

Irritable Bowel Syndrome in General Population of Cotonou: Prevalence and Associated Factors

Comlan N'déhougèa Martin Sokpon^{1*}, Aboudou Raïmi Kpoussou¹, Spéro Ludwig Kpèssou Aden-Henri¹, Rodolph Koffi Vignon¹, Jean Louis Savi de Tove², Akuvi Claude Gildas Adossou³, Colette Sylvie Azandjèmè⁴, Jean Séhonou¹

¹Hepato-Gastroenterology Department, National and University Hospital Hubert Koutoukou Maga (CNHU-HKM), Cotonou, Benin

²Clinique Santé du Sud, Cotonou, Benin

³Saint Vincent Hospital, Worcester, USA

⁴Regional Institute of Public Health (IRSP), Ouidah, Benin

Email: *msokpon@yahoo.fr

How to cite this paper: Sokpon, C.N.M., Kpoussou, A.R., Aden-Henri, S.L.K., Vignon, R.K., de Tove, J.L.S., Adossou, A.C.G., Azandjèmè, C.S. and Séhonou, J. (2023) Irritable Bowel Syndrome in General Population of Cotonou: Prevalence and Associated Factors. *Open Journal of Gastroenterology*, 13, 117-130.

<https://doi.org/10.4236/ojgas.2023.133013>

Received: March 2, 2023

Accepted: March 26, 2023

Published: March 29, 2023

Copyright © 2023 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: Irritable bowel syndrome (IBS) is a known public health burden in western countries while only a few studies have been published on this disease in Africa. The objective of this study was to determine the prevalence of IBS in the general adult population of Cotonou (Benin), its associated risk factors and its impact on patients' daily life. **Method:** This was a descriptive and analytical cross-sectional study conducted over one month. Data was collected via a questionnaire. IBS was defined by the Rome IV criteria. **Results:** A total of 768 participants were included, with a male predominance (sex ratio 1.8). The mean age of the participants was 30.6 years, with extremes of 15 to 76 years. The prevalence of IBS in our study was 4.2%. IBS-D was the most common subtype (34.4%). IBS symptoms were influenced by diet (46.9%), stress (31.3%) and lack of sleep (15.6%). In the univariate analysis, the risk factors associated with IBS were: Dendi and Otamari ethnicity ($p = 0.015$), low level of education ($p = 0.047$), family history of IBS ($p = 0.026$), smoking ($p < 0.001$), high-salt diet ($p = 0.001$), high-fat diet ($p = 0.044$), stress ($p < 0.001$) and anxiety ($p < 0.001$). In the multivariate analysis, male gender ($p = 0.047$), regular physical activity and good sleep quality were protective factors. IBS led to daily gurgling (31.3%), absenteeism (25%) and impacted the subjects' professional life in 28.1% of the cases. **Conclusion:** Despite IBS frequency, patients with IBS rarely seek medical attention. The public should therefore be informed about this condition to reduce its impact on their daily life.

Keywords

IBS, Rome IV Criteria, Associated Factors, Cotonou, Benin

1. Introduction

Irritable bowel syndrome (IBS) is a functional bowel disorder in which abdominal pain or digestive discomfort is associated with a change in the frequency or appearance of bowel movements. Bloating, abdominal distension, and abnormal bowel movements are also frequently associated [1]. Formerly known as “spastic colitis”, or “colonic neurosis”, “mucosal colitis” or also “muco-membranous colitis” and more recently as “functional colopathy”, the term “irritable bowel syndrome” has become more appropriate today [2]. Irritable bowel syndrome is the most common functional bowel disorder with an average prevalence of 10% in the general population [3]. To standardize its diagnosis, several clinical criteria have been developed, including Manning’s criteria in 1976, Rome I in 1990, Rome II in 1999 and Rome III in 2006. The latest version, Rome IV criteria, dates from May 2016 [4] [5].

