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The Bidirectional Link Between Mental Health Conditions and Functional Gastrointestinal Disorders Among Medical Students: A Cross-Sectional Study in KPK

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ABSTRACT

Functional gastrointestinal disorders are common among medical students worldwide, but little is known about how common they are in KPK, Pakistan. **Objective:** To find out how common FGIDs are among KPK medical students and investigate their connections to other mental health conditions. **Methods:** This cross-sectional study assessed the FGIDs and mental health of medical students in KPK, Pakistan, using the Rome IV criteria, GAD-7, and PHQ-9 scales. **Results:** The study found that 162 medical students (104 men and 58 females) with a median age of 18 (between 18 and 25) had an 11.7% FGID frequency (females 15.52% vs. males 9.62%), with GERD (12.3%) and IBS (27.5%) being the most common conditions, followed by FD (2.5%). Additionally, the IBS-FD, GERD-FD, GERD-IBS-FD, and GERD-FD overlapping distributions were 1.2%, 6.2%, 1.9%, and 1.2%, respectively. The prevalence of GAD and MDD were 17.9% and 22.2%, respectively. Multivariable logistic regression analysis revealed that the prevalence of GERD alone was significantly greater in MDD patients than in non-MDD patients ($p<0.01$). With p-values of 0.042 and 0.001, respectively, FD alone also showed a strong association with MDD and GAD. Additionally, a significant connection ($p = 0.024$) was seen between IBS and GAD. Participants with GAD showed the highest overlap between FD, IBS, and GAD ($p = 0.02$). **Conclusions:** FGIDs were rather common among the medical students in this study (11.7%). Furthermore, these results imply that MDD is linked to FGIDs and OS among Pakistani KPK medical students.

INTRODUCTION

Irritable Bowel Syndrome (IBS), non-organic bloating, non-organic constipation, functional diarrhea, and non-specified functional digestive illness are among the many conditions that fall within the broad category of functional gastrointestinal disorders. These disorders are the most common, affecting up to 40% of the broader population across the globe [1]. These disorders typically manifest as chronic symptoms, often exhibiting significant overlap across symptoms [2]. Recent research indicates that the progression of these disorders is associated with specific physiological processes like the gut-brain connection, protracted infections, inherited factors, gut flora, and antibiotic use [3, 4]. Since its establishment in 1992, Physicians worldwide have been evaluating FGIDs primarily using the Rome IV criteria [5, 6]. Like other nations, Pakistan is seeing a rise in concern regarding FGIDs; yet, the lack of information indicates that the problem is still being ignored. It is yet unknown how common all FGIDs are in Pakistan. Irritable Bowel Syndrome (IBS), the most common FGID in the country, has a 33.2% incidence rate, according to one study [7]. Stress, sleep disruptions, and an established family record of IBS are all strongly correlated with the identification of functional IBS in college students, with a frequency of 15.5% [8]. Female participants exhibited more intense manifestations; s, however, most of the males suffering from constipation

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used medications to alleviate the symptoms [9]. In a tertiary care facility, functional constipation affected around 37.5% of the children aged 2 to 14 [10]. There is little information available on the health of FGID patients in Pakistan. Furthermore, not enough research has been done on the impact of locally performed endoscopic examinations on mental health. According to one study, the prevalence of IBS is 14% higher in males than in women [11]. Studies have assessed how common IBS is among medical staff and students [12].

Since there were fewer research on FGIDs in Pakistan than in other Asian countries, a cross-sectional survey was designed to ascertain the prevalence of FGIDs in a Pakistani community.

