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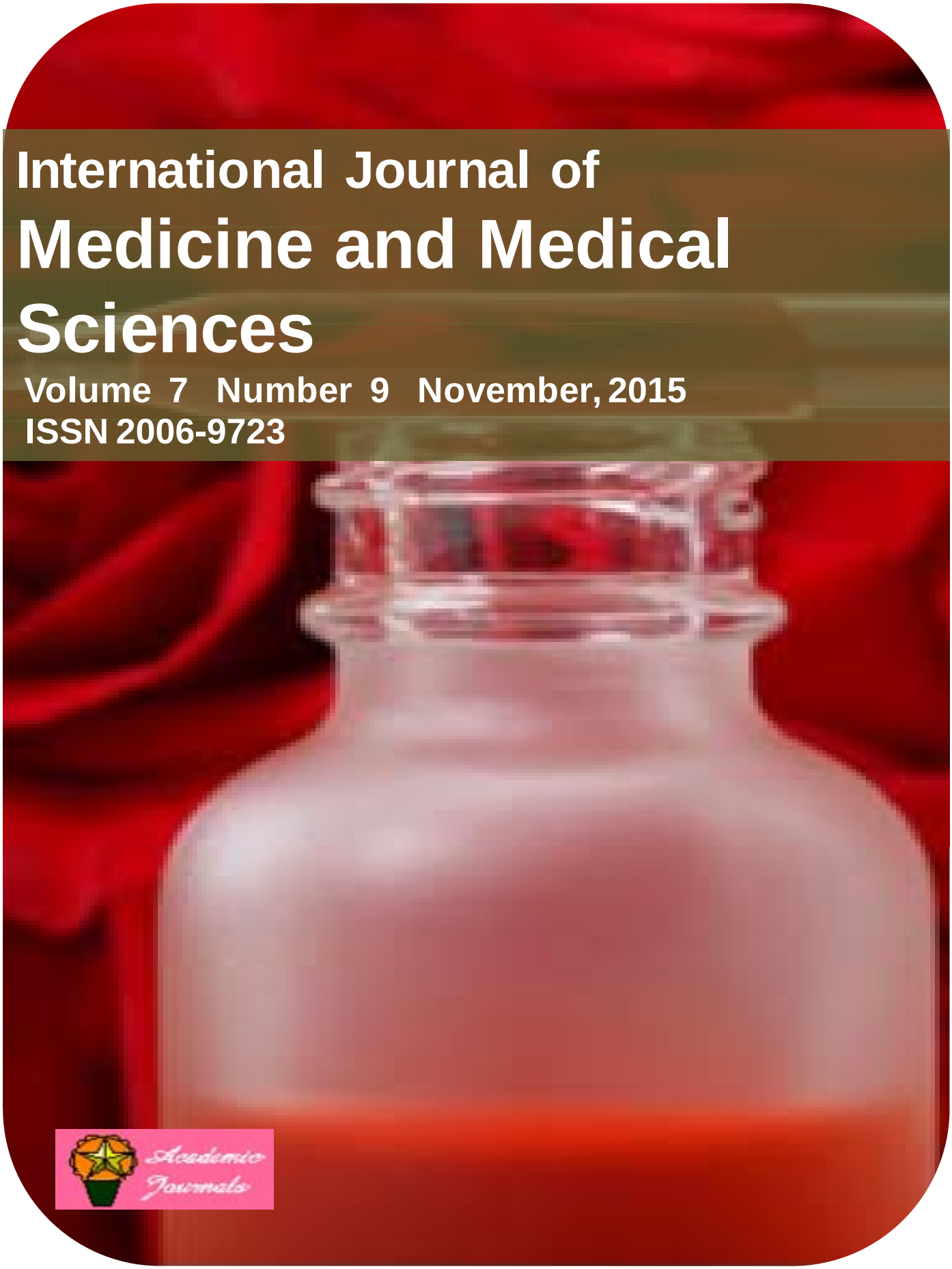

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Mussel RL, De Sa Silva E, Costa AM, Mandarim-De-Lacerda CA (2003). Mast cells in tissue response to dentistry materials: an adhesive resin, a calcium hydroxide and a glass ionomer cement. J. Cell. Mol. Med. 7:171-178.

