

Original Research Article

Prevalence of Irritable Bowel Syndrome, Psychological Ill-Health and Health-Seeking Behavior in a Population of Nigerian Medical Students

Abiodun Christopher Jemilohun^{1*}, Olukayode Abayomi², Philip Babatunde Adebayo³

¹*Department of Internal Medicine, Babcock University Teaching Hospital, Ilisan Remo, Ogun State, Nigeria*

²*Department of Psychiatry, Ladoke Akintola University of Technology Teaching Hospital, Ogbomoso, Oyo State, Nigeria*

³*Department of Medicine, Ladoke Akintola University of Technology Teaching Hospital, Ogbomoso, Oyo State, Nigeria*

ABSTRACT

Background: Irritable bowel syndrome (IBS) is a functional gastrointestinal disorder with considerable morbidity and profound negative impact on quality of life. It has been observed that patients with psychological disturbances relate more frequently with the symptoms of IBS and they have more debilitating illness than control populations. We examined the prevalence of IBS among a population of Nigerian medical students and the association between it and two common psychological conditions (anxiety and depression).

Methods: In a descriptive cross-sectional study, we enrolled 321 consenting medical students aged 20 years and above. A 34-item self-reporting questionnaire consisting of sociodemographic data, the Rome III irritable bowel syndrome questionnaire, the Hospital Anxiety and Depression Scale and two IBS-related health-seeking behavior questions was administered to the participants. Statistical analysis was done with the IBM-Statistical Package for Social Sciences (SPSS), version 20.

Results: A total of 320 participants were included in the analyses. The median (range) age of the participants was 25 (20-50) year. The prevalence of IBS among the medical students was 14.4%, IBS-M was the predominant subtype (58.7%). IBS had a significant relationship with the female gender [OR =2.19 (95% CI, 1.14 – 4.22), P =0.019] and anxiety [OR 1.18 (95% CI, 1.06-1.32), P =0.003]. Other risk factors considered showed no significant association with the disease. Depression was significantly associated with positive health-seeking behavior among the participants with IBS [OR = 8.89(95% CI, 1.66 - 47.51), P<0.001].

Conclusion: IBS is moderately prevalent among our study population and it is positively associated with the female gender and anxiety.

Keywords: Irritable Bowel Syndrome, Health Seeking Behavior, Anxiety and Depression, Medical Students, Nigeria

26 **1. INTRODUCTION**

27 Irritable bowel syndrome (IBS) is a functional gastrointestinal disorder (FGID) that is
28 characterized by recurrent abdominal pain or discomfort and a change in bowel habit in the
29 absence of any demonstrable organic pathology.^{1,2}

30 IBS represents a socioeconomic burden to the individual and the society as it
31 adversely affects the quality of life and the socio-economic value of the patient through
32 increased morbidity, medical consultation rate, healthcare cost and work absenteeism.^{3,4}
33 The prevalence of IBS within the community ranges from 10% to 25%.⁵ A meta-analysis
34 yielded a pooled global prevalence rate of 11.2% for IBS with significant differences in
35 prevalence between geographic regions.⁶ Just like the prevalence of IBS in the in the
36 community, there is a wide variation in the prevalence of IBS among medical students from
37 one region of the world to another. A review by Ibrahim showed a prevalence range of 9.3%
38 to 35.5% for IBS among medical students.⁷

39 It has been observed that patients with psychological disturbances are more predisposed to
40 having symptoms of IBS and they have more debilitating illness than control populations.⁸⁻¹⁰
41 Individuals with IBS who seek medical care tend to have a higher incidence of anxiety
42 disorder, panic disorder, major depression, and hypochondriasis than control populations.⁹⁻¹¹
43 It is, however, not clear whether these psychopathologies provoke the development of IBS
44 or vice versa.¹²

45 Several instruments like the Hospital Anxiety and Depression Scale (HADS) are available for
46 assessing levels of anxiety and depression in patients in non-psychiatric settings and
47 primary care clinics.¹³ The HADS, which was developed by Zigmond and Snaith in 1983
48 has been validated by several studies that showed good case-finding properties for anxiety
49 and depression .¹⁴⁻¹⁸ A review by Bjelland et al. showed that the HADS generally performs
50 well in assessing “caseness” and symptom severity of anxiety disorders and depression
51 when “caseness” was defined by a score of ≥ 8 on both the anxiety and depression
52 subscales.¹⁹ The instrument has also been validated in Nigeria and the optimum cut-off
53 points for both subscales were found to be a score of 8.²⁰

54 In Nigeria, the prevalence of IBS ranges from 8.6% to 45.2%.²¹⁻²⁷ The studies were
55 conducted among different population groups with the use of different diagnostic
56 instruments. Only two studies have tested the association between IBS and a psychological
57 condition (depression).^{23,27} However, none of the studies tested the relationship between IBS
58 and anxiety.

