

ORIGINAL ARTICLE

## Irritable bowel syndrome among nurses working in King Abdulaziz University Hospital, Jeddah, Saudi Arabia

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**Background:** Irritable bowel syndrome (IBS) is a highly prevalent gastrointestinal disorder that can cause disability and economic burden. Nurses are a vital part of the medical team and their well-being is an important issue. Yet, few studies have been done concerning IBS among nurses.

**Objectives:** To determine the prevalence, severity, and predictors of IBS among nurses working at King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

**Materials and methods:** A cross-sectional study was conducted among 229 nurses who fulfilled the eligibility criteria. They were selected by stratified random sampling during 2014–2015. A validated, confidential, self-administered data collection sheet was used for collection of personal and sociodemographic data. Rome III Criteria, IBS Severity Scoring System (IBS-SSS), Hospital Anxiety and Depression Scale (HADS), and Pittsburgh Sleep Quality Index (PSQI) were included. Both descriptive and inferential statistics were done. A multiple logistic regression analysis was done to determine the predictors of IBS.

**Results:** The prevalence of IBS among nurses was 14.4%, and IBS-Mixed type was the commonest variety (54.5%). Positive family history of IBS, working in outpatient clinics, having day shift, poor sleep quality, and high anxiety and depression scale scores were significantly associated with IBS. After controlling for confounding factors in regression analysis, the predictors of IBS were food hypersensitivity (aOR = 4.52; 95% CI: 1.80 – 11.33), morbid anxiety (aOR = 4.34; 95% CI: 1.49–12.67), and positive family history of IBS (aOR = 3.38; 95% CI: 1.12–13.23).

**Conclusion:** The prevalence of IBS was 14.4%. Food hypersensitivity, morbid anxiety, and family history were the predictors of IBS. Screening and management of IBS, food hypersensitivity, and psychological problems among nurses are recommended.

Keywords: *irritable bowel syndrome; nurses; prevalence; predictors; severity; anxiety; depression; sleep quality*

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Irritable bowel syndrome (IBS) is a highly prevalent functional gastrointestinal disorder (1), with high health burden and economic expenditure (2). IBS is characterized by the presence of abdominal pain associated with changing bowel habits in the absence of any organic damage of the intestine (1). Until now, the etiology of IBS remains without confirmed known causes. However, some associated risk factors have been implicated in its pathogenesis (3, 4). In addition, there are no diagnostic investigations or biomarkers for diagnosis of IBS, and it can be diagnosed only clinically by symptom-based

criteria (5). Furthermore, there is no cure for IBS, and the treatments are mainly symptomatic (6).

IBS may influence the health-related quality of life (HRQOL), reduce work productivity, and add to the already spiraling health expenditures (3). Out of all gastrointestinal diseases, IBS is the commonest diagnosed condition and the most frequent cause of visiting gastroenterologists. It was estimated that one of five persons is affected by IBS during some stage in life (7), and that it affects 11% of the world's population (8). Females were found to be about 1.5 to 3 times more susceptible to IBS compared with males (9).

Nurses represent an important sector in the medical field, and they are in close contact with patients. Furthermore, nursing is a demanding, stressful, and pressured occupation. Hence, nurses' well-being is a very important issue (10). In Saudi Arabia, a study done among nurses working in primary and secondary health care levels in Dammam found that up to 45.5% of them had work-related stress (11).

Nowadays, there is an increasing interest in epidemiological and clinical research into IBS (12), especially among the stressed population. A study conducted in the United States illustrated that nurses were at a high risk for developing IBS (4). Another study, from China, reported that the prevalence of IBS among nurses was 17.4% (13). A previous study was conducted in Jeddah to determine the prevalence and predictors of IBS (14). However, as the study was done on medical students, it neither provided information about nurses nor about IBS subtypes or their severity. It also did not use the Pittsburgh Sleep Quality Index (PSQI) to identify the relationship between sleep quality and IBS.

No adequate research has been conducted to elucidate the problem of IBS among nurses in the Kingdom of Saudi Arabia, especially in Jeddah. So, such a study is needed.