Booth M, Bundy DA, Albonico P, Chwaya M, Alawi K (1998). Associations among multiple geohelminth infections in school children from Pemba Island. Parasitol. 116: 85-93.0.

Fransiscus RG, Long JC (1991). Variation in human nasal height and breath, Am. J. Phys. Anthropol. 85(4):419-427.

Stanislawski L, Lefeuvre M, Bourd K, Soheili-Majd E, Goldberg M, Perianin A (2003). TEGDMA-induced toxicity in human fibroblasts is associated with early and drastic glutathione depletion with subsequent production of oxygen reactive species. J. Biomed. Res. 66:476-82.

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Full Length Research Paper

A study of impact and prevalence of irritable bowel syndrome among medical students

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Irritable bowel syndrome (IBS) is considered as a prevalent gastrointestinal disorder which is characterized by some non-specific symptoms, such as altered bowel habits and abdominal pain. There is no recognized organic pathology associated with IBS. The prevalence of IBS is different in different communities. Its etiology remains uncertain or obscure, perhaps multifactorial. The predestined objective was the determination of prevalence, associated factors and impact of IBS on medical student studying in Prince Sattam bin Abdulaziz University. A cross-sectional study was carried out among male medical students enrolled in Prince Sattam bin Abdulaziz University during the academic year 2013 to 2014. All male medical students of second to sixth year were invited for participation in the study by filling study questionnaire. A validated, reliable, confidential, and self-administered questionnaire was used for data collection. Rome III Criteria was used for the diagnosis of irritable bowed syndrome. The IBS prevalence was 21% with profiles characterized by constipation (20.0%), diarrhea (34.3%), and other alternating symptoms (45.7%). Students who having history of chronic health problems were about three times more prone to develop IBS (OR=2.93). Those reported having stress was at 2.63 times more risk to develop IBS. Those having food hypersensitivity as compared to others were more liable to develop IBS (OR=3.29). IBS was not significantly associated with academic performance. IBS prevailed among medical students. Thus, screening of these students for psychological problems, IBS and stress management strategies are recommended for these students.

Key words: Bowel habits, irritable bowel syndrome (IBS), medical students, prevalence, work absenteeism.

INTRODUCTION

Irritable Bowel Syndrome (IBS) is defined as a gastrointestinal syndrome which is distinguished by altered bowel habits and chronic abdominal pain, and no organic cause is identified for this condition. In North America, the estimation in accordance to the population-based studies showed the prevalence rate of 10 to 15%

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approximately (Talley et al., 1991; Drossman et al., 1993; American College of Gastroenterology, 2009; Hahn et al., 1997; Saito et al., 2000; Thompson et al., 2002). The overall prevalence of IBS in Europe was found to be 11.5% according to a study conducted on European population. These values were very close to the values that were reported in the United States (Hungin Aet al., 2003). This disease can affect any person, either a man or woman or younger or elder. However, the population at risk includes women and younger patients (Lovell and Ford, 2012) In North America, the result of a study revealed that the female predominance in developing IBS as 2:1 ratio (American College of Gastroenterology, 2009).

It was reported that medical attention was looked for by only 15% of the affected individuals and this percentage varied in different regions (Talley et al., 1991; Drossman et al., 1993; Jones and Lydeard, 1992; Ford et al., 2008). The total patients having IBS are so large that IBS with its different forms constitute 25 to 50% of all the referrals and visits to gastroenterologists (Everhart and Renault 1991). IBS is considered as the second major factor associated with work absenteeism (Schuster 1991). It is clear from the evidence based data that IBS is one of the major factors that increases the health care burden because of increased health care costs. The statistical data of some studies estimated that direct and indirect annual costs spend on IBS is up to $30 billion (Sandler et al., 2002).