IBS is a major cause of consultation with general practitioners, gastroenterologists, and internists [6]. It accounts for one third of gastroenterology consultations [7]. Initially considered as a purely motor disorder, IBS is now recognized as a multifactorial condition [3].

Several factors have been incriminated in its occurrence. These include a diet rich in oligosaccharides, disaccharides, monosaccharides, and polyols fermentable by the gut microbiota (FODMAPs) [8], alcohol and tobacco consumption [9], physical inactivity, sleep disorders [10], obesity [11], psychological factors such as stress [3], and a family history of IBS [12].

Because of the poor quality of life in developing countries, their population is theoretically considered at high risk of IBS. However, no general population study on this condition has been conducted in the Republic of Benin. For this reason, we deemed it appropriate to conduct this study on the prevalence of IBS, its associated risk factors in the general population of Cotonou, as well as the impact on the daily life of affected subjects.

2. Methods

2.1. Study Setting

The town of Cotonou is located on the coastline, hence the name of the Littoral Department. The later was created in the last administrative division of Benin on 15 January 1999. Initially, the Littoral Department was a sub-prefecture of the former Atlantic Department, which itself came from the 1958 territorial division; time during which the country of Benin had six provinces resulting from the French colonial division. With an area of 79 km² (0.07% of Benin’s area), the Littoral department is the smallest of the twelve departments currently in Benin.

Located at the intersection of the 6°20 North parallel and 2°20 East meridians, this department is bordered by Lake Nokoué to the north, the Atlantic Ocean to the south, the commune of Sèmè-Kpodji (of the department of Ouémé) to the east and the commune of Abomey-Calavi (of the department of Atlantique) to the west. It is the only department in the country that has a single municipality, with 13 districts and 143 neighborhoods. Cotonou is the economic capital of Benin and concentrates almost all the administrative and political functions of the country.

2.2. Type and Period of Study

It was a descriptive and analytical cross-sectional study. It was conducted over a period of one-month from July 8 to August 8, 2019.

2.3. Study Population

2.3.1. Inclusion Criteria

This study concerned subjects from a sample of the population of the city of Cotonou who met the following criteria:

- Residents living in Cotonou for 6 months at least.
- Be 15 years of age or older.
- No alarm signs (altered general condition, gastrointestinal bleed, nocturnal symptoms).
- Give their consent to participate in the study.

2.3.2. Non-Inclusion Criteria

People who were not included in this study:

- Any admitted subjects during the inclusion period.
- Subjects who were unable to speak.
- Subjects with a mental disability.
- Subjects with alarm signs: rectal bleed, melena, anemia, significant and unexplained weight loss.

2.4. Sampling

The minimum size of our sample was 768 persons.

This size was calculated using the Schawrtz formula:
$$N = \frac{\varepsilon Z \alpha^2 pq}{i^2}$$

Recruitment was done using a 2-stage probabilistic cluster sampling method. In the first stage, 69 clusters representing 69 neighborhoods of Cotonou were randomly selected. In the second stage, the so-called secondary units named individuals were selected according to a simple random design using the lottery method without replacement.

2.5. Study Variables

The data collection was done via a questionnaire essentially composed of the followings:

- **dependent variable:** IBS defined by Rome IV criteria:

- chronic abdominal pain at least 1 day per week in the last 3 months associated with at least two of the points below;

- pain in connection with defecation;
- pain associated with a change in stool frequency;
- pain associated with changes in stool appearance;
- all evolving for at least 6 months.

- **independent variables:** subtype of IBS (by Bristol stool scale), socio-demographic data, medical history, diagnostic criteria, clinical signs, influencing factors, onset of disorders and consultations made, paraclinical examinations performed, treatments received, lifestyle, eating habits and finally psychological disturbances.