METHODS

Medical and dental students from various medical colleges in KPK, Pakistan, were to participate in the study. The study was conducted over a three-month period from 1st November 2024 to 1st January, 2025. Data was collected from the representative sample using a standardized, structured, self-administered questionnaire. The inclusion criteria were all medical students (MBBS and BDS) aged over 18 from 1st year to final year, as well as those who were able to read and write in English. In addition, those students who were willing to participate in the study and completed the questionnaire without any missing data. The exclusion criteria were as follows: 1) students who failed to give informed consent; 2) students who did not complete the online survey or who provided inadequate responses; and 3) students with a history of any chronic gastrointestinal disorder. Through an internet platform, our study disseminated a standardized questionnaire to all medical students in the province. The questionnaire was designed to cover the following five components: (1) Demographic characteristics such as age, sex, and BMI. (2) lifestyle habits covering breakfast habits, intake of fruits and vegetables, consumption of junk food and carbonated drinks, academic time, non-academic activities, smoking habit; (3) sleep patterns including sleep schedule, total sleep length, personal evaluation of sleep quality (good/poor); (4) Rome IV criteria was used to determine different gastrointestinal concerns including reflux, heartburn, visceral pain, upper abdominal burning, meal-induced bloating, premature satiety, chronic gut discomfort linked to defecation patterns, the occurrence rate, and persistence of these symptoms, and questions related to the different symptoms of IBS were separately asked in the questionnaire. The questionnaire also inquired about the characteristics of bowel movements, such as alterations in bowel movements over the past year, infections that preceded these changes, and total bowel movements recorded on a weekly basis. The stool's consistency was assessed using the validated Bristol stool scale [13]. A family history of inflammatory bowel disease, unintended weight loss (≥ 6 kg) during the previous three months, and any chronic gastrointestinal bleeding were also inquired about; (5) mental health status was assessed using the English versions of the Generalized Anxiety Disorder Assessment (GAD-7) and Patient Health Questionnaire-9 (PHQ-9) [14–16]. The online form took an average of eight to ten minutes to complete. A convenient non-probability sampling method was used to gather data from the representative sample. The Rome IV criteria were used to diagnose students with common FGIDs, including as GERD, non-organic diarrhea, and IBS [17]. GERD was diagnosed based on the occurrence of usual heartburn and regurgitation two or more times per week, as recommended globally by the World Gastroenterology Organization [18]. In this study, generalized anxiety disorder (GAD) was diagnosed with a GAD-7 score of ≥10, while major depressive disorder (MDD) was identified with a PHQ-9 threshold of ≥10 [19, 20]. [20] As a diagnostic tool, the GAD-7 cutoff of ≥10 demonstrated an 89% true-positive rate and an 82% true-negative rate for diagnosing GAD. For the diagnosis of MDD, the PHQ-9 cutoff of ≥13 showed 68% sensitivity and 92% specificity [21, 32]. To calculate the sample size for this investigation, the OpenEpi calculator was utilized. An ideal prevalence (P) of 0.10 was selected based on a previous study by Tran et al., [23]. 141 participants was deemed to be an adequate sample size, with a 95% confidence level and a 0.05 margin of error (d). An Excel spreadsheet (Microsoft Office 2013) was used to organize the data, and IBM SPSS (software version 29) was used to analyze it. A chi-square test was employed as a descriptive test, and different variable numbers were allocated to perform different logistic regression and descriptive tests. Multiple logistic regression tests were used to evaluate the relationship between FGIDs, GADs, and MDD among medical students from various medical colleges.

RESULTS

Medical students from various colleges were given a comprehensive survey, to which 162 respondents responded. The group consisted of 58 women and 104 men, with a median age of 18 (ranging from 18 to 25). According to the PHQ-9 and GAD-7 measures, Table 1 indicates that 17.9% of the participants (n=29) had Generalized Anxiety Disorder (GAD) and 22.2% (n=36) had Major Depressive Disorder (MDD).

Table 1: Demographic Profile of the participants with FGIDs and those without FGIDs

Variables	Non-FGIDs (n=143) Frequency (%) / Median (Range)	FGIDs (n=19) Frequency (%) / Median (Range)	Total	p-Value
Gender				
Male	95 (66.4%)	9 (47.3%)	104	0.086

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Female	48 (33%)	10 (52.6%)	58	
Age	22 (18-25)	22 (18-25)	22 (18-25)	0.037
Breakfast Habit (Irregular)	53 (37%)	11 (57.8%)	-	0.06[a]
Academic Time	-	-	-	0.377[a]
Morning Till After Noon	70 (48%)	8 (42.8%)	78	-
Evening Till Late Night	73 (51%)	11 (57.8%)	84	-
Non-Academic Activities	79 (55.2%)	7 (36%)	76	-
Smoking	4 (2.79%)	1 (5.2%)	5	0.469[a]
Sleep After Midnight	136 (93%)	18 (99%)	155	0.034
Junk/Fast Food Once A Day	25 (17.4%)	11 (57.8%)	36	<0.001
Fruit/Salad >Once /Day	44 (30.7%)	2 (15.7%)	46	0.034
Non-Vegetarian >Once/Day	17 (11.8%)	12 (63.15%)	29	<0.001
Carbonated Drinks >Once/Day	23 (16%)	10 (52.6%)	33	0.004
Independent Living	17 (11.88%)	2 (10.5%)	19	0.610[a]
GAD-7	22 (15.38%)	7 (36.8%)	162	0.031[a]
PHQ-9	28 (19.5%)	8 (42.1%)	162	0.486 0.004[b]

Values: a=Fisher Exact Test b=Linear by Linear Association

Frequency of different Functional Gastrointestinal conditions (GERD, FD, and IBS) Among Medical Students across Various Colleges:

It was clear from the data analysis that GERD and FGIDs were common in the student body. Overall, we found that 12.3% of participants had GERD. The prevalence of IBS was reported to be 27.8%. The overlap in prevalence for GERD-FD, GERD-IBS, IBS-FD, and GERD-IBS-FD was 2.1%, 6.2%, 1.9%, and 1.2%, respectively, as table 2 further illustrates.

