

# Predictive Study of the Psychophysiological Symptoms of Chronic Stress and their Association with the Irritable Bowel Syndrome in Medical Students at a Public University in Mexico\*

Estudio predictivo de los síntomas psicofisiológicos del estrés crónico y su relación con el síndrome de intestino irritable en estudiantes de medicina de una universidad pública en México

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## ABSTRACT

The irritable bowel syndrome is reported often in the general population. Studies show that stress coexists with this malady. The purpose of this study was to identify physical and psychological symptoms of chronic stress as predictors of the irritable bowel syndrome in medical students at a public university in Mexico. A random representative sample of 561 students was evaluated in 2014. The *Stress Symptom Inventory* and the *ROMA III Criteria* were used. A multiple regression analysis was performed. This study showed that the psychophysiological symptoms of chronic stress: difficulties in concentrating, an urge to constantly eat, clinched jaw, abdominal pain, weakness-dizziness, anxiety feelings and constipation, were predictors of the irritable bowel syndrome. Therefore, the recommendation is to implement educational programs aimed at the identification and timely prevention of the psychophysiological symptoms of chronic stress as a risk factor for the presence of irritable bowel syndrome in medical students.

## Keywords

chronic stress; irritable bowel syndrome; medical students; psychophysiological disorders; Mexico.

## RESUMEN

El síndrome de intestino irritable se reporta frecuentemente en la población general. Los estudios demuestran que el estrés coexiste con esta afección. El propósito de este estudio fue identificar los síntomas físicos y psicológicos del estrés crónico, como predictores del síndrome de intestino irritable en estudiantes de medicina de una universidad pública en México. Se evaluó una muestra representativa y aleatoria de 561 estudiantes, en 2014. Se utilizó el *Inventario de Síntomas de Estrés* y los *Criterios de ROMA III*. Se llevó a cabo el análisis de regresión múltiple. Los resultados mostraron que los síntomas psicofisiológicos del estrés crónico: dificultad para concentrarse, ganas de comer a todas horas, mandíbula apretada, dolor abdominal, debilidad-mareos, sentirse ansioso y estreñimiento fueron predictores de la presencia del Síndrome de Intestino Irritable. Por lo que, se recomienda implementar programas educativos, encaminados a la identificación y prevención oportuna de los síntomas psicofisiológicos del estrés crónico como riesgo para la presencia del síndrome de intestino irritable en los estudiantes de medicina.

### Palabras clave

estrés crónico; síndrome de intestino irritable; estudiantes de medicina; trastornos psicofisiológicos; México.

Stress is one of the most frequent health problems in today's society, a multivariable phenomenon resulting from the relation between an individual and the events of his or her environment. It is assessed as disproportionate or threatening to their resources and puts their health at risk. (Alfonso, Calcines, Monteagudo, & Nieves, 2015) Symptoms associated with stress accompany adjustment, anxiety, behavioral and emotional disorders (Maturana & Vargas, 2015). When stress levels are high, the organism weakens due to increased cortisol levels, creating psychological problems (anxiety and depression), behavioral problems (violent abuse, conflicts with classmates, addition to toxic substances, boredom or failure at school); and physical health problems (coronary disease, peptic ulcer, diabetes, hypertension, allergic diseases, infections and irritable bowel syndrome, among others) (Maturana & Vargas, 2015; Byrd & McKinney, 2012).

Irritable bowel syndrome (IBS) is a typical functional gastrointestinal disorder characterized by chronic, persistent abdominal pains due to bowel movement alterations that may vary

from constipation to diarrhea, symptoms that worsen under stress (Alfonso et al., 2015). This disorder affects between 10% and 15% of the adult population (Bautista, Ortiz, & Muñoz, 2011; Pozos-Radillo, Preciado-Serrano, Plascencia, Morales, & Valdez, 2018). Studies report prevalence in the United States, Europe and Asia with 10% and 20%. Between 14% and 24% is reported in women in China and Japan and between 15% and 19% in men. In Latin America, the prevalence in Brazil, Colombia, Mexico and Uruguay fluctuates between 9% and 18% (Bautista et al., 2011).