59 This study, therefore, examined the prevalence of IBS, IBS association with two common
60 psychological conditions (anxiety and depression), IBS-related health-seeking behavior and
61 health-seeking behavior in relation to anxiety and depression among individuals with IBS in a
62 population of Nigerian medical students.

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64 **2. MATERIAL AND METHODS**

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66 **2.1 Population and study design**

67 The study was a descriptive cross-sectional survey conducted between October 2015 and
68 March 2016. The study population consisted of 321 consenting apparently healthy clinical
69 students aged 20 to 50 years of the Ladoke Akintola University of Technology (LAUTECH),
70 Ogbomoso Medical School. The LAUTECH, Ogbomoso student population consists majorly
71 of young men and women from the southwest geopolitical zone of Nigeria and a minority
72 from other regions of the country.

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74 **2.2 Research instruments and data collection**

75 A 34-item composite self-reporting questionnaire consisting of socio-demographic variables
76 (8 items), the Rome III IBS questionnaire (10 items), the Hospital Anxiety and Depression
77 Scale (14 items) and IBS-related health-seeking behavior (2 items) was used. A
78 convenience sampling method was used. The questionnaire was filled by participants in the
79 classrooms after a brief introduction of the research subject by the principal investigator. It
80 took about 10 minutes on the average to complete the questionnaire.

81 **2.2.1 Irritable Bowel Syndrome's (IBS) Definition and Assessment**

82 Diagnosis of IBS was made with the Rome III IBS criteria.² The Rome III IBS modular
83 questionnaire was used.

84 IBS is defined by the questionnaire as:

85 Recurrent abdominal pain or discomfort at least 2-3 days/month in the last 3 months
86 associated with two or more of:^{*}

87 1. Improvement with defecation

- 88 • Pain or discomfort gets better after bowel movement at least sometimes

89 2. Onset of pain/discomfort associated with a change in frequency of stool

- 90 • Onset of pain or discomfort associated with more stools at least sometimes, OR

- 91 • Onset of pain or discomfort associated with fewer stools at least sometimes

92 3. Onset associated with a change in form (appearance) of stool

- 93 • Onset of pain or discomfort associated with looser stools at least sometimes, OR

- 94 • Onset of pain or discomfort associated with harder stools at least sometimes

95 ^{*}Criteria fulfilled for the last 3 months with symptom onset at least 6 months prior to
96 diagnosis.

97 Irritable bowel syndrome is further classified into four subgroups by Rome III: the
98 Constipation-predominant IBS (IBS-C), the Diarrhea-predominant IBS (IBS-D), the Mixed
99 constipation and diarrhea IBS (IBS-M), and the Un-subtyped IBS (IBS-U).

100 The diagnosis of IBS can be reasonably made using the Rome IBS criteria as long as the
101 individual does not have "red-flag" symptoms like drastic weight loss, a history of organic
102 bowel disease, a history of digestive surgery, bloody stool, night awakening due to
103 abdominal pain, anemia, fever or arthralgia.^{28,29}

104 **2.2.2 Assessment of Psychological Conditions (anxiety and depression)**

105 We assessed anxiety and depression in the participants with the Hospital Anxiety and
106 Depression Scale.

107 The HADS is a self-reporting questionnaire comprising 14 four-point scale items made of
108 seven (7) items for anxiety subset (HADS-A) and seven (7) items for depression subset
109 (HADS-D). Each item has a score of 0-3 with the lowest total score of zero and the highest
110 total score of 21 for each subset. A score between 0-7 indicates normal (no mood disorder),
111 8-10 indicates a borderline case and 11-21 abnormal case (clinically significant anxiety or
112 depression).

