

# Irritable Bowel Syndrome as a Stress Prediction Model in Mexican Dentistry Students

## Modelo predictivo de estrés en el síndrome del intestino irritable en estudiantes mexicanos de odontología

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### Abstract

The Irritable Bowel Syndrome is a functional gastrointestinal disorder associated with stress that may occur in the academic context, given that students are exposed to high demands during their education process which can lead to the development of diseases. The purpose of this study was to examine the correlation and predictive value between the Irritable Bowel Syndrome (IBS) with stress in dentistry students at a public university in Mexico, taking into account the gender variable. The design is cross-sectional with 740 dental students. Nowack's Stress Profile was used as well as the ROMA III criteria to identify IBS. Multiple lineal regression models were built, in which the dependent variable was IBS and the independent ones were the stress profile variables and group data. Such models were built independently for each sex and their results were compared. The IBS model in males was significant in the following variables:  $IBS = -1.454$  (problem concentration) + .315 (negative valuation) - .390 (social support network) + .513 (type A behavior) - .464 (rest/sleep), with a strength of  $R^2 = .685$ ;  $F = 75.72$ ;  $p < .01$  which explains 68% of the variance; and for females it was:  $ISB = -.041$  (positive valuation) - .082 (eating habits/nutrition) with a strength of  $R^2 = .643$ ;  $F = 42.69$ ;  $p < .01$ , which explains 64% of the variance. The comparative analysis determined that male dental students are at a greater risk of developing IBS due to stress. Therefore, programs aimed at a timely identification of the stress risk variables would be recommended to prevent consequences to the health, inadequate academic performance and wellbeing of dental students in Mexico.

### Keywords

Stress; college students; dentistry; public health; sexes; health care.

## Resumen

El síndrome del intestino irritable es un trastorno gastrointestinal funcional asociado al estrés que puede presentarse en un contexto educativo, dado que los estudiantes están expuestos a exigencias del entorno académico durante su proceso de formación que pueden derivar en el desarrollo de enfermedades. El objetivo de este estudio fue examinar la correlación y los valores predictivos entre el Síndrome de Intestino Irritable (SII) con el estrés, teniendo en cuenta la variable género, en estudiantes mexicanos de odontología en una universidad pública. El diseño fue transversal con 740 estudiantes de odontología. Se utilizó el Perfil de Estrés de Nowack y los criterios ROMA III para identificar el SII. Se construyeron modelos de regresión lineal múltiple donde la variable dependiente fue el SII y las independientes fueron las variables del Perfil de estrés. Tales modelos fueron construidos para cada sexo y se compararon sus resultados. El modelo para SII en los hombres fue significativo en las siguientes variables:  $SII = -1.454$  (concentración del problema) +  $.315$  (valoración negativa) -  $.390$  (red de apoyo social) +  $.513$  (conducta tipo A) -  $.464$  (descanso/sueño), con una fuerza de  $R^2 = .685$ ;  $F = 75.72$ ;  $p < .01$  explicando el 68% de la varianza; y para las mujeres fue:  $ISB = -.041$  (valoración positiva) -  $.082$  (alimentación/nutrición) con una fuerza de  $R^2 = .643$ ;  $F = 42.69$ ;  $p < .01$  explicando el 64% de la varianza. El análisis comparativo determinó que los hombres estudiantes de odontología tienen mayor riesgo de desarrollar SII por estrés, por lo que se recomienda establecer programas dirigidos a la identificación oportuna de variables en situación de riesgo para estrés, buscando evitar sus consecuencias para la salud y el inadecuado desempeño académico en estudiantes mexicanos de odontología.