It has been shown that the bidirectional communication system along the gut-brain axis plays a crucial role in maintaining homeostasis. In fact, several lines of evidence suggest that intestinal microbiome has a significant impact on cerebral functions and affects state of mind, recognition and behavior (Nishida, Sawada, Kuwano, Tanaka, & Rokutan, 2019).

Only 25% to 30% of irritable bowel syndrome patients in the United States are reported to have consulted a physician (their symptoms begin between 30 to 50 years old); this represents 2.4 to 3.5 million medical consultations. In Mexico, general physicians, internal medicine specialists and surgeons are who attend to patients with acute symptomology; they mention that this disorder is found in a wide age range from 15 to 40 years old (Bautista et al., 2011).

We found in a review of the literature that stress is associated with the presence of IBS in medical students and affects different conditions such as their emotional state, physical health and/or interpersonal relationships (Bautista et al., 2011; Nishida et al., 2019). Some studies also show an association with psychological manifestations such as anxiety, frustration, nostalgia, social isolation and depression as well as physical symptoms such as migraines, muscle mobility problems and visceral sensitivity of gastrointestinal functions (Correa-Prieto, 2015; Perveen et al., 2016; Sehonou & Leoubou, 2018).

This study is based on transactional theory with a *social cognitive* focus that defines psychological stress as “a particular reaction

between an individual and the surroundings that he or she judges to be threatening or overwhelming to his or her resources and puts his or her wellbeing in jeopardy” (Gonzalez & Landero, 2008).

Therefore, the goal of this study was to identify psychophysiological symptoms of chronic stress as a predictor of irritable bowel syndrome in medical students at a public university in Mexico.

## Method

### *Design*

Quantitative, observational, cross-sectional analytical study.

### *Sampling / Participants*

A cross-sectional analytical study was made during the 2014 school year. The target population was 1,101 medical students (48% men and 52% women); the average age reported was 21.30 (+1.82) ranging from 18 to 26 years old. A simple random sampling was made, and to determine the size, the expected prevalence was estimated at 64.5%, 70% as an acceptable minimum rate, and 99% accuracy. The sampling included 561 college students studying medicine at a public university in Guadalajara, Mexico.

### *Recruiting Process*

The college student population was selected according to the random number technique, and was proportionate with respect to gender and school year from the list of students enrolled in the 2014 school year. Nevertheless, participation was voluntary and students responded to the survey with informed consent.

### *Instruments*

It was used the *Stress Symptoms Inventory* (SSI) by Lipp & Guevara, 1994; lists 41

psychophysiological symptoms characteristic of chronic stress, based on the three-phase Selye model (alarm, resistance and exhaustion). The adaption by Dominguez (1998), for the Mexican population was applied; it reports a consistent internal Cronback alpha of 0.94, indicating an acceptable degree of reliability. (Pozos-Radillo, Torres, Aguilera, Acosta, & González, 2008) The surveyed party was asked to point out the presence of symptoms on a scale of one to three (1 = never; to 3 = frequently) according to how he or she had felt over the previous six months. Frequency was scored according to the following classification: frequently (3), sometimes (2) and never (1).

Psychological chronic stress symptoms that the instrument considers are: feeling depressed, angry outbursts, an overwhelming need to run and hide, wanting very much to cry, impossible to concentrate, feeling tied down, nervous tic, tends to be startled by small noises, nervous laughter, constant urge to eat, insomnia, increased daily dose of tranquilizers, increased alcohol consumption, nightmares, increased daily cigarette consumption and an overwhelming need to move about constantly.

Physical chronic stress symptoms are: throbbing heartbeats, dry mouth, weakness-dizziness, fatigue, teeth-grinding, clinched jaw, tension headache, migraine, excessive sweating, frequent need to urinate, indigestion, neck and backache, loss of appetite, frequent colds, cold hands and feet, allergies, gastritis, colitis, hypertension and tremors, considered to be predictor variables of multiple regression.

IBS diagnoses are based on the ROMA III criteria, the clinical diagnostic criteria describing symptoms and the application of frequency and duration parameters, which allow for a more accurate IBS diagnosis (Shih, & Kwan, 2007).