The evidence based studies showed the association of psychological problems with the increased prevalence of various gastrointestinal disorders. In contrast to this, psychiatric diagnosis criteria are fulfilled by about 50% of patients visiting hospitals (Cash and Chey, 2005). Symptoms of IBS are most commonly adnominal pain which is cramping or colicky, and usually occur in lower abdominal part often relieved by emptying the bowels (Cremonini and Talley, 2005). The global prevalence of IBS cannot be estimated perfectly due to lack of data for several regions. Moreover, it is often difficult to compare the data obtained from different regions, because different diagnostic criteria are used by different researchers (Lovell and Ford, 2012).

Rationale

1. There were very few studies conducted in our community despite the importance of the subject, particularly for medical students exposed to stressful environment during medical school years.
2. This adverse health condition is responsible for large amounts of health care resources (Naeem et al., 2012).
3. Most of the persons suffering from IBS do not take treatment from physicians, but still this problem is responsible for increasing the health care burden or cost directly or indirectly. For instance, direct increase in cost due to the use of different drugs and work absenteeism increases the expense indirectly (Ibrahim et al., 2013; Jimenez, 2009).

Aim of the study

The predetermined intention of this cross-sectional study was the determination of prevalence of IBS and associated factors related to its development among the medical students studying in Prince Sattam bin Abdulaziz University.

Study objectives

(1) To identify the relationship between IBS and other factor during medical student live.
(2) To estimate the prevalence of IBS among medical student in Prince Sattam bin Abdulaziz University (PSAU).
(3) To determine the impact of IBS on medical students.

MATERIALS AND METHODS

Participants and measure

The study investigated all male health science students in Prince Sattam bin Abdulaziz University, Al-Kharj, Saudi Arabia during the academic year 2013 to 2014. Females were excluded from this study, because the Colleges of Medicine had not yet established their acceptance. A cross-sectional study was conducted between November and December, 2013. The total number of male health science students in Prince Sattam bin Abdulaziz University was 178 according to the academic affairs of each college during the academic year 2013 to 2014. The participants were enrolled through convenience non-random sampling. The sample size was calculated at 99% confidence interval and 5% worst acceptable limit, the estimated sample size was 141. The number was increased by 30 to account for any possible data loss.

Data collection tools

A validated, confidential, self administered, reliable, and anonymous questionnaire was used for data collection. It has been previously used among medical students of King Abdulaziz University, Jeddah (Drossman et al., 2000). It contained questions regarding personal information, social characteristics, life style and habits, family history of IBS, nutritional history, medication history, stress, and Rome III Criteria in the last part (Panagiotis et al., 2009; Longstreth et al., 2006). The diagnosis of IBS was dependent on the English version of 'Rome III Criteria'. IBS according to "Rome III Criteria" is described as the clinical condition with as recurrent abdominal discomfort or pain for at least 3 days/month and period of this discomfort has been reported in the past 3 months. The IBS is associated with some features (two or more of the following described features): (Wells et al., 2012).

(a) Improvement in the condition with defecation,
(b) Onset of this condition related with changed frequency of stool,
(c) a change in the appearance or form of stool with the onset of IBS.

The supporting symptoms that are associated with IBS include altered frequency of stool, altered passage of stool (urgency and/or

Table 1. Demographic characteristics of the participated male medical students, PSAU, KSA (n=167).

Demographic characteristic	Number	%
Age in years		
18-20	44	26.3
21-23	108	64.7
> 23	15	9.0
Marital status		
Single	158	94.6
Married	9	5.4
Academic level		
2nd	56	33.5
3rd	37	22.2
4th	27	16.2
5th	31	18.5
6th	16	9.6

straining), abdominal bloating, altered form of stool and subjective (Hadley and Gaarder, 2000; Thompson et al., 2000). The participants of the study were divided in three groups. Group 1 included the subjects with diarrhea-predominant IBS (IBS-D), the second group included the participants with constipation predominant IBS (IBS-C), while the third group included the individuals with alteration-type IBS (IBS-A) (Drossman et al., 2002; Rome foundation, 2006).