The objective of the study was to determine the prevalence, severity, and predictors of IBS among nurses working in King Abdulaziz University Hospital (KAUH) in Jeddah, Saudi Arabia.

## Material and methods

### Ethical statement

The study followed the ethical standards of the Helsinki Declaration. Approval was taken from the Unit of Biomedical Ethics of KAUH (Reference Number: 32-15). Approval was also obtained from the Committee of the University Vice-deans and from the nursing administrators. An informed written consent was taken from each participant. Permission for use of the PSQI was also taken from the corresponding author.

A cross-sectional study was carried out during 2014–2015 at KAUH. Nurses from all departments were invited to participate in the study, and a stratified random sample method was used (taking into consideration the department and gender).

The sample size was calculated using the following equation (15):

$$n = \frac{z^2 \times p \times q}{d^2}$$

where  $n$  = minimum sample size,  $z$  = constant (1.96); prevalence ( $p$ ) was considered to be 0.5 (as the most conservative estimate of the prevalence due to the absence

of similar studies among nurses in Jeddah),  $q = 0.5$ , and 'd' was set as 0.06. Calculation gave  $n = 267$ .

### Inclusion criteria

All nurses who fulfilled the eligibility criteria, accepted to participate in the study and were selected during the randomized sampling.

### Exclusion criteria

According to the American Gastroenterological Association, the exclusion criteria include history of gastrointestinal surgery, drastic weight loss, blood in stool, waking up during the night due to abdominal pain, anemia, arthralgia, and fever. Participants reporting one or more of these symptoms were excluded from the study.

A validated, confidential, anonymous, and self-administered data collection sheet was used.

The data collection sheet collected information on the following:

1. Personal and sociodemographic data such as age and gender;
2. Lifestyle, for example, physical exercise, cigarette smoking, and consumption of caffeine and energy drinks;
3. Medical history: any previous diagnosis of IBS;
4. Working conditions: department, shift time, working hours, and years of experience;
5. Rome III Criteria (16): IBS was defined as the onset of symptoms at least 6 months prior to diagnosis based on recurrent abdominal pain or discomfort for at least 3 days per month during the past 3 months and associated with two or more of the following criteria:
  - a. Improvement of the symptoms with defecation;
  - b. Onset associated with a change in stool frequency;
  - c. Onset associated with a change in stool appearance.

Rome III Criteria sensitivity in the lack of red flag symptoms is 65%, and its specificity is 100%. The positive predictive value is 100%, and the negative predictive value is 76% (16).

6. IBS Severity Scoring System (IBS-SSS): A scale from 0 to 100 was given to answer the five SSS questions, and the score was calculated accordingly. The scoring system sensitivity to change was high (17).
7. Hospital Anxiety and Depression Scale (HADS) (14, 18): This is a standardized, validated, reliable, and self-reporting scale. It includes two subscales for Anxiety (HADS-A) and Depression (HADS-D). There are seven questions for depression and seven for anxiety. Its sensitivity and specificity is approximately 0.80 (19).
8. Pittsburgh Sleep Quality Index (PSQI): PSQI is composed of seven components (sum of sleep

duration, disturbances, latency, efficiency, day dysfunction due to sleep, overall sleep quality, and the need for sleep medication). It has internal consistency and a reliability coefficient (Cronbach's alpha) of 0.83. Its high validity and reliability has been supported by many studies (20).

9. Height and weight were measured.

### Statistical analysis

Data analysis was done using the Statistical Package of Social Sciences (SPSS), Version 20 (SPSS Inc., Chicago, IL), and Epi-Info program.

Certain calculations were done as follows:

- Rome III Criteria were applied to identify IBS cases, and the diagnosed cases were further classified into IBS-C (IBS with predominant Constipation), IBS-D (IBS with predominant Diarrhea), IBS-M (Mixed IBS), or IBS-U (Un-subtype IBS) (16).
- IBS-SSS was calculated for IBS cases, and then they were divided accordingly into IBS in remission (control), mild, moderate, or severe (17).
- HADS was calculated for anxiety and depression, and accordingly the participants were classified as having a normal, borderline abnormal, or abnormally high score (morbid cases) (18).
- PSQI was calculated and participants were classified as having either a good or a poor sleep quality (20).
- Body mass index (BMI) was calculated, and the participants were classified as normal, overweight, or obese (14).