### *ROMA III Criteria*

The IBS diagnoses were based on the ROMA III criteria (criteria followed during the previous 3 months with an onset of symptoms at least 6 months prior to diagnosis):

Recurrent upset stomach or abdominal pain (means an uncomfortable nondescript sensation such as pain) at least 3 days / month during the last 3 months with 2 or more of the following: 1. improves after a bowel movement, 2. commences associated with a change of bowel movement frequency and 3. Commences associated with a change of bowel movements shape (appearance).

IBS is classified in terms of the seriousness of the symptoms on the Bristol Scale (Lewis & Heaton, 1997), according to bowel movements consistency and according to type 1 ("separate hard lumps hard to pass"); type 2: ("sausage-shaped but lumpy"); type 3: ("like a sausage but with cracks on the surface"); type 4: ("like a sausage or serpent, smooth and soft"); type 5: ("soft blobs with clear cut edges"); type 6: ("fluffy pieces with ragged edges"); and 7: ("watery, no solid pieces"). IBS classification consisted of the following: if more than 25% of the bowel movements were type 1 or 2, the student was considered to have ("IBS with constipation"); if more than 25% of the bowel movements were type 6 or 7, the student was considered to have ("IBS with diarrhea"); and if more than 25% of both types ("1 or 2, 6 or 7), the diagnosis was ("IBS with mixed bowel movements"). On the other hand, students with type 3 or 4 bowel movements were considered normal (Yang et al., 2014).

### *Ethical Considerations*

The study was approved by the Ethics Committee of the Occupational Health Institute of the University of Guadalajara under reference number IISO / CI / 2012-2013. Guidelines of the 1975 Helsinki Declaration were adhered to at all times. The data was processed as provided by the General Health Law in effect in Mexico for research involving human beings.

### *Statistical analysis*

The Pearson correlation analysis was used to calculate association, to specify predictive value information and to determine the effectiveness

of the measurements obtained. A step-by-step regression analysis was performed by simultaneously introducing an equation of the measurements at a meaningful level ( $p < 0.05$ ).

The variables in these analyses appear to be orderly in the equation in terms of the percentage of explained variance.

Later a hierarchical multiple regression analysis was applied to determine the predictive value of the physical and psychological symptoms vis-à-vis IBS, and the *Introduce* method was used for this purpose. This procedure yielded an incremental predictive value of the variables included.

The data were tabulated and processed with SPSS (Statistical Package for Social Sciences) Version 15 for Windows XP, under the university's license.

## **Results**

### *Descriptive Statistics and Correlations*

The frequency of psychophysiological symptoms of chronic stress (SSI) in the population was for psychological symptoms: feeling depressed 8% (47), angry outbursts 34% (191), overwhelming need to run and hide 2% (13), wanting to cry 1% (5), difficulty in concentrating 30% (170), feeling tied down 4% (22), nervous tic 0.3% (2), tend to be startled by small noises 12% (68), nervous laughter 6% (36), stuttering 2% (12), anxiety feelings 36% (203), constant urge to eat 28% (157), insomnia 29% (165), increased daily dose of tranquilizers 3% (17), increased alcohol consumption 5% (29), nightmares 15% (85), increased daily cigarette consumption 0.10% (12), accident proneness 10% (59), and an overwhelming need to constantly move about 9% (44).

Physical symptoms were: throbbing heartbeat 9% (51), dry mouth 22% (126), weakness-dizziness 20% (115), fatigue 22% (122), grinding teeth 24% (133), clinched jaw 28% (156), tension headaches 26% (145), migraines 15% (86), excessive sweating 19% (111), frequent need to urinate 17% (97), indigestion 20%

(114), abdominal pain 26% (144), neck and back pain 29% (162), loss of appetite 25% (139), constipation 28% (159), frequent colds 33% (187), cold hands and feet 17% (98), allergies 16% (93), gastritis 25% (139), colitis 25% (143), hypertension 2% (6) and tremors 1% (5).

IBS was present in 62% (347) of the medical students, including the following types: constipation in 178, diarrhea in 34 and mixed bowel movements in 135 medical students.

The association between the psychological symptoms of chronic stress with the presence of some kind of IBS is shown in Table 1 and was identified in more than 5% of medical students at a level of frequent symptoms such as: difficulty in concentrating, angry outbursts, anxiety feelings and insomnia with constipation; anxiety feelings with diarrhea; and a constant urge to eat, angry outbursts and insomnia with mixed bowel movements.