113 **2.2.3 Assessment of IBS-Related Health-Seeking Behavior**

114 The study participants were asked two questions in order to elicit IBS-Related Health-
115 Seeking behavior from them. The first question asked whether they have been diagnosed of

116 IBS by a doctor in the past, to which they were to answer “Yes’ or “No”. The second
117 question asked if the participants sought medical consultation(s) in the last 6 months
118 because of recurrent lower abdominal pain/discomfort that was associated with diarrhea or
119 constipation (recent medical consultation suggestive of IBS), to which they were to answer
120 “Yes’ or “No”. Participants who met the Rome III criteria for IBS, who also answered “Yes”
121 to either or both questions were regarded as having appropriate IBS-Related Health-Seeking
122 Behavior.

123 **2.3 Data analyses**

124 Data analyses was done with the IBM-Statistical Package for Social Sciences (SPSS),
125 version 20. Continuous variables were presented as median or range. Categorical variables
126 were expressed as frequencies and percentages. Univariate analysis was initially done to
127 determine the unadjusted odds ratios of the possible risk factors of IBS. Adjustment for
128 potential confounders through multivariate logistic regression analysis was done for the risk
129 factors that were found significant during univariate analysis. Variables with $p < 0.05$ were
130 considered significant.

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132 **3. RESULTS**

133 Of the 321 participants, one was excluded from data analyses because of incomplete data
134 entry. The results of the remaining 320 (99.7%) participants are here presented. The median
135 (range) age of the participants was 25 (20-50) year [Table 1]. Two hundred and ten
136 participants (65.6%) were males. In regard to the marital status of the participants, 274
137 (91.2%) were single while the others were married. One hundred and thirty-eight (43.1%)
138 participants consumed coffee, 41 (12.8%) consumed alcohol and 5 (1.6%) smoked
139 cigarettes.

140 Forty-six out of the 320 (14.4%) study participants had IBS [Table 1]. Of the 46 with IBS, 27
141 (58.7%) had IBS-M subtype, 9 (19.6%) had IBS-D, 8 (17.4%) had IBS-C and 2 (4.3%) had
142 IBS-U. With respect to psychological ill-health, 50 (15.6%) participants had anxiety, 30
143 (9.4%) of which was borderline (maximum score 8-10) and 20 (6.3%) was clinically
144 significant (maximum score >10) [Table 1]. Twenty-one (7.5%) of the respondents had
145 depression, 17 of which was borderline while 7 was clinically significant.

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Table 1: Sociodemographic variables and Psychological Ill-Health among Study participants

Variable	Total N =320	IBS n=46	No-IBS N= 274
Age [Median (range)]	25 (20-50)	24 (22-28)	26 (20-50)
Age group [n (%)]			
20 – 29	276(86.2)	43(93.5)	233(85.0)
>29	44(13.8)	3(6.5)	41(15.0)
Gender [n (%)]			
Male	210 (65.6)	21 (45.7)	189 (69.0)
Female	110 (34.4)	25(54.3)	85 (31.0)
Marital Status [n (%)]			
Single	274 (91.2)	43 (93.5)	249 (90.9)
Married	46 (8.8)	3 (6.5)	25 (9.1)
Smoking [n (%)]			
No	315 (98.4)	46 (100)	269 (98.2)
Yes	5 (1.6)	0 (0.0)	5 (1.8)
Alcohol [n (%)]			
No	279 (87.2)	43 (93.5)	236 (86.1)
Yes	41(12.8)	3 (6.5)	38(13.9)
Coffee [n (%)]			
No	182 (56.9)	22 (47.8)	160 (58.4)
Yes	138 (43.1)	24 (52.2)	114 (41.6)
Anxiety [Median (range)]	3 (0-18)	6 (0-18)	3 (0-16)
Anxiety [n (%)]			
0-7	270(84.3)	31 (67.4)	239 (87.2)
8-10	30(9.4)	8 (17.4)	22 (8.0)
>10	20(6.3)	7 (15.2)	13 (4.8)
Depression [Median (range)]	2 (0-14)]	3(0-12)	2(0-14)
Depression [n (%)]			
0-7	296(92.5)	38 (82.6)	258 (94.1)
8-10	17(5.3)	7 (15.2)	10 (3.7)
>10	7(2.2)	1(2.2)	6 (2.2)

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IBS: Irritable bowel syndrome

162 On univariate analysis, the factors associated with IBS were the female gender [OR =2.66
163 (95% CI, 1.40 - 4.99), P = 0.003], anxiety [OR = 1.18 (95% CI, 1.09 – 1.28), P = <0.001] and
164 depression [OR = 1.12 (95% CI, 1.01 -1.23), P = 0.023] [Table 2]. However, on multivariate
165 analysis the female gender [OR =2.19 (95% CI, 1.14 – 4.22), P =0.019] and anxiety [OR
166 1.18 (95% CI, 1.06-1.32), P =0.003] were associated with IBS [Table 2].

