11-2023

IRRITABLE BOWEL SYNDROME, EATING DISORDERS, AND MENTAL STRESS AMONG UNITED ARAB EMIRATES UNIVERSITY STUDENTS

Maram Braikan Alotaibi
United Arab Emirates University

جامعة الإمارات العربية المتحدة
United Arab Emirates University

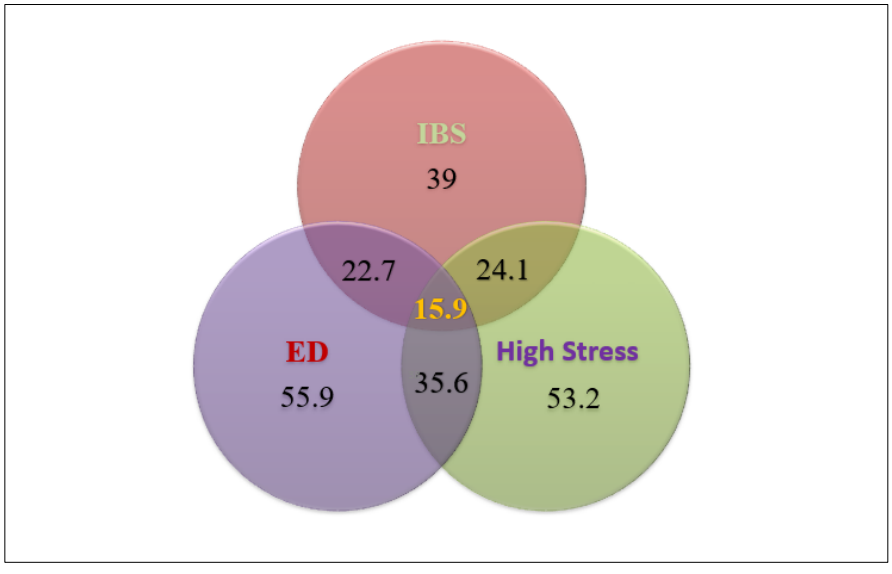
MASTER THESIS NO. 2023: 99

College of Medicine and Health Sciences

Department of Nutrition and Health

IRRITABLE BOWEL SYNDROME, EATING DISORDERS, AND MENTAL STRESS AMONG UNITED ARAB EMIRATES UNIVERSITY STUDENTS

Maram Braikan A. Alotaibi



IBS: Irritable Bowel Syndrome
ED: Eating Disorders

November 2023

United Arab Emirates University

College of Medicine and Health Sciences

Department of Nutrition and Health

IRRITABLE BOWEL SYNDROME, EATING DISORDERS, AND MENTAL STRESS AMONG UNITED ARAB EMIRATES UNIVERSITY STUDENTS

Maram Braikan A. Alotaibi

This thesis is submitted in partial fulfilment of the requirements for the degree of Master of Science in Human Nutrition

November 2023

United Arab Emirates University Master Thesis
2023: 99

Cover: Prevalence (%) and Co-existence of IBS, ED, and High Stress among UAEU Students

(Photo: By Maram Braikan A. Alotaibi)

Print: University Print Service, UAEU 2023

Declaration of Original Work

I, Maram Braikan A. Alotaibi, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this thesis entitled "*Irritable Bowel Syndrome, Eating Disorders, and Mental Stress Among United Arab Emirates University Students*", hereby, solemnly declare that this is the original research work done by me under the supervision of Dr. Amita Attlee, in the College of Medicine and Health Sciences at UAEU. This work has not previously formed the basis for the award of any academic degree, diploma or a similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied upon or included in my thesis have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation and/or publication of this thesis.

Student's Signature: 

Date: 13/11/2023

Advisory Committee

1) Advisor: Dr. Amita Attlee

Title: Associate Professor

Department of Nutrition and Health

College of Medicine and Health Sciences

2) Co-advisor: Prof. Nathan Davies

Title: Professor

University College London, United Kingdom

Approval of the Master Thesis

This Master Thesis is approved by the following Examining Committee Members:

1) Advisor (Committee Chair): Amita Attlee
   Title: Associate Professor
   Department of Nutrition and Health
   College of Medicine and Health Sciences

   Signature Amita Date November 26, 2023

2) Member: Farah Al-Marzooq
   Title: Assistant Professor
   Department of Microbiology and Immunology
   College of Medicine and Health Sciences

   Signature Date November 26, 2023

3) Member (External Examiner): Haleama Al Sabbah
   Title: Associate Professor of Public Health Nutrition
   Department of Public Health
   Institution: Abu Dhabi University, UAE

   Signature Haleama Date 27/11/2023

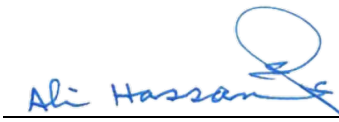
This Master Thesis is accepted by:

Acting Dean of the College of Medicine and Health Sciences: Professor Ahmed Alsuwaidi

Signature 

Date 3/1/2024

Dean of the College of Graduate Studies: Professor Ali Al-Marzouqi

Signature 

Date January 5, 2024

Abstract

Irritable Bowel Syndrome (IBS), Eating Disorders (EDs), and mental stress are under-studied in the United Arab Emirates (UAE), especially among university students. The objective of this study is to assess the prevalence of IBS, ED, mental stress, their associations, and the determinants of IBS among United Arab Emirates University (UAEU) students. An observational cross-sectional study was conducted via a 48-item online-survey shared with 14,268 undergraduate/graduate students, registered during academic year 2021-2022 in UAEU. Logistic regression models were performed to examine the predictive factors associated with IBS among UAEU students in total and by ED status. Significance was determined at $p< 0.05$. The prevalence of IBS was 39%, ED 55.9%, and high mental stress 53.2%, and they co-existed in 15.9% of UAEU students. Students who reported consuming trigger-food were 6 times more likely to have IBS than their counterpart [AOR: 5.859; 95% CI: 3.092–11.102, $p< 0.001$]. Those who reported intakes of relief-food were 4 times more likely to have IBS compared to their counterpart [AOR: 3.881; 95% CI: 1.669 – 9.022, $p=0.002$]. Students with family history of IBS (FH-IBS) were 2.6 times more likely to have IBS than their counterpart [AOR: 2.572; 95% CI: 1.420–4.660, $p= 0.002$]. Students with high mental stress were 1.7 times more likely to have IBS than those with low-moderate stress, when adjusted for sex and age [AOR:1.730; 1.058–2.830, $p= 0.029$). No significant associations existed between IBS and ED, Socioeconomic Characteristics (SEC), lifestyle, dietary, and health-related factors. UAEU students reported high prevalence of IBS, ED and mental stress. A significant relationship was found between IBS and FH-IBS, trigger- and relieving- food. This study confirmed the prevalence of IBS, ED and mental stress. Large cohort studies on university students in the UAE are warranted to establish the relationships among IBS, ED, mental stress and their determinants.

Keywords: Eating Disorders, Irritable Bowel Syndrome, Mental Stress, Students, University, United Arab Emirates.

Title and Abstract (in Arabic)

متلازمة القولون العصبي، إضطرابات الأكل، والتوتر الذهني بين طلاب الإمارات العربية المتحدة

الملخص

متلازمة القولون العصبي، إضطرابات الأكل لم يتم دراستها بما فيه الكفاية في الإمارات العربية المتحدة خصوصاً لدى طلاب الجامعات. الهدف من هذه الدراسة هو تحديد نسبة الطلاب المصابين بالقولون العصبي، إضطرابات الأكل، التوتر النفسي، علاقتهم، والعوامل المتعلقة بالقولون العصبي بين طلاب جامعة الإمارات العربية المتحدة (UAEU).تم إجراء دراسة رصدية مقطعية من 48-سؤال خلال استطلاع عبر الإنترنت عرض على 14,268 طالبًا جامعيًا/خريجًا مسجلين في عام 2021-2022 في UAEU. تم إستخدام Logistic regression model لتقييم العلاقة بين العوامل المتنبأه بالقولون العصبي بين طلاب UAEU بشكل عام وتغيراتها حسب حالة إضطرابات الأكل. نسبة العلاقة تم تحديدها ب $p< 0.05$. نسبة إنتشار القولون العصبي 39%، إضطرابات الأكل (55.9%) وارتفاع التوتر النفسي (53.2%) بينما تواجدت مع بعضها في 15.9% من المشتركين. الطلاب الذين أبلغوا عن الأطعمة المحفزة أكثر عرضة للإصابة بمتلازمة القولون العصبي ب 6 مرات من نظرائهم (AOR: 5.859, CI: 3.093-11.102, p< 0.001). الذين أبلغوا عن الطعام المخفف كانوا أكثر عرضة للإصابة بالقولون العصبي ب4 مرات مقارنةً بنظرائهم (AOR: 3.881, CI: 1.669-9.022, p= 0.002). الطلاب الذين لديهم تاريخ عائلي للقولون العصبي كانوا 2.6 من المرات أكثر عرضة للإصابة بالقولون العصبي من نظرائهم (AOR: 2.572, CI: 1.420-4.660, p= 0.002). كان الطلاب الذين لديهم توتر نفسي مرتفع أكثر عرضة لمتلازمة القولون العصبي ب 1.7 مرات مقارنةُ بنظرائهم، عند التعديل حسب الجنس والعمر (AOR: 1.730, CI: 1.058-2.830, p= 0.029). لم يتم وجود أي علاقة بين القولون العصبي وإضطرابات الأكل، الحالة الاجتماعية/الاقتصادية، نمط الحياة، والعوامل-الصحية المتعلقة. لوحظ ارتفاع معدل الإصابة بالقولون العصبي ،إضطرابات الأكل والتوتر النفسي بين طلاب UAEU. علاقة هامة وجدت بين القولون العصبي والتاريخ العائلي للقولون العصبي، والأطعمة المحفزة والمخففة. هذه الدراسة اكدت إنتشار القولون العصبي، إضطرابات الأكل، والتوتر النفسي. هناك ما يبرر إجراء دراسات جماعية كبيرة على طلاب UAEU لتحديد العلاقات بين القولون العصبي، إضطرابات الأكل، التوتر النفسي والعوامل المتعلقة بهم.

مفاهيم البحث الرئيسية: إضطرابات الأكل، القولون العصبي، التوتر النفسي، طلاب الجامعات، الإمارات العربية المتحدة.

Author Profile

Maram Braikan A. Alotaibi is currently working as a registered nurse in a medical-surgical ward in a private hospital in Saudi Arabia. She graduated from Nursing school in 2018 with a Bachelor of Science in Nursing from D'Youville University in Buffalo, New York. She was passionate to obtain a master's degree of science in nutrition to further assist patients about their dietary choices in inpatient setting.

Acknowledgements

My thanks go to UAEU faculty members

I would like to thank my committee for their guidance, support, and assistance throughout my preparation of this thesis, especially my advisor Dr. Amita Attlee who guided me through my thesis-work and who was always present to support her students. Also, thank you to my co-advisor Prof. Nathan Davies for guiding me with his valuable feedback throughout my thesis work.

Special thanks go to other faculty from the Department of Nutrition and Faculty- Dr. Emmanouela Magripli- Visiting Faculty, who assisted me with the statistical analysis portion of my study, despite her busy schedule. Thank you to Ms. Rubina Sabir- Instructor, for your helpful feedback and for always being present to answer my questions, and to Dr. Naser Ibrahim- ex faculty, who assisted me in the conceptualization of my thesis. Lastly, thank you to Dr. Henry Crayton, from the University of Sydney- Australia, for proofreading my thesis.

Dedication

To my beloved parents

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADL	Activities of Daily Living
CVD	Cardiovascular Disease
ED	Eating Disorder
FD	Financial Difficulty
FH-IBS	Family History of IBS
FODMAP	Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols
IBS	Irritable Bowel Syndrome
PA	Physical Activity
QoL	Quality of Life
SEC	Socioeconomic Characteristics
SES	Socioeconomic Status

Chapter 1: Introduction

1.1 Overview

Irritable Bowel syndrome (IBS) is a chronic functional disorder of the gastrointestinal (GI) tract causing symptoms, such as abdominal pain/discomfort, bloating, and sudden change in bowel habits (diarrhea, constipation, or mixed bowel habits) (Black & Ford, 2021; Emmanuel & Quigley, 2013). These bowel habit alterations are categorized as: predominantly diarrhea (IBS-D), constipation (IBS-C), or mixed (IBS-M) (Altomare et al., 2021; Farzaneh et al., 2012). The variations in IBS prevalence are dependent on the population of study. In a national survey conducted in 2020 in the United States, the prevalence of IBS was 6.1%, which is 0.8-1.4 % increase in prevalence than previously reported (Almario et al., 2023). In the Middle East, a Lebanese study reported IBS prevalence of 46.8% (Yazbeck et al., 2023). Another study in Saudi Arabia showed that 20.19% of Makkah city residents had IBS (Alharbi et al., 2022). Unlike the study conducted in the United States, the Middle Eastern studies were done on small populations (n= 425 and 921, respectively) and not on a national level (n= 88,607). There is a lack of national-survey studies examining the prevalence of IBS in the Middle East, which presents a problem in detecting the accurate impact of IBS on the region.

Those who suffer from IBS symptoms do not always seek medical interventions, and it is estimated that only 30% of them pursue treatment (Canavan et al., 2014). Early childhood conditions and experiences are potential early life mediators of IBS development in adulthood (Chitkara et al., 2008). For instance, IBS was found to be associated with family history of alcoholism, substance abuse, and mental illness; which places the child in a highly stressful home environment (Knight et al., 2015). Although the etiology of IBS is not fully understood, there are various risk factors that can influence or trigger its development (Katsanos et al., 2012). Factors that increase the risk of IBS include: family history of the disease, an altered psychological state due to stress, trauma, or abuse, history of GI infection, and imbalances of gut microbiota (Black & Ford, 2020; Henningsen et al., 2003; Kalantar et al., 2003; Kassinen et al., 2007; Wang et al., 2004). Studies show that females are more prone to IBS than males. A global systematic review reported 12% prevalence of IBS amongst females compared to 8.6% in males (Oka et al.,

2020). In the Arab world, a study conducted in Saudi Arabia reported IBS in 14.7% females as compared to 11.1% males (Ibrahim et al., 2016). Another recent study in the same region reported higher incidence of IBS among females (55.3%) compared to males (44.7%) (Arishi et al., 2021). Unhealthy lifestyle and dietary choices, such as diets high in sugar and saturated fat are associated with the development of IBS and the aggravation of its symptoms (Buscail et al., 2017). IBS can present in certain cases with a form of Eating Disorders (ED) resulting from a rigorous diet, for the purpose of eliminating trigger foods (Harer, 2019). This form of strict dieting may transition to abstaining from food, malnourishment, and distorted body-image; and subsequently leading to an ED (Santonicola et al., 2019). Individuals may suffer from both IBS and ED as one of them can contribute to the other (Ferreira, 2023; Harer et al., 2018).

EDs are life-threatening psychiatric disorders characterized by disturbances in eating habits that can be associated with altered body-image perception, weight loss, mental stress, and destructive behavior (Guarda, 2023). The most common EDs are Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Binge-Eating Disorder (BED), Avoidant/Restrictive Food Intake Disorder (ARFID), and Other Specified Feeding or Eating Disorder (OSFED) (Guarda, 2023). EDs are more prevalent among females worldwide, and it is estimated that the prevalence is four times more than their male counterpart (Galmiche et al., 2019). However, EDs are under-reported in males and the sex-specific incidence rates differ from one region of to another (Strother et al., 2012). The age of onset for EDs vary from childhood, adolescence, and adulthood (*Prevalence in the UK*, 2023). Although it can occur in different age groups, the average age of onset was reported to be 18 years in both anorexic and bulimic patients (Volpe et al., 2016). EDs are more common in developed counties but they are increasing rapidly in the rest of the world (Makino et al., 2004). This increase in ED cases may be attributed to the media's effects on the perception of body shape and the promotion of "slimness" (Abraham & Llewellyn-Jones, 2001; Gabrielli & Irtelli, 2022). ED related behaviors, such as vomiting, laxative/diuretic misuse, food restriction have a negative effect on mental health and the function of the GI system (Salvioli et al., 2013; Tan et al., 2023). Therefore, GI complications, such as IBS and high mental stress are common among patients with EDs.

It is well documented that exposure to high mental stress can trigger or aggravate illness and increase the risk of mortality (Yaribeygi et al., 2017). Studies show that chronic/uncontrolled stress can shrink the size of the brain and lead to its atrophy (Sarahian et al., 2014). Such changes can lead to decreased memory and immune system, ineffective learning, and GI and cardiac complications (Bae et al., 2019; Krivobokova et al., 2020; Li et al., 2008; Morey et al., 2015; Schaper & Stengel, 2022; Schwabe et al., 2022). Stress is a risk factor for both IBS and EDs (Fujii & Nomura, 2008; Gonçalves et al., 2014; Melchior et al., 2020). Further, poorly managed mental stress can lead to depression, which is linked to the development of IBS and EDs (Garcia et al., 2020; Li et al., 2020; Tafet & Nemeroff, 2016; Yang et al., 2015). As a result of that, it is necessary to investigate the role of stress in the presence of IBS or ED, as a risk factor and Trigger.

The connection between IBS, ED, and mental stress is a serious health concern, due to their negative impact and the major complications that can arise from their co-existence. There are multiple factors to explore in a population when assessing for IBS, ED, and mental stress, including: the role of Socioeconomic Characteristics (SEC), behavioral factors, and history of chronic diseases. In addition, dietary habits, trigger-food, and relief-food are important factors to assess in the diagnosis of IBS.

1.2 Statement of the Problem

IBS, ED, and mental stress negatively impact patients, and the co-existence of all three of them can have life-threatening consequences. Those with IBS or ED have common co-morbidities such as malnutrition and high mental stress that can lead to anxiety and depression (Hujoel, 2020; Lin et al., 2021; Yang et al., 2015). IBS among young adults, particularly among university students, is common. A Jordanian study reported a 30.9% prevalence of IBS among university medical students (Jadallah et al., 2022). Therefore, assessing the prevalence of IBS, ED, and mental stress in any population is a major step to address the extent of their effects. Assessing the prevalence in epidemiology is fundamental in determining the impact of health concerns, and subsequently in the management and prevention of any arising complications (Ward, 2013). There is a lack of scientific studies in the United Arab Emirates (UAE) assessing for the prevalence of IBS, ED, and mental stress and their association. Considering risk factors related to IBS and

ED, such as the onset of the disease and high-levels of mental stress; university students are a vital population to investigate. The lives of university students are stressful, due to the pressure of meeting the expectations of their curriculums, along with the responsibilities that come from transitioning from adolescence into adulthood, imposing changes in their dietary habits and lifestyle that play a significant role in the prevalence of IBS, ED, and mental stress. Therefore, this study targeted at undergraduate and graduate United Arab Emirates University (UAEU) students in the UAE. Knowing the impact of IBS, ED, and mental stress in this population and their determinants will enable formulating target-based interventions, such as bringing awareness of these health concerns, and providing educational and counseling campaigns to assist students.

1.3 Research Objectives

The aim of this study was to assess the proportion of students with IBS, ED, and mental stress, their associations, and determine the factors that may influence IBS among UAEU students.

The specific objectives of this study were as follows: 1) To assess the prevalence of IBS, ED, and mental stress in UAEU students using validated questionnaires. 2) To report perceived triggering and/or relieving foods among UAEU students with IBS. 3) To examine the associations of IBS, and mental stress by ED status among the UAEU students. 4) To determine predictive factors associated with IBS in UAEU students in total and by ED status.

The following hypotheses are tested: 1) The prevalence of IBS, ED, and mental stress is common among the UAEU students. 2) IBS is associated with ED and mental stress among UAEU students.

1.4 Relevant Literature

1.4.1 Irritable Bowel Syndrome

IBS is a chronic condition that alters bowel habits (Black & Ford, 2021). IBS causes GI symptoms, including abdominal bloating, pain, flatulence, along with changes in bowel habits and stool consistency (Longstreth et al., 2006). Although IBS has three main

subtypes based on stool patterns, it is common for patients with IBS to experience changes in their subtypes during the course of their disorder (Drossman et al., 2005; Garrigues et al., 2007). IBS affects approximately 11% of the world's population, and it is commonly misdiagnosed due to the overlapping of its symptoms with other disorders (Canavan et al., 2014). The onset of the disease usually occur in younger adults (Lovell & Ford, 2012). Females have 67% higher prevalence of IBS compared to their male counterparts (Houghton et al., 2016). The cause of the sex-specific variation in IBS prevalence is unknown but may be attributed to history of trauma, abuse, and social pressures in the female population (Voci & Cramer, 2009; Walker et al., 1993). IBS is considered a multifactorial disease that can be attributed to a complex interaction between hormonal, immune, and nervous systems (Katsanos et al., 2012). There are various risk factors related to IBS, including genetic predisposition, being a female, being 20-30 years old, Family History of IBS (FH-IBS), history of intestinal infection, sedentary lifestyle, history of abuse/trauma (stressful events), early life learning, trauma to the abdomen, food intolerance/allergy, disruption of gut microbiota, and bacterial overgrowth (Adam et al., 2007; Patel & Shackelford, 2018; Qin et al., 2014).