**Table 1**

*Distribution of the psychological symptoms of chronic stress (SSI) according to the types of Irritable Bowel Syndrome in medical students at a public university in Guadalajara, México, 2016*

Symptoms of chronic stress	Frequency of IBS with			Symptoms of chronic stress	Frequency of IBS with		
	Constipation	Diarrhea	Mixed bowel movements		Constipation	Diarrhea	Mixed bowel movements
<b>Feeling depressed</b>				<b>Anxiety feelings</b>			
Never			126	Never	113	0	95
Sometimes	166	25	4	Sometimes	45	0	27
Often	5	5	5	Often	20	34	13
<b>Angry outbursts</b>				<b>Constant urge to eat</b>			
Never			68	Never	112	17	87
Sometimes	98	22	48	Sometimes	18	14	28
Often	58	8	19	Often	48	3	20
<b>Overwhelming need to run and hide</b>				<b>Insomnia</b>			
Never			135	Never	109	18	82
Sometimes	177	26	0	Sometimes	52	12	37
Often	1	8	0	Often	17	4	16
<b>Wanting to cry</b>				<b>Increased daily dose of tranquilizers</b>			
Never			134	Never	178	32	126
Sometimes	178	32	1	Sometimes	0	0	8
Often	0	2	0	Often	0	2	1
<b>Difficulty in concentrating</b>				<b>Increased alcohol consumption</b>			
Never			98	Never	171	28	125
Sometimes	86	21	26	Sometimes	3	4	2
Often	28	5	11	Often	4	2	8
<b>Feeling tied down</b>				<b>Nightmares</b>			
Never			132	Never	156	25	113
Sometimes	174	27	2	Sometimes	11	6	13
Often	1	7	1	Often	11	3	9
<b>Nervous tic</b>				<b>Increased daily cigarette consumption</b>			
Never			134	Never	170	32	134
Sometimes	178	34	1	Sometimes	3	0	0
Often	0	0	0	Often	5	2	1
<b>Tends to be startled by small noises</b>				<b>Accident prone</b>			
Never			106	Never	165	28	104
Sometimes	159	25	19	Sometimes	2	3	26
Often	7	7	10	Often	11	3	5
<b>Nervous laugh</b>				<b>Overwhelming need to constantly move about</b>			
Never			132	Never	167	18	125
Sometimes	160	26	2	Sometimes	4	11	10
Often	14	8	1	Often	7	5	0
<b>Stutters</b>							
Never			135				
Sometimes	173	31	0				
Often	5	2	0				
	0	1	0				

Note. IBS = Irritable Bowel Syndrome

The association between the physical symptoms of chronic stress according to the type of IBS is shown in Table 2 and was identified in more than 5% of medical students at a level of frequent symptoms such as: clinched jaw, neck and back pain, dry mouth, frequent colds, gastritis, indigestion and colitis with the constipation type; abdominal pain with diarrhea; weakness-dizziness, tension headache, neck and back pain, frequent colds, cold hands and feet, indigestion and gastritis with mixed bowel movements.

**Table 2**

*Distribution of the physical symptoms of chronic stress (SSI) according to the types of Irritable Bowel Syndrome in medical students at a public university in Guadalajara, México, 2016*