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Table 2: Unadjusted and Adjusted Odds Ratios of Risk Factors for IBS

Variable	Total N =320	IBS n=46	No-IBS N= 274	Unadjusted OR	P-value	Adjusted OR	P- value
Age [Median (range)]	25 (20-50)	24 (22-28)	26 (20-50)	0.91(0.81-1.01)	0.086		
Gender [n (%)]							
Male	210 (65.6)	21 (45.7)	189 (69.0)	1(Reference)		1(Reference)	
Female	110 (34.4)	25(54.3)	85 (31.0)	2.65(1.40-4.99)	0.003	2.19(1.14-4.22)	0.019
Marital Status [n (%)]							
Single	274 (91.2)	43 (93.5)	249 (90.9)	1(Reference)			
Married	46 (8.8)	3 (6.5)	25 (9.1)	0.70(0.20-2.40)	0.565		
Smoking [n (%)]							
No	315 (98.4)	46 (100)	269 (98.2)	1(Reference)			
Yes	5 (1.6)	0 (0.0)	5 (1.8)	0.00	0.999		
Alcohol [n (%)]							
No	279 (87.2)	43 (93.5)	236 (86.1)	1(Reference)			
Yes	41(12.8)	3 (6.5)	38(13.9)	0.43(0.13-1.47)	0.179		
Coffee [n (%)]							
No	182 (56.9)	22 (47.8)	160 (58.4)	1.53(0.82-2.86)	1.183		
Yes	138 (43.1)	24 (52.2)	114 (41.6)				
Anxiety [Median (range)]	3 (0-18)	6 (0-18)	3 (0-16)	1.18(1.09-1.28)	<0.001	1.18(1.06-132)	0.003
Depression [Median (range)]	2 (0-14)]	3(0-12)	2(0-14)	1.12(1.01-1.23)	0.028	0.97(0.85-1.11)	0.654

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IBS: Irritable bowel syndrome; OR: Odds ratio

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Table 3 shows the IBS-related health-seeking behavior among the study participants. Only 2 of the 7 participants who had been previously diagnosed with IBS by a doctor satisfied the Rome III IBS criteria in this study and relationship was not significant ($p = 0.265$). Twenty participants had sought medical consultation(s) in the last 6 months because of recurrent lower abdominal pain or discomfort that was associated with diarrhea or constipation (recent medical consultation because of symptoms suggestive of IBS). Among these, 10 (50%) satisfied the Rome III IBS criteria and the relationship was significant ($p < 0.001$). In all, 25 participants had either been previously diagnosed with IBS by a doctor or had recent medical consultation because of symptoms suggestive of IBS (total number with IBS symptoms related medical consultation). Among these, 11 (44%) were diagnosed with IBS with the Rome III criteria in this study and the relationship was significant ($p < 0.001$). Hence, 11(23.9%) participants sought medical attention among the 46 participants who had IBS.

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Table 3: IBS-Related Health-seeking behavior among participants (n =320)

Variable	Total (%) 320 (100)	IBS (%) 46 (14.4)	Non-IBS (%) 274 (85.6)	Odds ratio	P-value
Known IBS patient					
No	313 (97.8)	44 (95.7)	269 (98.2)	1 (Reference)	
Yes	7 (2.2)	2 (4.3)	5(1.8)	0.00	0.265 [*]
Recent Med. Consultation [†]					
No	300 (93.8)	36 (78.3)	264 (96.3)	1 (Reference)	
Yes	20 (6.2)	10 (21.7)	10 (3.7)	7.33(2.86-18.83)	<0.001
Total Med Consultation [‡]					
No	295 (92.2)	35 (76.1)	260 (94.9)	1 (Reference)	
Yes	25 (7.8)	11(23.9)	14 (5.1)	5.84(2.46-13.86)	<0.001

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*IBS: irritable bowel syndrome, *Fisher Exact Test; †Medical consultation in the last 6*

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months because of symptoms suggestive of IBS; ‡Total possible IBS-related medical

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consultation (combined known IBS and recent medical consultation)

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Table 4 depicts the health-seeking behavior in relation to Anxiety and Depression among participants with IBS. Among participants with IBS, those without anxiety frequently consulted a doctor compared to those with anxiety (60 vs 40%, p = 0.1) but this was not significant. In contrast to this, those with depression frequently consulted a doctor than those without depression (62.5 vs 37.5%, p <0.001) and the relationship was significant.

