

## Original Research Article

# Prevalence of Irritable Bowel Syndrome and Associated Factors Among Patients with Migraine Attending Dubai Health Authority Clinics: A Cross Sectional Study, Dubai, 2023.

### ABSTRACT

**Aims:** This study aimed to evaluate the prevalence and associated factors of irritable bowel syndrome among migraine patients attending Dubai Health Authority clinics in Dubai. In addition to assess the association between food allergy and migraine.

**Study design:** cross-sectional study

**Place and duration of study:** Dubai health authority clinics, between February and May 2023.

**Methods:** The sample size was 312; it was done through a cross-sectional study through a Google Forms questionnaire distributed among known cases of migraine who are more than 18 years of age attending Dubai Health Authority (DHA) clinics. The survey includes 2 parts: the consent then the questionnaire, which is subdivided into 4 parts: demographics, questionnaire about migraine characteristics, Rome 4 criteria to screen for irritable bowel syndrome, a questionnaire to screen for anxiety and depression using Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). Analysis was done through the IBM SPSS Statistics version 28.0 program.

**Results:** The prevalence of IBS was 36.9% among migraine patients. The prevalence is greater among females, students, and those in the 30-39 age group. It was significantly noticed that those with longer headache duration have a higher prevalence of IBS 52.4% (p-value= 0.050); also, those with a family history of migraine had a higher prevalence of IBS 43.1% (p-value= 0.019). In the food allergy analysis,

27.6% of them had food allergy. We have found that people allergic to citrus, coffee, and dairy products are more likely to develop IBS symptoms. We have found that the prevalence of IBS was higher in those with mild and moderate forms of anxiety and depression.

**Conclusion:** In conclusion, there is an association of IBS in migraine patients attending Dubai Health Authority clinics, but further study is needed.

Keywords: Irritable bowel syndrome (IBS), migraine, depression, anxiety, food allergy.

UNDER PEER REVIEW

## 1. INTRODUCTION

Migraine is a common type of primary headache, which presents with recurrent attacks lasting between 4 and 72 hours, causing moderate to severe unilateral throbbing pain and pulsating in character. It can be associated with nausea, photophobia and phonophobia. It can reduce productivity at work or school and cause significant impairment of daily life [1].

On the other hand, irritable bowel syndrome describes changes in visceral hypersensitivity, GI mobility and altered GI permeability [1]. Clinical features are abdominal pain, bloating and altered bowel habits. There are different subtypes of IBS, such as IBS-C with predominant constipation, IBS-D with diarrhea, and IBS M, which is a mix of both.

The term gut-brain axis is the relationship between the GI system and the CNS, where the brain controls and regulates the function of the GI system. In return, it affects CNS, such as cognition, behaviour, and nociception. It is affected by gut microflora, serotonin pathways, sexual hormones, stress hormones, and diet [2].

There is a significant link between migraine and irritable bowel syndrome (IBS), as observed in various studies conducted globally. In Saudi Arabia, a study with 2802 participants showed that there is a higher likelihood of IBS in migraineurs compared to those without migraine [3]. Studies from Korea and Romania reported a higher incidence of gastrointestinal disorders in migraine patients [4]. It was also noted that the association is higher in females and in students [5-6]. It is, therefore, imperative to study and evaluate the correlation between these two conditions. This research aims to measure the prevalence of IBS in migraine patients and assess the associated factors among the patients who attend Dubai Health Authority clinics among a sample of residents in Dubai from ages 18 and above.

## 2. MATERIALS AND METHODS

It's a retrospective cross-sectional observational study conducted in Dubai Health Authority clinics in Dubai. An online questionnaire was given to the patients attending DHA clinics from February 8 2023 to March 15 2023. The sample size was calculated using the computer program EPI- Info version 7, using the registered population with headache of 3728, 95% confidence interval, 5% degree of precision and 33.1 % estimated prevalence of irritable bowel syndrome among patients with migraine [3], the minimum

sample size required is 312. Data was gathered from 312 patients. The enrolled participants were patients who were 18 years old and older, **both female and male patients**. The study was approved by the Dubai Scientific Research Ethics Committee (DSREC).