Symptoms of chronic stress	Frequency of IBS with			Symptoms of chronic stress	Frequency of IBS with		
	Constipation	Diarrhea	Mixed bowel movements		Constipation	Diarrhea	Mixed bowel movements
<b>Throbbing heartbeat</b>				<b>Abdominal pain</b>			
Never			117	Never	128	0	100
Sometimes	153	30	17	Sometimes	40	1	21
Often	23	4	1	Often	10	33	14
<b>Dry mouth</b>				<b>Neck and back pain</b>			
Never			104	Never	99	19	87
Sometimes	117	21	26	Sometimes	44	10	25
Often	38	12	5	Often	35	5	23
<b>Weakness-dizziness</b>				<b>Loss of appetite</b>			
Never			60	Never	121	20	90
Sometimes	171	11	6	Sometimes	40	10	34
Often	5	13	69	Often	17	4	11
<b>Fatigue</b>				<b>Constipation</b>			
Never			103	Never	119	24	72
Sometimes	124	18	30	Sometimes	12	2	52
Often	45	14	2	Often	47	8	11
<b>Grinding teeth</b>				<b>Frequent colds</b>			
Never			87	Never	94	13	84
Sometimes	124	25	39	Sometimes	47	13	27
Often	42	6	9	Often	37	8	24
<b>Clinched jaw</b>				<b>Cold hands and feet</b>			
Never			104	Never	150	20	89
Sometimes	92	21	24	Sometimes	15	9	25
Often	15	10	7	Often	13	5	21
<b>Tension headache</b>				<b>Allergies</b>			
Never			82	Never	144	26	93
Sometimes	128	16	30	Sometimes	22	7	33
Often	34	13	23	Often	12	1	9
<b>Migraine</b>				<b>Gastritis</b>			
Never			96	Never	120	19	89
Sometimes	154	25	31	Sometimes	32	9	26
Often	17	7	10	Often	26	6	20
<b>Excessive sweating</b>				<b>Colitis</b>			
Never			94	Never	119	22	87
Sometimes	134	26	28	Sometimes	32	6	29
Often	33	5	10	Often	27	6	19
<b>Frequent need to urinate</b>				<b>Hypertension</b>			
Never			102	Never	178	33	132
Sometimes	137	27	28	Sometimes	0	1	2
Often	36	6	5	Often	0	0	1
<b>Indigestion</b>				<b>Tremors</b>			
Never			96	Never	178	33	133
Sometimes	133	23	23	Sometimes	0	0	0
Often	30	9	16	Often	0	1	2

Note. IBS = Irritable Bowel Syndrome

*Predictive value of psychological and physical symptoms in association with a type of IBS.*

The correlates between scores of psychological symptoms of chronic stress for the constipation type of IBS, positive and moderate and

meaningful (Pearson  $r > 0.30$ ) were: difficulty in concentrating and a constant urge to eat; the diarrhea type is associated with anxiety feelings. The physical symptoms of chronic stress are associated positively and moderately with clinch jaw and constipation; abdominal pain with diarrhea, and weakness-dizziness with mixed bowel movements (Table 3). The other correlates did not reach a meaningful level.

**Table 3**  
Correlation coefficient between psychophysiological symptoms of chronic stress with the types of Irritable Bowel Syndrome in medical students at a public university in Guadalajara, México, 2016

Chronic stress symptoms	IBS type constipation		IBS type diarrhea		IBS type Mixed bowel movements	
	$r$ Pearson	95% CI LL UL	$r$ Pearson	95% CI LL UL	$r$ Pearson	95% CI LL UL
<i>Psychological</i>						
Difficulty to concentrate	0.450*	0.209-0.108				
Anxiety feelings			0.379*	0.436 - 0.369		
Constant urge to eat	0.431*	0.390-0.215				
<i>Physical</i>						
Weakness-dizziness					0.472*	0.142 - 0.003
Clinched jaw	0.512**	0.097-0.216				
Abdominal pain			0.439**	0.017 - 0.522		
Constipation	0.404*	0.268-0.001				

Note. IBS= Irritable Bowel Syndrome; CI = Confidence interval; LL = Lower limit; UL = Upper limit; \*  $p < 0.05$ ; \*\*  $p < 0.01$ .

Table 4 shows the step-by-step regression analysis of psychophysiological symptoms of chronic stress with each of the IBS types, and met the criteria of a meaningful predictive value. The regression model for the constipation type of IBS determined that difficulty in concentrating, a constant urge to eat (psychological symptoms), clinched jaw, abdominal pain and constipation (physical symptoms) were predictors ( $R^2 = 0.39$ ;  $F = 48.1$ ,  $p < 0.01$ ). The regression model for the diarrhea type indicated that anxiety feelings, abdominal pain and constipation (physical symptoms) were predictors ( $R^2 = 0.50$ ;  $F = 43.4$ ,  $p < 0.01$ ).