Table 2: Frequency of Different FGIDs among the Desired Sample

GIT Disorders	Prevalence (%)
GERD	12.3%
FD	2.5%
IBS	27.8%
GERD and FD	2.1%
GERD and IBS	6.2%
IBS and FD	1.9%
GERD\IBS\FD	1.2%

GERD: Gastrointestinal Reflux Disease; FD: Functional Dyspepsia; IBS: Irritable Bowel Syndrome.

The bidirectional link Between Mental Health Conditions and Gastrointestinal Disorders:

The frequency of gastrointestinal illnesses was compared across various psychiatric states in Table 3. Three groups of patients were formed based on the presence or absence of gastrointestinal problems: 2) individuals who only met the criteria for one of the gastrointestinal disorders mentioned above; 3) individuals who experienced overlapping conditions, signifying situations in which two or three different functional digestive disorders occurred at the same time; and 4) individuals who did not meet the criteria for FD, IBS, or GERD. GERD was much more common in those with MDD than in those without MDD ($p<0.01$). Similarly, FD alone showed a strong connection with both MDD and GAD, with p-values of 0.042 and 0.001, respectively. Additionally, a strong association between GAD and IBS was discovered ($p=0.024$). Among GAD subjects, the overlap of FD, IBS, and GAD was most commonly observed ($p=0.02$).

Table 3: Comparative Study of Different Gastrointestinal Disorders across Different Psychological Conditions

Variables	Non-GAD (n = 133) Frequency (%)	GAD (n = 29) Frequency (%)	p-Value*	Non-MDD (n = 126) Frequency (%)	MDD (n = 36) Frequency (%)	p-Value
Non-GERD/FD/IBS	117 (87.96%)	25 (96.15%)	0.794	125 (99.2%)	33 (91.66%)	0.07
GERD Alone	16 (12.03%)	4 (13.7%)	0.504	1 (0.7%)	3 (8.3%)	0.01
FD Alone	20 (15.03%)	9 (31%)	0.042	16 (12.6%)	13 (36.11%)	0.001
IBS Alone	32 (24%)	13 (44.8%)	0.024	31 (24.6%)	14 (36.5%)	0.09
Overlap GERD-FD	1 (0.7%)	3 (10.3%)	0.003	1 (0.7%)	3 (8.3%)	0.01
Overlap GERD-IBS	1 (0.7%)	3 (10.3%)	0.003	1 (0.7%)	3 (8.3%)	0.01
Overlap FD-IBS	11 (8.2%)	6 (20.6%)	0.048	8 (6%)	9 (25%)	0.001
Overlap GERD-FD-IBS	1 (0.70%)	2 (6%)	0.026	1 (0.7%)	2 (5%)	0.045

GERD: Gastrointestinal Reflux Disease; FD: Functional Dyspepsia; IBS: Irritable Bowel Syndrome; GAD: Generalized Anxiety Disorder; MDD: Major Depressive Disorder

Predictors of FGIDs among Medical Students: Insights from a Binary Logistic Regression Model:

The multivariable logistic regression analysis in Table 4 showed that medical students with Generalized Anxiety Disorder (GAD) and Major Depressive Disorder (MDD) had a significantly higher risk of developing Functional Gastrointestinal Disorders (FGIDs) ($p<0.05$).

Table 4: Results from Multivariable Logistic Regression Analysis for Students with FGIDs

Predictors	Multivariable		p-Value
	Adjusted Odd Ratio	95% CI	
Gender	0.705	0.223-2.227	0.103
BMI	3.191	0.453-10.592	0.021
Lack of Extracurricular Activities	0.483	0.152-1.529	0.131

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Sleep After Mid Night	0.891	0.891-0.273	0.013
Poor Sleep Quality	0.999	0.156-3.98	-
Junk/Fast Food Once /Day	2.9	2.13-6.7	0.034
Fruit/Salad Once/Day	0.37	0.14-1.1	0.75
Non-Vegetarian>Once /Day	6.9	3.23-9.13	0.002
Carbonated Drinks>Once/Day	1.5	0.15-2.45	0.083
GAD	0.335	0.506-7.373	0.022
MDD	0.308	1.91-7.04	0.026

OR: Odd Ratio; CI: Confidence Interval; GAD: Generalized Anxiety Disorder; MDD: Major Depressive Disorder.