An online survey was distributed among known migraine patients in two ways: in the headache clinic at Dubai Health Authority (DHA) and by calling the migraine patients using Electronic Medical Records (EMR) and sending the survey link if they **accepted participating**. The survey was divided into 5 parts: the first focuses on the participants' demographics, and the second assesses the severity measured by The Migraine Disability Assessment Score (MIDAS) [7-8]. The third part is the Rome IV Diagnostic Questionnaire (R4DQ) to evaluate the manifestations of irritable bowel syndrome [9]. The fourth and fifth parts are the Zung Self-Rating Depression Scale (SDS) [10] and the Zung Self-Rating Anxiety Scale (SAS) [11], respectively.

The MIDAS scale is used to assess the severity of migraine - multiple questions about characteristics of migraine where each (YES) equals 1 point. The total points classify the patients into grades. Grade I (scores from 0-5): little or no disability; Grade II (6-10): mild disability; Grade III (11-20): moderate disability; and Grade IV (21 or greater): severe disability [7-8].

In the third section of the questionnaire, we used Rome IV criteria, which has 62.2 sensitivity and a specificity of 97.1% [9]. There are 6 questions: when the patient answers (once a week) or more frequently, (30%) or more in the 2nd to 4th question, and (Yes) for the fifth question, then the patient will be identified as IBS-positive. The sixth question sorts patients into IBS subgroups [3].

The fourth part is depression screening using the Zung Self-Rating Depression Scale (SDS). It consists of twenty items that assess 4 common characteristics of depression: the pervasive effect, the physiological equivalents, other disturbances, and psychomotor activities. The score ranges from 25-100, where (25-49) is expected, (50-59) is mild depression, (60-69) is moderate depression, 70 & above is severe depression [10]. It has a sensitivity of 79.2% and a specificity of 72.2% [12].

Lastly, anxiety screening using the Zung Self-Rating Anxiety Scale (SAS), which has 20 questions based on cognitive, autonomic, motor, and central nervous system manifestations. The lowest mark is 20, and the highest is 80. 20-44 Normal anxiety levels, 45-59 Mild to Moderate, 60-74 Marked to Severe Anxiety, 75 and above Extreme Anxiety Levels [11]. It has 63% sensitivity and 97% specificity [13].

The study got approval from the Dubai Scientific Research Ethics Committee (DSREC) with the approval number (DSREC-SR-02/2023\_02). In addition, it was also approved by Dubai Medical College's head of research ethical committee. A full explanation of the study was included on the survey's front page, and participants gave consent after reading the explanation of the study. Consent and data were gathered in confidence. We used IBM SPSS Statistics for Macintosh, version 28.0 for data analysis. Variables were categorized and described using frequency and percentages. The correlations between the variables were evaluated using the chi-squared ( $\chi^2$ ) test of independence. P value  $\leq 0.050$  was taken as the significance level.

### 3. RESULTS

We have divided migraine patients into two groups based on whether they had IBS or not to compare the two groups. Total responses were 312 patients, and IBS prevalence **in them** was 36.9%. Listing of the samples' sociodemographic characteristics is in Table 1.

Table 1: Descriptive analysis of participants' sociodemographic characteristics.

<b>N= 312</b>	<b>n (%)</b>
<b>Gender</b>	
Female	234 (75%)
Male	78 (25%)
<b>Age Group</b>	
18-29	114 (36.5%)
30-39	106 (34%)
40-49	68 (21.8%)
>50	24 (7.7%)

<b>Marital Status</b>	
Single	111 (35.6%)
Married	180 (57.7%)
Divorced	21 (6.7%)
<b>Nationality</b>	
Emirati	201 (64.4%)
Non-Emirati	111 (35.6%)
<b>Employment</b>	
Full-time >40h/w	190 (60.9%)
Part-time <40h/w	18 (5.8%)
Unemployed	67 (21.5%)
Student	34 (10.9%)
Retired	3 (1%)

The majority were females, with a total of 233 out of which 37.3% showed that they have IBS, compared to 79 male patients, out of which 35.4% had IBS (p value= 0.763). Regarding marital status, 111 have never been married, compared to 201 who had been married (married, divorced, or widowed). The highest prevalence of IBS was noted in single marital status, 38.7% (p value=0.93). The employment status showed The highest prevalence of IBS was noted among students at 41.2% (p value= 0.942). Table 2 shows a descriptive analysis of migraine and IBS with participants' sociodemographic characteristics and the association between migraine and IBS.