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Table 4: Health-seeking Behavior with Anxiety and Depression among participants with Irritable Bowel Syndrome (n = 46)

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HADS [*]	Medical Consultation		Odds Ratio	P value
	Yes (n=11)	No (n=33)		
Anxiety				
No (n =31)	5 (16.1)	26 (83.9)	1 (Reference)	
Yes (n =15)	6 (40.0)	9 (60.0)	3.47(0.85 -14.17)	0.084
Depression				
No (n =38)	6 (15.8)	32 (84.2)	1(Reference)	
Yes (n =8)	5 (62.5)	3 (37.5)	8.89(1.66 - 47.51)	<0.0001

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^{*}Hospital Anxiety and Depression Scale

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4. DISCUSSION

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The prevalence of IBS varies greatly from one region of the world to another and from one population subgroups to the other. Variation also exists within the same country even when the same diagnostic criteria were used.^{6,30} We obtained a prevalence of 14.4% among the population of medical students we surveyed. This falls within the prevalence range obtained from previous studies among medical students around the world (9.3% to 35.5%).⁷ The wide IBS prevalence disparities observed across the world may be a reflection of the variation in the prevailing local risk factors, the study design and the type of survey instrument used in conducting the studies.⁵ The Manning criteria have been shown to account for the highest reported prevalence of IBS whilst the Rome iterations are associated with lower prevalence estimates.^{5,31} Olubuyide et al., in 1995 obtained a prevalence of 43.5% in the first IBS study conducted among medical students in Nigeria with the Manning criteria.²⁵ A study conducted by Okeke et al. among a combination of medical students and medical laboratory technology students in northcentral Nigeria in 2005 with the use of the Rome II IBS questionnaire

232 obtained a prevalence of 26.4%.²³ The observed prevalence disparities in the previous
233 Nigerian studies and ours could be explained by reasons already stated above. We used a
234 different instrument apart from the ones used in the previous Nigerian studies. Our study
235 was also conducted in another region of the country (southwestern region) in contrast to
236 some of the cited Nigerian studies.

237 We found the IBS-M subtype (58.7%) to be predominant among our study population.
238 Whereas Okeke et al. previously found IBS-A (IBS with alternating diarrhea and
239 constipation) as the predominant subtype with the Rome II criteria in a community study in
240 northcentral Nigeria; Ladep et al. found IBS-C as the predominant subtype in a hospital
241 patient population with the same instrument and in the same geographical location as the
242 former. While Dong et al. found IBS-C as the predominant subtype among college students
243 with the Rome III criteria in northern China, Liu et al. found IBS-M as the predominant
244 subtype with the same instrument in Beijing, China. It has been established that the pattern
245 and prevalence of IBS subtypes differ within the same country, from country to country and
246 from study to study.⁶ The geographical location, the established bowel habits of the
247 population and the diagnostic instrument used seem to influence these.³²

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249 In regard to gender distribution, our study showed IBS to be more associated with the female
250 gender (54.3%) as compared to the male (45.7%) and this was statistically significant ($p =$
251 0.019). Gender difference in IBS prevalence is well established. Drossman et al. noted that
252 the Female/Male ratio of IBS could be as high as 2:1,³³ although others researchers have
253 reported a rather lower ratio.³⁴ In most populations, women tend to report more IBS
254 symptoms than men irrespective of the diagnostic criteria employed.^{5-7,35} This gender
255 difference in the prevalence of IBS could be due to differences in gender-related illness
256 perception and health-seeking behavior. It could also be due to gender-related physiologic
257 and psychological differences.³⁶

258 In the present study, both anxiety and depression were significantly associated with IBS on
259 univariate analysis, although depression did not sustain the significance on multivariate
260 analysis. Two previous studies conducted in Nigeria showed positive associations between
261 depression and IBS on univariate analysis, though the studies neither considered anxiety nor
262 conducted multivariate analysis to eliminate the effect of possible confounders. Our findings
263 are in tandem with several studies conducted both at the community level and among
264 medical students that found positive association between psychological factors (anxiety,
265 depression and stress).^{5,7,37} A review of literature showed more than one-half of all patients
266 with IBS reported depression or anxiety and such individuals experience more severe
267 somatic symptoms.⁵