Statistical analyses

The data for the study was collected and manually verified by hand before entry of the data and its coding. For the purpose of data entry and its analysis, version 20.0 of "Statistical Package for Social Sciences" (SPSS) software was used. Inferential statistics and descriptive statistics were carried out for data. In order to observe and quantify the association of different variables with categorical outcome, Pearson's Chi-square (χ^2) test was carried out. For the small frequencies calculation, Fisher Exact test was used. For the delineation of significant predictors that predict the prevalence of IBS among participants, stepwise multiple logistic regression analysis was utilized.For statistically significant value with $p<0.05$, all P-values were two-tailed.

Ethical considerations

Before conducting the study, an informed consent form was filled by all the participants of the study. The approval for this study was obtained from Research and Ethics Committee of Prince Sattam bin Abdulaziz University. During the collection of data, the predetermined aim of the study was separately discussed with every participant so as to tell them the importance of the study.

RESULTS

178 medical students (ranging from the 1st to 6th academic year) were invited for participation in this study by filling the questionnaire. Out of these individuals, 167 completed the questionnaire, thus 93.8% response rate was obtained.

Demographic characteristics of the participants

The study included 167 male medical students. Their demographic characteristics that were considered are shown in Table 1. Approximately two third of them (64.7%) were in the age group 21 to 23 years and 26.3% had the age between 18 and 20 years. Majority of them (94.6%) were singles. Mean age of study participants was 22 years. Almost one third of them (33.5%) were enrolled in second academic level whereas 9.6% of them were in sixth academic level.

Irritable bowel syndrome (IBS) diagnosis

Figure 1 illustrated that IBS was diagnosed among 35 out of 167 participants (21.0%), based on Rome III Criteria. The profiles for symptoms were characterized by constipation (20.0%), diarrhea (34.3%), and some other alternating symptoms (45.7%) as shown in Figure 2.

As demonstrated in Table 2, IBS was not significantly associated with academic performance of male medical students. Table 3 shows the student`s age, marital status, family income and academic level were not significantly associated with irritable bowel syndrome. However, increased prevalence of this disease was found higher among the students who live with their friends or alone than among those living with their families (28, 30.3 versus 16.5%, respectively). Though the difference in values shows no statistically significant difference ($p>0.05$). The students whose parents were divorced were compared to 20.6% of those whose parents were living together. Almost half of the students whose parents had separated were diagnosed with IBS. However, the association between parental status and IBS was not statistically significant.

From Table 4, it is evident that irritable bowel syndrome was significantly associated with a history of chronic health problems. The prevalence of IBW was 40% among students who have chronic health problems compared to 17% prevalence among students who have no chronic health problem, $p=0.009$. Students who reported stress showed significantly higher prevalence of IBS as compared to those who did not report stress (26.1% versus10%). This difference was found to be significant on statistical basis ($p=0.020$). The history of food hypersensitivity was significantly associated with IBS. This was evident from the results as 43.7% of those who reported food hypersensitivity compared to 18.9% of those who did not report it had IBS. This difference was statistically significant. Family history of IBS, intake of regular medications, smoking, regular exercise, number of sleeping hours/day and common food sources were not significantly associated with IBS.

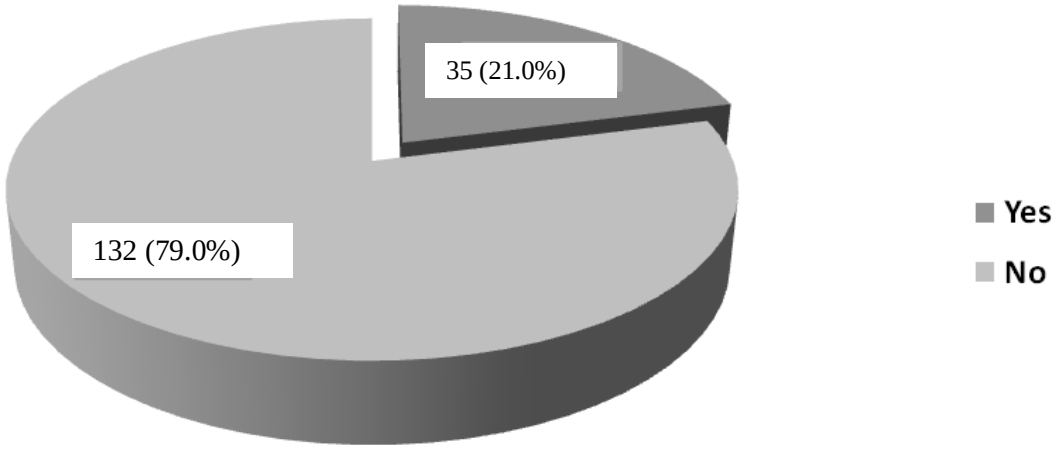

Figure 1. Prevalence of irritable bowel syndrome among male medical students, Prince Sattam bin Abdulaziz University, KSA.