## Palabras clave

Estrés; estudiantes universitarios; odontología; problemas de salud; sexos; cuidados de la salud

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## Introduction

Stress is the body's response to external situations altering an individual's emotional equilibrium. Everyone experiences stress during their life due to an accumulation of conflictive social and/or environmental pressures that surpasses the individual's ability to adapt. Nevertheless, if an individual has the tools to cope with stress, it does not always cause harmful effects to one's physical and psychological health that may affect work and/or academic performance as the result of everyday stress. On the contrary, when there is no proper response to stress, different effects may emerge, such as: tension, anxiety, nervousness, feeling overwhelmed and fear. These alterations may also occur in the academic context, causing less efficiency in learning since attention, concentration and retention are diminished, with consequential deterioration in academic performance and interpersonal relations as the result of needing to comply with academic demands and/or achieving resolutions and goals (Armenta et al., 2020; Silva, 2017).

Different investigations (Cordova & Santa, 2018; Díaz Cardenas et al., 2017; von-Bischhoffshausen-P et al., 2019), have reported dentistry education as one of the most stressful healthcare professions and that the main sources of perceived stress in this context are exams; grades; the fear of failing the course; the lack of rest areas; difficulty in understanding in class; beginning clinical practice; eating lunch at odd hours; academic load; and economic burden of coursing such major. All of these can create psychological disorders and burnout syndrome. The foregoing can make self-help practices in the area of health difficult, with possible adverse consequences for their wellbeing and academic and personal life at the university.

It is well known that stress creates different responses in individuals, which may be cognitive, emotional or physiological and be associated with changes or constant situations that may produce signs and symptoms of stress-related diseases (De la Roca-Chiapas et al., 2019).

The Irritable Bowel Syndrome (IBS) is a very common gastrointestinal disorder in clinical practice that has been proven to be a stress-related disease (Silva, 2017). It is considered chronic and is characterized by bowel movement alterations causing abdominal pain, constipation accompanied by diarrhea, gases and swelling. It

is classified into three kinds: diarrhea, constipation and mixed (von-Bischhoffshausen-P et al., 2019).

Factors that increase the risk of developing this syndrome may be psychosocial, environmental and/or genetic, and its triggers range from bad eating habits and prior gastroenteritis to different psychological disorders such as depression, anxiety, affective vulnerability and self-esteem disorder (Antón & Madrid, 2020; Rosas-Gonzalez et al., 2017).

A study reports that IBS has a global prevalence between 8.8% and 17.5% in Latin America (Bautista et al., 2011). Mexico reports a prevalence of 16%, occurring in an extensive age range between 15 and 40 years old. It is more common in females, the dominant IBS type is constipation, and anxiety, depression, sleep deprivation, diet, excessive caffeine and/or alcohol intake, age and emotional stress are some of the predominant causes activating this syndrome (Pontet & Olano, 2021; Sperber et al., 2021)

This study is supported by the cognitive-transactional model of stress, considered a dynamic process between the individual and his/her surroundings where the person sizes up a threat and his or her resources to deal with it. Psychological manifestations of stress encompass these factors: cognitive, emotional and behavioral, which may interconnect any individual with his or her environment as well as individual factors such as social ones that influence the individual's appraisal of situations and the meaning they attached to it. Stress and coping are a dynamic in the individual and his or her surroundings since they may constantly change shapes from one time to another, depending on the multiple forms of social influence. The essence of the model lies in the cognitive estimation of the response as well as the stimuli. Lazarus and Folkman have determined that there are elements intervening in the stress process, i.e., stimuli considered external events that may be psychological, physical, or every day and social events. Responses are considered behavioral, subjective and cognitive reactions and mediating elements are considered to be those that evaluate the stimulus as threatening for which available coping resources are insufficient (Lazarus & Folkman, 1986).

In our search for IBS-related stress in dental students, the reported studies were mainly concerned about

medical students and stress-related issues. One of the reported studies indicates that Mexican medical students with IBS were associated with anxiety, depression and stress, and females were affected the most (Bautista et al., 2011) while another study made performed on Latin American medical students reported that the female gender and the psychological component were the major factors associated with IBS (Novoa-Sandoval et al., 2017). A study from Beijing China reported the presence of moderate to serious IBA with a prevalence of 35% and that females were affected the most. This study reported IBS to be associated with anxiety, sleep disorders and mental problems (Liu et al., 2014).