Predictors of Overlap FGIDs among Medical Students: Insights from a Binary Logistic Regression Model:

Using a multivariable logistic regression model (binary logistic regression), overlapping gastrointestinal disorders (GERD, FD, and IBS) were found to be significantly associated with Generalized Anxiety Disorder (GAD) and Major Depressive Disorder (MDD, as measured by PHQ-9). In particular, the p-value for MDD was 0.04 and that of GAD was 0.02. As seen in table 5, other covariates did not exhibit significant relationships.

Table 5: Results from Multivariable Logistic Regression Analysis for Students with Overlap Gastrointestinal Disorders

Predictors	Multivariable		p-Value
	Adjusted Odd Ratio	95% CI	
Gender	2.684	0.15-48.127	0.928
Lack of Extracurricular Activities	0.325	0.20-9.247	0.489
Living Alone	3.179	0.67-20.7	0.240
Sleep After Mid Night	6.5	0.9-48.55	0.06
Poor Sleep Quality	2.1	0.1-3.5	0.3
Junk/Fast Food >Once/Day	3.6	2.23-5.5	0.037
Fruit /Salad >Once /Day	0.34	0.7-2.3	0.68
Non-vegetarian >once /day	5.9	3.34-8.76	<0.001
Carbonated Drinks >Once/Day	1.11	0.19-2.83	0.076
GAD	5.109	0.144-220	0.02
MDD	8.077	4.4-32.4	0.04

DISCUSSION

Based on Rome IV criteria, the study offers detailed information on the frequency of FGIDs among students at several medical schools in KPK, Pakistan. The impact of food habits, lifestyle decisions, and different mental health conditions on the prevalence of FGIDs was also discussed in the study. The overall frequency of FGIDs in this study was 11.7%, with the most common conditions being GERD (12.3%) and IBS (27.5%), followed by FD (2.5%). Numerous investigations conducted worldwide have found varying rates of FGIDs in the youth population. The prevalence of FGIDs was 40.3%, according to a global study that included online surveys in 33 countries [22]. The frequency of FGIDs in Asian youth has not been extensively studied. 10.3% of Vietnamese medical students had FGIDs, with 5.5% suffering from irritable bowel disease and 6.5% from functional dyspepsia, per a recent study [23]. Another study among Indian students revealed an overall prevalence of FGIDs of 26.9%, with FD (15.2%) and IBS (6.2%) being the most common, followed by FC (2.1%) [24]. This study showed a higher rate of FD, but a lower rate of IBS as compared this study. This variation in the prevalence of various FGID categories may be caused by environmental, genetic, cultural, and dietary variables. The Rome IV criteria has not adequately classified the overlapping FGID conditions, such as FD-IBS and GERD-FGIDs. Although these overlapping conditions are quite prevalent in the general population and appeared to be separate phenomena, this study found that the OS for GERD-FD was 1.2%, GERD-IBS was 6.2%, IBS-FD was 1.2%, and GERD-IBS-FD was 1.2%. GERD and FGIDs, with a prevalence of 3% among Vietnamese students, align with these results [23, 25]. Mental disorders, particularly depression and anxiety, are increasingly common among young adolescents [26]. A 2015 meta-analysis found that mental diseases are more common among children and teenagers. This study, which aggregated data from 27 countries, found that the pooled prevalence of any anxiety condition was 6.5% and the pooled prevalence of Major Depressive Disorder (MDD) was 1.3% [27]. Mental health risks rise significantly during the transition from adolescence to young adulthood compared to younger age groups [28]. In this study, the prevalence of generalized anxiety disorder (GAD) and MDD among medical students was 17.9% and 22.2%, respectively. 6.8% of newly enrolled medical students in Vietnam had GAD and 10.2% had MDD, according to a comparable study [29]. With a 12-month incidence of 18.5%, MDD was the most common disorder among newly enrolled college students, followed by GAD at 16.7%, according to data from the WHO World Mental Health International College Student Project, which polled students from 19 universities in Australia and other Western nations [29]. Nonetheless, Asian societies frequently have lower rates of these mental health conditions than do Western nations [30, 31]. This study's MDD prevalence was much higher than the overall Pakistani community's prevalence of 27.8% [32]. The elevated prevalence of MDD among medical students in the research may be attributed to factors such as academic stress and poor sleep quality [33]. Prior studies have generally recognized the link between various gastrointestinal disorders and mental health issues. The general population has lower rates of anxiety and depression than people with FGIDs, like FD and IBS, according to systematic reviews [34]. These studies, however, did not differentiate between individuals with FGIDs alone or those with overlapping symptoms, which may have compromised the true influence of mental health conditions on the presence of different gastrointestinal illnesses. Clearly, these