Unhealthy dietary behaviors can trigger IBS and exacerbate its symptoms. Various studies found an association between Western dietary pattern (e.g., diet high in saturated fat, sodium, and added sugar) and IBS (Buscail et al., 2017; Khayyatzadeh et al., 2016). A direct association was reported between IBS and insufficient consumption of vegetables, fruits, and fibers (Alharbi et al., 2019; Hosseini Oskouie et al., 2018). Individuals diagnosed with IBS are advised to control their symptoms by adhering to the following dietary recommendations to relieve their symptoms: small regular meals, adequate hydration, and low intake of insoluble fibers, alcohol, caffeine, and spicy and fatty foods (Cozma-Petruţ et al., 2017). Diet high in FODMAP (Fermentable Oligosaccharides, Disaccharides, Monosaccharides, And Polyols), fatty food, and gluten can worsen and trigger IBS-symptoms (Na et al., 2021; Singh et al., 2021). In addition, a lack of Physical Activity (PA) is a recognized risk factor of IBS, hence PA is advised in the prevention and management of IBS (Groenendijk et al., 2022; Sadeghian et al., 2018). Focusing on prevention and management of IBS through dietary and lifestyle alterations is crucial in preventing IBS and its reducing morbidity.

The changes in bowel habits have negative impact on mental health and Activities of Daily Living (ADLs). Some patients report impairment in ADLs due to uncontrolled symptoms and frequent bowel movement or discomfort (Ballou & Keefer, 2017). This can lead to poor quality of life (QoL), isolation, embarrassment, and mental distress (Simrén et al., 2017). Hemorrhoidal disease and anal fissures are another complications of IBS stemming from constant diarrhea, constipation, or the alternation of both (D'Ugo et al., 2015). In addition, chronic gastritis, and urolithiasis are all possible co-morbidities of IBS (Helvaci et al., 2009). Urolithiasis is reported to increase serotonin release which may subsequently induce IBS (Lei et al., 2016). On contrary to the other complications, the risk of Colorectal Cancer (CRC) in IBS is not clearly defined. Multiple studies found increased risk of CRC and colorectal neoplasms in IBS patients (Chang et al., 2015; Hu et al., 2015). On the other hand, various studies found no evidence of increased risk of CRC among IBS patients (García Rodríguez et al., 2000; Nørgaard et al., 2011). The symptoms of CRC can overlap with IBS symptoms, causing diagnostic confusion in clinical studies (Wu et al., 2022). (Mor et al., 2003). Mediterranean Fever is an autoinflammatory genetic disorder that presents mostly with diarrhea and has been hypothesized that it can lead to IBS (Kumei et al., 2022). However, other studies found that the predominance of diarrhea in that population may cause misdiagnosis of IBS (Börekci et al., 2017; Kucuk et al., 2015).

1.4.2 Eating Disorders

EDs are psychiatric illnesses with different range of characteristics such as, inability to maintain healthy weight, abnormal dietary habits (binge eating or abstaining from food), distorted body image, voluntarily induced vomiting, laxative abuse, and excessive exercising (Bulik et al., 2013). The different types of EDs vary in eating habits and disease severity. Anorexia Nervosa (AN) and Bulimia Nervosa (BN) are the most prevalent EDs. (Chen et al., 1992; Le Grange et al., 2012). A systematic review, exploring the prevalence of ED by continent, reported a mean prevalence of 4.6% in America, 3.5% in Asia, with an overall prevalence of 19.4% among women and 13.8% among men (Galmiche et al., 2019). Although the incidence of EDs in non-Western countries is less than Western countries, ED cases appear to be on the rise due to the effects of globalization and the promotion of ‘slimness’ imposed by the media (Kiriike et al., 1988; Makino et al., 2004).

According to a systematic review conducted in the Arab world, 2% to 54.8% of the population are at high risk of EDs (Melisse et al., 2020). In a UAE study conducted on female high-school students, 36.2% of students were at risk of EDs, and 4.8% of them had BN while 5.4% had AN (Kazim et al., 2017). There are multiple factors influencing/triggering the development of EDs, including the following: family history of ED, distorted body-image, relationship with family members, history of mental stress and traumatic events (*Eating disorders*, 2019; Lask & Frampton, 2011; Pike et al., 2008). Genetic predisposition may lead to EDs in the presence of adverse events, such as parental issues, death in the family, being a victim of sexual/physical abuse, or loss of control over one's life (de León-Vázquez et al., 2019; Gorwood, 2004).

Dietary habits in EDs differ depending on the type of ED. Patients with AN either restrict food intake, or purge after eating by inducing vomit or abusing laxatives/diuretics (Balasundaram & Santhanam, 2022; Frank et al., 2019). Patients with AN are in denial of being underweight, and appear extremely underweight with distorted body image (Machado et al., 2016). The eating pattern in BN involve binge eating followed by compensatory purging or excessive exercise (Balasundaram & Santhanam, 2022). Unlike AN, those with BN usually maintain a normal body mass index (BMI) (Masheb & White, 2012; Toppino et al., 2022). All these drastic dietary/behavioral habits can lead to serious health consequences. Complications of EDs are as follows: depression, suicide, GI disorders, hormonal imbalances, loss of bone mass, refeeding syndrome, electrolyte imbalance (caused by purging or abstaining from food), cardiac muscle atrophy, arrhythmia, and heart failure (Abdi et al., 2020; Puckett et al., 2021; Rome & Ammerman, 2003). The most common cause of death in AN is attributed to suicide (Smith et al., 2018). Overall, AN and BN are associated with the highest mortality rates among EDs. This is attributed mainly to suicide, Cardiovascular Disease (CVD), renal failure, and electrolytes imbalances (Izquierdo et al., 2023; Puckett, 2023; Sardar et al., 2015). Despite the fact that AN and BN patients tend to be hypovolemic, prolonged malnutrition leads to increased peripheral resistance and consequently lead to serious cardiac complications (Casiero & Frishman, 2006). Self-induced vomiting, seen in BN and in some cases of AN, causes clinical signs such as dental erosions, and callous formation on the knuckles (Russell's sign) resulting from repetitive insertion of the hand into the mouth (Mehler & Brown,

2015). Given the serious complications of the disease, both medical interventions and psychiatric treatment are necessary to reduce mortality and morbidity.

1.4.3 Mental Stress

Psychological stress is induced by various social/emotional triggers, varying from one individual to another (Qin et al., 2014). A systematic review reported that the global prevalence of high stress levels was 44.9% (Mahmud et al., 2021). A total of 29% UAE graduate students were experiencing high levels of mental stress (Al Marzouqi et al., 2022). Another study conducted among university students found that 16% of the participants had notable high stress levels (Asif et al., 2020). Uncontrolled mental stress can lead to poor health outcomes (Ford et al., 2023). Chronic stress lowers the immune system response and increases the risk of diseases, such as CVD, infections, cancer, GI disorders, depression, among others (Eckerling et al., 2021; Konturek et al., 2011; Mariotti, 2015; McDonald et al., 2005).

1.4.4 The Association between IBS, EDs, and Stress

IBS and EDs can lead to one another (Salvioli et al., 2013). Poorly managed IBS may cause disordered eating habits, which can lead to an ED. Disordered eating is an unusual eating pattern that may involve skipping meals, limiting certain types of food, or following a restrictive diet (Anderson, 2018; Harer, 2019). It is common for people who suffer from IBS, whether they are aware of their diagnosis or not, to have disordered eating. This disordered pattern results from avoiding certain types of foods or abstaining from eating for long periods of time, to prevent triggering IBS symptoms. Compared to disordered eating, EDs involve extreme behaviors and motivations (e.g., purging and body dysmorphia) (Cleland et al., 2023). Patients with EDs demonstrate disordered eating, but the opposite is not always correct. Those diagnosed with EDs exhibit both upper and lower GI symptoms, but it is unclear whether IBS is caused by malnutrition or by other behaviors related to EDs (Santonicola et al., 2019). Studies suggest that EDs related habits, such as self-induced vomiting, laxative and diuretics abuse, and food binging/restriction have a negative impact on GI function (Abraham & Kellow, 2013; Salvioli et al., 2013). Metabolic myopathy and electrolyte depletion, resulting from malnutrition, impair gastric

motility/emptying and damage intestinal transit (Norris et al., 2016). In addition, there are common trigger factors causing IBS and EDs that may be attributed to their link, such as mental stress, emotional instability, trauma, abuse, anxiety, depression, and addiction (Guarda et al., 2015). Almost 98% of ED patients (44% of which were anorexic) met ROME II criteria for at least one GI disorder, and the most common amongst them was IBS (Boyd et al., 2005). A total of 68.8% patients with BN had IBS with the majority presenting with IBS-C (DeJong et al., 2011). Another study reported that 64% of ED patients met IBS criteria, 87% of which developed ED before the onset of IBS by an average of 10 years (Perkins et al., 2005). Therefore, IBS should be considered in the management of ED patients to avoid the major complications that may result from their coexistence (Kayar et al., 2020). Regardless whether IBS leads to EDs or vice versa, the negative outcomes resulting from IBS and ED will have a major impact on one's physical and mental health along with the decline of their QoL (Melchior et al., 2020).

Mental stress is associated with IBS, and it can aggravate its symptoms. Psychosocial distress is a prevalent co-morbidity of IBS ranging from 40% to 60%, and is reported to reach 80% in some cases (Dekel et al., 2013; Singh et al., 2012). Mental stress is also associated with EDs (Erriu et al., 2020; Iyer & Shriraam, 2021; Vidaña et al., 2020). For instance, EDs may develop as a result of a negative coping mechanism to stressors (Wagener & Much, 2010). It was reported that AN and BN patients who are under stress exhibited metabolic dysfunction and disrupted homeostatic signaling (Westwater et al., 2020).

University students are a suitable population to study when measuring the effects of stress. This population deals with education stressors and the social pressure resulting from emerging into adulthood. A prevalence of 84.4% of high stress among university students was reported (Asif et al., 2020). The following factors were contributing to university students' stress: curriculum overload, course unfamiliarity, inadequate time to study, family pressure, and fear of failure (Bataineh, 2013). Students with academic overload and lack of time were at risk of developing IBS (Pozos-Radillo et al., 2018). Participants with IBS were 2.2 times more likely to experience high stress levels compared to their healthy counterpart (Kim et al., 2021). It was found that 11.0% of medical students were at risk of developing ED and 75.5% of them had high stress levels (Ngan et al., 2017).

Furthermore, IBS patients with EDs reported to have poor QoL and more stressful life (p= 0.02) than IBS patients without ED (Melchior et al., 2020). Considering the negative impact of stress on IBS, EDs, and IBS with coexisting ED, it is important to educate the community and facilitate programs for the management of stress. Similar attention is warranted to university students who are under great levels of stress, placing them at higher risk of various health conditions.

1.4.5 Factors Affecting IBS, ED, and Stress

Different factors are attributed to increase the risk of IBS, EDs, or stress; some of which are modifiable, such as SEC, PA, and smoking. Other factors are non-modifiable such as sex, age, and genetic predisposition. However, awareness and health education can make a difference in regards to early diagnosis, management, and intervention (Chimezie, 2023). The factors that will be discussed in this section, in relation to IBS, ED, and stress include: SES and lifestyle factors (PA and smoking).

- Socioeconomic Status

The relationships between Socioeconomic Status (SES) and IBS, EDs, and mental stress levels remain debatable. Studies supporting the association between IBS, mental stress, and low SES argue that financial struggles increase stress levels and decrease the likelihood of seeking medical care (Howell et al., 2004; Marmot et al., 2012). Hence, those with lower income have poorer health outcomes (McMaughan et al., 2020; Silvernale et al., 2019). Other studies suggest a reverse association between IBS, stress, and SES. This suggestion is attributed to the higher level of stress perceived by people with high SES, working in managerial roles (Grodzinsky et al., 2012). Both low and high SES can be associated with IBS and stress, and there is insufficient data to conclude which group has a higher risk. On the other hand, EDs are seen as a problem of developed nations, in particularly among people with middle or high SES. Although ED is assumed to be related with better SES, evidence to support or dispute this link is still inadequate (Huryk et al., 2021).

- Physical Activity

Lack of regular PA is a risk factor for IBS. Studies have shown that adhering to regular PA helps in the prevention and management of IBS (Cozma-Petruţ et al., 2017; Johannesson et al., 2015). Mild PA has been found to improve intestinal gas clearance and reduces abdominal bloating (Villoria et al., 2006). Improvement in IBS symptoms was reported by increasing PA compared to baseline ($p = 0.001$) (Johannesson et al., 2015). Exercising and maintaining PA is known to be indicative of better health. As a result, it is expected that PA may have a significant impact on the prevention and management of IBS.

The relation between EDs and PA is quite complicated. PA can reduce factors linked with the development of EDs, such as anxiety, depression, and stress. After the development of an ED, the relationship with PA varies depending on the type of ED. BED patients, who are usually obese, are less likely to engage in PA; hence it is possible that regular PA can help alleviate their mood, confidence, and overall physical/mental health. AN and BN, on the other hand, are both linked with abnormally high levels of PA due to the distorted body image and the sense of shame after binging (Brunet et al., 2021; Mathisen et al., 2018; Rizk et al., 2020). Compulsive exercising can be found sometimes among BED patients, yet it is more common among patients of AN and BN (Rizk et al., 2020). Excessive PA among AN and BN patients may lead to serious consequences, such as cardiac complication, hypovolemic shock, and death (Quesnel et al., 2023).

- Smoking

Smoking is a negative behavioral factor that is considered a causative or triggering agent for many diseases. In UAE, the prevalence of smoking varies from 0.8-24.3%, with 22.5% reporting that they smoke to relieve their stress (Razzak et al., 2020). Different studies found that smoking is associated with the development of IBS, and consider it an obstacle in the management and treatment of the condition (Mahmood et al., 2020; Talley et al., 2021). Smoking is a common behavior among individuals with EDs, especially those with AN and BN, to suppress appetite (Anzengruber et al., 2006; Bloom et al., 2019; Solmi et al., 2016). Also, smoking is attributed to the impulsive characteristics associated with AN and BN, such as binge eating and/or purging (Anzengruber et al., 2006; Chao et al., 2016). The habit of smoking can worsen the physical health of patients with EDs and put them at risk of other complications (Saha et al., 2007). Smoking can lead to stress, and

vice versa (Lawless et al., 2015). Some smokers use nicotine as a way to cope with stress, and the more they feel stressed the more they consume cigarettes (Metcalfe et al., 2003). However, tobacco is reported to increase stress and anxiety, defeating the purpose of its use as a stress-relieving habit (Goriounova & Mansvelder, 2012). There is no positive outcome associated with smoking, hence smoking cessation is always advised (Dai et al., 2022).

- University Students

Despite literature identifying students as a high-risk group, few studies on IBS and ED have focused on university students from the UAE. University students meet the age of onset for both IBS and ED. In addition, they deal with high levels of stress resulting from curriculum pressure, family expectations, and social pressure. All of these factors and more make them vulnerable to IBS, ED, and high mental stress. It is the role of any educational institute to assess and recognize health issues and challenges among its population. Studies that address the occurrences and associations of medical/mental disorders are significant for the prevention, early detection, and the management/treatment of these health issues. Therefore, the aim of this study was to address the prevalence of IBS, ED, and mental stress and their possible associations among UAEU students. IBS, ED, and mental stress were assessed among UAEU undergraduate and graduate students along with its potential determinants of IBS: SEC (Including: sex, age, nationality, and SES), anthropometric measurements (weight, height, and BMI), lifestyle factors, dietary habits, and health-related factors (including: FH-IBS, supplements use, and probiotics use).

1.4.6 Potential Contributions and Limitations of the Study

IBS, associated EDs and mental stress among young adults and university students, needs due attention to enable patients to enhance their academic performance, university experience, and overall health-related QoL. Despite their common co-occurrence, these three health concerns have not been adequately studied together, especially in context to university students in the UAE. Findings of such a study may produce incentives for formulating strategies at university level for early detection of these conditions, and

develop targeted diet and lifestyle programs to the benefit of students' satisfaction and health promotion.

Although this study utilized validated tools administered bilingually for the assessments of IBS, ED and mental stress, there were certain inherent limitations. Administration of self-reported online questionnaire was a major limitation, contributing to potential misreporting. To elaborate, transparency in participant responses was a challenge that might have underestimated or overestimated the prevalence of IBS, EDs and mental stress in this population. For example, some individuals with ED or obese individuals may overestimate or underestimate their weight due to their distorted body-perception or low-self-esteem. Self-reporting bias is another problem that can lead to overestimation of the prevalence. The study may have higher participation from those who take interest in the study-topic, because they suffer from IBS-like symptoms, ED, or high mental-stress. On the other hand, addressing one's bowel habits can be perceived as a private matter, thus hinder in recruiting participants and may lead to participants to report symptoms with less severity than what is actually experienced. To address some of these challenges, the survey was administered anonymously, without requiring personal information such as students' names or establishing a direct contact with them; to reduce the discomfort in answering invasive questions about bowel habits, lifestyle, dietary habits, and stress and financial levels.

IBS symptoms can overlap with other GI disorders and certain types of cancer, which cannot be clearly differentiated in a self-reported questionnaire. However, ROME III criteria, a validated tool to assess IBS, was used effectively in the diagnosis of IBS as a screening tool. IBS diagnosis is challenging even in a clinical setting; hence it is expected to face challenges with IBS screening tools (Olden, 2003). In general, using questionnaires to measure the effects of a disorder on a population, remains a limitation (Baaleman et al., 2021). Nevertheless, a questionnaire still gives a better understanding of the effects of health problems in a population and assesses their estimated/possible prevalence (Sardar et al., 2015). ED was also assessed using a validated 5-items SCOFF questionnaire (Sick, Control, One-stone, fat, and food) (Morgan et al., 2000). SCOFF is a quick and reliable tool for the diagnosis of AN and BN (Kutz et al., 2020; Wahida et al., 2017). Yet, the assessment of EDs in this study was limited only to AN and BN due to the inability of the

tool to identify other types of EDs (Eddy et al., 2008; Peat et al., 2009). IBS is associated with different EDs (Boyd et al., 2005; DeJong et al., 2011). However, AN and BN are the most life-threatening types of EDs and their co-existence with IBS can lead to worse complications (Abraham & Kellow, 2013; Salvioli et al., 2013; Santonicola et al., 2013). As a result of that, this study focused in AN and BN, using a concise questionnaire to reduce the burden on students' time and effort. Mental stress was assessed among UAEU students through the validated Perceived Stress Scale (PSS) which is a useful tool that identifies low, moderate, and high stress levels (Baik et al., 2019; Denovan et al., 2019).

The last potential limitation was the sampling of the population. Small sample size and selection of students using convenience sampling increased the risk of type-II error. However, the online questionnaire was administered without any bias targeting only UAEU students. Any student registered in the university during the survey period had the online accessibility to the questionnaire that was posted through a variety of digital social media platforms.

Chapter 2: Methods

2.1 Research Design

An observational cross-sectional study, using both quantitative and qualitative variables, was conducted among undergraduate and graduate students registered in UAEU during the academic year 2021-2022. UAEU, established in 1976, is the Federal university located in Al Ain city in the UAE. Students from all the seven emirates, and nearly 70 international countries attend this university. This diversity was the main factor in selecting UAEU as the location of this study. As per the UAEU statistics available at the UAEU Office for Institutional Effectiveness, a total of 14,268 students comprised of 24% males and 76% females were registered in the academic year 2021-2022. The inclusion criteria was undergraduate and graduate students who completed the survey. To ensure the completion of the survey, students had to answer all questions for the survey to be submitted with the exception of certain optional questions such as smoking period, types of medications used, and the name of triggering- and relieving- foods. The exclusion criteria was students above the age of 39, due to age-related changes of the GI tract that are expected in the middle-aged population (Dumic et al., 2019).

2.1.1 Ethics Considerations

Ethical approval (Reference No. ERS_2020_6188) was obtained from UAEU Social Sciences Ethics and Research Committee to conduct this study.

2.1.2 Study Population and Sampling

This study was conducted on undergraduate and graduate male and female students registered in UAEU in the academic year 2021-2022. Based on the sample size calculation with 5% margin of error and 95% confidence of interval, 385 undergraduate and graduate students were targeted. Convenience sampling technique was adopted to reach this target. This sampling method is affordable, easy and the participants are readily available. The

main assumption associated with convenience sampling is that the members of the target population are homogeneous (Palinkas et al., 2015). The sample size (n) was calculated according to this formula: n= $\frac{z^2 \times p \times (1-p)}{e^2}$, where: z = 1.96 for confidence level (α) of 95%, p = proportion (expressed as a decimal), and e = margin of error (Z = 1.96, p = 0.5, e = 0.05).

2.2 Data Collection

A self-administered 48-items bilingual (Arabic and English) questionnaire was posted online via students' university emails, students WhatsApp groups, and UAEU community-related posts on social media (Facebook and Twitter), the questionnaire can be seen in the (Appendix). The survey was created on Google Forms and the data collection period lasted between October 2021 to June 2022. The introduction of the online survey included a statement on providing consent for participation before completing it, and ended with a list of related resources for the reference of UAEU students who might have ED or uncontrolled high mental stress; due to the life-threatening nature of these health concerns.