268 We observed that 11 (23.9%) of the 46 participants with IBS had sought medical attention.
269 The proportion of individuals with IBS in the community that has sought medical attention
270 varies widely from country to country and from study to study but an average of 30% seek
271 medical attention because of their symptoms.⁵ Oluboyide et al., two decades ago observed
272 that about two-thirds of medical students with IBS had sought medical advice during the
273 study period and the consultation behavior was influenced by factors such as the presence
274 of other symptoms.²⁵ Although our current finding is close to the global average of 30%, it
275 may suggest a poor health-seeking behavior among the study population since they were
276 medical students who ought to pay prompt attention to their health. It may be a reflection of
277 poor illness perception in the participants' environment such that majority of those who suffer
278 from IBS do not see it as diseases state. Another possibility is that some of the participants
279 with IBS may have self-medicated since they have some knowledge in this regard.

280 Only 18.2% of the IBS subjects who sought medical attention were previously diagnosed
281 with IBS by doctors. This may suggest a low IBS index of suspicion among Nigerian doctors.
282 Despite that a community-based study conducted in the northcentral part of Nigeria showed

283 IBS to be relatively common in the community,²² a previous survey of Nigerian physicians
284 confirms the rarity of hospital diagnosis of IBS in that 83.3% of the Specialist Physicians
285 interviewed make the diagnosis of IBS “rarely”.³⁸ We posit that those who sought medical
286 attention because of lower abdominal pain with diarrhea and/or constipation but did not fulfill
287 Rome III criteria for IBS may have had alternate diagnoses like gastroenteritis or functional
288 constipation while those who were previously diagnosed with IBS by physicians but did not
289 fulfill the diagnostic criteria may have had symptoms amelioration due to the treatment they
290 have received.

291 Our study showed that there was a positive association between depression and seeking for
292 medical consultation among participants with IBS, although we did not find similar
293 association among participants with anxiety and IBS. It has been previously observed that
294 individuals with IBS who seek medical care tend to have higher incidence of depression,
295 anxiety disorder, panic disorder, and hypochondriasis than control populations.^{8–11,39}

296 The strength of this study lies in three aspects which to the best of our knowledge have not
297 been explored in regard to IBS in Nigeria: that we evaluated the association between anxiety
298 and IBS in addition to depression, that we conducted a logistic regression analysis to
299 eliminate the effects of confounders on the association between IBS and the psychological
300 conditions, and that we tested the association between the psychological conditions and the
301 health-seeking behavior among participants with IBS. The limitations of this study lie in the
302 fact that our study population consisted of only medical students who are knowledgeable
303 about IBS. Hence, the findings may not absolutely represent what obtains in the general
304 populace. Although we could not perform colonoscopy on those who fulfilled the criteria for
305 IBS to eliminate a differential of IBS like early inflammatory bowel diseases (IBD), it is
306 important to note that IBD is a rare disease in sub-Saharan Africa⁴⁰ and Nigeria in
307 particular.⁴¹

308 **5. CONCLUSION**

309 Our study shows that IBS was moderately prevalent among the medical student population
310 we studied, IBS-M was the predominant subtype, the female gender and anxiety were
311 significantly risk factors for IBS while depression was significantly associated with health-
312 seeking behavior among the participants with IBS. **These findings bring to the fore the
313 need for Nigerian physicians to heighten their suspicion index for IBS and FGIDs in
314 general. The psychological health needs of the general populace and the youths, in
315 particular, ought to be properly addressed as this could help to ameliorate the
316 severity or reduce the prevalence of the IBS.** Further research in the community is
317 needed to test the association between IBS and psychological disorders in Nigeria.

318 **COMPETING INTERESTS**

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320 Authors have declared that no competing interests exist.

322 **AUTHORS' CONTRIBUTIONS**

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324 This work was carried out in collaboration between all authors. Author ACJ designed the
325 study, wrote the protocol, performed the statistical analysis and wrote the first draft of the
326 manuscript. Authors OA and PBA participated in the design of the study and reviewed the
327 protocol and the manuscript. All authors read and approved the final manuscript.

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CONSENT

Written informed consent was obtained from all participants.