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findings demonstrated a substantial correlation between MDD and GERD alone, FD alone, and the overlap between GERD-FD and FD-IBS, but not with IBS alone. On the other hand, GAD was significantly associated with FD alone, IBS alone, and overlapping FGIDs. This study also illustrated a connection between FD-IBS and depression, which is consistent with a Korean study that used Rome IV criteria and discovered a greater prevalence of depression in FD-IBS overlap patients compared to those without overlap [35]. In this study, the occurrence of FGIDs tends to be more in females as compared to males (15.52% vs. 9.62%). Notably, sex -specific differences in FGID rates are not yet fully understood [36]. However, some research on FGIDs among students found that women were more likely than males to have these illnesses, especially IBS [37]. Furthermore, studies have revealed that compared to men, women with FD-IBS overlap experience more severe gastrointestinal symptoms and sadness [38]. Furthermore, FGIDs and the post-midnight sleep schedule were revealed to be significantly correlated by the study. According to earlier studies, FGID symptoms can arise and worsen as a result of circadian rhythm disturbances, irregular sleep patterns, inadequate sleep, eating late at night, being exposed to stressful situations late at night, and the influence of psychological factors on sleep disturbances [39]. These findings illustrated the need of enough sleep for gastrointestinal symptoms and health. This study also identified several dietary risk factors linked to the development of functional gastrointestinal disorders (FGIDs). Multivariate analysis revealed that a higher incidence of FGIDs was independently linked to eating junk food and a non-vegetarian diet more frequently each day. The correlation with FGID symptoms may be explained by the high protein content of a non-vegetarian diet, which may elicit an immune response [40]. The link between junk food and FGIDs may also be due to the fact that foods high in fat may change the motility of the intestines and saturated lipids may change the gut microbiota, making a person more likely to become overweight, which is strongly linked to FGIDs on its own. Human health is also negatively impacted by a diet low in fiber and heavy in salts, spices, and preservatives [41, 42]. Numerous studies have also connected fast food consumption to FGIDs [43, 44]. Also, regular consumption of fruits and vegetables has appeared to be protective against FGIDs [45]. However, the study lacks this association. Further studies regarding the intake of fruits and vegetables in relation to FGIDs are needed to ascertain this association. There are few limitations to this study. First, the diagnosis was made through clinical criteria. Structural abnormalities and other pathologies whose symptoms mimic FGIDs and GERD were not excluded through endoscopic investigations. Another constraint was that an unequal gender distribution (male 64% vs. female 36%) were experienced. Additionally, a self-reported questionnaire was used, there was a chance of underreporting or exaggerating disease-related data. This study only includes medical students, which does not reflect the true burden of FGIDs among KPK's local population. However, analysis of this study became important as students were included from all the medical colleges throughout the province. Future research with a larger sample size is necessary to allow for a more thorough examination of the connection between mental health conditions and FGIDs.

CONCLUSIONS

The current study investigated the prevalence of Functional Gastrointestinal Disorders (FGIDs) among medical students in Khyber Pakhtunkhwa (KPK), Pakistan, using the Rome IV criteria. The findings indicated that a noteworthy 11.7% of these pupils had FGIDs. Additionally, this research demonstrated an association between Major Depressive Disorder (MDD), FGIDs, and Occupational Stress (OS) among medical students in KPK, Pakistan.

Authors Contribution

Conceptualization: MS
Methodology: SAK
Formal analysis: EUH, MAK
Writing, review and editing: SK, HA, SI

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Black CJ, Drossman DA, Talley NJ, Ruddy J, and Ford AC. Functional gastrointestinal disorders: advancements in understanding and management. The Lancet. 2020; 396(10263): 1664-74. doi: 10.1016/S0140-6736(20)32115-2.