Both descriptive and inferential statistics were done. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. A multiple logistic regression model was constructed to determine the predictors of IBS after controlling for confounding factors. All  $p$  values  $< 0.05$  were considered statistically significant.

### Results

A total of 276 nurses accepted to participate in the study (the minimum calculated sample size was 267, and 9 more nurses were included). Furthermore, 47 nurses of them were excluded because they did not meet the eligibility criteria for diagnosis of IBS by Rome III Criteria. Two hundred and twenty nine nurses fulfilled the inclusion criteria and completed the study. Their ages ranged from 21 to 60 years with a mean of  $36.5 \pm 9.2$  years. Females represented 92.1% of the sample. The majority of participants were non-Saudi (88.2%) and also married (77.3%).

It was found that 33 nurses had been diagnosed as having IBS by Rome III Criteria, giving a prevalence of 14.4%. Regarding IBS subtypes, IBS-Mixed subtype was the commonest one (54.5%), followed by IBS-C (27.3%), IBS-U (12.1%), and IBS-D (6.1%).

Using IBS-SSS revealed that 18.2% of the cases were in remission, while 66.7, 12.1, and 3.0% had mild, moderate, and severe IBS, respectively.

The results show that only eight nurses (24.2%) who were diagnosed with IBS in the current study had also been previously diagnosed by physicians.

Table 1 shows that females had a higher prevalence (14.7%) of IBS compared with males (11.1%). However, the difference is not statistically significant. Non-Saudi nurses had a lower prevalence (12.9%) of IBS compared with Saudis (25.9%), but again the difference was not statistically significant ( $p > 0.05$ ). Similarly, no statistical associations were found between other personal and sociodemographic variables (age, marital status, education, and living condition) and IBS. On the contrary, the same table shows that nurses who reported a positive family history of IBS had a much higher prevalence of the condition (42.85%) compared with others (12.7%). A statistical association was found (OR = 5.14; 95% CI: 1.66–15.95).

Analysis of the results revealed that the prevalence of overweight and obesity among all nurses was 55.9%. Table 2 demonstrates that there was no statistical association between BMI score and IBS ( $p > 0.05$ ). The table also shows that there is no association between smoking and IBS. Similarly, physical exercise and consumption of caffeine and energy drinks were not associated with IBS. On the contrary, IBS prevalence was much higher (28.7%) among nurses who had food hypersensitivity compared with others (10.6%), with statistical significance ( $p < 0.001$ ).

Regarding working conditions, nurses who worked in the outpatient clinics had significantly higher IBS rates compared with those working in the inpatient departments ( $p < 0.01$ ). In addition, participants who were working on day shifts had higher IBS compared with those working in alternating shifts ( $p < 0.05$ ) Table 3.

The prevalence of high anxiety score (morbid anxiety) among all nurses was 21.7%, while 11.5% of the participants were found to have high depression score (morbid depression).

Table 4 shows that nurses with morbid anxiety had a higher prevalence of IBS (24.5%) compared with those with borderline anxiety scale (15%) and normal nurses (9.3%), and the difference was statistically significant ( $p < 0.001$ ). Regarding depression, the prevalence of IBS was 43.8, 9.8, and 13.2% among nurses who were morbidly depressed, who were borderline depressed, and who were normal, respectively ( $p < 0.01$ ). Analysis of PSQI showed that the overall prevalence of poor sleep quality was 53.2% among all nurses. Table 4 shows that participants who suffered from poor sleep quality had significantly higher prevalence of IBS compared with the others (OR = 2.92; 95% CI: 1.31–6.52).