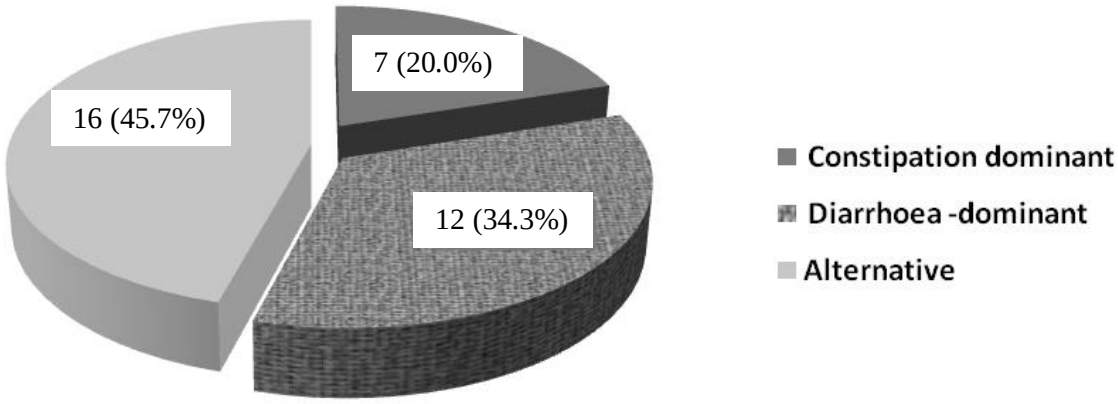

Figure 2. Distribution of IBS cases according to their type. (n=35).

Table 2. Association between medical students` academic performance and irritable bowel syndrome, PSAU, KSA.

Academic performance	IBS		p-value of Fisher Exact test
	No (n=128), N (%)	Yes (n=35), N (%)	
<4 (n=25)	20 (80.0)	5 (20.0)	0.542*
≥4 (n=138)	108 (84.4)	30 (85.7)	

By using the multiple logistic regression analysis for controlling the confounding factors showed that the history of chronic health problems was the prime predictor for IBS. Those having the history of chronic health problems were at more than three times risk of developing IBS frequently in comparison to those who have no such history (adjusted odds ratio [AOR]=2.93; 95% CI: 1.12-7.68). The presence of stress or its stress was the second predictor for development of IBS. The result showed that persons with the history of stress were 2.63 times more risky to develop IBS regardless of its source (OR=2.63; 95% CI: 1.04-8.26). Those having food hypersensitivity were at more risk for the development of IBS in comparison to the rest (AOR=3.29; 95% CI: 1.03-10.47) (Table 5).

DISCUSSION

The prevalence rate of IBS was reported as 21% among the male medical students studying at “Prince Sattam bin Abdulaziz University”. This value was higher than that

Table 3. Association between socio-demographic characteristics and irritable bowel syndrome among male medical students, PSAU, KSA.