[2] Ghoshal UC, Singh R, Chang FY, Hou X, Wong BC, Kachintorn U. Facts and fiction: Epidemiology of uninvestigated and functional dyspepsia in Asia. Journal of Neurogastroenterology And Motility. 2011 Jul; 17(3): 235. doi: 10.5056/jnm.2011.17.3.235.

[3] Holtmann G., Shah A., and Morrison M. Pathophysiology of functional gastrointestinal disorders: a holistic overview. Digestive Diseases. 2018 Mar; 35(Suppl. 1): 5-13. doi: 10.1159/000485409.

[4] Paula H, Grover M, Halder SL, Locke III GR, Schleck CD, Zinsmeister AR *et al.* The study focuses on

DOI: https://doi.org/10.54393/pbmj.v8i3.1221

nonenteric infections, the use of antibiotics, and the likelihood of developing functional gastrointestinal disorders. Neurogastroenterology & Motility. 2015 Nov; 27(11): 1580-6. doi: 10.1111/nmo.12655.

[5] Lacy BE and Patel NK. Rome criteria, and a diagnostic approach to irritable bowel syndrome. Journal of clinical medicine. 2017 Oct; 6(11): 99. doi: 10.3390/jcm6110099.

[6] Aziz I, Törnblom H, Palsson OS, Whitehead WE, Simrén M. How the change in IBS criteria from Rome III to Rome IV impacts on clinical characteristics and key pathophysiological factors? Official journal of the American College of Gastroenterology ACG. 2018 Jul; 113(7): 1017-25. doi: 10.1038/s41395-018-0074-z.

[7] Bachani P, Kumar L, Kumar N, Fatima M, Naz S, Memon MK *et al*. Prevalence of irritable bowel syndrome and frequency of symptoms in the general population of Pakistan. Cureus. 2021 Jan; 13(1). doi: 10.7759/cureus.12541.

[8] Tauseef H, Siddque H, Akhtar M, Hurera A. Frequency of irritable bowel syndrome (IBS) and its risk factors among MBBS students of Allama Iqbal Medical College, Lahore. Pakistan Journal of Medicine Health Science. 2021; 15: 2062-7. doi: 10.53350/pjmhs211572062.

[9] Mawani M, Azeem A, Gheewala S, Butt N, Abid S. Understanding constipation: A cross-sectional study from a developing country setting. JCPSP: Journal of the College of Physicians and Surgeons—Pakistan. 2019; 29(3): 284. doi: 10.29271/jcpsp.2019.03.284.

[10] Muhammad S., Nawaz G., Jamil I, Rehman AU, Hussain I, and Akhter S. Pediatric patients with lower urinary tract symptoms often experience constipation. Journal of the College of Physicians and Surgeons Pakistan. 2015 Nov; 25(11): 815.

[11] Jafri W, Yakoob J, Jafri N, Islam M, Ali QM. Irritable bowel syndrome and health seeking behavior in different communities of Pakistan. Journal of Pakistan Medical Association. 2007; 57(6): 285.

[12] Naeem SS, Siddiqui EU, Kazi AN, Memon AA, Khan ST, and Ahmed B. Prevalence and factors associated with irritable bowel syndrome among medical students of Karachi, Pakistan: a cross-sectional study. Notes from BMC research. 2012 Dec; 5: 1-5. doi: 10.1186/1756-0500-5-255.

[13] Riegler G, Esposito I. The Bristol scale stool form remains a valuable tool in both medical practice and clinical research. Tech Coloproctol. 2001 Dec; 5: 163-4. doi: 10.1007/s101510100019.

[14] Hammer J, Eslick GD, Howell SC, Altiparmak E, Talley NJ. Diagnostic yield of alarm features in irritable bowel syndrome and functional dyspepsia. Gut. 2004 May; 53(5): 666-72. doi: 10.1136/gut.2003.021857.

[15] Ngoc TL, Le MA, Nguyen HT, Vo HV, Le NQ, Tang LN *et al*. Patient Health Questionnaire (PHQ-9): A depression screening tool for people with epilepsy in Vietnam. Epilepsy & Behavior. 2021 Dec; 125: 108446. doi: 10.1016/j.yebeh.2021.108446.

[16] Mughal AY, Stockton MA, Bui Q, Go V, Ha TV, Pence BW *et al*. Validation of screening tools for common mental health disorders in the methadone maintenance population in Hanoi, Vietnam. BMC psychiatry. 2021 Dec; 21: 1-9. doi: 10.1186/s12888-021-03493-8.

[17] Palsson OS, Whitehead WE, Van Tilburg MA, Chang L, Chey W, Crowell MD *et al*. Development and validation of the Rome IV diagnostic questionnaire for adults. Gastroenterology. 2016 May; 150(6): 1481-91. doi: 10.1053/j.gastro.2016.02.014.