Therefore, the purpose of this study is to determine the effects the Stress Profile variables have on

the Irritable Bowel Syndrome in dentistry students and to compare data between males and females at a public university in Mexico. The results establish the foundations for implementing actions in favor of these student's health, thus confirming the cognitive-transactional model proposal.

### **Hypothesis**

H1. The positive and negative variables of the *Stress Profile* are identified as predictors of the Irritable Bowel Syndrome during the 2019 school year.

H2. There's a meaningful difference in the presence of the stress profile variables as predictors of the Irritable Bowel Syndrome between men and women.

## **Method**

### **Type of study**

A quantitative, cross-sectional and correlational study (Dagnino, 2014).

### **Participants**

Students from a public university in Guadalajara, Mexico belonging to the School of Dentistry were included in this study, excluding all students from educational programs other than this one. The total population was 1670 students, the sample size was calculated with an expected prevalence of 64.5% and a minimum acceptable frequency of 70% was set with a precision level of 99%. With these parameters, a sample of 740 dental students was formed.

The sampling is of the simple random type with proportional affixation for each school year. This kind of sampling was chosen because it tends to be more representative of the population and because it ensures that each level is represented in the sample.

The sample used in this study consisted of 740 dental students at a public university in Mexico, and the semesters varied between first to ninth (the total amount of semesters needed to graduate), distributed as follows: 11% (81) in each of the first through eighth semester and 12% (92) in their ninth semester. The sample selection was made with a random number technique, proportional according to academic level.

The list of students enrolled in 2019 was used. Inclusion criteria: being an active dental student and agreeing to participate in the study. Exclusion criteria: all those students studying for a degree other than in dentistry, students completing their community service and those who had a college degree.

The students were chosen and located to invite them to participate voluntarily after being informed about the purpose of this study.

### **Instruments**

The *stress profile* (SP) developed by Nowack identifies traits and behavior of those persons who may benefit by coping with the harmful effects of stress that may induce vulnerability in the face of related diseases (De La Roca-Chiapas et al., 2019; Nowack, 2002). The profile is designed with established dimensions such as reliable, positive and meaningful protective resources for health (exercise, rest/sleep, eating habits/nutrition and preventive behavior), satisfactory support networks (family, social and at the workplace), cognitive strength (internal locus of control), coping style (positive valuation, threat minimization and problem concentration) and psychological wellbeing (affirmative self-esteem feelings) as well as risk behavior dimensions in the presence of stress such as stressful situations (health, work, finance, family, social and environmental surroundings), type A

behavior, negative valuation, threat minimization and the auto informed consumption of alcohol, recreational drugs and cigarettes (ARC reagent cluster) (Novack, 2002; Preciado-Serrano & Vazquez-Coñi, 2010).

The questionnaire includes 118 items. Each question offers multiple choices of 5 answers on a Likert-type scale and grading is specified in the manual. The time allotted for answers varies between 20 and 25 minutes. The psychometric properties of the instrument report reliability by halves of .89 and .91 in populations consisting of different races and academic levels. Scale homogeneity with test-retest reliability shows a range between .51 and .92 Cronbach alpha and factorial analyses report a low to moderate relation (.41 to .75 eigen), thus confirming that the constructs represented by these variables are sufficiently independent to justify their separate identification. Altogether, the variables explain 57% of the variance (Nowack, 2002). The questionnaire was validated for Mexican population with a sample consisting of 883 participants, 58.3% females and 41.7% males and ages ranging between 15 and 76 years old ( $M=21.40$ ,  $DE=10.02$ ). The psychometric properties of the instrument report adequate reliability for this population and a Cronbach's alpha of .65 to .93 was obtained (De la Roca-Chiapas et al., 2019).