Socio-demographic variable	IBS		Chi-square value	p-value
	No (n=132), N (%)	Yes (n=35), N (%)		
Age in years				
18-20 (n=44)	36 (81.8)	8 (18.2)		
21-23 (n=108)	84 (77.8)	24 (22.2)	0.32	0.853
> 23 (n=15)	12 (80.0)	3 (20.0)		
Marital status				
Single (n=158)	125 (79.1)	33 (20.9)	0.598*	
Married (n=9)	7 (77.8)	2 (22.2)		
Academic level				
2nd (n=56)	45 (80.4)	11 (19.6)		
3rd (n=37)	28 (75.7)	9 (24.3)		
4th (n=27)	22 (81.5)	5 (18.5)	3.72	0.446
5th (n=31)	22 (71.0)	9 (29.0)		
6th (n=16)	15 (93.8)	1 (6.3)		
Living status				
With family (n=109)	91 (83.5)	18 (16.5)		
With friends (n=25)	18 (72.0)	7 (28.0)	3.79	0.150
Alone (n=33)	23 (69.7)	10 (30.3)		
Income				
Enough and exceeds (n=100)	80 (80.0)	20 (20.0)	0.18	0.673
Not enough (n=66)	51 (77.3)	15 (22.7)		
Parental status				
Living together (n=141)	112 (79.4)	29 (20.6)		
Divorced (n=8)	4 (50.0)	4 (50.0)	4.93	0.085
Died (one or both) (n=17)	15 (88.2)	2 (11.8)		

*p-value of Fisher`s Exact test.

reported in China among university students (7.85%) (Dong et al., 2010). On the other hand, it is lower than that reported in Japan (25.2%) among male nursing and medical school students (Okami et al., 2011). The studies that were conducted in Japan revealed that the prevalence rate was about 5 to 10% (Miwa, 2008; Shinozaki et al., 2006) while the prevalence rate among university students was 10.7% (Shiotani et al., 2006). In Nigeria, the prevalence rate of 26.1% has been reported among medical students (Okeke et al., 2005). An international study was conducted by Hungin et al. (2003) on a sample size of 41,984 individuals residing in eight different countries of European countries and they reported prevalence rate of 11.5% for IBS. In Saudi Arabia, Drossman et al. (2000) illustrated that the prevalence of IBM is higher among the medical interns and students and this prevalence was reported as 31.8% in King Abdulaziz University, Jeddah. In addition, our figure was lower than those reported in two Pakistani studies that were conducted on the medical students of Pakistan. This prevalence rate was reported as 28.3% in the year 2012 (Naeem 2012) as compared to the prevalence of 34% in the year 2005 (Jafri et al., 2005). Furthermore, prevalence rate was 29.2% among medical and paramedical students from Korea (Jung et al., 2011). These prevalence rates are higher than that reported in the current study.

The discrepancy between the current study and the outcomes of other investigational studies may be the result of dissimilarities among the studies. These dissimilarities include the variability of the study group, different diagnostic criteria, and different geographical area. These differences and variability would be very effective for the correlation of the difference with the

Table 4. Association between medical, life style and nutritional characteristics and irritable bowel syndrome among male medical students, PSAU, KSA.

Socio-demographic variable	IBS		Chi-square value	p-value
	No (n=132), N (%)	Yes (n=35), N (%)		
Family history of IBS				
No (n=119)	95 (79.8)	24 (20.2)	0.36	0.551
Yes (n=45)	34 (75.6)	11 (24.4)		
Chronic health problems				
No (n=141)	117 (83.0)	24 (17.0)	6.88	0.009
Yes (n=25)	15 (60.0)	10 (40.0)		
Regular medications				
No (n=147)	118 (80.3)	29 (19.7)	1.12	0.290
Yes (n=20)	14 (70.0)	6 (30.0)		
Stress				
No (n=50)	45 (90.0)	5 (10.0)	5.40	0.020
Yes (n=115)	85 (73.9)	30 (26.1)		
Smoking				
No (n=143)	113 (79.0)	30 (21.0)	0.001	0.987
Yes (n=24)	19 (79.2)	5 (20.8)		
Regular exercise				
No (n=120)	92 (76.7)	28 (23.3)	2.00	0.157
Yes (n=45)	39 (86.7)	6 (13.3)		
Sleeping hours/day				
<8 (n=114)	88 (77.2)	26 (22.8)	0.74	0.389
≥8 (n=53)	44 (83.0)	9 (17.0)		
Common food source				
Home food (n=29)	26 (89.7)	3 (10.3)		
Fast food (n=40)	28 (70.0)	12 (30.0)	3.91	0.142
Both (n=96)	76 (79.2)	20 (20.8)		
Food hypersensitivity				
No (n=148)	120 (81.1)	28 (18.9)	5.30	0.021
Yes (n=16)	9 (56.3)	7 (43.7)		

*p-value of Fisher`s Exact test.

dietary and the cultural trends of various countries in future studies. The other reasons for the deviation of the results from the results of other studies may be the difference of the age group and the sample size.