**Table 4**  
Multiple regression analysis of each of the Irritable Bowel Syndrome types con and psychophysiological symptoms of chronic stress as predictors

Regression Model	$r^2$	Beta	95% CI		F	p
	Adjusted		LL	UL		
<i>IBS type Constipation</i>						
Constant	0.394	10.299	9.572	11.027	48.16	< 0.001
<b>Psychological symptoms of chronic stress</b>						
1- Difficulty to concentrate		0.711	0.456	0.966		
2- Constant urge to eat		0.694	0.438	0.951		
<b>Physical symptoms of chronic stress</b>						
3- Clinched jaw		0.640	0.395	0.620		
4- Abdominal pain		0.381	0.089	0.673		
5- Constipation		0.322	0.018	0.627		
<i>IBS type Diarrhea</i>						
Constant	0.535	8.638	7.666	9.609	41.88	< 0.001
<b>Psychological symptoms of chronic stress</b>						
1- Anxiety feelings		0.749	0.513	1.110		
<b>Physical symptoms of chronic stress</b>						
3- Abdominal pain		0.506	0.442	1.057		
<i>IBS type Mixed Bowel Movements</i>						
Constant	0.500	4.008	3.324	4.692	43.49	< 0.001
<b>Physical symptoms of chronic stress</b>						
1- Weakness-dizziness		0.598	0.393	0.802		

Different contrasts were made to these data with regard to independence, normality and homoscedasticity assumptions. We should mention in this regard that data did not show multicollinearity between the predictive variables. The average statistical values of <Tolerance> for physical, psychological and behavioral factors was 0.95, with no value less than 0.89. The closeness of these values to the maximum value (range 0-1) indicates the independence of the predictive variable contributions based on the values of the types of IBS, indicating that the residual variance is constant and establishing that residuals are distributed normally. The average value of the variance inflation factor ( $VIF = 1.15$ ) with no value lower than 1.05 showed there was no collinearity problem.

## Discussion and Conclusions

The main goal of this study was to identify psychophysiological symptoms of chronic stress as a predictor of IBS in medical students at a public university in Mexico. According to results obtained, 62% of the medical students reported being affected by IBS, and of these, and regarding type, 51% were for constipation, 10% for diarrhea and 39% for mixed bowel movements. Nevertheless, the findings of previous studies with similar samplings (Yang, et al., 2014; Iftikhar, Naveed, & Rehman, 2018), reported the presence of 30.9% to 33.3% in students affected by IBS, percentages below 50% compared to those found in this study. This may be due to some factors that could be the cause of why results differ significantly, such as different curricula at the different universities where the medical students study, or that the studies were made in different countries in different contexts. These findings become more relevant when the last report by the World Health Organization (WHO) showed that 75% of Mexicans suffer from stress, putting us at the head of the list with China at 73% and the United States at 59% of their population (Aselton, 2012; Cox, & Mackay, 1981; Builes, & Fernández, 2017).

The study also showed there is a positive correlation between medical students meeting the IBS criteria and the presence of the psychophysiological symptoms of chronic stress, such as difficulty in concentrating, constant urge to eat, cinched jaw, abdominal pain, constipation, anxiety feelings and weakness-dizziness. The index indicates a dependency between the variables; i.e. when one of them increases, the other also does so at a constant proportion.

The predictive model resulting from this investigation contributes to the transactional theory of the *social cognitive* approach that emphasizes the interaction of stress variables, based on cognitive processes that develop around a stressful situation, as well as the internal representation of particular problematic situations between students, their surroundings and their health.

Not unlike other studies that have shown the relationship between IBS and stress in students (Bautista et al., 2011; Pozos-Radillo et al., 2018; Gulewitsch et al., 2013; Teoman et al., 2016), the symptoms reported in this study as associated with IBS were anxiety and abdominal pain as philological and psychological responses of the medical students (Iftikhar et al., 2018; Ramírez-Baena et al., 2019; Faria & Maia, 2007; Yuval et al., 2016). These symptoms are considered to be a response by the organism in the face of physical and psychological demands (Builes & Fernández, 2017). The differences between this study and others is the kind of analyzed stress; while this study addresses the psychophysiological symptoms of chronic stress, the other studies aim at situations such as academic stress, anxiety disorders, acculturative stress, depression, eating habits, mental tension, frustration, nostalgia, social isolation, mobility problems, visceral sensitivity and gastrointestinal functions. (Correa-Prieto, 2015; Perveen et al., 2016; Sehonou & Leoubou, 2018; Yang et al., 2014; Builes & Fernández, 2017). Another likely difference with this study may be the analysis of the relationships with different variables such as coping with stressful situations or with a tendency towards low academic achievement (Díaz, 2010; Sohail, 2013).