After the 15 variable scores were analyzed: health habits, exercise, rest-sleep, eating habits-nutrition, prevention, social support network, cognitive strength, positive valuation, threat minimization, problem concentration and psychological wellbeing, scores of  $T > 60$  were considered protectors against stress and  $T < 40$  as vulnerability to health risk. For the variables of stress, type A behavior, negative valuation and the ARC reagent cluster (alcohol, recreational drugs and cigarettes),  $T < 40$  was considered a risk and  $T > 60$  as invulnerability to disease or with protective health resources (Nowack, 2002).

IBS was diagnosed according to the ROMA III criteria, i.e., parameters for clinical diagnosis that describe symptoms based on the parameters of frequency and duration during the previous 3 months in which symptoms began at least 6 months prior to the diagnosis, such as recurrent abdominal pain or discomfort (meaning an uncomfortable sensation not described as pain) at least 3 days per month during the previous 3 months, associated with two or more of the following: 1. It improves with evacuation, 2. The beginning is associated with a change of evacuation frequency, and 3. The beginning is associated with a change of the form (appearance) of the evacuations (Shih & Kwan, 2007).

IBS was classified according to the seriousness of the symptoms on the Bristol Scale (Lewis & Heaton, 1997), according to the consistency of the stool in the three subtypes of the type 1 scale ("separate hard nut-like lumps"); type 2 ("sausage with lumps"); type 3 ("like a sausage or snake with cracks on the surface"); type 4 ("like a soft sausage or snake"); type 5 (soft balls with clear edges, easy to evacuate); type 6 ("spongy pieces with irregular edges, soft stool"); and type 7 ("watery with no solid pieces"). The classification consisted of the following: if more than 25% of the evacuation was type 1 or 2, it was deemed that the students had ("IBS with constipation"); if more than 25% of the evacuation was type 5 or 6, it was deemed that the students had ("IBS with diarrhea"); if more than 25% of the evacuation showed 2 types (1 or 2, or 6 or 7) the diagnosis was ("IBS with mixed bowel movements"). On the other hand, students with type 3 or 4 evacuations were considered normal. The psychometric properties of the Bristol Scale reach appropriate reliability with a Cronbach's alpha of .85 (Martinez & Azevedo, 2012; Parés et al., 2009).

### Data Analysis

Two databases were set up for each gender in SPSS 2019 where data were recorded according to indications of the instruments. A descriptive analysis was made of the study's variables. Afterwards, a multiple linear regression analysis was applied to determine IBS predictive models for males and for females. The multiple lineal regression analysis was carried out with the step method and  $p = < .05$  was considered a meaningful level. The Pearson correlation was called on to identify interlinking dimensions. The variables appear orderly in these analyses, in the equation, and in terms of the percentage of explained variance for each model. An analysis was made with different contrasts in the areas of independence, normality and homoscedasticity. We should point out that data did not show multicollinearity among the predictive variables. The average <<Tolerance>> statistic for the SP is .90 with a value lower than 0.89, thus indicating that the variance of the residuals was constant and established that residuals were distributed normally. The value average (VIF = 1.15) with no value below 1.05 showed that there was no collinearity problem.

Then Student's  $t$  statistic was used to identify the differences between the answers given by males and females regarding to IBS valuations and the SP dimensions.

The data were tabulated and processed in the Statistical Package for Social Studies (SPSS), SPSS for Windows v. 17.0 under the University's license.

**Ethical Considerations**

Participants were asked to answer the survey voluntarily with their informed consent. They were guaranteed confidentiality of the gathered data and their anonymity, and the participants had the choice of answering or dropping

out whenever they wanted. The investigative protocol and informed consent form were reviewed and approved with reference number IISO/CI/2016-2020.

The study was made according to the guidelines of the Regulations of the General Health Law in Research Matters for the Health of Mexico, and the Helsinki Declaration. Participants' mental and physical health was not affected, and we had the permission of university authorities.

**Results**

**Descriptive statistics**

Of the 740 dental students participating in this study, 62% (459) were female and 38% (281) male with ages ranging between 19 and 21 years old. The average age was 19 (+ 1.20) years old.