In the present study, the overall profiles for symptom were characterized by constipation (20.0%), diarrhea (34.3%), and some other alternating symptoms (45.7%). These findings were quite similar to have been reported by Wilson et al. (2004). However, others (American College of Gastroenterology Functional Gastrointestinal Disorders Task Force, 2002; Mansour-Ghanaei et al., 2009; Gomez et al., 2009) have reported different figures where cases were found to be equally divided among IBS with diarrhea, IBS with constipation, and alternating IBS between constipation and diarrhea.

In the current study, stress among medical students, regardless of its source was proved to be a major risk factor associated with the development of irritable bowel syndrome. Alhazmi et al. (2011) carried out a study in which the sample population was the school students of a secondary school in Saudi Arabia. By utilizing the “Manning and Rome II Criteria”, the respective prevalence

Table 5. Risk factors for irritable bowel syndrome among male medical students, PSAU, KSA: Multivariate logistic regression analysis.

Risk factor	B	SE	p-value	Adjusted Odds ratio	95% CI
Chronic health problems					
No (n=141)[a]	1.076	0.491	0.028	1.0	1.12-7.68
Yes (n=25)				2.93	
Stress					
No (n=50)	1.076	0.529	0.042	1.0	1.04-8.26
Yes (n=115)				2.93	
Food hypersensitivity					
No (n=148)	1.190	0.591	0.044	1.0	1.03-10.47
Yes (n=16)				3.29	

[a]Reference category. B: slop e; SE: standard error; CI: confidence interval.

of 8.9 and 9.2% was recorded. The inconsistency exists between the earlier described two studies and the outcomes of this study and this inconsistency may be due to the increased stress of the students studying medicine (Okami et al., 2011; Mansour-Ghanaei et al., 2009). The time span of the medical studies, irregular internship and working hours, difficult courses and exams, etc., are the important stress causing factors among medical students (Mansour-Ghanaei et al., 2009). Jimenez et al. (2010) described the academic, clinical and external factors as three major stressors associated with clinical nursing practice.

The current study illustrated the fact that the prevalence of IBS was many folds higher among the individual that have the problem of food hypersensitivity. Similar outcomes were reported in a study conducted by Carroccio et al. (2011). Contrary to this, our result showed no significant statistical difference between the prevalence of obesity and the source of food. The result of the current study in this regard closely resembles the outcomes of Korean study conducted on medical students in 2011 (Jung et al., 2011). On the other hand, Okami et al. (2011) described a significant difference between the intakes of food in suffering from IBS in comparison to others.

Al-Turki et al. (2011) concluded that 15.5% of IBS were due to a dietary factor. The current study showed a significant relationship between chronic health problems and the development of IBS. The results of this study are in accordance with the outcomes of a study conducted by Chirila et al. (2012). This also could be attributed to the impact of stress and depression among these students as a result of chronic health problems.

Conclusion

The results of this study concluded the prevalence rate of 21% for IBS among the students studying medicine in Prince Sattam bin Abdulaziz University. History of chronic health problems, presence of stress and history of food hypersensitivity were significant predictors for IBS. These predictors also identified as the underlying cause for IBS. In addition, this study concluded that IBS is not significantly associated with academic performance of male medical students. There is a prime need to conduct various advanced clinical studies among a large community including males and females for estimating the overall prevalence of IBS.

RECOMMENDATIONS

(1) It is recommended to use screening approach for IBS and related psychological symptoms and problems.
(2) In order to make the students capable to cope up and overcome the stressors during their studies or medical assignment or work, there is a primary requirement of stress management courses.
(3) Studying IBS problem among female medical students in our community, as from literature, IBS was more prevalent among females worldwide.

Conflict of Interests

The authors have not declared any conflict of interests.

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