[18] Hunt R, Armstrong D, Katelaris P, Afihene M, Bane A, Bhatia S *et al*. World gastroenterology organization global guidelines: GERD global perspective on gastroesophageal reflux disease. Journal of clinical gastroenterology. 2017 Jul; 51(6): 467-78. doi: 10.1097/MCG.0000000000000854.

[19] Garabiles MR, Lao CK, Yip P, Chan EW, Mordeno I, Hall BJ. Psychometric validation of PHQ-9 and GAD-7 in Filipino migrant domestic workers in Macao (SAR), China. Journal of personality assessment. 2020 Nov; 102(6): 833-44. doi: 10.1080/00223891.2019.1644343.

[20] Manea L, Gilbody S, McMillan D. Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): a meta-analysis. C major. 2012 Feb; 184(3): E191-6. doi: 10.1503/cmaj.110829.

[21] Villarreal-Zegarra D, Barrera-Begazo J, Otazú-Alfaro S, Mayo-Puchoc N, Bazo-Alvarez JC, Huarcaya-Victoria J. Sensitivity and specificity of the Patient Health Questionnaire (PHQ-9, PHQ-8, PHQ-2) and General Anxiety Disorder scale (GAD-7, GAD-2) for depression and anxiety diagnosis: a cross-sectional study in a Peruvian hospital population. BMJ open. 2023 Sep; 13(9): e076193. doi: 10.1136/bmjopen-2023-076193.

[22] Sperber AD, Bangdiwala SI, Drossman DA, Ghoshal UC, Simren M, Tack J *et al*. Worldwide prevalence and burden of functional gastrointestinal disorders, results of Rome Foundation Global Study. Gastroenterology. 2021 Jan; 160(1): 99-114. doi: 10.1053/j.gastro.2020.04.014.

[23] Tran TTT, Luu MN, Tran LL, Nguyen D, Quach DT, Hiyama T. Vietnamese new-entry medical students exhibit a correlation between mental health conditions and functional gastrointestinal disorders. PLoS One. 2023 Jul; 18(7): e0289123. doi: 10.1371/journal.pone.0289123.

DOI: https://doi.org/10.54393/pbmj.v8i3.1221

[24] Goyal O., Nohria S., Dhaliwal AS, Goyal P., Soni RK, Chhina RS *et al.* The study examined the prevalence, overlap, and risk factors for Rome IV functional gastrointestinal disorders among college students in northern India. Indian Journal of Gastroenterology, April 2021, 40: 144-53. doi: 10.1007/s12664-020-01106-y.

[25] Kaji M, Fujiwara Y, Shiba M, Kohata Y, Yamagami H, Tanigawa T *et al.* Prevalence of overlaps between GERD, FD and IBS and impact on health-related quality of life. Journal of gastroenterology and hepatology. 2010 Jun; 25(6): 1151-6. doi: 10.1111/j.1440-1746.2010.06249.x.

[26] Centers for Disease Control and Prevention. Anxiety and depression in children: Get the facts. Atlanta, GA: CDC; 2022.

[27] Polanczyk GV, Salum GA, Sugaya LS, Caye A, Rohde LA. Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. Journal of child psychology and psychiatry. 2015 Mar; 56(3): 345-65. doi: 10.1111/jcpp.12381.

[28] Brice L, Zdanowicz N, de Becker E, de Timary P, and Lorant V. Adolescents in Transition to Young Adulthood: Evolution of Mental Health Status and Risk Factors Associated with Depressive and Anxiety Disorder. Psychiatria Danubina. 2019 Sep; 31(suppl 3): 371-5.

[29] Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P *et al.* WHO world mental health surveys international college student project: Prevalence and distribution of mental disorders. Journal of abnormal psychology. 2018 Oct; 127(7): 623. doi: 10.1037/abn0000362.

[30] Kessler RC, Chiu WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Archives of general psychiatry. 2005 Jun; 62(6): 617-27. doi: 10.1001/archpsyc.62.6.617.

[31] Lee S, Tsang A, Zhang MY, Huang YQ, He YL, Liu ZR *et al.* The study examined the lifetime prevalence and inter-cohort variation in DSM-IV disorders in metropolitan China. Psychological medicine. 2007 Jan; 37(1): 61-71. doi: 10.1017/S0033291706008993.