**Table 1.** Relationship between sociodemographic factors, family history, and IBS among nurses in King Abdulaziz University Hospital

Variable	IBS (No. 33)		Non-IBS (No. 196)		$\chi^2$	<i>p</i>	OR	95% CI
	No.	%	No.	%				
<b>Age</b>								
≤ 30	12	15.2	67	84.8	0.06	0.81	1.10	0.51–2.37
> 30	21	14.0	129	86.0				
<b>Gender</b>								
Male	2	11.1	16	88.9	0.17 <sup>a</sup>	0.68	0.73	0.16–3.31
Female	31	14.7	180	85.3				
<b>Nationality</b>								
Saudi	7	25.9	20	74.1	3.92	0.07	2.37	0.92–6.16
Non-Saudi	26	12.9	176	87.1				
<b>Marital status</b>								
Single	9	17.3	43	82.7	0.46	0.49	1.33	0.58–3.08
Ever married	24	13.6	153	86.4				
<b>Level of education</b>								
Less than university	6	13.6	38	86.4	0.04	0.84	0.91	0.35–2.35
University or above	27	14.8	155	85.2				
<b>Income</b>								
Enough and exceeds	1	12.5	7	87.5	0.04 <sup>a</sup>	0.98	1	
Enough only	22	14.7	128	85.3				
Not enough (with debt)	9	14.1	55	85.9				
<b>Living condition</b>								
With family (home)	12	16.4	61	83.6	2.59	0.27	1	
Private residence	7	21.9	25	78.1				
University dormitory	14	11.4	109	88.6				
<b>Family history<sup>b</sup></b>								
Yes	6	42.85	8	57.12	9.56	0.002	5.14	1.66–15.95
No	27	12.7	185	87.26				

<sup>a</sup>Fisher's exact test; <sup>b</sup>three nurses did not answer the question regarding family history. IBS = irritable bowel syndrome.

Table 5 shows the results of logistic regression analysis. The first predictor of IBS was food hypersensitivity (aOR = 4.52; 95% CI = 1.80–11.33), followed by morbid anxiety (aOR = 4.34; 95% CI: 1.49–12.67), and family history of IBS (aOR = 3.38; 95% CI: 1.12–13.23).

### Discussion

To the best of our knowledge, this is the first study done to identify the prevalence, severity, and predictors of IBS among nurses in Jeddah.

The present study demonstrates that the prevalence of IBS among nurses was 14.4%, which is considered a moderate prevalence of IBS. Similar rates were reported among nurses from Seoul, Korea (21), and from Beijing, China (13). On the contrary, a much higher prevalence (28.1%) was reported among nurses and nursing assistants in the study from Korea (22). Such differences may be attributed to the type of target population, ethnic variations between target populations,

hospital workload, and shifts. On the contrary, a much lower prevalence (5.7%) was reported among young university students in another Korean study in 2005 (23). This discrepancy may be because the previous study was conducted among university students with less life or work stress, or due to the time at which the two studies were conducted and the used diagnostic criteria.

The results of the current study reveal that about one-fourth of the nurses who were diagnosed with IBS in the current work had been diagnosed earlier by physicians. This rate agrees with other studies from Saudi Arabia (14), Iran (24), and Bangladesh (25). These findings indicate the importance of screening programs for early detection of IBS among nurses and other health care personnel.

The results of the current study reveal that IBS-Mixed type had the highest prevalence (54.5%) among all types of IBS. This agrees with the study results from Beijing, China (13) and from Michigan, USA (4).

**Table 2.** Relationship between life style factors, chronic conditions, and IBS among nurses in King Abdulaziz University Hospital

