 (23.8)	6 (13.3)
P-value	-	0.56	0.58
Total IBS	2 (4.3)	9 (5.0)	1 (2.2)
P-value	-	>0.99	>0.99

[†]Symptoms experienced at least 3 days per month in the last 3 months.
[‡]Associated with two of (1) improvement with defecation; (2) onset associated with change in stool frequency; (3) onset associated with change in stool form.

Table 4 Characteristics of respondents who experienced GI symptoms compared to asymptomatic respondents

Parameter, *n* (%)	Any GI symptoms[†] ($n = 148$)	No GI symptoms ($n = 126$)	*P*-value
Age (years), median, IQR	35, 26–50	36, 28–53	0.57
Female	122 (84.1)	88 (69.8)	0.006
Ethnicity			
Caucasian	96 (80.7)	67 (63.2)	0.004
Asian	20 (16.8)	37 (34.9)	0.002
African	2 (1.7)	2 (1.9)	>0.99
Doctors (vs. other occupations)	19 (12.9)	28 (22.2)	0.045
Regular working hours	48 (37.5)	56 (52.8)	0.025
Herbal medication	19 (12.9)	11 (8.8)	0.33
Alcohol ≥4 STD per week	31 (21.0)	29 (23.0)	0.77
Fruit/vegetable servings per day, mean (SD)	3.0 (1.3)	3.1 (1.3)	0.45
Current or past smoker	45 (30.4)	30 (23.8)	0.28
Red meat ≥2 days per week	91 (61.5)	81 (64.3)	0.71
Sleep <8 h per night	99 (66.9)	81 (64.3)	0.70
Often stressed	129 (87.2)	93 (73.8)	0.006
Easily stressed	96 (64.9)	47 (37.3)	<0.001

[†]Symptoms included early satiety, epigastric pain, or characteristic abdominal pain experienced at least 3 days per month in the last 3 months.

Discussion

This is the first study exploring the frequency and risk factors of GI symptoms and FGIDs – particularly FD and IBS – in Australian healthcare workers. This study shows that healthcare workers are similarly afflicted by common GI symptoms and have a similar prevalence of FGIDs as the general population.[4,5,17] Additionally, the data suggest that QOL and work productivity are affected, with up to a third of those with symptoms experiencing interruptions to their activities of daily living.

GI symptoms, which can occur suddenly and unexpectedly, can lead to work absenteeism and reduced productivity in the workplace.[7,8,18] Indeed, health-related productivity loss is recognized to be a major issue in chronic diseases including FGIDs and affects up to 10%–15% of adults.[11] The societal impact of productivity loss in the community is well known, but when this affects health professionals as we have demonstrated, the additional burden on the healthcare system can have further ramifications in terms of patient care and safety[11,18,19]. Strategies to mitigate the risk of health-related productivity loss are therefore required.[20] In addition, although the economic impact of FGIDs has been well demonstrated, further cost analyses are required to evaluate the economic impact of work absenteeism in healthcare.[5]

The effect of FGIDs on QOL can be profound, with potential interruptions to daily activities, sleep, personal relationships, work, and leisure.[21] Our study demonstrates that healthcare professionals are not exempt from the effects of chronic illness on health-related QOL, where up to a third of respondents with GI symptoms reporting interruptions to activities of daily living. A diminished QOL is associated with increased psychological distress and may lead to an increased demand on the healthcare system.[22]

Table 5 Characteristics of respondents with symptoms suggestive of a functional gut disorder compared to respondents without suggestive symptoms

Parameter, *n* (%)	Functional gut disorder[†] (*n* = 64)	None (*n* = 210)	*P*-value
Age (years), median, IQR	35, 28–49	37, 27–52	0.57
Female	48 (77.4)	162 (77.5)	>0.99
Ethnicity			
Caucasian	37 (78.7)	126 (71.2)	0.47
Asian	9 (19.2)	48 (27.1)	0.27
African	1 (2.1)	3 (1.7)	>0.99
Occupation			
Doctor	9 (14.0)	38 (18.2)	0.57
Nurse	49 (76.6)	132 (63.2)	0.049
Allied health and other	6 (9.4)	39 (18.7)	0.086
Regular working hours	23 (42.6)	81 (45.0)	0.88
Herbal medication	4 (6.3)	26 (12.5)	0.25
Alcohol ≥4 STD per week	10 (15.6)	50 (23.8)	0.23
Fruit/vegetables servings per day, mean (SD)	2.9 (1.3)	3.1 (1.3)	0.47
Current or past smoker	19 (29.7)	56 (26.7)	0.63
Red meat ≥2 days per week	43 (67.2)	129 (61.4)	0.46
Sleep <8 h per night	42 (65.6)	138 (65.7)	>0.99
Often stressed	59 (92.2)	163 (77.6)	0.010
Easily stressed	42 (65.6)	101 (48.1)	0.015

[†]Using Rome III criteria for diagnosis, not including endoscopic criteria.