The online survey included the following assessment tools/questions: ROME III criteria for the diagnosis of IBS, SCOFF for ED, and PSS for mental stress level. The SEC questions included: sex, age, nationality, college of study, and Financial Difficulty level (FD). Anthropometric measurements included self-reported weight (kg) and height (cm). The students were also asked about lifestyle behaviors, such as PA level, PA awareness, and smoking status. Dietary habits related to the fast-food, fried food, and spices consumption were inquired. Moreover, information on triggering and/or relieving foods related to IBS symptoms was obtained. Lastly, the survey contained questions about the students' health status, such as history of chronic diseases, and family history of IBS (FH-IBS), and supplements/medications use.

The following sections elaborate upon the different assessment tools that were self-administered in the study:

2.2.1 Socioeconomic Characteristics

As mentioned above, the self-administrated questionnaire elicited information regarding the following SEC characteristics of the participants: age, sex, nationality (Emirati or Non-Emirati), college of study, and FD level, weight, and height. Specifically, appropriate option for the college of study was selected by the students from the list of all 9 UAEU colleges. Nationality was assessed in terms of Emirati or non-Emirati. FD was measured from a scale of 0 (no financial difficulty) to 5 (very much). This scale was used to divide the answers into two categories, low FD (from 0-2) and high FD (score of 3-5).

2.2.2 Anthropometric Measurements

Students were asked to self-report their heights (cm), and weights (kg). Body mass index (BMI) was later calculated in kg/m^2. BMI was categorized as per CDC guidelines (CDC, 2022) as follows: Underweight < 18.5 kg/m^2, Normal weight 18.5-24.9 kg/m^2, Overweight 25-29.9 kg/m^2, and Obesity ≥ 30 kg/m^2.

2.2.3 Lifestyle, Dietary and Health Related Factors

Lifestyle factors assessed included: regular exercise (a minimum of 30-minutes of exercise per day for at least three times a week), PA awareness, and smoking status. Dietary habits were related to the frequency of fast food, fried food, and spices consumption. The frequency of fast-food and fried food consumption was measured by week. Since spices use cannot be quantified by week, the frequency of spices-consumption was measured as: always, usually, sometimes, rarely/never. The students were asked whether triggering and/or relieving foods affected their IBS-like symptoms', and were asked to list them. Based on the most reported answers for those who scored with IBS based on ROME III criteria, trigger and relieving foods were divided into different categories. The health-related questions were supplements/vitamins use and their types, probiotics use, FH-IBS, chronic diseases status, and current used medications, if any.

Trigger foods were classified as fatty/fast food (both were used interchangeably in students' answers), spicy food, gluten, and dairy, based on the answers given by participants. The remaining answers that did not fit into these categories were deemed as "others" and were not included in the statistical analysis. Also, relieving food were

categorized based on answers reported by the participants as: dairy, dietary changes, probiotics, herbs, vegetables, white rice, hydration, fruits, and others. Some students did not report specific food item as relieving to their symptoms, and instead they mentioned hydration, supplements, and diet alteration as a form of relief.

The reported chronic diseases were categorized into endocrinological disorders, GI disorders, respiratory disorders, blood disorders, CVD, hypertension, and others (diseases that did not fit in the previous categories). Medications were also categorized based on their targeted body system as follows: GI medications, hormone replacement, antidiabetic medications, antihypertensive medications, acne medications, psychotropic medications, and others. Worth noting that many of the students used acne medication, such as Accutane, thus it was added as a category. Gabapentin was classified as "Others" due to its multiple purposes. Though Gabapentin is an anticonvulsant drug that can be used in low doses for anxiety (fits under psychotropic medications category), it was still listed in the "Others" category to avoid bias and assumptions since the purpose of use was not specified. Medications listed in the "Others" category were either unknown, did not belong to the rest of categories, or were listed as numbers (the number of medications used) and not by names. Due to the lack of answers driven by university students in general not taking many medications, the medication data was not included in the statistical analysis portion of this study.

2.2.4 Assessment Tools for IBS, ED, and Stress

The three assessment tools for IBS, ED and mental stress were ROME III criteria, SCOFF, and PSS.

- ROME III for IBS

ROME III criteria were used to determine the prevalence of IBS, and scored from 0-4 (Shih & Kwan, 2007). ROME III section in the survey contained a total 4 questions of ROME III criteria along with extra two questions assessing for trigger and relief foods. The first and second questions include the following: recurrent abdominal pain or discomfort (at least 3 days a month) associated with two or more of the following: 1) Relief with defecation. 2) Onset associated with a change in stool frequency 3) Onset associated

with a change in the form (appearance) of the stool. The third and fourth questions are related to the consistency of bowel movement. The additional questions, trigger- and relief food sought information on whether the students find any type of food triggering or relieving to their IBS symptoms. These last two questions were not scored, instead each of them was followed by a short-answer space for the students to specify the types of food items that they perceived as triggering and/or relieving to their IBS symptoms. A score of 3 or 4 in ROME III criteria indicate the diagnosis of IBS. The two stool consistency questions in ROME III criteria determine the subtype of IBS (IBS-D, IBS-C, or IBS-M).

- SCOFF for EDs

SCOFF questionnaire is an acronym for the 5 questions it contains (Sick, Control, One stone, Fat, and Food) (Morgan et al., 2000). A "Yes" for each question is equivalent to one point in the final score. A score of ≥ 2 indicates a diagnosis of EDs: AN, or BN. Since metric system is followed in UAE, it was specified between parentheses that one stone of weight loss is equivalent to approximately 6 kg. SCOFF scores were used as a nominal category in the statistical analysis (either with or without ED).

- PSS for Mental Stress

PSS or Perceived Stress Scale contains 10 questions each is scored from 0 (Never) to 4 (Very Often) (Cohen et al., 1983). However, the score is reversed for questions 4,5,7,8 to be 0 (Very Often) to 4 (Never). A score of 0-13 indicates low stress level, while a score of 14-26 and a score of 27-40 denote moderate stress and high stress levels, respectively. It is worth noting that low and moderate stress results were combined (Low-Moderate Stress vs. High Stress) due to the lack of participants in the low stress category (n= 2).

2.3 Statistical Analysis

Data analysis was performed using IBM SPSS statistics version 27 (SPSS Inc., Chicago, IL, USA). Probability plots (PP) and Kernel density were used to test normality. Accordingly, parametric tests were performed.

Categorical variables were presented as frequency and proportion (n, %) and associations between the categorical variables were analyzed using chi-square test (χ^2). To

elaborate, chi-square tests were performed to find if there were associations between ROME III, SCOFF, and mental stress scores categories. Chi-square tests were also performed to find the associations of ROME III, SCOFF, PSS and SEC, lifestyle factors, dietary habits, and health-related factors. PSS was used in the analysis as a continuous scale (mental stress score) as well as two-categories (Low-moderate stress or high stress).

Independent Student's t-test was used to compare the differences in the means of continuous variables between two groups. The differences in the means of BMI, age, and mental stress score (as a continuous scale) were compared between the students with or without IBS.

BMI was used as a continuous scale and categories of four. However, BMI was also used as a category of two in logistic regression analysis: 1. Underweight or normal weight (coded 0), 2. Overweight or obese (coded 1).

Logistic regression was performed to find the independent determinants of IBS. Logistic regression model was used to obtain Odds Ratio (OR) and probability of IBS and its confounding factors based on various independent variables. ROME III category (With IBS or without IBS) was used as the dependent variable for the following independent determinants: ED (category), mental stress (scale), FH-IBS, BMI (as category of two), PA, smoking status, and trigger- and relief foods. A second logistic regression model was performed for IBS and its covariates, ED (category) and stress (category), adjusted for age and sex. Lastly, a final logistic regression model was performed for IBS stratified by ED to understand the effects of ED on IBS confounding factors. For all analyses, a p-value of < 0.05 was considered significant.

Chapter 3: Results and Discussion

3.1 Overview of Main Findings

There was a high prevalence of IBS, ED, and mental stress among UAEU students. No significant associations were found among IBS, and SEC, lifestyle factors, and dietary habits. However, FH-IBS, and trigger- and relieving-foods increased the likelihood of IBS among UAEU students.

3.2 Profile and Statistics of Respondents

3.2.1 Socioeconomic Characteristics and Anthropometric Measurements

A total of 295 students participated in this study (*Table 1*), 87.8% of which were females (n= 259) and 12.2% were males (n= 36). The majority, 71.2%, of the students were Emirati (n= 210) while 28.8% of them are Non-Emirati (n= 85). One-third of the students (n= 109) reported high level of FD (36.9%), in contrast to almost two-thirds of the students (n= 186) who reported low level of FD (63.1%). The mean age of the students was 21 (21.11 ± 3.66) years, with a median of 20 years [20.00, Range: 18], while the mean height, weight and BMI were 161.5 cm (161.52 ± 7.67), 62.9 kg (62.93 ± 17.36), and 24.1 kg/m^2 (24.05 ± 6.14), respectively (Table 1). As per BMI classification, 47.1% of the students had normal-weight (n= 139), 18.6% were underweight (n= 55), 18.3% were overweight (n= 54), and 15.1% were obese (n= 47) (Table 1).

Figure 1 presents the distribution of students according to their college of study in UAEU. Majority, 36.6% were registered in College of Medicine and Health Sciences, followed by: 15.3% College of Sciences, 11.2% College of Humanity and Social Sciences, 8.5% College of Information Technology, 6.4% College of Business and Economics, 4.9% College of Engineering, 3.7% College of Education, 1.7% College of Agriculture and Veterinary Medicine, and 1.4% College of Law.

Table 1: Characteristics and Behaviors of UAEU Students According to Their Status of Irritable Bowel Syndrome (Chi-Square And Independent T-Test Results)

Variable	Total (n= 295)	With IBS (n=115)	Without IBS (n=180)	p-value
	N (%)	N (%)	N (%)	
Sex				
Female	259 (87.80)	101 (87.80)	158 (87.80)	
Male	36 (12.20)	14 (12.20)	22 (12.20)	0.990
Nationality				
Emirati	210 (71.20)	85 (73.90)	125 (69.40)	
Non-Emirati	85 (28.80)	30 (26.10)	55 (30.60)	0.409
Financial Difficulty				
Low	186 (63.10)	72 (62.60)	114 (63.30)	
High	109 (36.90)	43 (37.40)	66 (36.70)	0.900
Smoking Status				
Smokers	17 (5.80)	8 (7.00)	9 (5.00)	
Non-Smokers	278 (94.20)	107 (93.00)	171 (95.00)	0.482
Body Mass Index (kg/m^2)[a]				
Underweight	55 (18.60)	20 (17.40)	35 (19.40)	
Normal weight	139 (47.10)	57 (49.60)	82 (45.60)	
Overweight	54 (18.30)	17 (14.80)	37 (20.60)	0.509
Obesity	47 (15.90)	21 (18.30)	26 (14.40)	
Regular Exercise[b]				
Yes	108 (36.60)	39 (33.90)	69 (38.30)	
No	187 (63.40)	76 (66.10)	111 (61.70)	0.442
Family History of IBS				
Yes	92 (31.20)	54 (47.00)	38 (21.10)	
No	203 (68.80)	61 (53.00)	142 (78.90)	< 0.001
Age (years) [$\bar{X}$ ± SD]	21.11 ± 3.66	21.50 ± 3.80	20.86 ± 3.55	0.143
Height (cm) [$\bar{X}$ ± SD]	161.52 ± 7.67	161.24 ± 7.67	161.69 ± 7.69	0.626
Weight (kg) [$\bar{X}$ ± SD]	62.93 ± 17.36	62.80 ± 15.87	63.01 ± 18.30	0.920
Body Mass Index (kg/m^2) [$\bar{X}$ ± SD]	24.05 ± 6.14	24.11 ± 5.72	24.02 ± 6.40	0.905

a. BMI cut-off: Underweight < 18.5, Normal weight 18.5-24.9, Overweight 25-29.9, Obesity ≥ 30 (CDC, 2022).
b. ≥ 30-minutes of exercises for at least 3 times a week.
$\bar{X}$ = mean, SD= standard deviation.

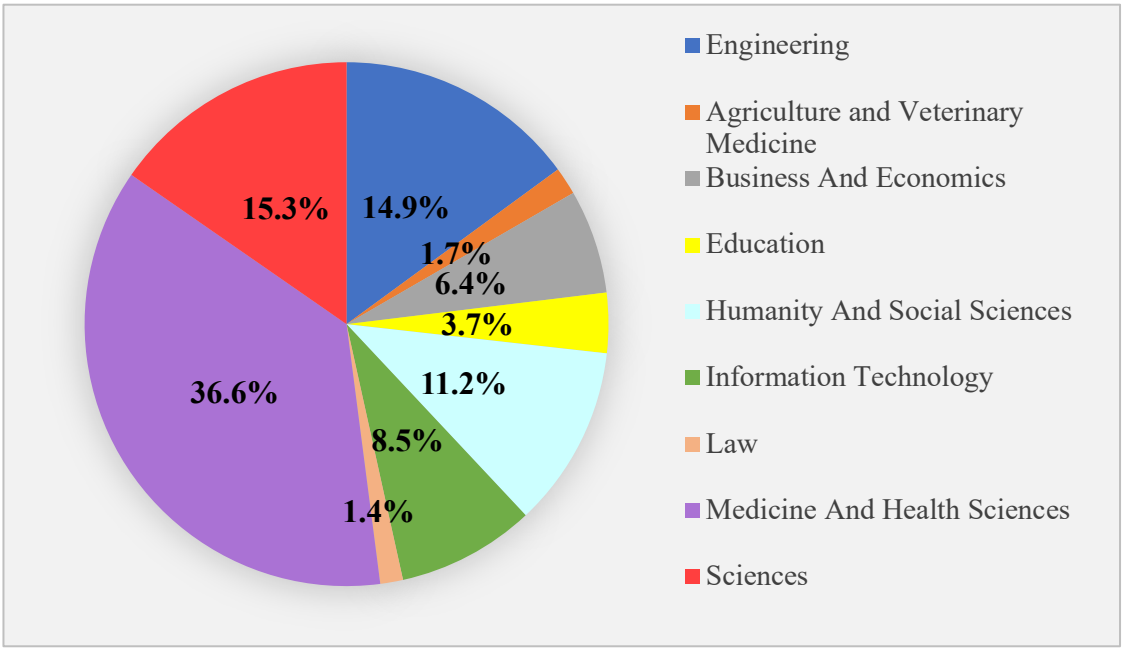


Figure 1: Distribution of Students Based on College of Study

3.2.2 Lifestyle factors

Table 1 also represents the behaviors of the students with regard to their PA and smoking habits. Students were asked about their PA in terms of regular exercise (exercising at least 30 minutes 3 or more times a week), and their awareness about the importance of PA. Although 97% of the students (97.3%, n= 287) reported to be aware of the importance of PA, merely one-third (n= 108) actually indulged in regular exercises. Further, almost 6.0% students (n= 17) identified themselves as smokers, with an average of three (3.03 ± 1.80) years of smoking history.

3.2.3 Dietary Habits

To reiterate, the students were asked about the frequencies of consuming fast-food, fried food, and spices in their diets. Almost 5.0% of the students (n= 15) consumed fast-food daily in comparison to 51.2% who consumed it 1-3 times a week (n= 151), 41.7% consumed it less than once a week (n= 123), while 2% responded that they never consume fast-food (n= 6). For fried-food (home-prepared or not), consumption was reported as the following: 10.5% consumed on daily basis (n= 31), 64.4% consumed it 1-3 times a week (n= 190), and 25.1% consumed it less than once a week (n= 74). The frequency of students adding spices to their diets were: 67.5% always (n= 199), 23.1% usually (n= 68), 6.4%

sometimes (n= 19), and 3.1% (n=9) responded that they rarely/never used spices in their diets.

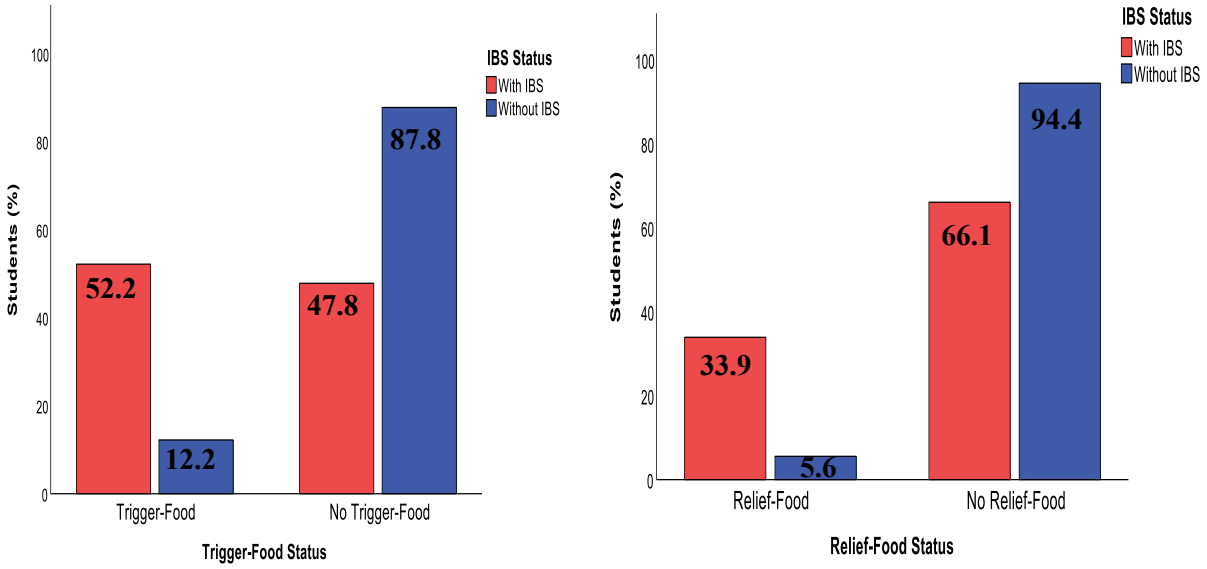
3.2.4 Triggering- and Relieving Foods

Symptom triggering and relieving foods were identified for those who are diagnosed with IBS in this study based on ROME III criteria (*Figure 2*). 52.2% of students with IBS reported having certain foods triggering their symptoms (n= 60) while the remaining 47.8% did not report symptoms-triggering foods (n= 55). A total of 104 triggering foods were reported by sixty students. Spicy food was perceived as a triggering food by 19.2% of the students with IBS (n= 20). Dairy products were reported to be triggering to 20.2% of the students (n= 21). Gluten containing products were considered triggering to 9.6% of the students (n= 10). Fried and fast foods were used interchangeably by the students; hence they were merged into one category of triggering food. To specify, 17.3% of the students found fried and fast-food triggering to their IBS-like symptoms (n=18). The remaining 33.7% reported other trigger foods and their answers were: grilled meat, sugary food, caffeine, fruits and 'random foods' (n= 35). On the other hand, 39 out of 115 students with IBS, reported symptoms-relieving foods, while 66.1% did not (n= 76). A total of 53 symptom-relieving-foods were listed by these 39 students, categorized as follows: 15.1% dairy products (n= 8), 9.4% dietary changes (n= 5), 24.5% herbs (n= 13), 9.4% vegetables (n= 5), 3.8% white rice (n= 2), 11.3% hydration (n= 6), 13.2% fruits (n= 7), and 13.2% other relieving food (n= 7). The 'others' category included random answers from the students, such as raw sugar, probiotics, medications, chicken, honey, oats, and coffee.

3.2.5 Health Status and Other Health Related Factors

FH-IBS was not commonly observed as reported by 68.8% (n= 203) students, although 30.2% reported FH-IBS (n= 92) (Figure 3). About 21% (n= 63) of the total students were diagnosed with chronic diseases including endocrinological disorders (n= 16), GI disorders (n= 16), respiratory disorders (n= 8), blood disorders (n= 4), CVD (n=3), hypertension (HTN) (n= 2), and other (unclassified) chronic diseases (n=14), such as renal failure, food allergies, skin disorders, migraines, vertigo, and Mediterranean fever. Out of

those who reported having GI disorders 62.5% of them were previously diagnosed with IBS (n= 10), and scored with IBS according to ROME III criteria.