The descriptive analysis of IBS showed that 70% (520) had IBS and reported the following symptoms: constipation 49% (259), diarrhea 34% (181) and mixed types 15% (80). Female students showed greater frequency (38%) than did the males (Table 1).

**Table 1.** Distribution of Irritable Bowel Syndrome types by gender among dental students at a public university in Guadalajara, México

Irritable Bowel Syndrome	Gender			
	Female		Male	
	<i>n</i>	%	<i>n</i>	%
Constipation	199	38	60	11
Diarrhea	100	19	81	15
Mixed Evacuation	60	11	20	4

As for the *Stress Profile*, the dimensions considered to be protective and reliable resources present in IBS, the most frequent variables were: exercise 340 (65%), rest/sleep 399 (77%), eating habits/nutrition 302 (58%), prevention 165 (32%), social support network 260 (50%), cognitive strength 350 (67%), positive valuation 230 (44%), problem concentration 225 (43%), threat minimization 220 (42%) and psychological wellbeing 221 (42%). The description of each IBS type

and each gender (Table 2).

On the other hand, the SP variables considered risky behavior with IBS frequency and that posed a risky situation were: stressful situations 67% (349), ARC reagent cluster 66% (347), type A behavior 75% (389) and negative valuation 80% (416). Table 2 shows the distribution of each IBS type and each gender.

**Table 2.** Distribution of Stress Profile variables associated with the Irritable Bowel Syndrome in dental students at a public university in Guadalajara México

Stress Profile variables	Irritable Bowel Syndrome					
	With constipation		With diarrhea		With mixed evacuation	
	Female	Male	Female	Male	Female	Male
<b>Variables with reliable, positive and meaningful protective resources for health</b>						
<b>Exercise</b>						
With risk	128	42	73	47	45	5
No risk	68	21	34	27	11	19
<b>Rest / sleep</b>						
With risk	142	38	104	65	41	09
No risk	40	39	07	05	25	05
<b>Eating habits / nutrition</b>						
With risk	142	30	48	32	42	8
No risk	41	46	68	33	18	12
<b>Prevention</b>						
With risk	57	23	56	04	25	0
No risk	116	63	57	64	48	07
<b>Social support network</b>						
With risk	100	49	26	35	44	06
No risk	80	30	85	35	24	06
<b>Cognitive strength</b>						
With risk	105	44	70	71	50	10
No risk	85	25	30	10	19	01
<b>Positive Valuation</b>						
With risk	68	31	73	18	28	12
No risk	108	52	53	37	29	11
<b>Problem concentration</b>						
With risk	86	34	32	19	46	08
No risk	105	34	71	59	19	07
<b>Threat Minimization</b>						
With risk	53	36	71	20	26	14
No risk	132	38	51	39	26	14
<b>Psychological wellbeing</b>						
With risk	75	35	46	25	30	10

Stress Profile variables	Irritable Bowel Syndrome					
	With constipation		With diarrhea		With mixed evacuation	
	Female	Male	Female	Male	Female	Male
No risk	114	35	65	45	29	11
Risky behavior variables						
Stressful situation						
With risk	123	46	73	57	47	03
No risk	63	27	34	17	19	11
ARC reagent cluster						
With risk	94	66	79	51	53	04
No risk	72	27	38	13	23	0
Type A behavior						
With risk	134	44	100	51	25	15
No risk	37	24	19	11	24	16
Negative Valuation						
With risk	152	47	91	66	63	07
No risk	33	27	18	06	12	08

**Analysis of the predictive models**

As for the analysis of the predictive model, it was determined with multiple linear regression according to gender.

The first model indicated that the SP variables of problem concentration, negative valuation, social support network, type A behavior and rest/sleep were IBS predictors in males, as follows:  $IBS = -1.454$  (problem concentration) +  $.315$  (negative valuation) -  $.390$  (social support network) +  $.513$  (type A behavior) -  $.464$  (rest/sleep), with a strength of 68.5% ( $F = 75.72$ ;  $p = .001$ ).