ETHICAL APPROVAL

Ethical approval was obtained from the ethics review committee of the LAUTECH Teaching Hospital, Ogbomoso. The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

REFERENCES

1. Thompson WG, Longstreth GF, Drossman DA, Heaton KW, Irvine EJ, Müller-Lissner SA. Functional bowel disorders and functional abdominal pain. *Gut*. 1999;45(Suppl 2):43-7.
2. Longstreth GF, Thompson WG, Chey WD, Houghton LA, Mearin F, Spiller RC. Functional bowel disorders. *Gastroenterol*. 2006;130(5):1480–91.
3. Talley NJ, Gabriel SE, Harmsen WS, Zinsmeister AR, Evans RW. Medical costs in community subjects with irritable bowel syndrome. *Gastroenterol*. 1995;109(6):1736–41.
4. Hahn BA, Yan S, Strassels S. Impact of irritable bowel syndrome on quality of life and resource use in the United States and United Kingdom. *Digestion*. 1999;60(1):77–81.
5. Canavan C, West J, Card T. The epidemiology of irritable bowel syndrome. *Clin Epidemiol*. 2014;6:71–80.
6. Lovell RM, Ford AC. Global prevalence of and risk factors for irritable bowel syndrome: a meta-analysis. *Clin Gastroenterol Hepatol*. 2012;10(7):712–721.
7. Ibrahim NK. A systematic review of the prevalence and risk factors of irritable bowel syndrome among medical students. *Turk J Gastroenterol*. 2016;27(1):10–6.
8. Surdea-Blaga T, Băban A, Dumitrascu DL. Psychosocial determinants of irritable bowel syndrome. *World J Gastroenterol*. 2012;18(7):616–26.
9. Saha L. Irritable bowel syndrome: pathogenesis, diagnosis, treatment, and evidence-based medicine. *World J Gastroenterol*. 2014;20(22):6759–73.
10. Lee Y-T, Hu L-Y, Shen C-C, Huang M-W, Tsai S-J, Yang AC, et al. Risk of Psychiatric Disorders following Irritable Bowel Syndrome: A Nationwide Population-Based Cohort Study. *PLoS One*. 2015;10(7):e0133283.
11. Fadgyas-Stanculete M, Buga A-M, Popa-Wagner A, Dumitrascu DL. The relationship between irritable bowel syndrome and psychiatric disorders: from molecular changes to clinical manifestations. *J Mol psychiatry*. 2014;2(1):4.
12. Talley NJ, Spiller R. Irritable bowel syndrome: a little understood organic bowel disease? *Lancet*. 2002;360(9332):555–64.
13. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67(6):361–70.
14. Snaith RP. The Hospital Anxiety And Depression Scale. *Health Qual Life Outcomes*. 2003;1:29.
15. Lisspers J, Nygren A, Söderman E. Hospital Anxiety and Depression Scale (HAD): some psychometric data for a Swedish sample. *Acta Psychiatr Scand*. 1997;96(4):281–6.
16. Michopoulos I, Douzenis A, Kalkavoura C, Christodoulou C, Michalopoulou P, Kalemis G, et al. Hospital Anxiety and Depression Scale (HADS): validation in a Greek general hospital sample. *Ann Gen Psychiatry*. 2008;7:4.
17. Herrero MJ, Blanch J, Peri JM, De Pablo J, Pintor L, Bulbena A. A validation study of the hospital anxiety and depression scale (HADS) in a Spanish population. *Gen Hosp*