(a) (b)

Figure 2: Percent Distribution of Students with Trigger (a) and Relief Food (b) Based on Irritable Bowel Syndrome (IBS) Status

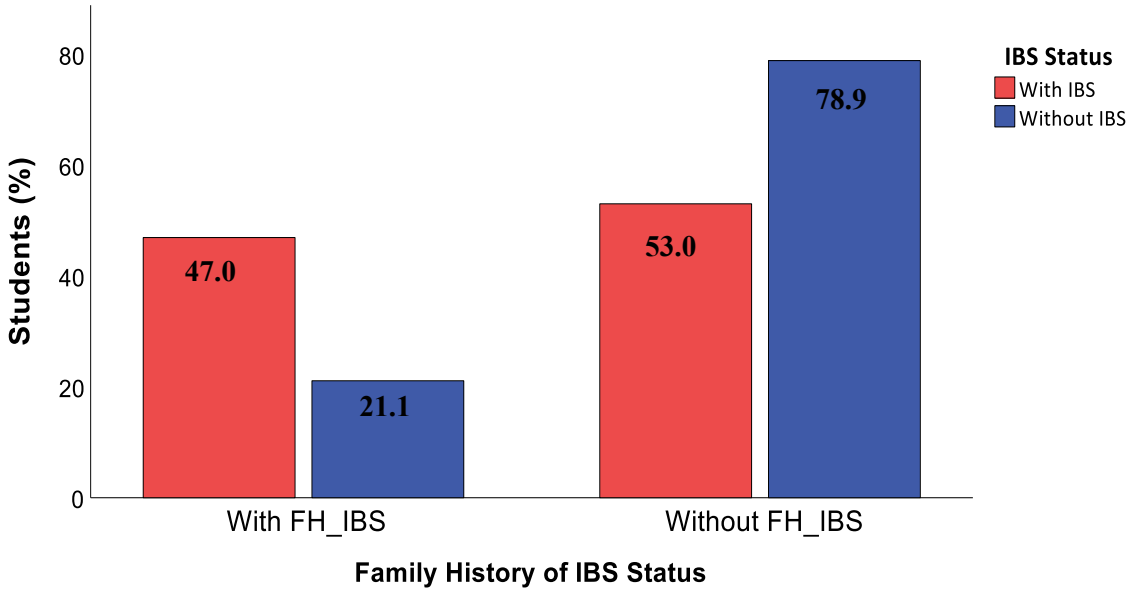


Figure 3: Distribution of Students According to Family History of IBS Based on IBS Status

- Medications and Supplements Use

Prescribed probiotics were used by 3.4% of the students (n= 10), 4.1% used probiotics over the counter and without prescription (n= 12), and 92.5% did not use probiotics (n= 273). Prescribed supplements were used by 24.7% of the students (n= 73), 20.7% used supplements over the counter (n= 61), while 54.6% did not use supplements (n= 161). The types of supplements used among students were as follows: 36.6% vitamin D (n= 108), 23.7% multivitamins (n= 70), 21% iron (n= 62), 10.5% fish oil supplement or Omega 3 (n= 31), 6.4% vitamin B (n= 19), 3.7% folic acid (n= 11), and 4.4% calcium (n= 13).

Out of 295 students, 55 regularly used medications; consuming a total of 64 types of medications. The medications used were classified as follows: 15.6% hormone-replacement (n= 10), 14.1% psychotropic medicines (n= 9), 12.5% GI related medicines (n= 8), 10.9% acne oral-medications (n= 7), 7.8% antidiabetic agents (n= 5), and 39.1% were classified as other medicines (n= 25). Other medicines included: cardiac medicines (unspecified), asthma medication, antihypertensive, antihistamines, non-steroidal anti-inflammatory medicines, Gabapentin (as anticonvulsant or as a treatment for anxiety, the purpose was unspecified), vitamins/supplements, and unspecified medicines (reporting the number of medications used but not the name).

3.3 Prevalence and Associations of IBS, ED, and Mental Stress

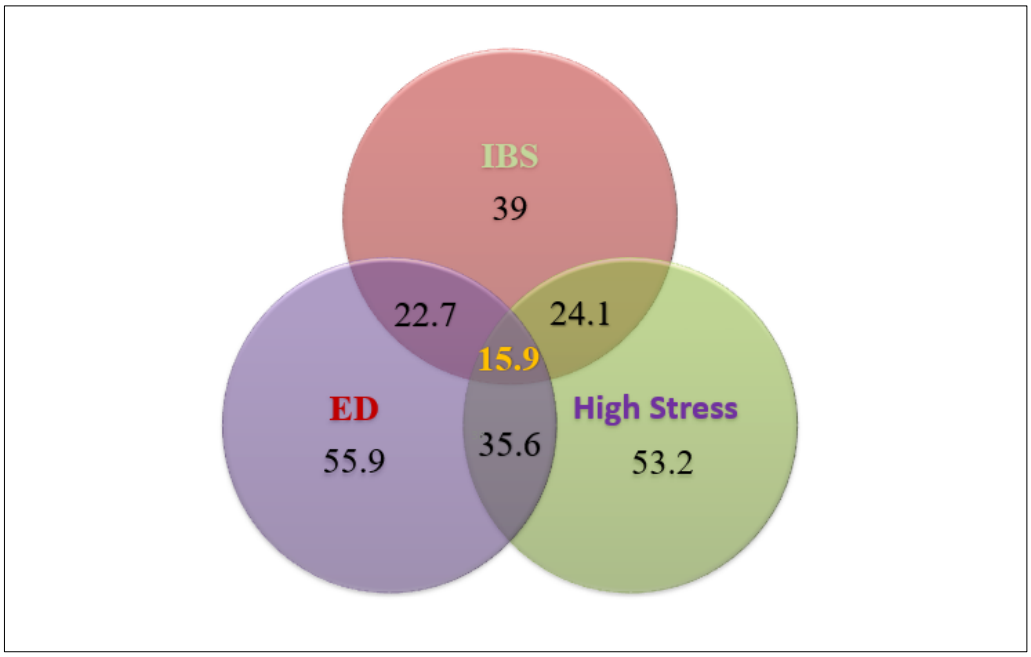
3.3.1 Prevalence of IBS, ED, and Mental Stress

The prevalence of IBS among UAEU students surveyed was found to be 39% (n= 115). Additionally, ED was estimated in 55.9% (n= 165), and the combination of IBS and ED was reported in 22.7% (n= 67) students. Moreover, high mental stress was reported in 53.2% (n= 157) students, and co-existence of IBS, ED, and high mental stress was estimated in 15.9% (n= 47) students (Figure 4). IBS subtypes among the studied sample were distributed as follows: 26.1% IBS-D (n= 30), 31.3% IBS-C (n= 36), and 42.6% IBS-M (n= 49).

In SCOFF questionnaire, 17.6% of UAEU students admitted they induced-vomit when they felt full (n= 52). Students who viewed themselves as fat yet others viewed them

as skinny (body dysmorphia) were 41.0% (n= 121). Students who lost 6 kg in a period of 3 months were 17.3% of the population (n= 51).

According to PSS, students reported 0.7% low stress (n=2), 46.1% moderate stress (n= 136), and 53.2% high stress (n= 157). Due to the small sample of students with low stress, low and moderate stress levels were merged into one category. As a result, 46.8% of the students had low-moderate stress (n= 138), while 53.2% had high stress (n= 157).



IBS: Irritable Bowel Syndrome
ED: Eating Disorders

Figure 4: Prevalence (%) and Co-existence of IBS, ED, and High Stress among UAEU Students

3.3.2 Associations of IBS, SES, BMI, and Lifestyle Factors

- Socioeconomic Characteristics and BMI

Chi-square test was conducted to examine the associations of IBS, SEC, and BMI. IBS was found to be independent of sex ($\chi 2$= 0.00, p = 0.990); 39% females (n= 101) in contrast to 38.9% males had IBS (n= 14). There was no association between IBS and nationality ($\chi 2$= 0.683, p = 0.409). Emirati students with IBS were 40.5% (n= 85) as compared to 35.3% Non-Emirati students (n= 30). Age was similar between With IBS

(21.50 ± 3.80 years) and Without IBS groups (20.86 ± 3.55 years) [t= -1.468, p= 0.143]. No significant association was observed between IBS and FD ($\chi 2$= 0.016, p = 0.900). Similar proportion of students with low FD (n= 72, 38.7%) and high FD (n= 43, 39.4%) were identified with IBS.

Further, significant differences were not found with BMI categories, although higher cases of IBS were noted among obese students, 44.7% (n= 21) as compared to 36.4% (n= 20) in underweight, 41% (n= 57) in normal weight, and 31.5% (n= 17) of those who were overweight ($\chi 2$= 2.317, p = 0.509). Similar trend was observed between the means of BMIs in students with IBS (24.11 ± 5.72 kg/m^2) and without IBS (24.02 ± 6.40 kg/m^2) status [t= - 0.120, p = 0.905]. Additionally, IBS was independent of the college of study ($\chi 2$= 9.434, p = 0.398). All these results can be seen in Table 1.

- Lifestyle Factors

There was no association between IBS and regular PA (χ^2= 0.591, p = 0.442). IBS prevalence was 36.1% among those who regularly exercised (n= 39), compared to 40.6% in those who did not (n= 76). Smoking status had no association with IBS (χ^2= 0.591, p = 0.442). Smokers had 47.1% prevalence of IBS (n= 8), compared to 38.5% in non-smokers (n= 107).

3.3.3. Associations of IBS, Dietary habits and Health-Related Factors

Chi-square was used to test the association between dietary habits of fast-food, fried food, and spices consumption and IBS. No association was found between IBS and fast-food consumption (χ^2= 1.389, p = 0.499). Those who consumed fast-food daily had 40% prevalence of IBS (n= 6), compared to 35.8% in 1-3 times a week consumption (n= 54), and 42.6% in those who consumed less than once week or never (n= 55). It is relevant to mention that less than once a week category was combined with the never category, due to a count less than 5 in the latter category. There was also no association between IBS and fried food consumption (χ^2= 0.585, p = 0.746). IBS prevalence was 41.9% among those who consumed fried food on daily basis (n= 13), 37.4% in those who consumed it 1-3 times weekly (n= 71), and 41.9% in those who consumed it less than once a week (n= 31). No association was noted between IBS diagnosis and spices use ($\chi 2$= 1.223, p =

0.748). IBS occurred in 37.2% of those who always used spices (n= 74), 44% in those who usually used spices (n= 30), 42.1% for those who sometimes used spices (n= 8), and 33.3% in those who rarely/never consumed them (n= 3). No association was found between IBS and probiotics use (χ^2= 2.650, p = 0.266) or supplements use (χ^2= 2.403, p = 0.301). Worth noting that the 'rarely' responses were combined with 'never' responses due to a count less than 5 in the never category. Interestingly, a significant association was found between IBS and trigger-foods (χ^2= 55.805, p < 0.001). Another statistically significant association was observed between IBS and symptoms-relieving foods (χ^2= 40.738, p < 0.001). FH-IBS was also found to be significantly associated with IBS (χ^2= 21.841, p < 0.001). FH-IBS and trigger- and relieving- foods associations with IBS are to be discussed in logistic regression results.

3.3.4 IBS Association with ED and Mental Stress

As evident from Table 2, no association was found between IBS and ED (χ^2= 0.415, p = 0.520), with 40.6% IBS prevalence in those with ED, compared to 36.9% (n= 67) in those without ED (n= 48). On the other hand, significant association was found between IBS and stress (χ^2= 5.494, p = 0.019). The prevalence of IBS was 45.2% among those with high stress (n= 71), compared to 31.9% in those with low-moderate stress (n= 44). Independent t-test also showed a significant difference in mental stress score between those with IBS (27.30 ± 4.70) and those without IBS (26.12 ± 4.64) [t= - 2.107, p= 0.036].

Table 2: Comparisons of Eating Disorders, and Mental Stress Scales According to the Status of Irritable Bowel Syndrome (IBS) among UAEU Students

	Total (n= 295)	**With IBS (n= 115)**	**Without IBS (n= 180)**	**p value**
	Mean ± SD	Mean ± SD	Mean ± SD	
Eating Disorders[a]	1.78 ± 1.34	1.81 ± 1.26	1.76 ± 1.39	0.080
Mental Stress[b]	26.58 ± 4.69	27.30 ± 4.70	26.12 ± 4.64	0.708

a. SCOFF score from 0-5. With ED is a score ≥ 2.
b. PSS score from (0-40). Low stress (0-13), moderate stress (14-26), and high stress (27-40)
p value < 0.05 is statistically significant; SD= Standard Deviation

3.3.5 IBS-Related Logistic Regression Models

In Model 1, Binary logistic regression was used to investigate the association between IBS (no or yes) and its possible predictive factors: ED [category: no (0) or yes (1)], mental stress (scale), age, regular exercise [category: no (0) or yes (1)], smoking status [category: no (0) or yes (1)], FH-IBS [category: no (0) or yes (1)], BMI [category: underweight or normal weight (0) or overweight or obese (1)], triggering-foods [category: no (0) or yes (1)], and relieving foods [category: no (0) or yes (1)].

Model 1 (Table 3) was statistically significant [$\chi^2(9, n= 295) = 88.217$, $p < 0.001$], denoting its ability to distinguish those diagnosed with IBS from those who were not. Model 1 explains 35% (Nagelkerke R Square) of the variability in the dependent variable (IBS), and it was able to classify 76.6% of IBS cases correctly. Hosmer–Lemeshow test was used to assess the goodness of fit of the regression model, which showed a statistically significant result denoting miss-specification in the predictive capacity of the model ($p= 0.003$). FH-IBS, IBS-symptoms triggering- and relieving foods showed statistically significant associations with IBS. Those with FH-IBS were almost 2.6 times more likely to have IBS compared to those with no FH-IBS [AOR: 2.572; 95% CI: 1.420 – 4.660, $p = 0.002$]. Those who reported having trigger-foods were nearly 6 times more likely to be With IBS than those who did not have trigger-foods [AOR: 5.859; 95% CI: 3.092 – 11.102, $p < 0.001$]. Those with symptoms-relieving foods were about 4 times more likely to have IBS compared to those who did not have symptoms-relieving foods [AOR: 3.881; 95% CI: 1.669 – 9.022, $p = 0.002$].

In Model 2, This model investigated the relationships between IBS and its covariates, ED [category: no (0) or yes (1)] and stress [category: low-moderate stress (0) or high stress (1)], adjusted for age and sex. Model 2 (Table 4) was not statistically significant [$\chi^2(3, n= 295) = 7.457$, $p = 0.059$], denoting that the null hypothesis of equal variances (between those with IBS and those without IBS) cannot be rejected. The model explains 3.4% (Nagelkerke R Square) of the variability in the dependent variable (IBS) correctly, and managed to classify 61% of IBS cases correctly. Hosmer–Lemeshow test was used to investigate the goodness of fit of the regression model, which showed a statistically significant result suggesting miss-specification in the predictive capacity of

the model (p= 0.013). Mental stress significantly contributed to the model showing that students with high stress had 1.7 times increase in the likelihood of having IBS compared to those with low-moderate levels [AOR: 1.730; 1.058 – 2.830, p = 0.029].

Table 3: Logistic Regression of the Predictive Factors of Irritable Bowel Syndrome among UAEU Students (Model 1)

Irritable Bowel Syndrome	AOR[a]	SE	P value	[95% CI[b]]
ED[c]	1.221	0.298	0.502	[0.681 - 2.188]
Stress[d]	1.042	0.032	0.199	[0.979 - 1.109]
Age	1.021	0.039	0.588	[0.946 - 1.103]
Regular Exercise	0.837	0.301	0.554	[0.464 - 1.509]
Smoking Status	1.927	0.573	0.253	[0.626 - 5.930]
FH-IBS[e]	2.572	0.303	0.002	[1.420 - 4.660]
BMI[f]	1.005	0.313	0.987	[0.544 - 1.858]
Triggering Foods	5.859	0.326	< 0.001	[3.092 - 11.102]
Relieving Foods	3.881	0.430	0.002	[1.669 - 9.022]

a. Adjusted Odds Ratio (AOR).
b. CI= Confidence Interval.
c. ED (Eating disorder) was used as a categorical variable with either no (0) or yes (1) for ED. Based on SCOFF questionnaire, a score ≥ 2 indicates a high likelihood of ED (AN or BN, specifically).
d. PSS scale for mental stress was used as a continuous variable. A score of (0-13) indicated low-stress, (14-26) moderate-stress, and (27-40) high-stress.
e. Family History of IBS was used as two categories with either no (0) or yes (1).
f. BMI (Body Mass Index) was used as category of two: Underweight or Normal-weight, and Overweight or Obese.

Table 4: Logistic regression of the Predictive Factors of Irritable Bowel Syndrome (Eating Disorder and Mental Stress) among UAEU Students (Model 2)

Irritable Bowel Syndrome	AOR	SE	P value	[95% CI]
ED[a]	1.039	0.252	0.878	[0.634 - 1.703]
Stress[b]	1.733	0.251	0.029	[1.059 – 2.836]

Model 2 is adjusted by age and sex.
a. ED (Eating Disorder) As a category: No ED (0), and ED (1).
b. Stress is used here as a category: Low-moderate stress (0), and High-stress (1).

Model 3, as seen in (Table 5), examined the association between IBS and its possible predictors from Model 1, using weight status as per BMI [categorical: underweight or normal weight (0), or overweight or obese (1)], stress (scale), age, regular exercise [category: no (0) or yes (1)], smoking status [category: no (0) or yes (1)], FH-IBS [category: no (0) or yes (1)], triggering-foods [category: no (0) or yes (1)], and relieving

foods [category: no (0) or yes (1)], stratified by ED. The purpose of this model was to examine the changes in the relationship between IBS and its cofactors in the presence/absence of ED [category: no (0) or yes (1)].

After stratifying by ED, the model shows a statistically significant result [$\chi^2(8, n= 295) = 61.533$, $p < 0.001$] to reject the null hypothesis of equal variance. The model explains 51.5% (Nagelkerke R Square) of the variability in the dependent variable with a correct classification of 71.5% of the cases. Hosmer–Lemeshow test was used to assess the goodness of fit, which showed a statistically significant results denoting miss-specification in the predictive capacity of the model ($p = 0.005$).

FH-IBS, trigger- and relief foods significantly contributed to the above model. In the absence of ED, participants with FH-IBS were 4.2 times more likely to be have IBS compared to those with no FH-IBS [AOR: 4.243; 95% CI: 1.580 – 11.393, $p = 0.004$]. Those who reported having symptoms-triggering foods were 10.3 times more likely to have IBS than those without trigger-foods [AOR: 10.312; 95% CI: 3.591 – 29.613, $p < 0.001$]. Students with symptoms-relieving foods were 11.4 times more likely to have IBS compared to those who did not have relieving foods [AOR: 11.371; 95% CI: 2.563 – 50.457, $p = 0.001$].

Table 5: Logistic Regression of the Predictive Factors of Irritable Bowel Syndrome by Eating Disorders among UAEU Students (Model 3)

IBS	**Total population**		**With ED**		**No ED**	
	AOR	**[95% CI]**	**AOR**	**[95% CI]**	**AOR**	**[95% CI]**
BMI[a]	1.038	[0.566 - 1.906]	1.032	[0.492 - 2.164]	0.790	[0.257- 0.2.43]
Smoking Status	2.018	[0.663 - 6.137]	2.584	[0.795 - 8.911]	1	-
Age	1.020	[0.945 - 1.101]	1.021	[0.692 - 1.132]	1.028	[0.911 - 1.159]
Regular PA	0.837	[0.464 - 1.510]	0.634	[0.292 - 1.377]	1.153	[0.424 - 3.138]
FH-IBS	2.528	[1.400 - 4.563]	2.000	[0.914 - 4.376]	4.243	[1.580 - 11.393]
Stress[b]	1.046	[0.984 - 1.112]	1.087	[0.710 - 1.663]	1.510	[0.898 - 2.539]
Trigger-Foods	5.803	[3.070 - 10.967]	4.465	[1.846 - 10.797]	10.312	[3.591- 29.613]
Relief-Foods	3.873	[1.672 – 8.973]	2.264	[0.747 - 6.864]	11.371	[2.563 - 50.457]

Model 3 contains logistic regression of IBS predictors by ED [category: no ED (0) or yes ED (1)]
a. BMI as a two-category; Underweight or Normal-weight, and Overweight or Obese.
b. PSS scale from 0-40.

In the presence of ED, the model is statistically significant [$\chi^2(8, n= 295) = 38.074$, $p < 0.001$], suggesting that it can distinguish between those with and without IBS diagnosis in the presence of ED. Hosmer–Lemeshow test showed a statistically insignificant result indicating that the model is a good fit (p= 168). The model explains 27.8% of the variance in IBS by ED, with 76.2% correctly classified cases. Only symptom triggering foods showed a significant association with IBS by ED. Those who reported trigger-foods were 4.5 times more likely to be diagnosed with IBS in the presence of ED than those without trigger-foods [AOR: 4.465; 95% CI: 1.846 - 10.797, $p < 0.001$]. No other variables were found to be significantly associated with IBS in the presence of ED.

3.4 Discussion

This study assessed the prevalence of IBS, ED, and mental stress, their associations and IBS determinants among UAEU students. More than half of the participants had self-reported ED and high mental stress (55.9% and 53.2%, respectively). More than one-third of them (39%) had unidentified IBS with the following sub-types: IBS-M (42.6%), IBS-C (31.3%), and IBS-D (26.1%). IBS was significantly associated with mental stress. Those with high mental stress (adjusted for age and sex) were 1.7 times more likely to have IBS compared to those with low-moderate stress. However, this association did not remain significant when adjusted for other cofactors of IBS (as illustrated previously in Model 1). FH-IBS, symptoms triggering- and relieving-food were significantly associated with the prevalence of IBS in this study. Students with FH-IBS were 2.6 times more likely to have IBS compared to those with no FH-IBS. Those who reported having trigger-foods were 6 times more likely to have IBS than those who did not have trigger-foods. Lastly, students with symptoms-relieving foods were 4 times more likely to have IBS compared to those who did not have symptoms-relieving foods. In the presence of ED, the only predictor of IBS was trigger-food. Those who reported trigger-food, in the presence of ED, are 4.5 times more likely to have IBS compared to their counterpart.