The second model showed the SP variables of positive valuation and eating habits/nutrition were IBS predictors in females as follows:  $IBS = -.041$  (positive valuation) -  $.082$  (eating habits/nutrition) with

a strength of 54.3% ( $F = 42.69$ ;  $p = .001$ ) This confirms hypothesis 1 (Table 3).

**Differences between Males and Females**

Student's *t* analysis resulted in meaningful differences when the mean score between males and females was compared. Table 4 shows that male students reported a higher mean than females in IBS ( $M = 1.43$ ,  $t = -6.188$ ,  $p = .03$ ), exercise ( $M = 44.08$ ,  $t = -6.40$ ,  $p = .02$ ), prevention ( $M = 68.03$ ,  $t = -6.66$ ,  $p = .001$ ) and social support network ( $M = 50.15$ ,  $t = 4.19$ ,  $p = 0.00$ ). Female students showed a higher mean than males in eating habits/nutrition ( $M = 47.88$ ,  $t = -3.79$ ,  $p = .02$ ), psychological wellbeing ( $M = 51.32$ ,  $t = 7.71$ ,  $p = .001$ ), threat minimization ( $M = 54.67$ ,  $t = 5.06$ ,  $p = .02$ ), thus allowing us to confirm the hypothesis 2.

**Table 3.** Multiple regression analysis with Nowack Stress Profile Variables and the Irritable Bowel Syndrome in dental students at a public university in Guadalajara México

StressProfile	Correlation of Pearson with IBS	B Value	EE Value	F Value	p Value	R <sup>2</sup> Adjusted	Model
<b>Males</b>							
<b>Constant</b>		.873	.305	75.72	.001	.685	<i>t</i> = 7.295 ( <i>p</i> = .001)
<b>Problem Concentration</b>	-.573( <i>p</i> = .00)	-1.45	.019				
<b>Negative Valuation</b>	.395( <i>p</i> = .00)	.315	.022				
<b>Social Support Network</b>	-.390( <i>p</i> = .00)	.751	.017				
<b>Type A Behavior</b>	.513( <i>p</i> = .00)	1.54	.024				
<b>Rest/Sleep</b>	-.464( <i>p</i> = .00)	-.527	.022				
<b>Females</b>							
<b>Constant</b>		5.79	.413	42.69	.001	.643	<i>t</i> = 13.936 ( <i>p</i> = .001)
<b>Positive Valuation</b>	-.308 ( <i>p</i> = .001)	-.041	.004				
<b>Eating habits/nutrition</b>	-.426 ( <i>p</i> = .001)	-.082	.006				

**Table 4.** Difference means of dental students at a public university in Guadalajara México, 2019.

Variables	Females (n = 459)		Males (n =281)		t value	p value
	M	SD	M	SD		
<b>Irritable Bowel Syndrome</b>	1.22	(.413)	1.43	(.496)	-6.188	.015
<b>Stress Profile Variables</b>						
<b>Exercise</b>	38.74	(11.40)	44.08	(10.76)	-6.40	.015
<b>Rest / Sleep</b>	35.90	(11.24)	43.52	(12.70)	-8.26	.936
<b>Eating habits / nutrition</b>	47.58	(13.73)	43.89	(12.23)	-3.79	.024
<b>Prevention</b>	60.45	(18.19)	68.03	(12.67)	-6.66	.000
<b>Social support network</b>	44.77	(15.63)	50.15	(17.69)	4.19	.000
<b>Cognitive strength</b>	42.46	(10.89)	37.26	(9.821)	6.71	.417
<b>Psychological wellbeing</b>	51.32	(12.62)	42.75	(15.76)	7.71	.000
<b>Positive valuation</b>	52.95	(14.31)	47.68	(14.34)	4.85	.184
<b>Threat minimization</b>	54.67	(14.02)	49.60	(12.72)	5.06	.024
<b>Negative valuation</b>	55.38	(14.53)	52.53	(14.88)	2.55	.927
<b>Type A behavior</b>	50.94	(12.01)	49.41	(13.03)	1.59	.387
<b>ARC reagent cluster</b>	46.62	(11.81)	52.74	(10.98)	-7.13	.556
<b>Stressful situation</b>	47.57	(11.91)	47.39	(11.56)	.209	.254
<b>Problem concentration</b>	47.88	(11.93)	44.59	(11.24)	3.77	.085