*Table 1: Descriptive analysis of migraine and IBS with participants' sociodemographic characteristics and the association between migraine and IBS*

<b>N= 312</b>	<b>IBS (%) (n=115)</b>	<b>Non-IBS (%) (n=197)</b>	<b>P value</b>
<b>Sex</b>			

Female	87 (37.3%)	146 (62.7%)	0.76
Male	28 (35.4%)	51 (64.6%)	
<b>Age Group</b>			
18-29	23 (20.2%)	91 (79.8%)	0.12
30-39	30 (28.3%)	76 (71.7%)	
40-49	19 (28.0%)	49 (72.0%)	
>50	2 (8.3%)	22 (91.7%)	
<b>Marital Status</b>			
Single	43 (38.7%)	68 (61.3%)	0.93
Married	64 (35.6%)	116 (64.4%)	
Divorced	8 (38%)	13 (62%)	
<b>Nationality</b>			
Emirati	78 (38.8%)	123 (61.2%)	0.33
Non-Emirati	37 (33.3%)	74 (66.7%)	
<b>Employment</b>			
Full-time >40h/w	71 (37.4%)	119 (62.6%)	0.94
Part-time <40h/w	7 (38.9%)	11 (61.1%)	
Unemployed	22 (32.8%)	45 (67.2%)	
Student	14 (41.2%)	20 (58.8%)	
Retired	1 (33.3%)	2 (66.7%)	

Participants were also asked to fill out a migraine disability survey with a scoring system to classify their migraine severity. A total of 115 migraine patients had IBS, and the results revealed that the majority answered mild (29.6%) and severe (29.6%), followed by moderate (25.2%) and little or no disability (15.7%) . On the other hand, 197 patients reported that they do not have IBS, the results showed (27.4%) little or no disability, (27.9%) moderate (23.9%) severe and (20.8%) mild (p value=0.074). Table 3.

Table 3: Clinical features in migraine patients in association with IBS.

<b>N= 312</b>	<b>IBS (%) (n=115)</b>	<b>Non-IBS (%) (n=197)</b>	<b>P value</b>
<b>Number of headache attacks</b>			
<7 d/mon	68 (34.3%)	130 (65.7%)	0.23
≥7d/mon	47 (41.2%)	67 (58.8%)	
<b>Duration of headache</b>			
4-72 hr	67 (36.4%)	117 (63.6%)	0.05
72 hr	26 (30.2%)	60 (69.8%)	
>72 hr	22 (52.4%)	20 (47.6%)	
<b>Migraine with aura</b>			
Yes	77 (40.3%)	114 (59.7%)	0.11
No	38 (31.4%)	83 (68.6%)	
<b>Family history of migraine</b>			
Yes	69 (43.1%)	91 (56.9%)	0.02
No	46 (30.3%)	106 (69.7%)	
<b>Average sleep hours</b>			
<6 hr	57 (35.8%)	102 (64.2%)	0.71
>6hr	58 (37.9%)	95 (62.1%)	
<b>Migraine score</b>			
Little or no disability	21 (27.3%)	56 (72.7%)	0.15
Mild disability	31 (43.7%)	40 (56.3%)	
Moderate disability	30 (35.3%)	55 (64.7%)	
Severe disability	33 (41.8%)	46 (58.2%)	

Migraine patients were asked to complete a survey with their food allergies if applicable. Results showed that a total of 81 responses were also suffering from IBS. The values obtained showed patients allergic coffee (15.7%), dairy products(17.4%) , citrus fruits (7.0%), chocolates (4.3%) and others (26.1%) (p value=0.085). Table 4.

Part of the survey was about the clinical features of migraine: the number of headache attacks, duration of headache, presence of migraine aura, family history of migraine and average sleep hours. We found that patients with longer duration of headache attacks were more likely to have IBS (p value = 0.050). In addition, patients with a family history of migraine showed a significant probability of having IBS (P values=0.02).The two groups had no significant differences in sleep hours, headache frequency, and migraine aura (P values of 0.71, 0.23, and 0.11, respectively).Migraine patients with and without IBS were asked to fill out Anxiety and

Table 4: Associated factors as anxiety, depression, and food allergy in association with migraine.