These findings are concerning; considering high occurrences of IBS (39%) and ED (55.9%) among UAEU students which is above the global prevalence of 15% and 3.3–18.6%, respectively (Galmiche et al., 2019; Zhang et al., 2022). In a 2023 meta-analysis, global prevalence of 16-25% mental stress was lower (Mahmud et al., 2023) than the

present study of 53.2%. However, studies conducted on university students in the region (UAE, Saudi Arabia, Egypt, Pakistan, and Lebanon), showed high prevalence of IBS (15.8-46.8%) ED (17-33%), and mental stress (16-20%) (Al Marzouqi et al., 2022; AlButaysh et al., 2020; Ali & Shehata, 2020; Asif et al., 2020; Bizri et al., 2020; Yazbeck et al., 2023). On the other hand, studies from different regions (India, Israil, and New Zealand) have reported lower prevalence of IBS (2.9%), ED (0.5%), and mental stress (4%) in their populations (Koshy, 2019; Sperber et al., 2005; Wells et al., 2006). IBS-M (42.6%) was the predominant IBS subtype in our sample. Similarly, different studies have reported IBS-M as the most common subtype in their populations (Saudi Arabia, and an international multi-center study in East Asia) with a prevalence of 53.8% and 54.9% (Alharbi et al., 2022; Takeoka et al., 2023). On the contrary, other studies reported IBS-D (46%) and IBS-C (58.1%) as the most common IBS subtypes among their populations (Kibune Nagasako et al., 2016; Self et al., 2014).

IBS was reported as the most common (52%) GI disorder among EDs patients (Boyd et al., 2005). Though it is unclear whether it is more common for IBS to proceed ED or vice versa, they can both lead to one another (Abraham & Kellow, 2013; Hayes et al., 2014). Studies have shown that eating behaviors in ED (purging, abstaining from food, laxative and diuretics abuse) can trigger the GI disorders including IBS (Salvioli et al., 2013). Disordered eating in IBS may lead to ED (Harer, 2019). The effects of IBS, ED, and mental health were investigated among university students in France. The findings revealed approximately 3% prevalence of IBS with coexisting ED, and stress was noted as a risk factor for both IBS and ED (Spillebout et al., 2019). In contrast, no difference in ED cases was evident among IBS patients and healthy participants, although co-existing IBS with ED was associated with stressful life events and poor QoL (Melchior et al., 2020).

Uncontrolled stress and stressful life events increase the risk of IBS development and its deterioration (Chang, 2011). A recent case-control study reported that mental stress exacerbated IBS symptoms and altered GI motility (Schaper & Stengel, 2022). Another study conducted on female university students in Taiwan found that With IBS students had higher levels of stress and low QoL compared to healthy students (Chen et al., 2021). Although these results are consistent with our findings, only crude analysis showed association between mental stress and IBS; however, mental stress was not associated with

IBS when adjusted by other factors in logistic regression. This may indicate a weak association and a suppression effect in the presence of other factors in the logistic regression model.

In our study, no association was found between IBS and SEC or lifestyle factors. On the contrary, different studies found links between IBS and SEC and lifestyle factors. Females had a higher prevalence of IBS compared to males (AlAmeel et al., 2020; Alharbi et al., 2019; Wilson et al., 2004). Female hormones may play a role in the pathology of IBS, which explains the disparity of IBS diagnosis between sexes (Kim & Kim, 2018). In contrast, a cross-sectional study conducted in East Asia should that male participants had higher prevalence of IBS (54.9%) with predominance of IBS-D, as compared to females (Takeoka et al., 2023). Moreover, previous literature suggested that although females and males may differ in the symptomology and subtypes, there were no difference in the incidence of IBS between sexes (Adeyemo et al., 2010; Anbardan et al., 2012). The lack of association between IBS and sex in the present study may be attributed to the small sample size and the high ratio of female participants 7:1 compared to male participants.

Our study showed no association between IBS and age, probably due to the lack of age variations in our sample. Inconsistent evidence is found in the literature. To elaborate, adults 50 years or above of age were less likely to have IBS compared to those who are younger (Kosako et al., 2018; Lovell & Ford, 2012). Nevertheless, IBS was more common in younger adults, although high IBS reports were also documented among older adults (Wu et al., 2023).

Financial difficulty did not appear as an associative factor for IBS. The role of financial status on IBS is unclear, and it can be more common among those with high or low FD depending on the population (Howell et al., 2004; Mansouri et al., 2017). Low- or high-income jobs and environment can lead to mental stress, which in turn lead to the development of IBS and the aggravation of its symptoms (Silvernale et al., 2019).

The present study did not show an association of IBS and BMI. Studies show conflicting results regarding IBS and its connection to BMI. IBS can be seen among people with different BMIs, yet different research reports worsen symptoms among those who are overweight or obese due to increase in C-reactive protein and other inflammatory markers

among overweight or obsess individuals (Dong et al., 2018; Thomas-Dupont et al., 2022; Yamamoto et al., 2022).

Our study confirmed that FH-IBS increased the likelihood of IBS in university studies. Previous studies also showed findings consistent with ours (AlButaysh et al., 2020; Pace et al., 2006). IBS aggregating in families may indicate genetic ties or shared environmental exposure to risk factors of IBS, such as mental stress or diet (Saito et al., 2010).

Lifestyle factors including PA and smoking were not associated with IBS in the present study. We did not find evidence to suggest that PA is a predictor of IBS. Yet, sedentary lifestyle is a risk factor of IBS, and regular PA can be used in the prevention of IBS and the management of its symptoms (Dong et al., 2010; Fani et al., 2019; Groenendijk et al., 2022). Further, various studies found an association between IBS and smoking which is not consistent with our results (Mahmood et al., 2020; Nilsson & Ohlsson, 2021; Talley et al., 2021).

Unhealthy dietary habits are seen as major contributor to the diagnosis and poor management of IBS in earlier studies (Dong et al., 2010; Geissler & Powers, 2005; Monsbakken et al., 2006; Yazbeck et al., 2023). Although, we did not find any relationship between dietary habits and IBS, our study showed an association between IBS and symptoms triggering- and relieving-food. Those with IBS report trigger-food consumption, such as diet high in FODMAP, dairy intolerance, fatty food, and gluten (Hayes et al., 2014; Jansson-Knodell et al., 2022; Lee et al., 2019). On the other hand, the consumption of low FODMAP diet and more relieving foods such as herbs, yogurt, and gluten substitutes can alleviate IBS-symptoms (Bahrami et al., 2016; Hajiani et al., 2019; Noorbakhsh et al., 2019; Radziszewska et al., 2023).

Our study had some inherent limitations. Usual dietary intakes in addition to the specific triggering- relieving foods should have been included to investigate the nutrient adequacy of the students. Males contributed to a small sample size (n= 36), in comparison to a proportionately larger female sample (n= 259). Thus, results based on sex in IBS, ED, and stress might have been underestimated. Data analysis based on sample size of n=295 in contrast to the target of 385, could have adversely affected the margin of error. The

majority of the participants were from College of Medicine and Health Sciences (36.6%) which can be attributed to the interest this group of students have in the topic. Lastly, IBS can be easily misdiagnosed due to the overlapping of its symptomology with other GI diseases and disorders. Those with Crohn's disease, ulcerative colitis, celiac disease, CRC, and other GI disorders can still score high in ROME III criteria for IBS. Furthermore, self-reporting bias was another important limitation. Those who had IBS-like symptoms, ED, and/or high mental stress might have taken better interest in completing the online survey due to their personal experiences; subsequently causing an overestimation of their prevalence in the population.

Nevertheless, the study had the following strengths, rebutting the above limitations. Administering a single comprehensive survey, comprising of different sections adopted from validated questionnaires for the assessments of IBS, ED, and mental stress ensured students' attention to complete it one sitting. Since it was self-administered online during COVID period, the students had the time to complete the survey. Better understanding of the items leading to improved accuracy was secured through the bilingual (English and Arabic) versions. There is a lack of scientific evidence on prevalence and associations of IBS, ED, and mental stress in context to young adults, university students in particular, in the UAE. This study, therefore, highlighted some important findings related to IBS, ED and mental stress as common health conditions among the UAEU students.

Chapter 4: Conclusion

Among UAEU students, the prevalence of IBS, ED, and high stress were 39%, 55.9%, and 53.2% respectively. An association was found between IBS and mental stress. However, this association did not remain when adjusted to other SEC which may indicate a weak association. IBS was also associated with FH-IBS, symptoms triggering- and relieving-food in our study. In the presence of ED, trigger-food was the only predictor of IBS. No other significant associations were noted between IBS and ED, SEC, regular exercise, or dietary habits.

It is, however, advised for participants with unidentified IBS to seek stress management, quit smoking, and adhere to regular exercise and healthy dietary behaviors. Although UAEU provides counseling and wellbeing services, there is a lack of services targeting EDs with trained staff. It is advised for UAEU administration to encourage students to seek counseling for stress management and to provide assistance to students with ED, due to the possible serious complications that may arise from them. Further research is warranted on university students at the national level to address the above-mentioned limitations and generalizability of results in this study.

4.1 Managerial Implications

The high prevalence of ED and mental stress among UAEU students should be addressed by providing proper counselling and immediate targeted interventions. Since IBS, ED, and high mental stress lower the QoL and affect students' performance and wellbeing, resources should be facilitated for early detection and management of IBS to help the UAEU students overcome these health issues.

4.2 Research Implications

This research provides the baseline prevalence of IBS, ED, and mental stress among UAEU students that need to be further explored in future studies. Our study findings show high prevalence of IBS (39%), ED (55.9%), and high mental stress levels (53.2%) among UAEU students. FH-IBS, trigger- and relieving foods showed statistically significant associations with IBS. To specify, FH-IBS increased the likelihood of IBS by 2.6 times; symptoms triggering- and relieving food by 6 and 4 times, respectively, among the UAEU students. SES and lifestyle factors were not associated with IBS. Although IBS and ED showed association, students with high mental-stress were 7.3 times more likely to have IBS compared to those with low-moderate stress, when adjusted to sex an age. However, the significant relationship between IBS and mental stress was lost when adjusted for other SES and lifestyle factors. This may indicate a weak association between IBS and mental stress or the presence of suppressor effect in presence of other factors in the logistic regression model.

Pragmatic actions that should be taken into consideration when assessing for IBS, ED, and mental stress, their determinants and associations in future research. An interview rather than online-survey would minimize the proxy and missing information. Large cohort studies on a representative, randomly selected sample should be conducted to avoid bias, and generalize the results for the university students in the UAE.

References

Abdi, L., Rostami, H., Rahmani, A., & Shojaei, R. (2020). Prevalence of anorexia nervosa and bulimia nervosa among women who recently attempted suicide compared with suicide non-attempting women. *Archives of Psychiatry and Psychotherapy*, *22*(3), 54-60. https://doi.org/10.12740/APP/114187

Abraham, & Kellow. (2013). Do the digestive tract symptoms in eating disorder patients represent functional gastrointestinal disorders? *BMC Gastroenterol*, *13*, 38. https://doi.org/10.1186/1471-230x-13-38

Abraham, S., & Llewellyn-Jones, D. (2001). *Eating disorders: The facts*. Oxford University Press.

Adam, B., Liebregts, T., & Holtmann, G. (2007). Mechanisms of disease: genetics of functional gastrointestinal disorders--searching the genes that matter. *Nat Clin Pract Gastroenterol Hepatol*, *4*(2), 102-110. https://doi.org/10.1038/ncpgasthep0717

Adeyemo, M. A., Spiegel, B. M., & Chang, L. (2010). Meta-analysis: do irritable bowel syndrome symptoms vary between men and women? *Aliment Pharmacol Ther*, *32*(6), 738-755. https://doi.org/10.1111/j.1365-2036.2010.04409.x

Al Marzouqi, A. M., Otim, M. E., Alblooshi, A., Al Marzooqi, S., Talal, M., & Wassim, F. (2022). State of Emotional Health Disorders of Undergraduate Students in the United Arab Emirates: A Cross-Sectional Survey. *Psychol Res Behav Manag*, *15*, 1423-1433. https://doi.org/10.2147/prbm.s365012

AlAmeel, T., Roth, L. S., & Al Sulais, E. (2020). The Prevalence of Irritable Bowel Syndrome Among Board-Certified Medical Doctors In Saudi Arabia: A Cross-sectional Study. *J Can Assoc Gastroenterol*, *3*(6), e32-e36. https://doi.org/10.1093/jcag/gwz020

AlButaysh, O. F., AlQuraini, A. A., Almukhaitah, A. A., Alahmdi, Y. M., & Alharbi, F. S. (2020). Epidemiology of irritable bowel syndrome and its associated factors in Saudi undergraduate students. *Saudi Journal of Gastroenterology: Official Journal of The Saudi Gastroenterology Association*, *26*(2), 89-93. https://doi.org/10.4103/sjg.SJG_459_19

Alharbi, M. H., Alhazmi, A. H., Ujaimi, M. H., Alsarei, M., Alafifi, M. M., Baalaraj, F. S., & Shatla, M. (2022). The Prevalence of Irritable Bowel Syndrome and Its Relation to Psychiatric Disorders Among Citizens of Makkah Region, Saudi Arabia. *Cureus*, *14*(12), e32705. https://doi.org/10.7759/cureus.32705

Alharbi, S. H., Alateeq, F. A., Alshammari, K. I., Alshammri, A. S. S., Alabdali, N. A. N., Alsulaiman, M. A. S., . . . Ahmed, H. G. (2019). Irritable Bowel Syndrome and Dietary Habits in Northern Saudi Arabia. *Health*, *11*(03), 289.

Ali, E. A. A., & Shehata, W. M. (2020). Eating disorder risk among medical students at Tanta University, Egypt. *Egyptian J Community Med*, *38*(4), 17.

Almario, C. V., Sharabi, E., Chey, W. D., Lauzon, M., Higgins, C. S., & Spiegel, B. M. R. (2023). Prevalence and Burden of Illness of Rome IV Irritable Bowel Syndrome in the United States: Results from a Nationwide Cross-Sectional Study. *Gastroenterology 65*(6)*,*1475-1487. https://doi.org/10.1053/j.gastro.2023.08.010

Altomare, A., Di Rosa, C., Imperia, E., Emerenziani, S., Cicala, M., & Guarino, M. P. L. (2021). Diarrhea Predominant-Irritable Bowel Syndrome (IBS-D): Effects of Different Nutritional Patterns on Intestinal Dysbiosis and Symptoms. *Nutrients*, *13*(5), 1506. https://doi.org/10.3390/nu13051506

Anbardan, S. J., Daryani, N. E., Fereshtehnejad, S. M., Taba Taba Vakili, S., Keramati, M. R., & Ajdarkosh, H. (2012). Gender Role in Irritable Bowel Syndrome: A Comparison of Irritable Bowel Syndrome Module (ROME III) Between Male and Female Patients. *J Neurogastroenterol Motil*, *18*(1), 70-77. https://doi.org/10.5056/jnm.2012.18.1.70

Anderson, M. (2018). *What Is Disordered Eating?* Academy of Nutrition and Dietetics. Retrieved May 27 from https://www.eatright.org/health/diseases-and-conditions/eating-disorders/what-is-disordered-eating

Anzengruber, D., Klump, K. L., Thornton, L., Brandt, H., Crawford, S., Fichter, M. M., . . . Bulik, C. M. (2006). Smoking in eating disorders. *Eat Behav*, *7*(4), 291-299. https://doi.org/10.1016/j.eatbeh.2006.06.005

Arishi, A. M., Elmakki, E. E., Hakami, O. M., Alganmy, O. M., Maashi, S. M., Al-Khairat, H. K., . . . Elmakki, E. E. (2021). Irritable bowel syndrome: prevalence and risk factors in Jazan Region, Saudi Arabia. *Cureus*, *13*(6), 15979.

Asif, S., Mudassar, A., Shahzad, T. Z., Raouf, M., & Pervaiz, T. (2020). Frequency of depression, anxiety and stress among university students. *Pakistan Journal of Medical Sciences*, *36*(5), 971-976. https://doi.org/10.12669/pjms.36.5.1873

Baaleman, D. F., Velasco-Benítez, C. A., Méndez-Guzmán, L. M., Benninga, M. A., & Saps, M. (2021). Functional gastrointestinal disorders in children: agreement between Rome III and Rome IV diagnoses. *European Journal of Pediatrics*, *180*(7), 2297-2303. https://doi.org/10.1007/s00431-021-04013-2

Bae, Y. S., Shin, E. C., & Van Eden, W. (2019). Editorial: Stress and Immunity. *Front Immunol*, *10*, 245. https://doi.org/10.3389/fimmu.2019.00245

Bahrami, H. R., Hamedi, S., Salari, R., & Noras, M. (2016). Herbal Medicines for the Management of Irritable Bowel Syndrome: A Systematic Review. *Electron Physician*, *8*(8), 2719-2725. https://doi.org/10.19082/2719

Baik, S. H., Fox, R. S., Mills, S. D., Roesch, S. C., Sadler, G. R., Klonoff, E. A., & Malcarne, V. L. (2019). Reliability and validity of the Perceived Stress Scale-10 in Hispanic Americans with English or Spanish language preference. *J Health Psychol*, *24*(5), 628-639. https://doi.org/10.1177/1359105316684938

Balasundaram, P., & Santhanam, P. (2022). *Eating Disorders*. StatPearls Publishing. Retrieved March 1 from https://www.ncbi.nlm.nih.gov/books/NBK567717/

Ballou, S., & Keefer, L. (2017). The impact of irritable bowel syndrome on daily functioning: Characterizing and understanding daily consequences of IBS. *Neurogastroenterol Motil*, *29*(4), 12-16. https://doi.org/10.1111/nmo.12982

Bataineh, M. Z. (2013). Academic stress among undergraduate students: the case of education faculty at King Saud University. *International Interdisciplinary Journal of Education*, *1*(1033), 1-7.

Bizri, M., Geagea, L., Kobeissy, F., & Talih, F. (2020). Prevalence of Eating Disorders Among Medical Students in a Lebanese Medical School: A Cross-Sectional Study. *16*, 1879-1887.

Black, C. J., & Ford, A. C. (2020). Global burden of irritable bowel syndrome: trends, predictions and risk factors. *Nat Rev Gastroenterol Hepatol*, *17*(8), 473-486. https://doi.org/10.1038/s41575-020-0286-8

Black, C. J., & Ford, A. C. (2021). Best management of irritable bowel syndrome. *Frontline Gastroenterology*, *12*(4), 303-315.

Bloom, E. L., Farris, S. G., DiBello, A. M., & Abrantes, A. M. (2019). Smoking-related weight and appetite concerns and use of electronic cigarettes among daily cigarette smokers. *Psychol Health Med*, *24*(2), 221-228. https://doi.org/10.1080/13548506.2018.1537495

Boyd, C., Abraham, S., & Kellow, J. (2005). Psychological features are important predictors of functional gastrointestinal disorders in patients with eating disorders. *Scand J Gastroenterol*, *40*(8), 929-935. https://doi.org/10.1080/00365520510015836

Brunet, J., Del Duchetto, F., & Wurz, A. (2021). Physical activity behaviors and attitudes among women with an eating disorder: a qualitative study. *Journal of Eating Disorders*, *9*(1), 20. https://doi.org/10.1186/s40337-021-00377-w

Bulik, C. M., Trace, S. E., & Mazzeo, S. E. (2013). Chapter 87 - Eating Disorders. In M. B. Goldman, R. Troisi, & K. M. Rexrode (Eds.), *Women and Health (Second Edition)* (pp. 1293-1303). Academic Press. https://doi.org/10.1016/B978-0-12-384978-6.00087-X

Buscail, C., Sabate, J.-M., Bouchoucha, M., Kesse-Guyot, E., Hercberg, S., Benamouzig, R., & Julia, C. (2017). Western Dietary Pattern Is Associated with Irritable Bowel Syndrome in the French NutriNet Cohort. *Nutrients*, *9*(9), 986. https://doi.org/10.3390/nu9090986

Börekci, E., Celikbilek, M., Soytürk, M., Akar, S., Börekci, H., & Günaydin, I. (2017). Functional gastrointestinal disorders in patients with familial Mediterranean fever. *Int J Rheum Dis*, *20*(12), 2101-2105. https://doi.org/10.1111/1756-185x.12207

Canavan, C., West, J., & Card, T. (2014). The epidemiology of irritable bowel syndrome. *Clin Epidemiol*, *6*, 71-80. https://doi.org/10.2147/clep.s40245

Casiero, D., & Frishman, W. H. (2006). Cardiovascular complications of eating disorders. *Cardiology in Review*, *14*(5), 227-231.

CDC. (2022). *Defining Adult Overweight & Obesity*. Central of Disease Control. Retrieved September 5 from https://www.cdc.gov/obesity/basics/adult-defining.html

Chang, H. C., Yen, A. M. F., Fann, J. C. Y., Chiu, S. Y. H., Liao, C. S., Chen, H. H., . . . Lin, Y. M. (2015). Irritable bowel syndrome and the incidence of colorectal neoplasia: a prospective cohort study with community-based screened population in Taiwan. *British Journal of Cancer*, *112*(1), 171-176. https://doi.org/10.1038/bjc.2014.575

Chang, L. (2011). The role of stress on physiologic responses and clinical symptoms in irritable bowel syndrome. *Gastroenterology*, *140*(3), 761-765. https://doi.org/10.1053/j.gastro.2011.01.032

Chao, A. M., White, M. A., & Grilo, C. M. (2016). Smoking status and psychosocial factors in binge eating disorder and bulimia nervosa. *Eat Behav*, *21*, 54-58. https://doi.org/10.1016/j.eatbeh.2015.12.011

Chen, H.-H., Hung, C.-H., & Hsieh, H.-F. (2021). Exploring Quality of Life, Stress, and Risk Factors Associated with Irritable Bowel Syndrome for Female University Students in Taiwan. *International Journal of Environmental Research and Public Health*, *18*(8), 3888. https://doi.org/10.3390/ijerph18083888

Chen, Z. F., Mitchell, J. E., Li, K., Yu, W. M., De Lan, Y., Jun, Z., . . . Pomeroy, C. (1992). The prevalence of anorexia nervosa and bulimia nervosa among freshman medical college students in China. *International Journal of Eating Disorders*, *12*(2), 209-214.