**Note:** SD: standard deviation. t-de student p-values obtained using the two-sample t-test.  
M-Statistics Media

## Discussion

The results of this study show that the SP risky behavior variables of negative valuation and type A behavior as well as the positive and inverse variables of social support network, problem concentration and rest/sleep, were predictive of IBS in males, and the inverse variables of positive valuation and eating habits/nutrition were predictive of IBS in females.

Given that no evidence of studies on IBS focused on dentists was found, we can say that this is the first study establishing IBS predictive models in a dental student population for each gender, and the findings confirm that there are differences in the SP variables between males and females. In addition, our findings suggest that males face more risk of IBS than females in the SP predictive variables of exercise, prevention and social support network, and that females only showed meaningful differences in eating habits/nutrition, psychological wellbeing and threat minimization in our sample, unlike other studies that establish that females are at greater risk of stress and IBS (Novoa-Sandoval et al., 2017; Pontet & Olano, 2021).

The results prove to be meaningful under the linear regression analysis of SP and IBS in students, finding common ground with the results of other studies:

The stress profile variables that were significant in men were: rest/sleep, meaning that male dentistry students who have inadequate rest and/or sleep can experience tiredness, fatigue and stress, which could generate health problems related to memory and poor academic performance, since the rest/sleep function serves in regulating physiological functions and behavioral responses. That in turn may cause potentially serious physical disorders (Álvarez-Aguire et al., 2021; Suardiaz-Muro et al., 2020).

The social support network refers to the feeling that the individual has no social or emotional support and, therefore, stressful events during their educational process may lead to mental disorders and lack of empathy for his or her professional development (Park et al., 2015). Type A behavior targets students tending to show angrier behavior, specifically, the tendency to try to carry out activities quickly, impatiently, and with peeved and hostile demeanor. They may also manifest psychological factors, personality problems and psychiatric disorders

that may be conducive to disease (Lazarus & Folkman, 1986; Preciado-Serrano & Vazquez-Goñi, 2010). Negative valuation, considered a coping variable, is characterized as self-blaming or pathetic thinking, and refers to focusing on the worst aspect or consequence of a situation. Applying it to life situations may be the beginning of interpersonal difficulties and, therefore, health problems (Antón & Madrid, 2020; Balverde, 2017). Problem concentration, when this strategy is not reinforced, creates concentration and memory problems that may lead to low performance caused by not focalizing on the specific elements, hindering efficacy and success in completion of tasks (Martínez et al., 2020; Restrepo et al., 2020).

Positive valuation variables were found among the female group, indicating that they were not focused on positive aspects, by not recalling happy experiences or visualizing positive solutions to difficult situations, thus reducing the impact of the problems and/or frustrations and creating positive psychological health. On the contrary, having negative emotions may lead to health problems such as IBS as well as anxiety, stress, worries and sadness, problems that may have undesirable effects on learning (Antón & Madrid, 2020; Carranza et al., 2017; Chales-Aoun & Merino, 2019). As for eating habits/nutrition, they revealed that they do not have “healthy” eating habits, and that may lead to health problems such as IBS. This may be explained because this age group is considered at risk due to its eating habits, given that they undergo behavioral changes with unhealthy practices of physical activities and eating during the first years of their professional education (Antón & Madrid, 2020; Chales-Aoun & Merino, 2019; Ponce et al., 2017).

It should be mentioned that the discrepancies between this study and the above-mentioned works are that most investigations of a population of dental students are aimed at problematic situations associated with different types of stress. Furthermore, most research is aimed at college population that does not include dentistry students, but rather students from other health areas such as psychology, nursing and medicine; and consider other variables such as violence, cognitive conflicts, social skills and academic performance in countries and academic contexts that differ from the work reported in this study, which could make the difference.