- 381 Psychiatry. 2003;25(4):277–83.
- 382 18. Montazeri A, Vahdaninia M, Ebrahimi M, Jarvandi S. The Hospital Anxiety and
383 Depression Scale (HADS): translation and validation study of the Iranian version. *Health*
384 *Qual Life Outcomes*. 2003;1:14.
- 385 19. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and
386 Depression Scale. An updated literature review. *J Psychosom Res*. 2002;52(2):69–77.
- 387 20. Abiodun OA. A validity study of the Hospital Anxiety and Depression Scale in general
388 hospital units and a community sample in Nigeria. *Br J Psychiatry*. 1994;165(5):669–72.
- 389 21. Onyekwere CA, Asiyambi A, Obi J. PWE-002 IBS in Nigeria; is there a decline in
390 prevalence? *Gut*. 2012;61(Suppl 2):A297.
- 391 22. Okeke EN, Ladep NG, Adah S, Bupwatda PW, Agaba EI, Malu AO. Prevalence of
392 irritable bowel syndrome: a community survey in an African population. *Ann Afr Med*.
393 2009;8(3):177–80.
- 394 23. Okeke EN, Agaba EI, Gwamzhi L, Achinge GI, Angbazo D, Malu AO. Prevalence of
395 irritable bowel syndrome in a Nigerian student population. *Afr J Med Med Sci*.
396 2005;34(1):33–6.
- 397 24. Akere A, Oyewole A. Prevalence of irritable bowel syndrome among psychiatric
398 patients. *Nigerian Journal of Gastroenterology and Hepatology*. 2013;5(2):85–89
- 399 25. Olubuyide IO, Olawuyi F, Fasanmade AA. A study of irritable bowel syndrome
400 diagnosed by Manning criteria in an African population. *Dig Dis Sci*. 1995;40(5):983–5.
- 401 26. Akere A, Akande KO. Association Between Irritable Bowel Syndrome and Shift Work:
402 Prevalence and Associated Factors Among Nurses. *J Gastroenterol Hepatol Res*.
403 2014;3:1327-1330.
- 404 27. Ladep N-G, Obindo T-J, Audu M-D, Okeke E-N, Malu A-O. Depression in patients with
405 irritable bowel syndrome in Jos, Nigeria. *World J Gastroenterol*. 2006;12(48):7844–7.
- 406 28. Vanner SJ, Depew WT, Paterson WG, DaCosta LR, Groll AG, Simon JB, et al.
407 Predictive value of the Rome criteria for diagnosing the irritable bowel syndrome. *Am J*
408 *Gastroenterol*. 1999;94(10):2912–7.
- 409 29. Dong Y-Y, Zuo X-L, Li C-Q, Yu Y-B, Zhao Q-J, Li Y-Q. Prevalence of irritable bowel
410 syndrome in Chinese college and university students assessed using Rome III criteria.
411 *World J Gastroenterol*. 2010;16(33):4221–6.
- 412 30. Kang JY. Systematic review: the influence of geography and ethnicity in irritable bowel
413 syndrome. *Aliment Pharmacol Ther*. 2005;21(6):663–76.
- 414 31. Saito YA, Locke GR, Talley NJ, Zinsmeister AR, Fett SL, Melton LJ. A comparison of
415 the Rome and Manning criteria for case identification in epidemiological investigations
416 of irritable bowel syndrome. *Am J Gastroenterol*. 2000;95(10):2816–24.
- 417 32. Chang F-Y, Lu C-L, Chen T-S. The current prevalence of irritable bowel syndrome in
418 Asia. *J Neurogastroenterol Motil*. 2010;16(4):389–400.
- 419 33. Drossman DA, Whitehead WE, Camilleri M. Irritable bowel syndrome: a technical
420 review for practice guideline development. *Gastroenterol*. 1997;112(6):2120–37.
- 421 34. Anbardan SJ, Daryani NE, Fereshtehnejad S-M, Taba Taba Vakili S, Keramati MR,
422 Ajdarkosh H. Gender Role in Irritable Bowel Syndrome: A Comparison of Irritable Bowel
423 Syndrome Module (ROME III) Between Male and Female Patients. *J*
424 *Neurogastroenterol Motil*. 2012;18(1):70–7.
- 425 35. Quigley EMM, Bytzer P, Jones R, Mearin F. Irritable bowel syndrome: the burden and
426 unmet needs in Europe. *Dig Liver Dis*. 2006;38(10):717–23.
- 427 36. Chang L, Heitkemper MM. Gender differences in irritable bowel syndrome.
428 *Gastroenterol*. 2002;123(5):1686–701.
- 429 37. Lee S, Wu J, Ma YL, Tsang A, Guo W-J, Sung J. Irritable bowel syndrome is strongly
430 associated with generalized anxiety disorder: a community study. *Aliment Pharmacol*
431 *Ther*. 2009;30(6):643–51.
- 432 38. Okeke E. Frequency of irritable bowel syndrome diagnosis made by consultant
433 physicians in Nigeria. *International Journal of Medicine and Health Development*.

- 434 2010;15(1):51–5.
435 39. Butt AS, Salih M, Jafri W, Yakoob J, Wasay M, Hamid S. Irritable bowel syndrome and
436 psychiatric disorders in pakistan: a case control study. *Gastroenterol Res Pract.*
437 2012;2012:291452.
438 40. Mayberry J, Mann R. Inflammatory bowel disease in rural sub-Saharan Africa: rarity of
439 diagnosis in patients attending mission hospitals. *Digestion.* 1989;44(3):172–6.
440 41. Naish JM, Batchvarov BD, Lawoyin VL. A case of ulcerative colitis and pyostomatitis
441 vegetans in an African. *Gut.* 1970;11(1):38–40.
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