To assess the subjects' psychological state, we used two scales: the "Hospital Anxiety and Depression scale" (HADS) and the Cungi brief stress assessment scale. It is a standardized self-questionnaire, with a valid and reliable rating scale. It consists of 14 items rated from 0 to 3 each: seven for anxiety (HADS-anxiety) and seven for depression as follows: 0 - 7 = normal; 8 - 10 = moderate; 11 - 14 = medium; 15 - 21 = severe.

Stress was assessed using Cungi's brief stress assessment scale. It is a self-assessment scale with few items, easy to understand and to fill in by patients, easy to analyze by professionals and which explores how a patient perceives his stress reaction. It consists of 11 items rated from 0 to 6 each. The interpretation of the scale is as follows: 11 - 19 = Very low stress; 19 - 30 = Low stress; 30 - 45 = high stress; ≥ 45 = very high stress.

2.6. Analysis

Our analysis consisted first in making a simple description (frequency tables, average, standard deviation, median, graphs) of the various variables considered in our study. Then we looked for possible statistical associations between the dependent variables and several other variables by means of the χ^2 Pearson test or the Fischer exact test according to the case of an ANOVA model. The data were entered into a mask designed on Epi data 3.1. Analysis was performed with SPSS 25 statistical software. The accepted threshold of statistical significance was 5%. When required, the student's t test, the odds ratio were used with an interval of 95%.

3. Results

3.1. Characteristics of the Study Population

Our study included 768 people living in Cotonou, recruited from 69 different districts of the city. The average age in our study was 30.6 years with extremes from 15 to 76 years. The modal age range was 15 to 30 years and represented (56.6%) of the study population.

Our study population was predominantly male with a sex ratio of 1.8. There were 498 males, *i.e.* 64.8% of our sample. The Fon ethnic group was the most represented (n = 309; 40.2%) and the majority of the subjects surveyed had

grown up in the Littoral department (n = 509; 66.3%). Regarding psychological disturbances, more than half of the population (n = 452; 58.9%) had a low level of stress. Stress was high in 174 subjects (22.7%) and very high in 3 subjects (0.4%). A moderate level of anxiety was found in 17.2% of the cases (n = 132), and severe in 1.4% (n = 11). The prevalence of mild depression in our study was 9.9% (n = 76), 1.7% (n = 45) for moderate depression. Only one subject had severe depression.

3.2. Prevalence of IBS According to the Rome IV Criteria and Subtypes

The prevalence of IBS in our study was 4.2% (32 subjects out of 768 included). IBS-D was the most frequent subtype (n = 11; 34.4%), followed by IBS-C (n = 10; 31.3%) (Table 1).

3.3. Epidemiological Aspects of IBS Patients

IBS was more frequent in subjects aged 30 to 44 years (4.8%) followed by subjects aged 15 to 30 years (4.4%). There was a female predominance, with a sex ratio of 0.60.

3.4. Clinical Aspects of IBS Patients

The gastrointestinal (GI) symptoms were distributed as follows: abdominal pain (n = 27; 84.4%), diarrhea (n = 21; 65.6%), constipation (n = 20; 62.5%), abdominal discomfort (n = 17; 53.1%), frequent gas emission (n = 12; 37.5%), abdominal bloating (n = 8; 25%), borborygmi rumbling (n = 4; 12.5%). The extra-digestive symptoms found were asthenia (n = 19; 59.4%), migraine (n = 18; 56.3%), pollakiuria (n = 10; 31.3%), chronic lumbago (n = 8; 25%). Regarding excretion, it was considered easy (46.9%), laborious (34.4%), imperative (18.8%), satisfactory (53.1%) or unsatisfactory (46.9%). Nineteen (59.4%) subjects meeting the Rome IV criteria reported food as a factor aggravating the symptoms in 46.9% (n = 15) of cases. Stress and lack of sleep were reported in 31.3% and 15.6% of cases respectively.

3.5. Factors Associated with IBS

In the univariate analysis, epidemiologically, the factors associated with IBS

Table 1. Distribution of sick subjects according to IBS subtype.