This study is the first to show that Asian ethnicity may be protective for GI symptoms and FGIDs in Australian healthcare workers. This has not been reflected in the literature, although the prevalence of FGID in one Asian population was reported as 26%.[23] A previous study showed that affluent parts of Asia had a higher prevalence of IBS than South Asia but did not significantly differ from prevalence in Western studies.[24] Differences in diet, perception of symptoms, and attitudes toward seeking healthcare due to cultural background may partly explain differences in presentation, treatment, and outcomes.[25] Additionally, a 2018 study by Siah et al. found that Western-developed diagnostic criteria may fail to identify symptom clusters in Asian patients with the same success as English-speaking countries.[26,27] Whether or not this effect is carried over into the healthcare setting would require further investigation.

Other risk factors found in this study are in keeping with prior studies. Women and respondents who had irregular working hours were more likely to experience GI symptoms.[7,8,28] Interestingly, dietary intake (including fruit/vegetable and red meat intake), alcohol consumption, smoking, and reduced sleep were not associated with reported GI symptoms, which is largely in keeping with the current literature, although some studies have shown large-volume alcohol consumption to aggravate FGID symptoms and smoking associated with a higher risk of functional dyspepsia.[29,30] The lack of correlation between reduced sleep and worsening of symptoms, however, is in contrast with the current literature specifically related to healthcare workers.[13–15] Studies looking particularly at smoking and alcohol, however, largely failed to correct for confounding factors, and further investigation is needed.[29]

Interestingly, of respondents with regular working hours, doctors were less likely to experience symptoms compared with nurses and allied health professionals, yet there was no difference among respondents with irregular working hours. This suggests that the work of nurses and allied health professionals may harbor additional risk factors for GI symptoms beyond the irregularity of shift-based work.

The association with psychological symptoms or mood disorders with FGIDs remains contentious.[9,31] In our study, higher perceived levels of stress were independently associated with GI symptoms after adjusting for relevant confounding factors such as regularity of working hours. Irregular and long working hours may contribute to increased levels of stress and increased cortisol levels,[32] which may be associated with various symptoms of FGIDs.[12,33]

There are several limitations in this study. This was a single-center study and therefore the findings may have limited external validity. The cross-sectional design of the study prohibits any associations from being taken as causative. The nature of survey-based research introduces the risk of selection bias, with the potential for those suffering symptoms to be more likely to participate than those without symptoms. Given the subjective nature of many of the symptoms, it is certainly prone to affirmation bias. There was a predominance of female respondents, which demonstrates a degree of selection bias. A questionnaire for depression and anxiety was not included, and as such cannot be definitively ruled out in the participants. A cost analysis was not undertaken in this study. Rome III criteria were used instead of the latest Rome IV criteria in this study. This was because the frequency of FGID was substantially lower with the Rome IV criteria, suggesting that these more restrictive criteria might be less suitable than Rome III criteria for population-based epidemiological surveys.[34,35]

Conclusion

FGIDs are a common problem among healthcare workers, and the frequency may be understated in the current literature. This is

the first population-based survey using Rome III criteria to evaluate FGIDs among healthcare workers in Australia. FGIDs were identified in one in four hospital workers, and GI symptoms occurred in over half of the respondents. We found that being easily stressed or often feeling stressed increased the likelihood of having GI symptoms and FGIDs. Females, those with irregular working hours, and non-Asians were more likely to have GI symptoms. Preventative strategies should be considered in healthcare professionals who may have high-stress jobs with unpredictable working hours, and any investments here are likely to reap dividends with healthier, happier staff and reduced absenteeism.

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Supporting information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. A multivariable model predicting GI symptoms including early satiety, epigastric pain, or characteristic abdominal pain experienced at least 3 days per month in the last 3 months.

Table S2. A multivariable model predicting symptoms suggestive of a functional gut disorder.

Data S1. Supporting Information.