<b>N= 312</b>	<b>IBS (%) (n=115)</b>	<b>Non-IBS (%) (n=197)</b>	<b>P value</b>
<b>Anxiety</b>			
Normal	23 (32.4%)	48 (67.6%)	0.12
Minimal to moderate	66 (40.2%)	98 (59.8%)	
Marked to severe	23 (40.4%)	34 (59.6%)	
Most extreme	3 (15%)	17 (85%)	
<b>Depression</b>			
Normal	44 (33.6%)	87 (66.4%)	0.80
Mild	40 (36.4%)	70 (63.6%)	
Moderate	10 (32.3%)	21 (67.7%)	
Severe	10 (43.5%)	13 (56.5%)	
<b>Food allergy</b>			
Coffee	18 (41.9%)	25 (58.1%)	

Dairy products	20 (55.6%)	16 (44.4%)	0.09
Citrus fruits	8 (42.1%)	11 (57.9%)	
Chocolate	5 (20.8%)	19 (79.2%)	
Others	30 (26.1%)	56 (28.4%)	
No food allergy	34 (32.7%)	70 (65.3%)	

Depression self-rating scales. The results showed that severe symptoms of anxiety and depression are not significantly correlated with IBS (P values of 0.12 and 0.80, respectively).

#### 4. DISCUSSION

Migraine, with a prevalence of approximately 11.6% globally, ranks among the most prevalent neurological disorders, causing substantial disability-adjusted life years (DALYs) [3]. IBS, affecting about 9.2% of individuals worldwide, reflects a substantial gastrointestinal concern [3]. These prevalence rates align with the global burden of these disorders, emphasizing their significance in public health.

There is a significant link between migraine and irritable bowel syndrome (IBS), as observed in various studies conducted globally, which had similar results to ours. The prevalence of IBS in migraine patients was 36.9%, which is near the results of other researches. A study done in China showed that the prevalence was 27.5% [14]. In Saudi Arabia, with 2802 participants, the prevalence of IBS was 16.4%, with a higher likelihood of IBS in migraineurs compared to those without migraine [3]. A Korean study reported that more than 70% of migraine patients had one or more gastrointestinal (GI) disorders [4]. In Romania results showed that migraine patients displayed higher incidence of digestive problems [3]. A cohort study that looked at the prevalence of migraine in IBS patients using data from a major US health plan discovered that those with IBS had a 60% higher risk of migraine than people without IBS [3].

Regarding demographics, females had a considerably higher prevalence of IBS (37.3%) compared to males (35.4%). Higher IBS prevalence was noted in the age group of 30-39 years. Students were noticed to have a higher IBS prevalence, and the same result was also found in a study done in Saudi Arabia [3], correlating to the stressful life of a student.

It was significantly noticed that those with longer headache duration have a higher prevalence of IBS 52.4% (p value = 0.05); also, those with a family history of migraine had a higher prevalence of IBS 43.1% (p value = 0.01). People who have more recurrent attacks per month, were noted to have a higher association with IBS. The same results were mentioned in a study conducted in China, in which there is a higher risk of IBS in migraine patients with longer headache duration and higher frequency of migraine attacks [14]. Furthermore, patients with more severe migraine symptoms were more likely to have IBS. This finding suggests that the severity of migraine attacks may be indicative of a closer relationship between these two conditions. Further research is warranted to elucidate the potential causal or exacerbating factors linking migraine severity to IBS.