The comparative results of variables showed a higher means among males were IBS, exercise, prevention and social support network. Females, on the other hand, showed a higher mean in eating habits, psychological wellbeing and threat minimization. This study showed that males score higher on stress-related variables than females regarding the relation between the areas of lack of rest and sleeping well, bad eating habits and the lack of a social or family support network, with IBS. The reference works we found (Armenta et al., 2020; Park et al., 2015; Suardiaz-Murom et al., 2020; Torales et al., 2018; Zeledón et al., 2021), showed that the female gender has less probability of suffering from IBS than males, a discrepancy with other studies indicating that females are more susceptible to this disorder.

IBS is one of the most frequent functional digestive disorders and is prevalent in an estimated 5% to 15% of the world population, given that diagnosis is not easy. Although the causes of this syndrome are not well-known, it has been known for some time that it is associated with the patient's psychological state, including anxiety, depression and stress in persons with obesity, type two diabetes mellitus and high blood pressure. A prevalence of relatively high stress symptoms is found in students. Nevertheless, in our study, some college students manifested greater symptoms (68.7%) and also a slightly altered sleep quality. Females were meaningfully more affected in the means of eating habits/nutrition and positive valuation than their male counterparts, indicating that females have worse eating habits and do not apply positive valuation to cope with handling and controlling IBS, unlike the males. The differences between this study and the above-mentioned ones may be due to the fact that those studies are associated with other academic areas, in other countries and with other factors, such as varying levels of academic stress, poverty, depression and anxiety (Carranza et al., 2017; Loor et al., 2019).

One of the areas of education considered most stressful is dentistry because of difficulties in the academic environment, where stress increases during the successive courses work and the beginning of their clinical practices with patients. Furthermore, if the student fails to cope adequately with these stressful events, there could be repercussions such as a sensation of being overwhelmed, a feeling that they cannot do more and act out with negative behavior and a loss of interest, devaluation and self-criticism, which can cause them to become unable to find meaning or value

in their academic training. Furthermore, excess stress could have a negative impact on their health, including the presence of IBS, that could affect the quality of their life and poor academic performance on their studies by those suffering from it. There may also be negative economic effect for the State as well as for patients due to the chronic nature of the disorder (Córdova & Santa, 2018; Vallejo-Martín et al., 2017; Visoso et al., 2012).

One of the strengths of this study is the large representative sample size, focusing on dentistry students in comparison with other IBS and stress studies (Baustista et al., 2011; Preciado-Serrano & Vazquez-Goñi, 2010). It is also worth mentioning that the limitations of this study lie mainly in the presence of other factors that may have exerted influence on IBS and stress at the time the questionnaire was applied, such as social, economic and family issues that were not evaluated in this study.

### **Conclusion**

In conclusion, this study determined that male dental students at a public university in Mexico who make negative valuations; show type A behavior and do not concentrate on problems; do not have sufficient rest or sleep enough hours; and do not have a good support network are at higher risk for IBS. Females who do not make positive valuations nor keep good eating habits and/or nutrition increase their possibility of having IBS.

The presence of IBS may cause changes to one's health and reduce the quality of life and wellbeing as well as increase morbimortality (Carranza-Esteban et al., 2017). This work contributes knowledge about SP variables for each gender of dentistry students at a public university in Mexico with regards to the presence of IBS.

Stress, as well as IBS, can have a negative impact on health due to its elevated incidence in college students, which could result in a high personal cost on their lifestyle and social relationships, as well as lead to drug consumption and/or absenteeism with repercussions varying from poor academic performance to dropping out from college (Córdova & Santa, 2018; Vallejo-Martín et al., 2017).

We recommend establishing immediate actions with the objective of offering educational programs aimed at improving health through self-care, as well as providing coping tools to prevent stress before it has a negative impact on health, academic performance and school dropout of dentistry students.

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