Variable	IBS (No. 33)		Non-IBS (No. 196)		$\chi^2$	<i>p</i>	OR	95% CI
	No (%)	No (%)	No (%)	No (%)				
<b>BMI</b>								
Normal	14 (13.9)	87 (86.1)	0.04	0.83	1.08	0.51–2.28		
Overweight and obese	19 (14.8)	109 (85.2)						
<b>Physical exercise</b>								
Practice	12 (13.8)	75 (86.2)	0.04	0.84	0.92	0.43–1.98		
No practice	21 (14.8)	121 (85.2)						
<b>Smoking</b>								
Yes	0 (0.0)	6 (100.0)	1.04 <sup>a</sup>	0.30	1.17	1.11–1.24		
No	33 (14.8)	190 (85.2)						
<b>Caffeine intake</b>								
Yes	28 (13.8)	175 (86.2)	0.55	0.46	0.67	0.23–1.93		
No	5 (19.2)	21 (80.8)						
<b>Energy drinks consumption</b>								
Yes	7 (25.9)	20 (74.1)	3.29	0.07	2.37	0.91–6.15		
No	26 (12.9)	176 (87.1)						
<b>Food hypersensitivity</b>								
Yes	12 (38.7)	19 (61.3)	17.16	0.000	5.32	2.27–12.48		
No	21 (10.6)	177 (89.4)						
<b>Chronic diseases</b>								
Yes	9 (19.1)	38 (80.9)	1.08	0.30	1.56	0.67–3.63		
No	24 (13.2)	158 (86.8)						

<sup>a</sup>Fisher's exact test; IBS = irritable bowel syndrome.

Regarding the severity of IBS, our results show that 18.2% of IBS cases were in remission, while 66.7, 12.1, and 3.0% had mild, moderate, and severe degrees, respectively. On the contrary, the Chinese study (13) reported that 25.4 and 74.6% of their nurses had mild and moderate degrees, respectively, and no cases of severe IBS were found.

Many studies found that females had a significantly higher prevalence of IBS compared with males (14, 23, 26). Though our findings show that females had higher prevalence, the difference was not significant. This may be attributed to the smaller number of male nurses than females in general and in the current study as well (18 males only). This is similar to the results of Liu et al. from China (13), as they included only 11 male nurses.

Our results found that age, nationality, marital status, and educational level were not associated with IBS, which agrees with the results from the study in Jeddah (14).

There is no association between physical exercise and IBS in the current study, which agrees with the results of Kim et al. (23). The results from a recent systematic review of 16 studies done among medical students revealed that some studies found protective effects of physical activities, while the other studies did not find such an association (12).

The current results do not show any association between smoking and IBS. This is in line with the results of Chirila et al. from Romania (26). Similarly, our study revealed that there is no significant association between IBS and caffeine or energy drink consumption.

According to PSQI, nurses with poor sleep quality in the current study were about three times more prone to IBS compared with others. Poor sleep may be a hazardous stress issue that can influence gastrointestinal function, cognition, emotion, and somatic reaction. It may disrupt the biological rhythm and hence change gut motility (12). This agrees with the results of many other studies (12, 14, 27). Similarly, another study done among healthy nurses in Singapore found that poor sleep quality could affect bowel functions even in healthy individuals (28).

Regarding working conditions, our target nurses who worked in the outpatient clinics had a higher prevalence of IBS than the other nurses. This may be attributed to the large number of patients attending the outpatient clinics, with a higher work load in these clinics leading to increased anxiety or IBS. Contrary to many previous studies postulating that nurses who worked in rotating shifts are at a higher risk for IBS (4, 21, 22), our study found that nurses who worked in the day shift were more prone to have IBS

**Table 3.** Relationship between working conditions and IBS among nurses working in King Abdulaziz University Hospital

Variable	IBS (No. 33)		Non-IBS (No. 196)		$\chi^2$	<i>p</i>	OR	CI
	No (%)	No (%)	No (%)	No (%)				
Shift (221) <sup>a</sup>								
Day shift	18 (23.4)	59 (76.6)			7.56	0.006	2.79	1.32–5.90
Alternating or night	15 (9.9)	137 (90.1)						
Work experience (221) <sup>a</sup>								
≤ 16 years	26 (15.6)	141 (84.4)			0.22	0.640	1.24	0.51–3.04
> 16 years	7 (13)	47 (87)						
Work place								
Outpatient	16 (25.4)	47 (74.6)			8.51	0.004	2.98	1.39–6.37
Inpatient	17 (10.2)	149 (89.8)						
Working hours/day (221) <sup>a</sup>								
< 12	13 (20.0)	52 (80.0)			2.72	0.095	1.93	0.88–4.19
≥ 12	18 (11.5)	138 (88.5)						
Work stress								
Yes	30 (14.6)	176 (85.4)			0.04 <sup>b</sup>	0.844	1.136	0.32–4.06
No	3 (13.0)	20 (87.0)						

<sup>a</sup>Eight nurses did not answer any of these questions; <sup>b</sup>Fisher's exact test.

than those involved in rotating shifts. This might have been due to poor sleep quality at home.