This underlines the importance of further exploration into the shared pathogenic pathways, such as serotonin, central and visceral hypersensitivity, and hereditary predisposition, to better understand the **mechanistic underpinnings** of this comorbidity. There is a relationship between the GI and central nervous systems called the gut-brain axis. Autonomic nervous system, hypothalamic-pituitary-adrenal axis, and **nerves in GI** connect the gut and the brain, allowing the brain to influence intestinal activities and affect mood, cognition, and mental health. The gut-brain axis is affected by gut microflora, serotonin pathways, sexual hormones, stress hormones, and diet [2]. Another major factor contributing is the change in serotonergic signaling, which activates the trigeminovascular system (TGV) which is involved in the initiation of a migraine attack and lead to the development of gastric symptoms, including nausea, vomiting, and delayed gastric emptying by activating GI serotonin receptors [3]. This theory is supported by the similar management of both conditions, as serotonin agonists and antagonists are beneficial in managing chronic hyperalgesic illnesses such as IBS and migraine. It has been proposed that serotonin pathway might be one of the main ways by which GI microbiota may affect the function of the CNS due to the presence of synthetic enzymes in bacterial strains of the intestine that may produce tryptophan metabolite which is a precursor of serotonin [2]. There is another hypothesis involving a correlation between the two diseases mediated by the role of neuropeptides. Glutamate and neuropeptide Y which are linked to the gut-brain axis, are elevated during migraine attacks and play a role in migraine pathophysiology [4].

Anxiety and depression are recognized comorbidities of both migraine and IBS. We have found that the prevalence of IBS was higher in those with mild and moderate forms of anxiety. In addition, the same results were noted in mild and moderate forms of depression. Thus, there is a correlation between IBS, migraine, depression, and anxiety. These mood disorders remain significant factors to consider in clinical management. A study in Romania revealed that there is correlation between anxiety in patients having IBS and the recurrence of migraine attacks [6].

The exploration of food allergies to migraine and IBS revealed intriguing findings. 27.6% of the patients were having food allergies to variable types of food. The food allergy analysis found that people allergic to citrus, coffee, and dairy products were more likely to develop IBS symptoms. Same results were also noted in a study conducted in KSA, where dairy products fruits and chocolate are found to be triggers for migraine and IBS [3]. An article also mentioned that food allergies that cause migraine attack also may cause IBS relapse, thus explaining the association between these two disorders [2]. This highlights the role of dietary factors in the etiology of both conditions and underscores the need for comprehensive dietary assessments when managing patients with migraine and IBS.

### **Limitations**

This study had some limitations that should be considered. This study does not take into account other potential confounding factors, such as lifestyle habits, stressful events, medication use, or co-morbidities that may influence the prevalence of IBS in migraine patients. Another point is that this study used a cross-sectional design, meaning that data were collected at only one point in time. This limits the ability to draw conclusions about causality or changes over time. In addition, it has a relatively small sample size, which may limit the generalizability of the findings to the larger population. Lastly, the information given by the participants may have a risk of recall bias.

## **5. CONCLUSION**

The prevalence of IBS in migraine patients attending DHA clinics was 36.9%. It was significant that longer headache duration, and a family history of migraine, were associated with increased prevalence of IBS. Anxiety and depression were correlated with IBS, emphasizing the role of mood disorders in clinical management. Food allergies, particularly to citrus, coffee, and dairy products, were noted to trigger IBS

symptoms and migraine attacks. In conclusion, our study contributes to the growing evidence supporting the link between IBS and migraine patients. The shared influencing factors underscore the importance of considering both conditions in clinical practice and further investigating their common pathogenic pathways to develop effective interventions and improve the quality of life for individuals affected by these disorders.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

#### **ETHICAL APPROVAL:**

The study got approval from the Dubai Scientific Research Ethics Committee (DSREC) with the approval number (DSREC-SR-02/2023\_02). In addition, it was also approved by Dubai Medical College's head of research ethical committee. A full explanation of the study was included on the survey's front page, and participants gave consent after reading the explanation of the study. Consent and data were gathered in confidence.

#### **REFERENCES**

1. Steven Agabegi and Elizabeth D. Agabegi: Step-up to medicine (5th ed.). Duncan, Chuang (ed): Wolters Kluwer, Philadelphia; 2020.
2. Mahsa Arzani, Soodeh Razeghi Jahromi, Zeinab Ghorbani, et al.: Gut-brain axis and migraine headache: a comprehensive review. . The journal of headache and pain.. 2020, 21:12.  
DOI:10.1186/s10194-020-1078-9
3. Khalid A. Bin Abdulrahman , Nawaf S. Alenazi , Saad B. Albishri , and Faisal F. Alshehri : Association of Migraine and Irritable Bowel Syndrome in Saudi Arabia: A Nationwide Survey. . BioMed Research International. 2022, 2022:8. DOI:10.1155/2022/8690562