Chimezie, R. O. (2023). Health Awareness: A Significant Factor in Chronic Diseases Prevention and Access to Care. *Journal of Biosciences and Medicines*, *11*(2), 64-79.

Chitkara, D. K., van Tilburg, M. A., Blois-Martin, N., & Whitehead, W. E. (2008). Early life risk factors that contribute to irritable bowel syndrome in adults: a systematic review. *Am J Gastroenterol*, *103*(3), 765-774; 775. https://doi.org/10.1111/j.1572-0241.2007.01722.x

Cleland, L., Kennedy, H. L., Pettie, M. A., Kennedy, M. A., Bulik, C. M., & Jordan, J. (2023). Eating disorders, disordered eating, and body image research in New Zealand: a scoping review. *Journal of Eating Disorders*, *11*(1), 7. https://doi.org/10.1186/s40337-022-00728-1

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 385-396.

Cozma-Petruţ, A., Loghin, F., Miere, D., & Dumitraşcu, D. L. (2017). Diet in irritable bowel syndrome: What to recommend, not what to forbid to patients! *World Journal of Gastroenterology*, *23*(21), 3771-3783. https://doi.org/10.3748/wjg.v23.i21.3771

D'Ugo, S., Stasi, E., Gaspari, A. L., & Sileri, P. (2015). Hemorrhoids and anal fissures in inflammatory bowel disease. *Minerva Gastroenterol Dietol*, *61*(4), 223-233.

Dai, X., Gil, G. F., Reitsma, M. B., Ahmad, N. S., Anderson, J. A., Bisignano, C., . . . Gakidou, E. (2022). Health effects associated with smoking: a Burden of Proof study. *Nature Medicine*, *28*(10), 2045-2055. https://doi.org/10.1038/s41591-022-01978-x

de León-Vázquez, C. n. D. a., Villalobos-Hernández, A., Rivera-Márquez, J. A., & Unikel-Santoncini, C. (2019). Effect of parental criticism on disordered eating behaviors in male and female university students in Mexico City. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, *24*(5), 853-860. https://doi.org/10.1007/s40519-018-0564-4

DeJong, H., Perkins, S., Grover, M., & Schmidt, U. (2011). The prevalence of irritable bowel syndrome in outpatients with bulimia nervosa [https://doi.org/10.1002/eat.20901]. *International Journal of Eating Disorders*, *44*(7), 661-664. https://doi.org/https://doi.org/10.1002/eat.20901

Dekel, R., Drossman, D. A., & Sperber, A. D. (2013). The use of psychotropic drugs in irritable bowel syndrome. *Expert Opin Investig Drugs*, *22*(3), 329-339. https://doi.org/10.1517/13543784.2013.761205

Denovan, A., Dagnall, N., Dhingra, K., & Grogan, S. (2019). Evaluating the Perceived Stress Scale among UK university students: implications for stress measurement and management. *Studies in Higher Education*, *44*(1), 120-133.

Dong, Y., Berens, S., Eich, W., Schaefert, R., & Tesarz, J. (2018). Is body mass index associated with symptom severity and health-related quality of life in irritable bowel syndrome? A cross-sectional study. *BMJ Open*, *8*(10), e019453. https://doi.org/10.1136/bmjopen-2017-019453

Dong, Y.-Y., Zuo, X.-L., Li, C.-Q., Yu, Y.-B., Zhao, Q.-J., & Li, Y.-Q. (2010). Prevalence of irritable bowel syndrome in Chinese college and university students assessed using Rome III criteria. *World Journal of Gastroenterology*, *16*(33), 4221-4226.

Drossman, D. A., Morris, C. B., Hu, Y., Toner, B. B., Diamant, N., Leserman, J., . . . Bangdiwala, S. I. (2005). A prospective assessment of bowel habit in irritable bowel syndrome in women: Defining an alternator. *Gastroenterology*, *128*(3), 580-589. https://doi.org/https://doi.org/10.1053/j.gastro.2004.12.006

Dumic, I., Nordin, T., Jecmenica, M., Stojkovic Lalosevic, M., Milosavljevic, T., & Milovanovic, T. (2019). Gastrointestinal Tract Disorders in Older Age. *Can J Gastroenterol Hepatol*, *2019*, 6757524. https://doi.org/10.1155/2019/6757524

Eating Disorders. (2019). Mayo Clinic. Retrieved May 27 from https://www.niddk.nih.gov/health-information/digestive-diseases/irritable-bowel-syndrome/definition-facts

Eckerling, A., Ricon-Becker, I., Sorski, L., Sandbank, E., & Ben-Eliyahu, S. (2021). Stress and cancer: mechanisms, significance and future directions. *Nat Rev Cancer*, *21*(12), 767-785. https://doi.org/10.1038/s41568-021-00395-5

Eddy, K. T., Dorer, D. J., Franko, D. L., Tahilani, K., Thompson-Brenner, H., & Herzog, D. B. (2008). Diagnostic crossover in anorexia nervosa and bulimia nervosa: implications for DSM-V. *Am J Psychiatry*, *165*(2), 245-250. https://doi.org/10.1176/appi.ajp.2007.07060951

Emmanuel, A., & Quigley, E. M. M. (2013). *Irritable Bowel Syndrome : Diagnosis and Clinical Management*. Wiley.

Erriu, M., Cimino, S., & Cerniglia, L. (2020). The Role of Family Relationships in Eating Disorders in Adolescents: A Narrative Review. *Behav Sci (Basel)*, *10*(4). https://doi.org/10.3390/bs10040071

Fani, M., Mostamand, J., Fani, M., Chitsaz, N., & Feizi, A. (2019). The effect of aerobic exercises among women with mild and moderate irritable bowel syndrome: A pilot study. *Journal of Bodywork and Movement Therapies*, *23*(1), 161-165. https://doi.org/https://doi.org/10.1016/j.jbmt.2018.02.003

Farzaneh, N., Ghobakhlou, M., Moghimi-Dehkordi, B., Naderi, N., & Fadai, F. (2012). Evaluation of Psychological Aspects Among Subtypes of Irritable Bowel Syndrome. *Indian Journal of Psychological Medicine*, *34*(2), 144-148. https://doi.org/10.4103/0253-7176.101780

Ferreira, B. A. G. G. (2023). Eating Disorders and Gastrointestinal Diseases: relationship, coexistence and state of the art. *TC Porto*. University of Porto. https://repositorio-aberto.up.pt/bitstream/10216/151297/2/635314.pdf

Ford, D. M., Budworth, L., Lawton, R., Teale, E. A., & O'Connor, D. B. (2023). In-hospital stress and patient outcomes: A systematic review and meta-analysis. *PLoS One*, *18*(3), e0282789. https://doi.org/10.1371/journal.pone.0282789

Frank, G. K. W., Shott, M. E., & DeGuzman, M. C. (2019). Recent advances in understanding anorexia nervosa. *F1000Research*, *8*, F1000 Faculty Rev-1504. https://doi.org/10.12688/f1000research.17789.1

Fujii, Y., & Nomura, S. (2008). A prospective study of the psychobehavioral factors responsible for a change from non-patient irritable bowel syndrome to IBS patient status. *BioPsychoSocial Medicine*, *2*(1), 1-10.

Gabrielli, F., & Irtelli, F. (2022). Body image and eating disorders: an anthropological and psychological overview. *Cambridge University Press*.

Galmiche, M., Déchelotte, P., Lambert, G. g., & Tavolacci, M. P. (2019). Prevalence of eating disorders over the 2000–2018 period: a systematic literature review. *The American Journal of Clinical Nutrition*, *109*(5), 1402-1413. https://doi.org/10.1093/ajcn/nqy342

Garcia, S. C., Mikhail, M. E., Keel, P. K., Burt, S. A., Neale, M. C., Boker, S., & Klump, K. L. (2020). Increased Rates of Eating Disorders and their Symptoms in Women with Major Depressive Disorder and Anxiety Disorders. *The International Journal of Eating Disorders*, *53*(11), 1844-1854. https://doi.org/10.1002/eat.23366

García Rodríguez, L. A., Ruigómez, A., Wallander, M. A., Johansson, S., & Olbe, L. (2000). Detection of colorectal tumor and inflammatory bowel disease during follow-up of patients with initial diagnosis of irritable bowel syndrome. *Scand J Gastroenterol*, *35*(3), 306-311. https://doi.org/10.1080/003655200750024191

Garrigues, V., Mearin, F., Badia, X., Balboa, A., Benavent, J., Caballero, A., . . . Figueras, M. (2007). Change over time of bowel habit in irritable bowel syndrome: a prospective, observational, 1-year follow-up study (RITMO study). *Alimentary Pharmacology & Therapeutics*, *25*(3), 323-332.

Geissler, C., & Powers, H. (2005). Human Nutrition with CD-Rom. *Churchill Livingstone*.

Gonçalves, S. F., Machado, B. C., Martins, C., & Machado, P. P. P. (2014). Eating and weight/shape criticism as a specific life-event related to bulimia nervosa: a case control study. *The Journal of Psychology*, *148*(1), 61-72.

Goriounova, N. A., & Mansvelder, H. D. (2012). Short- and long-term consequences of nicotine exposure during adolescence for prefrontal cortex neuronal network function. *Cold Spring Harb Perspect Med*, *2*(12), a012120. https://doi.org/10.1101/cshperspect.a012120

Gorwood, P. (2004). Eating disorders, serotonin transporter polymorphisms and potential treatment response. *Am J Pharmacogenomics*, *4*(1), 9-17. https://doi.org/10.2165/00129785-200404010-00002

Grodzinsky, E., Hallert, C., Faresjö, T., Bergfors, E., & Faresjö, Å. O. (2012). Could gastrointestinal disorders differ in two close but divergent social environments? *International Journal of Health Geographics*, *11*(1), 1-10.

Groenendijk, D. W., Witteman, B. J., & Mulder, B. C. (2022). The Experiences of Female IBS Patients Concerning Physical Activity as Treatment Modality: A Qualitative Study. *Qualitative Health Research*, *32*(11), 1690-1700. https://doi.org/10.1177/10497323221110109

Guarda, A. (2023). *Eating Disorders*. American Psychiatric Association. Retrieved September 5 from https://www.psychiatry.org/patients-families/eating-disorders/what-are-eating-disorders

Guarda, A. S., Schreyer, C. C., Boersma, G. J., Tamashiro, K. L., & Moran, T. H. (2015). Anorexia nervosa as a motivated behavior: Relevance of anxiety, stress, fear and learning. *Physiology & Behavior*, *152*, 466-472. https://doi.org/https://doi.org/10.1016/j.physbeh.2015.04.007

Hajiani, E., Masjedizadeh, A., Shayesteh, A. A., Babazadeh, S., & Seyedian, S. S. (2019). Comparison between gluten-free regime and regime with gluten in symptoms of patients with irritable bowel syndrome (IBS). *J Family Med Prim Care*, *8*(5), 1691-1695. https://doi.org/10.4103/jfmpc.jfmpc_464_18

Harer, K., Baker, J., Reister, N., Collins, K., Watts, L., Phillips, C., & Chey, W. D. (2018). Avoidant/restrictive food intake disorder in the adult gastroenterology population: an under-recognized diagnosis?: 417. *Official Journal of The American College of Gastroenterology| ACG*, *113*, S247-S248.

Harer, K. N. (2019). Irritable Bowel Syndrome, Disordered Eating, and Eating Disorders. *Gastroenterology & Hepatology*, *15*(5), 280-282.

Hayes, P., Corish, C., O'Mahony, E., & Quigley, E. M. (2014). A dietary survey of patients with irritable bowel syndrome. *J Hum Nutr Diet*, *27 Suppl 2*, 36-47. https://doi.org/10.1111/jhn.12114

Helvaci, M. R., Algin, M. C., & Kaya, H. (2009). Irritable bowel syndrome and chronic gastritis, hemorrhoid, urolithiasis. *The Eurasian Journal of Medicine*, *41*(3), 158-161.

Henningsen, P., Zimmermann, T., & Sattel, H. (2003). Medically unexplained physical symptoms, anxiety, and depression: a meta-analytic review. *Psychosomatic Medicine*, *65*(4), 528-533.

Hosseini Oskouie, F., Vahedi, H., Shahrbaf, M. A., Sadeghi, A., Rashidkhani, B., & Hekmatdoost, A. (2018). Dietary fiber and risk of irritable bowel syndrome: a case-control study. *Gastroenterology and Hepatology from Bed to Bench*, *11*(Suppl 1), S20-S24.

Houghton, L. A., Heitkemper, M., Crowell, M. D., Emmanuel, A., Halpert, A., McRoberts, J. A., & Toner, B. (2016). Age, gender, and women's health and the patient. *Gastroenterology*, *150*(6), 1332-1343.

Howell, S., Talley, N. J., Quine, S., & Poulton, R. (2004). The irritable bowel syndrome has origins in the childhood socioeconomic environment. *Am J Gastroenterol*, *99*(8), 1572-1578. https://doi.org/10.1111/j.1572-0241.2004.40188.x

Hu, L. Y., Ku, F. C., Lu, T., Shen, C. C., Hu, Y. W., Yeh, C. M., . . . Liu, C. J. (2015). Risk of cancer in patients with irritable bowel syndrome: a nationwide population-based study. *Ann Epidemiol*, *25*(12), 924-928. https://doi.org/10.1016/j.annepidem.2015.07.006

Hujoel, I. A. (2020). Nutritional status in irritable bowel syndrome: a North American population-based study. *JGH Open*, *4*(4), 656-662.

Huryk, K. M., Drury, C. R., & Loeb, K. L. (2021). Diseases of affluence? A systematic review of the literature on socioeconomic diversity in eating disorders. *Eating Behaviors*, *43*, 101548. https://doi.org/https://doi.org/10.1016/j.eatbeh.2021.101548

Ibrahim, N. K., Al-Bloushy, R. I., Sait, S. H., Al-Azhary, H. W., Al Bar, N. H., & Mirdad, G. A. (2016). Irritable bowel syndrome among nurses working in king Abdulaziz University Hospital, Jeddah, Saudi Arabia. *Libyan Journal of Medicine*, *11*(1).

Iyer, S., & Shriraam, V. (2021). Prevalence of Eating Disorders and Its Associated Risk Factors in Students of a Medical College Hospital in South India. *Cureus*, *13*(1), e12926. https://doi.org/10.7759/cureus.12926

Izquierdo, A. M., Nelson, J. D., Daza, A., Gasbarro, A., Hardin, R., Marino, J., & Fischer, S. (2023). Predictors of current suicidal ideation in a multi-diagnostic sample of individuals with eating disorders. *Journal of Eating Disorders*, *11*(1), 94. https://doi.org/10.1186/s40337-023-00789-w

Jadallah, K. A., Khatatbeh, M. M., Sarsak, E. W., Sweidan, A. N., & Alzubi, B. F. (2022). Irritable bowel syndrome and its associated factors among Jordanian medical students: A cross-sectional study. *Medicine (Baltimore)*, *101*(33), e30134. https://doi.org/10.1097/md.0000000000030134

Jansson-Knodell, C. L., White, M., Lockett, C., Xu, H., & Shin, A. (2022). Associations of Food Intolerance with Irritable Bowel Syndrome, Psychological Symptoms, and Quality of Life. *Clinical Gastroenterology and Hepatology: The Official Clinical Practice Journal of The American Gastroenterological Association*, *20*(9), 2121-2131. https://doi.org/10.1016/j.cgh.2021.12.021

Johannesson, E., Ringström, G., Abrahamsson, H., & Sadik, R. (2015). Intervention to increase physical activity in irritable bowel syndrome shows long-term positive effects. *World Journal of Gastroenterology*, *21*(2), 600-608. https://doi.org/10.3748/wjg.v21.i2.600

Kalantar, J. S., Locke, G. R., Zinsmeister, A. R., Beighley, C. M., & Talley, N. J. (2003). Familial aggregation of irritable bowel syndrome: a prospective study. *Gut*, *52*(12), 1703-1707.

Kassinen, A., Krogius-Kurikka, L., Mäkivuokko, H., Rinttilä, T., Paulin, L., Corander, J., . . . Palva, A. (2007). The fecal microbiota of irritable bowel syndrome patients differs significantly from that of healthy subjects. *Gastroenterology*, *133*(1), 24-33.

Katsanos, A. H., Giannopoulos, S., & Tsivgoulis, G. (2012). The brain-gut axis in the pathophysiology of irritable bowel syndrome. *Immuno-Gastroenterology*, *1*(1), 23-26.

Kayar, Y., Agin, M., Dertli, R., Kurtulmus, A., Boyraz, R. K., Onur, N. S., & Kirpinar, I. (2020). Eating disorders in patients with irritable bowel syndrome. *Gastroenterología y Hepatología*, *43*(10), 607-613. https://doi.org/https://doi.org/10.1016/j.gastrohep.2020.03.001

Kazim, A. A., Almarzooqi, M. S., & Karavetian, M. (2017). The prevalence and determents of eating disorders among Emirati female students aged 14–19 years in Ajman, UAE. *J Food Nutr Disord*, *6*, 2. https://doi.org/10.4172/2324-9323.1000222

Khayyatzadeh, S. S., Esmaillzadeh, A., Saneei, P., Keshteli, A. H., & Adibi, P. (2016). Dietary patterns and prevalence of irritable bowel syndrome in Iranian adults. *Neurogastroenterol Motil*, *28*(12), 1921-1933. https://doi.org/10.1111/nmo.12895

Kibune Nagasako, C., Garcia Montes, C., Silva Lorena, S. L., & Mesquita, M. A. (2016). Irritable bowel syndrome subtypes: Clinical and psychological features, body mass index and comorbidities. *Rev Esp Enferm Dig*, *108*(2), 59-64. https://doi.org/10.17235/reed.2015.3979/2015

Kim, O., Cha, C., Jeong, H., Cho, M., & Kim, B. (2021). Influence of Irritable Bowel Syndrome on Stress and Depressive Symptoms in Nurses: The Korea Nurses' Health Study. *Int J Environ Res Public Health*, *18*(23), 12324. https://doi.org/10.3390/ijerph182312324

Kim, Y. S., & Kim, N. (2018). Sex-Gender Differences in Irritable Bowel Syndrome. *J Neurogastroenterol Motil*, *24*(4), 544-558. https://doi.org/10.5056/jnm18082

Kiriike, N., Nagata, T., Tanaka, M., Nishiwaki, S., Takeuchi, N., & Kawakita, Y. (1988). Prevalence of binge-eating and bulimia among adolescent women in Japan. *Psychiatry Res*, *26*(2), 163-169. https://doi.org/10.1016/0165-1781(88)90071-6

Knight, J. R., Locke, G. R., Zinsmeister, A. R., Schleck, C. D., & Talley, N. J. (2015). Family history of mental illness or alcohol abuse and the irritable bowel syndrome. *Journal of Psychosomatic Research*, *78*(3), 237-241. https://doi.org/https://doi.org/10.1016/j.jpsychores.2014.11.021

Konturek, P. C., Brzozowski, T., & Konturek, S. J. (2011). Stress and the gut: pathophysiology, clinical consequences, diagnostic approach and treatment options. *J Physiol Pharmacol*, *62*(6), 591-599.

Kosako, M., Akiho, H., Miwa, H., Kanazawa, M., & Fukudo, S. (2018). Impact of symptoms by gender and age in Japanese subjects with irritable bowel syndrome with constipation (IBS-C): a large population-based internet survey. *Biopsychosocial Medicine*, *12*. https://doi.org/10.1186/s13030-018-0131-2

Koshy, B. (2019). Academic Stress Among 10 th Class Students. *Journal of Psychiatric Nursing*, *8*, 95-99. https://doi.org/10.21088/jpn.2277.9035.8319.2

Krivobokova, V., Kiseleva, M., & Gryaznykh, A. (2020). Analysis of the emotional strain influence on the indicators of the heart rhythm variability in students. *BIO Web*, *26*, 1-4. https://doi.org/10.1051/bioconf/20202600004

Kucuk, A., Biyik, M., Solak, Y., Ucar, R., Polat, I., Pektas, F., . . . Tunc, R. (2015). Irritable bowel syndrome prevalence in patients with familial mediterranean fever. *Acta Medica*, *31*, 841.

Kumei, S., Ishioh, M., Murakami, Y., Ando, K., Nozu, T., & Okumura, T. (2022). A patient with familial Mediterranean fever mimicking diarrhea-dominant irritable bowel syndrome who successfully responded to treatment with colchicine: a case report. *Journal of Medical Case Reports*, *16*(1), 247. https://doi.org/10.1186/s13256-022-03446-z

Kutz, A. M., Marsh, A. G., Gunderson, C. G., Maguen, S., & Masheb, R. M. (2020). Eating Disorder Screening: a Systematic Review and Meta-analysis of Diagnostic Test Characteristics of the SCOFF. *J Gen Intern Med*, *35*(3), 885-893. https://doi.org/10.1007/s11606-019-05478-6

Lask, B., & Frampton, I. (2011). *Eating disorders and The Brain* (1st ed.). John Wiley & Sons.