Our findings reveal the presence of a statistical association between the prevalence of IBS and food hypersensitivity, which was the first IBS predictor. This result is in line with the results from Jeddah (14) and many studies in a systematic review (12), and with results from Italy (29).

In the current study, approximately half of the nurses who had a family history of IBS were diagnosed with IBS, and family history was one of the predictors of IBS. This is similar to the findings of Saito et al. from the United States

(30), and with the results of many studies on medical students described in a systematic review (12). Similarly, another review published in 2016 illustrated the presence of an inherited component in IBS, which was confirmed in twin and family studies (6).

Our results reveal that participants with a high anxiety score had higher prevalence of IBS compared with normal nurses. This result is confirmed by the findings of many previous studies (12, 31, 32). Increasing attention has been given to the influence of psychosocial factors in the pathogenesis, severity, course, and outcome of IBS (13).

**Table 4.** Relationship between sleep quality, anxiety, depression scores, and IBS among nurses in King Abdulaziz University Hospital

Score	IBS (No. 33)		Non-IBS (No. 196)		$\chi^2$	<i>p</i>	OR	CI
	No (%)	No (%)	No (%)	No (%)				
Sleep quality (PSQI) (216) <sup>a</sup>								
Poor sleep	22 (21.8)	79 (78.2)			7.30	0.007	2.92	1.31–6.52
Good sleep	10 (8.7)	105 (91.3)						
Anxiety grade (No. 226) <sup>b</sup>								
Normal	9 (9.3)	88 (90.7)			6.06	0.048	1	
Borderline	12 (15)	68 (85)					1.73	0.69–4.33
Morbid	12 (24.5)	37 (75.5)					3.17	1.23–8.17
Depression grade (No. 226) <sup>b</sup>								
Normal	21 (13.2)	138 (86.8)			12.09	0.002	1	
Borderline	5 (9.8)	46 (90.2)					0.71	0.25–2.00
Morbid	7 (43.8)	9 (56.2)					5.11	1.72–15.19

<sup>a</sup>Thirteen nurses missed one item or more of PSQI; <sup>b</sup>three nurses did not answer questions of HADS.

**Table 5.** Logistic regression analysis of predictors of IBS among nurses in King Abdulaziz University Hospital

Variable	B	p	aOR	95% CI
Food hypersensitivity	1.509	0.001	4.52	1.80–11.33
Morbid anxiety	1.469	0.007	4.34	1.49–12.67
Borderline anxiety	0.730	0.230	2.08	0.77–5.60
Normal		0.064	1	
Family history	1.218	0.033	3.38	1.12–13.23
Constant	–6.326			

IBS = irritable bowel syndrome.

The prevalence of IBS was significantly higher among nurses with morbid depression. Another study done on Singaporean nurses working in rotating shifts reported that functional bowel disturbance (FBD) symptom scores were positively correlated with depression (27).

### Conclusion

The current study reported a moderate prevalence of IBS among nurses working at KAUH, Jeddah. Food hypersensitivity, anxiety, and family history of IBS were the main predictors of IBS. IBM-Mixed type was the commonest prevalent variety, followed by IBS-C, IBS-U, and IBS-D. Screening programs for IBS, anxiety, depression, and sleep disorders are required. Multifaceted approaches are needed to decrease symptoms among patients, such as dietary education and management of psychosocial problems. Further multicenter studies are recommended to increase the representation of male nurses. It is important to conduct more investigations into the role of food hypersensitivity in IBS. The findings of the current study point to the need for creating programs addressing important health concerns of nurses, especially IBS, anxiety, and food hypersensitivity.

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### Conflicts of interests and funding

The authors declare that there is no conflict of interests.

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