[32] Hira, Shahid., Muhammad, Hasan., Osama, Ejaz., Hashim, Raza, Khan., Muhammad, Usman, Idrees., Mishal, Ashraf *et al.* The Severity of Depression, Anxiety, and Stress: Recommendations from Joint Work of Research Center and Psychology Clinics in COVID-19 Pandemic. Frontiers in Psychiatry, (2022). doi: 10.3389/fpsyt.2022.839542. doi: 10.3389/fpsyt.2022.839542.

[33] Ruyue, Shao., He, Ping., Bin, Ling., Li, Tan., Lu, Xu., Yanhua, Hou *et al.* Prevalence of depression and anxiety and correlations between depression, anxiety, family functioning, social support and coping styles among Chinese medical students. BMC Psychology. 2020. doi: 10.1186/S40359-020-00402-8.

[34] Lee C, Doo E, Choi JM, Jang SH, Ryu HS, Lee JY *et al.* The increased level of depression and anxiety in irritable bowel syndrome patients compared with healthy controls: systematic review and meta-analysis. Journal of neurogastroenterology and motility. 2017 Jul; 23(3): 349. doi: 10.5056/jnm16220.

[35] Coss-Adame E, Rao SS. Brain and gut interactions in irritable bowel syndrome: new paradigms and new understandings. Current gastroenterology reports. 2014 Apr; 16: 1-8. doi: 10.1007/s11894-014-0379-z.

[36] Chang L, Toner BB, Fukudo S, Guthrie E, Locke GR, Norton NJ *et al.* Gender, age, society, culture, and the patient's perspective in the functional gastrointestinal disorders. Gastroenterology. 2006 Apr; 130(5): 1435-46. doi: 10.1053/j.gastro.2005.09.071.

[37] Tan YM, Goh KL, Muhidayah R, Ooi CL, and Salem O. Prevalence of irritable bowel syndrome in young adult Malaysians: a survey among medical students. Journal of gastroenterology and hepatology. 2003 Dec; 18(12): 1412-6. doi: 10.1046/j.1440-1746.2003.03212.x.

[38] Nam K, Kim N, Song HJ, Baik GH, Choi SC, Kim HJ et al. Gender difference in the overlap of irritable bowel syndrome and functional dyspepsia: a prospective nationwide multicenter study in Korea. Journal of Gastroenterology. 2021 Jun; 56: 537-46. doi: 10.1007/s00535-021-01775-2.

[39] Orr WC, Fass R, Sundaram SS, and Scheimann AO. The impact of sleep on gastrointestinal functioning in prevalent digestive disorders is a topic of discussion. The Lancet Gastroenterology & Hepatology. 2020 Jun; 5(6): 616-24. doi: 10.1016/S2468-1253(19)30412-1.

[40] Chey WD. The role of food in the functional gastrointestinal disorders: introduction to a manuscript series. Official journal of the American College of Gastroenterology| ACG. 2013 May; 108(5): 694-7. doi: 10.1038/ajg.2013.62.

[41] Cani PD, Everard A. Talking microbes: when gut bacteria interact with diet and host organs. Molecular nutrition and food research. 2016 Jan; 60(1): 58-66. doi: 10.1002/mnfr.201500406.

[42] Chouliaras G, Kondyli C, Bouzios I, Spyropoulos N, Chrousos GP, Roma-Giannikou E. Dietary habits and abdominal pain-related functional gastrointestinal disorders: a school-based, cross-sectional analysis

DOI: https://doi.org/10.54393/pbmj.v8i3.1221

of Greek children and adolescents. Journal of neurogastroenterology and motility. 2019 Jan; 25(1): 113. doi: 10.5056/jnm17113.

[43] Shau JP, Chen PH, Chan CF, Hsu YC, Wu TC, James FE I *et al.* Fast foods-are they a risk factor for functional gastrointestinal disorders? 2016: 393-401.

[44] Schnabel L, Buscail C, Sabate JM, Bouchoucha M, Kesse-Guyot E, Alles B *et al.* Association between ultra-processed food consumption and functional gastrointestinal disorders: results from the French NutriNet-Santé cohort. Official journal of the American College of Gastroenterology| ACG. 2018 Aug; 113(8): 1217-28. doi: 10.1038/s41395-018-0137-1.

[45] Tabibian SR, Hajhashemy Z, Shaabani P, Saneei P, Keshteli AH, Esmaillzadeh A *et al.* The association exists between the consumption of fruits and vegetables and functional dyspepsia in adults. Neurogastroenterology & Motility. 2021 Sep; 33(9): e14129. doi: 10.1111/nmo.14129.