Lawless, M. H., Harrison, K. A., Grandits, G. A., Eberly, L. E., & Allen, S. S. (2015). Perceived stress and smoking-related behaviors and symptomatology in male and female smokers. *Addict Behav*, *51*, 80-83. https://doi.org/10.1016/j.addbeh.2015.07.011

Le Grange, D., Swanson, S. A., Crow, S. J., & Merikangas, K. R. (2012). Eating disorder not otherwise specified presentation in the US population. *International Journal of Eating Disorders*, *45*(5), 711-718.

Lee, H. J., Kim, H. J., Kang, E. H., Jung, K. W., Myung, S. J., Min, Y. W., . . . Park, K. S. (2019). Self-reported Food Intolerance in Korean Patients With Irritable Bowel Syndrome. *J Neurogastroenterol Motil*, *25*(2), 222-232. https://doi.org/10.5056/jnm18125

Lei, W. Y., Chang, C. Y., Wu, J. H., Lin, F. H., Hsu Chen, C., Chang, C. F., . . . Wu, H. P. (2016). An Initial Attack of Urinary Stone Disease Is Associated with an Increased Risk of Developing New-Onset Irritable Bowel Syndrome: Nationwide Population-Based Study. *PLoS One*, *11*(6), e0157701. https://doi.org/10.1371/journal.pone.0157701

Li, J., Yuan, B., Li, G., Lu, X., Guo, Y., Yang, Y., . . . Zhou, Q. (2020). Convergent syndromic atrophy of pain and emotional systems in patients with irritable bowel syndrome and depressive symptoms. *Neuroscience Letters*, *1,* 723. https://doi.org/10.1016/j.neulet.2020.134865

Li, S., Wang, C., Wang, W., Dong, H., Hou, P., & Tang, Y. (2008). Chronic mild stress impairs cognition in mice: from brain homeostasis to behavior. *Life Sciences*, *82*(17-18), 934-942.

Lin, J. A., Jhe, G., Vitagliano, J. A., Milliren, C. E., Spigel, R., Woods, E. R., . . . Richmond, T. K. (2021). The Association of Malnutrition, illness duration, and pre-morbid weight status with anxiety and depression symptoms in adolescents and young adults with restrictive eating disorders: a cross-sectional study. *J Eat Disord*, *9*(1), 60. https://doi.org/10.1186/s40337-021-00415-7

Longstreth, G. F., Thompson, W. G., Chey, W. D., Houghton, L. A., Mearin, F., & Spiller, R. C. (2006). Functional Bowel Disorders. *Gastroenterology*, *130*(5), 1480-1491. https://doi.org/https://doi.org/10.1053/j.gastro.2005.11.061

Lovell, R. M., & Ford, A. C. (2012). Global prevalence of and risk factors for irritable bowel syndrome: a meta-analysis. *Clin Gastroenterol Hepatol*, *10*(7), 712-721.e714. https://doi.org/10.1016/j.cgh.2012.02.029

Machado, B. C., Gonçalves, S. F., Martins, C., Brandão, I., Roma-Torres, A., Hoek, H. W., & Machado, P. P. (2016). Anorexia nervosa versus bulimia nervosa: differences based on retrospective correlates in a case-control study. *Eat Weight Disord*, *21*(2), 185-197. https://doi.org/10.1007/s40519-015-0236-6

Mahmood, K., Riaz, R., Ul Haq, M. S., Hamid, K., & Jawed, H. (2020). Association of cigarette smoking with irritable bowel syndrome: A cross-sectional study. *Med J Islam Repub Iran*, *34*, 72. https://doi.org/10.34171/mjiri.34.72

Mahmud, S., Hossain, S., Muyeed, A., Islam, M. M., & Mohsin, M. (2021). The global prevalence of depression, anxiety, stress, and, insomnia and its changes among health professionals during COVID-19 pandemic: A rapid systematic review and meta-analysis. *Heliyon*, *7*(7), e07393. https://doi.org/10.1016/j.heliyon.2021.e07393

Mahmud, S., Mohsin, M., Dewan, M. N., & Muyeed, A. (2023). The Global Prevalence of Depression, Anxiety, Stress, and Insomnia Among General Population During COVID-19 Pandemic: A Systematic Review and Meta-analysis. *Trends in Psychology*, *31*(1), 143-170. https://doi.org/10.1007/s43076-021-00116-9

Makino, M., Tsuboi, K., & Dennerstein, L. (2004). Prevalence of eating disorders: a comparison of Western and non-Western countries. *MedGenMed : Medscape General Medicine*, *6*(3), 49-49.

Mansouri, A., Rarani, M. A., Fallahi, M., & Alvandi, I. (2017). Irritable bowel syndrome is concentrated in people with higher educations in Iran: an inequality analysis. *Epidemiol Health*, *39*, e2017005. https://doi.org/10.4178/epih.e2017005

Mariotti, A. (2015). The effects of chronic stress on health: new insights into the molecular mechanisms of brain-body communication. *Future Sci OA*, *1*(3), Fso23. https://doi.org/10.4155/fso.15.21

Marmot, M., Allen, J., Bell, R., Bloomer, E., & Goldblatt, P. (2012). WHO European review of social determinants of health and the health divide. *Lancet*, *380*(9846), 1011-1029. https://doi.org/10.1016/s0140-6736(12)61228-8

Masheb, R., & White, M. A. (2012). Bulimia nervosa in overweight and normal-weight women. *Comprehensive Psychiatry*, *53*(2), 181-186. https://doi.org/10.1016/j.comppsych.2011.03.005

Mathisen, T. F., Bratland-Sanda, S., Rosenvinge, J. H., Friborg, O., Pettersen, G., Vrabel, K. A., & Sundgot-Borgen, J. (2018). Treatment effects on compulsive exercise and physical activity in eating disorders. *Journal of Eating Disorders*, *6*(1), 43. https://doi.org/10.1186/s40337-018-0215-1

McDonald, P. G., Antoni, M. H., Lutgendorf, S. K., Cole, S. W., Dhabhar, F. S., Sephton, S. E., . . . Sood, A. K. (2005). A biobehavioral perspective of tumor biology. *Discov Med*, *5*(30), 520-526.

McMaughan, D. J., Oloruntoba, O., & Smith, M. L. (2020). Socioeconomic Status and Access to Healthcare: Interrelated Drivers for Healthy Aging. *Front Public Health*, *8*, 231. https://doi.org/10.3389/fpubh.2020.00231

Mehler, P. S., & Brown, C. (2015). Anorexia nervosa - medical complications. *Journal of Eating Disorders*, *3*, 11-11. https://doi.org/10.1186/s40337-015-0040-8

Melchior, C., Desprez, C., Riachi, G., Leroi, A.-M., Déchelotte, P., Achamrah, N., . . . Gourcerol, G. (2020). Anxiety and Depression Profile Is Associated With Eating Disorders in Patients With Irritable Bowel Syndrome. *Frontiers in Psychiatry*, *10*, 928-928. https://doi.org/10.3389/fpsyt.2019.00928

Melisse, B., de Beurs, E., & van Furth, E. F. (2020). Eating disorders in the Arab world: a literature review. *Journal of Eating Disorders*, *8*(1), 59. https://doi.org/10.1186/s40337-020-00336-x

Metcalfe, C., Smith, G. D., Wadsworth, E., Sterne, J. A., Heslop, P., Macleod, J., & Smith, A. (2003). A contemporary validation of the Reeder Stress Inventory. *Br J Health Psychol*, *8*(Pt 1), 83-94. https://doi.org/10.1348/135910703762879228

Monsbakken, K. W., Vandvik, P. O., & Farup, P. G. (2006). Perceived food intolerance in subjects with irritable bowel syndrome–etiology, prevalence and consequences. *European Journal of Clinical Nutrition*, *60*(5), 667-672.

Mor, A., Gal, R., & Livneh, A. (2003). Abdominal and digestive system associations of familial Mediterranean fever. *The American Journal of Gastroenterology*, *98*(12), 2594-2604. https://doi.org/https://doi.org/10.1016/j.amjgastroenterol.2003.07.007

Morey, J. N., Boggero, I. A., Scott, A. B., & Segerstrom, S. C. (2015). Current Directions in Stress and Human Immune Function. *Curr Opin Psychol*, *5*, 13-17. https://doi.org/10.1016/j.copsyc.2015.03.007

Morgan, J. F., Reid, F., & Lacey, J. H. (2000). The SCOFF questionnaire: a new screening tool for eating disorders. *West J Med*, *172*(3), 164-165. https://doi.org/10.1136/ewjm.172.3.164

Na, W., Lee, Y., Kim, H., Kim, Y. S., & Sohn, C. (2021). High-Fat Foods and FODMAPs Containing Gluten Foods Primarily Contribute to Symptoms of Irritable Bowel Syndrome in Korean Adults. *Nutrients*, *13*(4). https://doi.org/10.3390/nu13041308

Ngan, S. W., Chern, B. C. K., Rajarathnam, D. D., Balan, J., Hong, T. S., & Tiang, K.-P. (2017). The relationship between eating disorders and stress among medical undergraduate: a cross-sectional study. *Open Journal of Epidemiology*, *7*(02), 85.

Nilsson, D., & Ohlsson, B. (2021). Gastrointestinal symptoms and irritable bowel syndrome are associated with female sex and smoking in the general population and with unemployment in men. *Frontiers in Medicine*, *8*, 646658.

Noorbakhsh, H., Yavarmanesh, M., Adibi, P., & Moazzami, A. A. (2019). Metabolomics analysis revealed metabolic changes in patients with diarrhea-predominant irritable bowel syndrome and metabolic responses to a synbiotic yogurt intervention. *European Journal of Nutrition*, *58*(8), 3109-3119. https://doi.org/10.1007/s00394-018-1855-2

Norris, M. L., Harrison, M. E., Isserlin, L., Robinson, A., Feder, S., & Sampson, M. (2016). Gastrointestinal complications associated with anorexia nervosa: A systematic review. *International Journal of Eating Disorders*, *49*(3), 216-237.

Nørgaard, M., Farkas, D. K., Pedersen, L., Erichsen, R., de la Cour, Z. D., Gregersen, H., & Sørensen, H. T. (2011). Irritable bowel syndrome and risk of colorectal cancer: a Danish nationwide cohort study. *British Journal of Cancer*, *104*(7), 1202-1206. https://doi.org/10.1038/bjc.2011.65

Oka, P., Parr, H., Barberio, B., Black, C. J., Savarino, E. V., & Ford, A. C. (2020). Global prevalence of irritable bowel syndrome according to Rome III or IV criteria: a systematic review and meta-analysis. *Lancet Gastroenterol Hepatol*, *5*(10), 908-917. https://doi.org/10.1016/s2468-1253(20)30217-x

Olden, K. W. (2003). The challenge of diagnosing irritable bowel syndrome. *Rev Gastroenterol Disord*, *3 Suppl 3*, S3-11.

Pace, F., Zuin, G., Di Giacomo, S., Molteni, P., Casini, V., Fontana, M., & Porro, G. B. (2006). Family history of irritable bowel syndrome is the major determinant of persistent abdominal complaints in young adults with a history of pediatric recurrent abdominal pain. *World J Gastroenterol*, *12*(24), 3874-3877. https://doi.org/10.3748/wjg.v12.i24.3874

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Adm Policy Ment Health*, *42*(5), 533-544. https://doi.org/10.1007/s10488-013-0528-y

Patel, N., & Shackelford, K. S. (2018). Irritable Syndrome Syndrome. *Treasure Island (FL): StatPearls Publishing.* Retrieved October 12 from https://www.ncbi.nlm.nih.gov/books/NBK534810/

Peat, C., Mitchell, J. E., Hoek, H. W., & Wonderlich, S. A. (2009). Validity and utility of subtyping anorexia nervosa. *Int J Eat Disord*, *42*(7), 590-594. https://doi.org/10.1002/eat.20717

Perkins, S. J., Keville, S., Schmidt, U., & Chalder, T. (2005). Eating disorders and irritable bowel syndrome: is there a link? *J Psychosom Res*, *59*(2), 57-64. https://doi.org/10.1016/j.jpsychores.2004.04.375

Pike, K. M., Hilbert, A., Wilfley, D. E., Fairburn, C. G., Dohm, F. A., Walsh, B. T., & Striegel-Moore, R. (2008). Toward an understanding of risk factors for anorexia nervosa: a case-control study. *Psychological Medicine*, *38*(10), 1443-1453. https://doi.org/10.1017/S0033291707002310

Pozos-Radillo, E., Preciado-Serrano, L., Plascencia-Campos, A., Morales-Fernández, A., & Valdez-López, R. (2018). Predictive study of academic stress with the irritable bowel syndrome in medicine students at a public university in Mexico. *The Libyan Journal of Medicine*, *13*(1), 1479599-1479599. https://doi.org/10.1080/19932820.2018.1479599

Prevalence in the UK. (2023). Beat Eating disorders. Retrieved September 5 from https://www.beateatingdisorders.org.uk/about-beat/policy-work/policy-and-best-practice-reports/prevalence-in-the-uk/

Puckett, L. (2023). Renal and electrolyte complications in eating disorders: a comprehensive review. *J Eat Disord*, *11*(1), 26. https://doi.org/10.1186/s40337-023-00751-w

Puckett, L., Grayeb, D., Khatri, V., Cass, K., & Mehler, P. (2021). A Comprehensive Review of Complications and New Findings Associated with Anorexia Nervosa. *J Clin Med*, *10*(12). https://doi.org/10.3390/jcm10122555

Qin, H.-Y., Cheng, C.-W., Tang, X.-D., & Bian, Z.-X. (2014). Impact of psychological stress on irritable bowel syndrome. *World Journal of Gastroenterology*, *20*(39), 14126-14131. https://doi.org/10.3748/wjg.v20.i39.14126

Quesnel, D. A., Cooper, M., Fernandez-Del-Valle, M., Reilly, A., & Calogero, R. M. (2023). Medical and physiological complications of exercise for individuals with an eating disorder: A narrative review. *J Eat Disord*, *11*(1), 3. https://doi.org/10.1186/s40337-022-00685-9

Radziszewska, M., Smarkusz-Zarzecka, J., & Ostrowska, L. (2023). Nutrition, Physical Activity and Supplementation in Irritable Bowel Syndrome. *Nutrients*, *15*(16). https://doi.org/10.3390/nu15163662

Razzak, H. A., Harbi, A., & Ahli, S. (2020). Tobacco Smoking Prevalence, Health Risk, and Cessation in the UAE. *Oman Med J*, *35*(4), e165. https://doi.org/10.5001/omj.2020.107

Rizk, M., Mattar, L., Kern, L., Berthoz, S., Duclos, J., Viltart, O., & Godart, N. (2020). Physical Activity in Eating Disorders: A Systematic Review. *Nutrients*, *12*(1), 183. https://doi.org/10.3390/nu12010183

Rome, E. S., & Ammerman, S. (2003). Medical complications of eating disorders: an update. *Journal of Adolescent Health*, *33*(6), 418-426.

Sadeghian, M., Sadeghi, O., Hassanzadeh Keshteli, A., Daghaghzadeh, H., Esmaillzadeh, A., & Adibi, P. (2018). Physical activity in relation to irritable bowel syndrome among Iranian adults. *PloS one*, *13*(10), e0205806.

Saha, S. P., Bhalla, D. K., Whayne, T. F., Jr., & Gairola, C. (2007). Cigarette smoke and adverse health effects: An overview of research trends and future needs. *Int J Angiol*, *16*(3), 77-83. https://doi.org/10.1055/s-0031-1278254

Saito, Y. A., Petersen, G. M., Larson, J. J., Atkinson, E. J., Fridley, B. L., de Andrade, M., . . . Talley, N. J. (2010). Familial aggregation of irritable bowel syndrome: a family case-control study. *Am J Gastroenterol*, *105*(4), 833-841. https://doi.org/10.1038/ajg.2010.116

Salvioli, B., Pellicciari, A., Iero, L., Di Pietro, E., Moscano, F., Gualandi, S., . . . Franzoni, E. (2013). Audit of digestive complaints and psychopathological traits in patients with eating disorders: a prospective study. *Dig Liver Dis*, *45*(8), 639-644. https://doi.org/10.1016/j.dld.2013.02.022

Santonicola, A., Angrisani, L., Ciacci, C., & Iovino, P. (2013). Prevalence of functional gastrointestinal disorders according to Rome III criteria in Italian morbidly obese patients. *The Scientific World Journal*, *2013*.

Santonicola, A., Gagliardi, M., Guarino, M. P. L., Siniscalchi, M., Ciacci, C., & Iovino, P. (2019). Eating disorders and gastrointestinal diseases. *Nutrients*, *11*(12), 3038.

Sarahian, N., Sahraei, H., Zardooz, H., Alibeik, H., & Sadeghi, B. (2014). Effect of memantine administration within the nucleus accumbens on changes in weight and volume of the brain and adrenal gland during chronic stress in female mice. *Pathobiology Research*, *17*(2), 71-82.

Sardar, M. R., Greway, A., DeAngelis, M., Tysko, E. O., Lehmann, S., Wohlstetter, M., & Patel, R. (2015). Cardiovascular Impact of Eating Disorders in Adults: A Single Center Experience and Literature Review. *Heart Views*, *16*(3), 88-92. https://doi.org/10.4103/1995-705x.164463

Schaper, S. J., & Stengel, A. (2022a). Emotional stress responsivity of patients with IBS - a systematic review. *Journal of Psychosomatic Research*, *153*, 1. https://doi.org/10.1016/j.jpsychores.2021.110694

Schwabe, L., Hermans, E. J., Joëls, M., & Roozendaal, B. (2022). Mechanisms of memory under stress. *Neuron*, *110*(9), 1450-1467. https://doi.org/https://doi.org/10.1016/j.neuron.2022.02.020

Self, M. M., Czyzewski, D. I., Chumpitazi, B. P., Weidler, E. M., & Shulman, R. J. (2014). Subtypes of Irritable Bowel Syndrome in Children and Adolescents. *Clinical Gastroenterology and Hepatology*, *12*(9), 1468-1473. https://doi.org/https://doi.org/10.1016/j.cgh.2014.01.031

Shih, D. Q., & Kwan, L. Y. (2007). All Roads Lead to Rome: Update on Rome III Criteria and New Treatment Options. *Gastroenterol Rep*, *1*(2), 56-65.

Silvernale, C., Kuo, B., & Staller, K. (2019). Lower socioeconomic status is associated with an increased prevalence of comorbid anxiety and depression among patients with irritable bowel syndrome: results from a multicenter cohort. *Scand J Gastroenterol*, *54*(9), 1070-1074. https://doi.org/10.1080/00365521.2019.1665095

Simrén, M., Palsson, O. S., Heymen, S., Bajor, A., Törnblom, H., & Whitehead, W. E. (2017). Fecal incontinence in irritable bowel syndrome: Prevalence and associated factors in Swedish and American patients. *Neurogastroenterol Motil*, *29*(2). https://doi.org/10.1111/nmo.12919

Singh, P., Agnihotri, A., Pathak, M. K., Shirazi, A., Tiwari, R. P., Sreenivas, V., . . . Makharia, G. K. (2012). Psychiatric, somatic and other functional gastrointestinal disorders in patients with irritable bowel syndrome at a tertiary care center. *J Neurogastroenterol Motil*, *18*(3), 324-331. https://doi.org/10.5056/jnm.2012.18.3.324

Singh, P., Grabauskas, G., Zhou, S. Y., Gao, J., Zhang, Y., & Owyang, C. (2021). High FODMAP diet causes barrier loss via lipopolysaccharide-mediated mast cell activation. *JCI Insight*, *6*(22). https://doi.org/10.1172/jci.insight.146529

Smith, A. R., Zuromski, K. L., & Dodd, D. R. (2018). Eating disorders and suicidality: what we know, what we don't know, and suggestions for future research. *Curr Opin Psychol*, *22*, 63-67. https://doi.org/10.1016/j.copsyc.2017.08.023

Solmi, M., Veronese, N., Sergi, G., Luchini, C., Favaro, A., Santonastaso, P., . . . Stubbs, B. (2016). The association between smoking prevalence and eating disorders: a systematic review and meta-analysis. *Addiction*, *111*(11), 1914-1922. https://doi.org/10.1111/add.13457

Sperber, A. D., Shvartzman, P., Friger, M., & Fich, A. (2005). Unexpectedly low prevalence rates of IBS among adult Israeli Jews. *Neurogastroenterology & Motility*, *17*(2), 207-211.

Spillebout, A., Dechelotte, P., Ladner, J., & Tavolacci, M. P. (2019). Mental health among university students with eating disorders and irritable bowel syndrome in France. *Rev Epidemiol Sante Publique*, *67*(5), 295-301. https://doi.org/10.1016/j.respe.2019.04.056

Strother, E., Lemberg, R., Stanford, S. C., & Turberville, D. (2012). Eating disorders in men: underdiagnosed, undertreated, and misunderstood. *Eat Disord*, *20*(5), 346-355. https://doi.org/10.1080/10640266.2012.715512

Tafet, G. E., & Nemeroff, C. B. (2016). The links between stress and depression: psychoneuroendocrinological, genetic, and environmental interactions. *The Journal of Neuropsychiatry and Clinical Neurosciences*, *28*(2), 77-88.