4. Jemin Kim, Sujin Lee and Kiyon Rhew: Association between Gastrointestinal Diseases and Migraine. . International Journal of Environmental Research and Public Health.. 2022, 19:9.  
DOI:10.3390/ijerph19074018
5. Irin Perveen, Rukhsana Parvin, Madhusudan Saha, Shafiqul Bari, Nazmul Huda, Mridul Kanti Ghosh: Prevalence of irritable bowel syndrome (IBS), migraine and co-existing IBS-migraine in medical students . Journal of Clinical and Diagnostic Research. 2016, 10:5. DOI:10.7860/JCDR/2016/20900.8832
6. Doina georgescu, Daniela reisz, camelia Vidita gurban, liviuandreigeorgescu, ioanaionita, Oana elenaancusa, Daniel lighezan: Migraine in young females with irritable bowel syndrome: still a challenge . Neuropsychiatric Disease and Treatment. 2018, 14:21-28. DOI:10.2147/NDT.S144955
7. Walter F. Stewart, Richard B. Lipton, Andrew J. Dowson, and James Sawyer: Development and testing of the Migraine Disability Assessment (MIDAS) Questionnaire to assess headache-related disability. Neuropsychological Function in Migraine Headaches, Neurology. 2001, 56:20-28.  
DOI:10.1212/WNL.56.suppl\_1.S20
8. Stephen D. Silberstein: 30 - Headache Management . Practical Management of Pain (Fifth Edition). Honorio T. Benzon, James P. Rathmell, Christopher L. Wu, Dennis C. Turk, Charles E. Argoff, Robert W. Hurley (ed): Elsevier, Netherlands; 2014. 30:408-423. DOI: 10.1016/B978-0-323-08340-9.00030-X
9. Max J Schmulson and Douglas A Drossman: What is new in Rome IV. Journal of Neurogastroenterology and Motility. 2017, 23:13. DOI: 10.5056/jnm16214
10. William W.K. Zung: A Self-Rating Depression Scale. .Arch Gen Psychiatry.. 1965, 12:63-70.  
DOI: 10.1001/archpsyc.1965.01720310065008
11. William W.K. Zung: A Rating Instrument For Anxiety Disorders . Psychosomatics. 1971, Volume 12, Issue 6:371-379. DOI: 10.1016/S0033-3182(71)71479-0
12. Jari Jokelainen, Markku Timonena, Sirkka Keinänen-Kiukaanniemi, Pirjo Härkönen, Heidi Jurvelin and Kadri Suija: Validation of the Zung self-rating depression scale (SDS) in older adults . Scand J Prim Health Care. 2019, 37:353-357. DOI: 10.1080/02813432.2019.1639923
13. Debra A. Dunstan and Ned Scott: Norms for Zung's Self-rating Anxiety Scale. BMC Psychiatry 20. 2020, 20:8. DOI: 10.1186/s12888-019-2427-6

14. Chunlin Li, Shengyuan Yu, Huiying Li, Jin Zhou, Jieqiong Liu, Wenjing Tang and Lei Zhang: Clinical features and risk factors for irritable bowel syndrome in Migraine patients. Pakistan Journal of Medical Sciences. 2017, 33:720-725. DOI: 10.12669/pjms.333.12379

UNDER PEER REVIEW

## **GLOSSARY OF ABBREVIATIONS**

- CNS: Central nervous system
- DALY: Disability adjusted life years
- DHA: Dubai Health Authority
- DSREC: Dubai Scientific Research Ethics Committee
- EMR: Electronic Medical Records
- GI: Gastrointestinal
- IBM: International Business Machines Corporation
- IBS: Irritable bowel syndrome
- ICMJE: International Committee of Medical Journal Editors
- MIDAS: The Migraine Disability Assessment Score
- R4DQ: Rome IV Diagnostic Questionnaire
- SAS: Self-Rating Anxiety Scale
- SDS: Self-Rating Depression Scale
- SPSS: Statistical Package for the Social Sciences
- TGV: Trigeminovascular system

UNDER PEER REVIEW