We should mention that the constipation type of IBS presented more psychological and physical symptoms when compared to the diarrhea and mixed bowel movements types, so it is important to detect psychophysiological symptoms associated with this kind of IBS and thus attend to this problem. If it persists, it may cause dilatation of veins, varicose veins in the lower extremities, and huge efforts made to evacuate may push the stomach upwards a bit above the diaphragm and may result in a hiatal hernia. Furthermore, if one stops eating because he or she feels full, it may result in gastritis as well as body weight increases and reductions and in severe cases it may be associated with an increased risk of colorectal cancer. Psychological problems that may be insomnia and low self-esteem, worry about what others expect from them, may have a negative influence on quality

of life. Therefore, the consequences of the constipation type of IBS reported here may have a bearing on each person's organism (González, Peña, Candia, & Durán, 2015).

There were only two psychophysiological symptoms of chronic stress associated with the IBS of diarrhea, abdominal pain and anxiety, and one, weakness-dizziness, with mixed bowel movements. So it is important to detect and attend to chronic stress present in medical students with these symptoms. Diseases such as chronic stress generally speaking are not perceived as diseases by a large part of the population, making it difficult for early diagnosis and the prevention of the serious complications accompanying it, such as IBS and its consequences.

The IBS of diarrhea may be associated with general malaise, abdominal pain and fever. In less serious cases diarrhea goes away on its own but in more serious cases it may result in dehydration, lower blood pressure, perforated bowel and on rare occasions toxic megacolon (massive dilation of the large intestine with sepsis-induced organism failure, necessarily resulting in surgery) (Morales & Navazo, 2006).

Diagnosis is often a hard task due to the complex relationship between the physical and the psychic. Symptoms of psychophysiological disorders are usually similar to those seen in strictly organic disease. Therefore it is quite important to carry out research aimed at detecting symptomatology that may indicate health problems associated with other illnesses to be able to offer comprehensive attention to medical students, thereby improving their health and academic performance.

#### *Implications for the University System*

This article describes a study carried out to determine the prevalence of irritable bowel syndrome and its association with the psychophysiological symptoms of chronic stress found in 62% of medical students at a public university in Mexico. The results reflect the presence of psychophysiological symptoms of

chronic stress with the presence of three types of IBS.

Based on these results, a profile can be constructed of the kind of student that probably has IBS. The creation of this kind of profile may improve the understanding of those suffering from this illness which in turn lays a foundation for preparing programs offering timely attention to the students at risk by identifying chronic stress by detecting the associated psychophysiological symptoms. This will reduce the adverse effects that could be harmful to medical students' health and academic performance. This study also enables a basis for developing longitudinal studies that permit greater knowledge of the problem and the most frequent causes of IBM. Measures could then be taken in school systems to encourage better healthful behavior and prevent and improve this problem.

#### *Strengths and Limits of this Study*

One of the strengths of this study is the large representative sample size that included more students than those reported in other studies (Díaz, 2010; Meyer, Espinoza, & Quera, 2014). The limitations of the study should also be mentioned, especially the existence of other factors that could have been influenced by IBS but not recognized by the instruments applied in this study. Moreover, at the time the questionnaires were administered, records of diets, social problems, economic problems and family characteristics were not controlled, variables that could have affected the results of this study.

In conclusion, our study determined that only the psychophysiological symptoms of difficulty in concentrating, constant urge to eat, clinched jaw, abdominal pain and constipation were predictors of the IBS of constipation, that the symptoms of anxiety feelings and abdominal pain were predictors of the IBS of diarrhea, and the physical symptom of chronic stress and weakness-dizziness was a predictor of the IBS of mixed

bowel movements in medical students at a public university in Mexico.

An exact identification of stressors may help reduce and understand stress, thereby eliminating harmful effects that could have negative repercussions on students' academic performance. The resulting recommendation is to implement educational programs aimed at preventing stress and its negative effects and to enhance students' ability to cope with stressful situations.

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## Notes

- \* Research article. None conflict of interest was declared.