Takeoka, A., Kimura, T., Hara, S., Hamaguchi, T., Fukudo, S., & Tayama, J. (2023). Prevalence of Irritable Bowel Syndrome in Japan, China, and South Korea: An International Cross-sectional Study. *J Neurogastroenterol Motil*, *29*(2), 229-237. https://doi.org/10.5056/jnm22037

Talley, N. J., Powell, N., Walker, M. M., Jones, M. P., Ronkainen, J., Forsberg, A., . . . Wallner, B. (2021). Role of smoking in functional dyspepsia and irritable bowel syndrome: three random population-based studies. *Alimentary Pharmacology & Therapeutics*, *54*(1), 32-42.

Tan, E. J., Raut, T., Le, L., Hay, P., Ananthapavan, J., Lee, Y. Y., & Mihalopoulos, C. (2023). The association between eating disorders and mental health: an umbrella review. *Journal of Eating Disorders*, *11*. https://doi.org/10.1186/s40337-022-00725-4

Thomas-Dupont, P., Velázquez-Soto, H., Izaguirre-Hernández, I. Y., Amieva-Balmori, M., Triana-Romero, A., Islas-Vázquez, L., . . . Remes-Troche, J. M. (2022). Obesity Contributes to Inflammation in Patients with IBS via Complement Component 3 and C-Reactive Protein. *Nutrients*, *14*(24). https://doi.org/10.3390/nu14245227

Toppino, F., Longo, P., Martini, M., Abbate-Daga, G., & Marzola, E. (2022). Body Mass Index Specifiers in Anorexia Nervosa: Anything below the "Extreme"? *J Clin Med*, *11*(3), 542. https://doi.org/10.3390/jcm11030542

Vidaña, A. G., Forbush, K. T., Barnhart, E. L., Mildrum Chana, S., Chapa, D. A. N., Richson, B., & Thomeczek, M. L. (2020). Impact of trauma in childhood and adulthood on eating-disorder symptoms. *Eating Behaviors*, *39*, 101426. https://doi.org/https://doi.org/10.1016/j.eatbeh.2020.101426

Villoria, A., Serra, J., Azpiroz, F., & Malagelada, J. R. (2006). Physical activity and intestinal gas clearance in patients with bloating. *Am J Gastroenterol*, *101*(11), 2552-2557. https://doi.org/10.1111/j.1572-0241.2006.00873.x

Voci, S. C., & Cramer, K. M. (2009). Gender-related traits, quality of life, and psychological adjustment among women with irritable bowel syndrome. *Qual Life Res*, *18*(9), 1169-1176. https://doi.org/10.1007/s11136-009-9532-9

Volpe, U., Tortorella, A., Manchia, M., Monteleone, A. M., Albert, U., & Monteleone, P. (2016). Eating disorders: What age at onset? *Psychiatry Research*, *238*, 225-227. https://doi.org/https://doi.org/10.1016/j.psychres.2016.02.048

Wagener, A., & Much, K. (2010). Eating Disorders as Coping Mechanisms. *Journal of College Student Psychotherapy*, *24*, 203-212. https://doi.org/10.1080/87568225.2010.486291

Wahida, W. M. Z. W., Lai, P. S. M., & Hadi, H. A. (2017). Validity and reliability of the english version of the sick, control, one stone, fat, food (SCOFF) in Malaysia. *Clinical Nutrition ESPEN*, *18*, 55-58.

Walker, E. A., Katon, W. J., Roy-Byrne, P. P., Jemelka, R. P., & Russo, J. (1993). Histories of sexual victimization in patients with irritable bowel syndrome or inflammatory bowel disease. *Am J Psychiatry*, *150*(10), 1502-1506. https://doi.org/10.1176/ajp.150.10.1502

Wang, L. H., Fang, X. C., & Pan, G. Z. (2004). Bacillary dysentery as a causative factor of irritable bowel syndrome and its pathogenesis. *Gut*, *53*(8), 1096-1101.

Ward, M. M. (2013). Estimating disease prevalence and incidence using administrative data: some assembly required. In *J Rheumatol* (Vol. 40, pp. 1241-1243). https://doi.org/10.3899/jrheum.130675

Wells, J. E., Browne, M. A., Scott, K. M., McGee, M. A., Baxter, J., & Kokaua, J. (2006). Prevalence, interference with life and severity of 12 month DSM-IV disorders in Te Rau Hinengaro: the New Zealand Mental Health Survey. *Aust N Z J Psychiatry*, *40*(10), 845-854. https://doi.org/10.1080/j.1440-1614.2006.01903.x

Westwater, M. L., Mancini, F., Shapleske, J., Serfontein, J., Ernst, M., Ziauddeen, H., & Fletcher, P. C. (2020). Dissociable hormonal profiles for psychopathology and stress in anorexia and bulimia nervosa. *Psychological Medicine*, 1-11. https://doi.org/10.1017/S0033291720001440

Wilson, S., Roberts, L., Roalfe, A., Bridge, P., & Singh, S. (2004). Prevalence of irritable bowel syndrome: a community survey. *Br J Gen Pract*, *54*(504), 495-502.

Wu, S., Yang, Z., Liu, S., Zhang, Q., Zhang, S., & Zhu, S. (2023). Frailty status and risk of irritable bowel syndrome in middle-aged and older adults: A large-scale prospective cohort study. *EClinicalMedicine*, *56*, 101807. https://doi.org/10.1016/j.eclinm.2022.101807

Wu, X., Wang, J., Ye, Z., Liao, X., Liv, M., & Svn, Z. (2022). Risk of Colorectal Cancer in Patients With Irritable Bowel Syndrome: A Meta-Analysis of Population-Based Observational Studies. *Front Med (Lausanne)*, *9*, 819122. https://doi.org/10.3389/fmed.2022.819122

Yamamoto, Y., Furukawa, S., Watanabe, J., Kato, A., Kusumoto, K., Miyake, T., . . . Hiasa, Y. (2022). Association between body mass index and irritable bowel syndrome in the young Japanese population: a cross-sectional study. *International Journal of Colorectal Disease*, *37*(11), 2357-2363. https://doi.org/10.1007/s00384-022-04267-8

Yang, L., Zhao, Y., Wang, Y., Liu, L., Zhang, X., Li, B., & Cui, R. (2015). The Effects of Psychological Stress on Depression. *Curr Neuropharmacol*, *13*(4), 494-504. https://doi.org/10.2174/1570159x1304150831150507

Yaribeygi, H., Panahi, Y., Sahraei, H., Johnston, T. P., & Sahebkar, A. (2017). The impact of stress on body function: A review. *Excli J*, *16*, 1057-1072. https://doi.org/10.17179/excli2017-480

Yazbeck, G., Malaeb, D., Shaaban, H., Sarray El Dine, A., Hallit, S., & Hallit, R. (2023). Irritable bowel syndrome (IBS) among Lebanese adults: unidentified IBS and associated factors. *BMC Public Health*, *23*(1), 1589. https://doi.org/10.1186/s12889-023-16543-5

Zhang, T., Ma, X., Tian, W., Zhang, J., Wei, Y., Zhang, B., . . . Tang, X. (2022). Global research trends in irritable bowel syndrome: a bibliometric and visualized study. *Frontiers in Medicine*, *9*, 922063.

Appendix

Questionnaire

UAEU كلية الطب والعلوم الصحية College of Medicine and Health Sciences | جامعة الإمارات العربية المتحدة United Arab Emirates University

1. I agree to participate in this research study and I understand I can withdraw at any time.

2. I have been explained the purpose and nature of the study and I have the email of the researcher to ask questions about the study.

3. I understand that no information will be collected about my identity.

4. I understand that disguised extracts from my questionnaire may be quoted in dissertation, conference presentation, published papers etc.

5. I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

6. I understand that all information about me will be treated in strict confidence and that I will not be named in any written work arising from this study.

By answering this survey, I am giving consent to participate in this research study.

1. أنا أوافق على المشاركة في هذه الدراسة البحثية وأدرك انه يمكنني الانسحاب من الدراسة في اي وقت
2. لقد كان لي حق معرفة الغرض من الدراسة وطبيعتها التي أوضحت لي كتابةً وأتيحت لي الفرصة لطرح أسئلة حول الدراسة
3. أدرك أنه لن يتم جمع أي معلومات حول هويتي
4. أدرك أن المقتطفات المقنعة من مقابلتي قد يتم اقتباسها في الرسالة، أو عرض المؤتمر، أو الأوراق المنشورة، إلخ
5. أدرك أنني حر في الاتصال بأي من الأشخاص المشاركين في البحث لطلب المزيد من التوضيح والمعلومات
6. أدرك أن جميع المعلومات المتعلقة بي ستعامل بسرية تامة ولن يتم ذكر اسمك في أي عمل مكتوب ينشأ عن هذه الدراسة

عن طريق الإجابة على هذا الاستبيان، فإنك توافق على المشاركة في هذه الدراسة البحثية

Part 1: Socioeconomic Status (SES) القسم الأول: الخصائص الاجتماعية والإقتصادية

1.1. Sex (الجنس)

☐ 1. Female ☐ (انثى) 2. Male (ذكر)

1.2. Nationality (الجنسية)

☐ 1. Emirati (مواطن/مواطنة) ☐ 2. Non-Emirati (غير مواطن/ غير مواطنة)

1.3. Date of Birth: DD MM YY

☐ ☐ ☐

1.4. Height in cm (سم) ب ☐ الطول

1.5. Weight in kg (ك) الوزن ب ☐

1.6. College of study (الكلية) ☐

Choose the appropriate option:

إختار الخيار المناسب:

1. College of Business and Economics. 2. College of Humanities and Social Sciences. 3. College of Information Technology. 4. College of Engineering. 5. College of Education. 6. College of Law. 7. College of Agriculture and Veterinary Medicine. 8. College of Science. 9. College of Graduate Studies.

1.7. In a scale from 0 to 5 [(0) means not at all, (5) very much], do you consider yourself having any financial difficulties? (مقياس صفر إلى خمسة "0 يعني ابداً و 5 يعني كثيراً"، هل لديك من اي صعوبات مالية

0	1	2	3	4	5
☐	☐	☐	☐	☐	☐

Part 2: Lifestyle *القسم الثاني: نمط الحياة*

2.1.1 Do you exercise or play a sport for at least thirty minutes three or more times a week?

هل تمارس أو تلعب الرياضة لمدة ثلاثين دقيقة على الأقل ثلاث مرات أو أكثر في الأسبوع؟

☐ 1. Yes (نعم) ☐ 2. No (لا)

2.1.2 Are you aware of the importance of physical activity?

هل تدرك أهمية النشاط البدني؟

☐ 1. Yes (نعم) ☐ 2. No (لا)

2.2.1 Are you a smoker?

هل انت مدخن؟

☐ 1.Yes (نعم) ☐ 2. No (لا)

2.2.2 If you answer yes, for how long have you been smoking (in years)? ☐

إذا كان الجواب نعم منذ متى وانت تدخن (بالسنوات)؟

2.3.1 Do you currently use any type of medication? If yes, you please mention the name/s: ☐

هل تستخدم اي نوع من الأدوية؟ إذا كان الجواب نعم، الرجاء كتابة اسمه

2.3.2 Do you use probiotics daily?

هل تستخدم البروبايوتك او المعززات الحيوية بشكل يومي؟

☐ 1. Yes. Prescribed by a doctor (نعم موصوفة من قبل طبيب) ☐ 2. Yes. Over the counter (نعم من غير وصفة) ☐ 3. No (لا)

2.3.3 Do you take vitamins/supplements on a daily basis?

هل تتناول الفيتامينات او المكملات الغذائية بشكل يومي؟

☐ 1. Yes. Prescribed by a doctor (نعم موصوفة من قبل طبيب)

2. Yes. Over the counter (نعم من غير وصفة) ☐ 3. No (لا) ☐

2.3.4 If you responded "Yes", to the above Q, which kinds of vitamins/supplements do you take?

ما هي أنواع الفيتامينات/المكملات الغذائية التي تتناولها؟

☐ 1. Multivitamin (فيتامينات متعدده) ☐ 2. Vitamin D (فيتامين د) ☐ 3. Vitamin B (فيتامين ب)

☐ 4. Folic Acid (حمض الفوليك) ☐ 5. Calcium (كالسيوم)

☐ 6. Fish oil, omega 3 (زيت السمك، اوميغا 3) ☐ 7. Iron (حديد)

2.4.1 Are you diagnosed with a chronic disease? For example, diabetes, heart disease, high blood pressure? If the answer is yes, please specify. ☐

هل تم تشخيصك بمرض مزمن؟ مثل، مرض السكري، امراض القلب، ارتفاع في ضغط الدم ... الخ؟ إذا كانت الجواب نعم الرجاء كتابته في الأسفل

2.4.2. Do you have a family history of Irritable Bowel Syndrome (IBS)

هل لديك تاريخ عائلي للإصابه بمتلازمة القولون العصبي

☐ 1. Yes (نعم) ☐ 2. No (لا)

Part 3: Dietary habits (Your diet last year) *القسم الثالث: عادات الأكل-نظامك الغذائي في* العام الماضي

3.1 Over the last year, how often did you eat fast-food?

(خلال العام الماضي، كم مرّة أكلت الوجبات في مطاعم الوجبات السريعة)

☐ 1. Daily (يومياً) ☐ 2. 1-3 times a week (1-3 مرات في الأسبوع)

☐ 3. Less than once a week (أقل من مره واحده في الأسبوع)

☐ 4. Never (ابداً)

3.2 Over the last year, how often did you eat fried foods (Inside or outside the home)?

خلال العام الماضي، كم مرة أكلت الأطعمة المقليَّة (في البيت أو خارج البيت)؟

☐ 1. Daily (يومياً) ☐ 2. 1-3 times a week (1-3 مرات في الأسبوع)

☐ 3. Less than once a week (أقل من مره واحده في الأسبوع)

☐ 4. Never (ابداً)

3.3 Over the last year, how often did you use spices in your cooking?

خلال العام الماضي كم عدد المرات التي استخدمت فيها التوابل في طبخك؟

☐ 1. Always (دائماً) ☐ 2. Usually (معظم الوقت)

☐ 3. Sometimes (أحياناً) ☐ 4. Rarely (نادراً)

☐ 5. Never (ابداً)

Part 4: Irritable Bowel Syndrome (IBS).القسم الخامس: تشخيص متلازمة القولون العصبي

4.1 Do you feel abdominal discomfort or pain for at least 3 days a month? These do not need be consecutive days.

هل تشعر بعدم الراحة أو الألم في البطن لمدة ثلاث أيام على الأقل في الشهر؟ لاداعي لأن تكون الأيام متتالية

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.2 If yes, is this pain or discomfort from 3 months has two or more of the following three features 1) Relief with defecation. 2) Onset associated with a change in stool frequency 3) Onset associated with a change in the form (appearance) of the stool

هل كان الألم او الشعور بعدم الراحة من ثلاثة أشهر يحتوي على نقطتين او أكثر من النقاط التالية:

1) البداية مرتبطة بتغير في شكل/مظهر (3 البداية مرتبطة بتغير في وتيرة البراز (2 شعور بالإرتياح بعد التغوط البراز

إذا كانت الإجابة لا الرجاء الإنتقال مباشرةً الى القسم الخامس

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.3 If you answered yes to Q 4.2, do you experience more than 25% of loose stool/watery stool and less than 25% of hard stool.

إذا كان الجواب نعم لسؤال 4.2، فهل عانيت من حوالي أكثر من 25% من البراز السائل واقل من 25% من البراز الصلب؟

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.4 If you answered yes to Q 4.2, do you experience more than 25% of hard stool and less than 25% of loose stool/watery stool?

إذا كان الجواب نعم لسؤال 4.2، فهل عانيت من حوالي أكثر من 25% من البراز الصلب واقل من 25% من البراز السائل؟

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.4.1 If you answered yes to Q 4.2, do these symptoms happen after eating any specific food?

إذا كان جوابك نعم لسؤال 4.2، هل ظهرت هذه الأعراض بعد تناول نوع معين من الطعام

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.4.2 If yes, Describe/name the food. إذا كان جوابك نعم، اوصف/اذكر اسم الطعام ☐

4.4.3 If you experience these symptoms, do you get relief by using any specific food item?

إذا قمت بتجربة هذه الأعراض، هل انخفضت بعد استخدام نوع محدد من المواد الغذائية

☐ 1. Yes (نعم) ☐ 2. No (لا)

4.4.4 If yes, describe/name the food اذا كان جوابك نعم، اوصف/اذكر اسم الطعام ☐

Part 5: Eating Disorders (ED) القسم الخامس: تشخيص إضطرابات الطعام.

5.1 Do you make yourself Sick because you feel uncomfortably full?

هل تجبر نفسك على التقيؤ الذاتي لإنك تشعر بعدم الراحة عند الشبع

☐ 1. Yes (نعم) ☐ 2. No (لا)

5.2 Do you worry that you have lost Control over how much food you eat?

هل انت قلق بأنك فقدت سيطرتك على كمية الطعام التي قمت بتناولها

☐ 1. Yes (نعم) ☐ 2. No (لا)

5.3 Have you recently lost more than 6 kg in a 3-month period?

هل فقدت مؤخراً أكثر من 6 كجم في فترة ثلاثة أشهر؟

☐ 1. Yes (نعم) ☐ 2. No (لا)

5.4 Do you believe yourself to be Fat when others say you are too thin?

هل تعتقد أنك سمين عندما يقول الاخرون انك نحيف للغاية

☐ 1. Yes (نعم) ☐ 2. No (لا)

5.5 Would you say that Food dominates your life?

هل تقول بأن الطعام يسيطر على حياتك

☐ 1. Yes (نعم) ☐ 2. No (لا)

Part 6: Mental Stress

مقياس الصحة العقلية

6.1.1 In the last 2 months, how often have you been upset because of something that happened unexpectedly?

خلال الشهرين الماضيين، كم مرة شعرت بالضيق بسبب شيء حدث بشكل غير متوقع ☐

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.2 In the last 2 months, how often have you felt that you were unable to control the important things in your life?

خلال الشهرين الماضيين، كم مرة شعرت بعدم قدرتك على السيطرة على أمور مهمه في حياتك ☐

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.3 In the last 2 months, how often have you felt nervous and stressed?

خلال الشهرين الماضيين، كم مرة شعرت فيها بالتوتر والضغط ☐

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.4 In the last 2 months, how often have you felt confident about your ability to handle your personal problems?

خلال الشهرين الماضيين كم مرة شعرت بالثقة بشأن قدرتك على التعامل مع مشاكلك الشخصية ☐

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.5 In the last 2 months, how often have you felt that things were going your way?

☐ خلال الشهرين الماضيين، كم مرة شعرت بأن الأمور تسير على طريقك

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.6 In the last 2 months, how often have you found that you could not cope with all the things that you had to do?

☐ خلال الشهرين الماضيين، كم مرة وجدت بأنك لا تستطيع التعامل مع كل الأشياء التي كان عليك القيام بها

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.7 In the last 2 months, how often have you been able to control irritations in your life.

☐ خلال الشهرين الماضيين، كم مرة تمكنت من التحكم من الانزعاج في حياتك

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.8 In the last 2 months, how often have you felt that you were on top of things?

☐ خلال الشهرين الماضيين، كم مرة شعرت أن الأمور تحت سيطرتك

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.1.9 In the last 2 months, how often have you been angered because of things that happened that were outside of your control?

☐ خلال الشهرين الماضيين، كم مرة شعرت فيها بالغضب بسبب أشياء حدثت خارجة عن إرادتك

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

6.2 In the last 2 months, how often have you felt difficulties were piling up so high that you could not overcome them?

☐ خلال الشهرين الماضيين، كم مرة شعرت بأن الصعوبات تتراكم بشكل كبير بحيث لا يمكنك التغلب عليها

0 = never (ابداً), 1 = almost never (على الاغلب لا), 2 = sometimes (احياناً), 3 = fairly often (في كثير من الأحيان), 4= very often (غالباً)

Resources for Assistance with Eating Disorders & Stress/Depression مصادر للمساعدة من إضطرابات الأكل و التوتر/الإكتئاب

1. Beat (UK's Eating Disorder Charity) in ENG: https://www.beateatingdisorders.org.uk/
2. Mental Health (NAMI) in English/Spanish: https://nami.org/Home
3. UAEU Student Counseling Center (التواصل مع مركز الإرشاد الطلابي في جامعة الإمارات) contacts in
ENG/ARABIC: https://www.uaeu.ac.ae/en/student_services/scss/contact_us.shtml
4. Mental Health Support Inside UAE الحفاظ على الصحة النفسية من داخل دولة الإمارات: https://u.ae/ar-ae/information-and-services/justice-safety-and-the-law/handling-the-covid-19-outbreak/maintaining-mental-health-in-times-of-covid19

UAEU جامعة الإمارات العربية المتحدة United Arab Emirates University

UAE UNIVERSITY MASTER THESIS NO. 2023: 99

This research study aimed to assess the prevalence of Irritable Bowel Syndrome, eating disorders, mental stress, their associations, and the determinants of Irritable Bowel Syndrome among United Arab Emirates University students.

Maram Braikan A. Alotaibi received her Master of Science in Human Nutrition from the Department of Nutrition and Health, College of Medicine & Health Sciences at UAE University, UAE. She received her Bachelor of Science in Nursing from D'Youville University, USA.