	Sample	Percentage (%)
IBS-D	11	34.4
IBSC	10	31.3
IBS-M	9	28.1
IBS not specified	2	6.3
Total	32	100

were: Dendi and Otamari ethnicities ($p = 0.015$), origin from Alibori (OR [IC 95%] = 23.71 [1.45 - 387.95]; $p = 0.043$), low level of education ($p = 0.047$) (**Table 2**), family history of IBS (OR [IC 95%] = 4.09 [1.47 - 4.34]; $p = 0.026$) (**Table 3**). Considering lifestyle, there was no relationship between IBS and physical activity, sleep time and alcohol consumption. Only smoking was associated with IBS (OR [IC 95%] = 7.08 [2.82 - 16.83]; $p < 0.001$) (**Table 4**). Regarding dietary habits, high-salt diet (OR [IC 95%] = 5.26 [1.83 - 6.23]; $p = 0.001$) and high-fat

Table 2. Study in univariate analysis of the socio-demographic characteristics associated with IBS.

	IBS		Univariate analysis		
	Yes	No	OR	IC (95%)	p-value
Department of origin					0.043*
Littoral	22 (4.3%)	487(95.7%)	1	-	
Collines	2 (14.3%)	12 (85.7%)	3.68	0.78 - 2.18	
Atacora	1 (25.0%)	3 (75.0%)	7.38	0.74 - 2.09	
Zou	1 (3.1%)	31 (96.9%)	0.57	0.07 - 1.08	
Atlantique	1(2.6%)	38 (97.4%)	0.58	0.08 - 1.08	
Mono	1 (6.7%)	14 (93.3%)	1.58	0.19 - 1.22	
Alibori	1 (50.0%)	1 (50.0%)	23.71	1.45 - 387.95	
Foreign	1 (2.4%)	40 (97.6%)	0.55	0.07 - 1.07	
Plateau	0 (0.0%)	17 (100%)	-	-	
Borgou	0 (0.0%)	9 (100.0%)	-	-	
Couffo	0 (0.0%)	17 (100%)	-	-	
Donga	0 (0.0%)	2 (100%)	-	-	
Ethnic group					0.015*
Fon and related	16 (5.2%)	293 (94.8%)	1		
Yorouba and related	2 (2.2%)	89 (97.8%)	0.41	0.09 - 1.09	
Goun and related	4 (2.2%)	175 (97.8%)	0.42	0.13 - 1.14	
Mina	3 (7.0%)	40 (93.0%)	1.37	0.38 - 1.47	
Adja	2 (3.5%)	55 (96.5%)	1.09	0.14 - 1.16	
Dendi and related	2 (28.6%)	5 (71.4%)	9.74	1.74 - 52.29	
Otamari and related	2 (22.2%)	7 (77.8%)	6.94	1.38 - 34.85	
Haoussa	1 (12.5%)	7 (87.5%)	2.61	0.30 - 1.35	
Bariba and related	0 (0.0%)	3 (100%)	-	-	
Xwla	0 (0.0%)	36 (100%)	-	-	
Foreigners	0 (0.0%)	26 (100%)	-	-	

(*) Reflects a statistically significant link.

Table 3. Univariate analysis study of the family history associated with IBS.

	IBS		Univariate analysis		
	Yes	No	OR	IC (95%)	p-value
Family history of IBS					0.026*
Yes	5 (13.9%)	31 (86.1%)	4.09	1.47 - 4.34	
No	25 (3.8%)	635 (96.2%)	1	-	
Do not know	2 (2.8%)	70 (97.2%)	0.725	0.17 - 1.18	
Family history of colon cancer					0.262
Yes	1 (25.0%)	3 (75.0%)	8.06	0.81 - 2.25	
No	27 (4.0%)	653 (96.0%)	1		
Do not know	4 (4.8%)	80 (95.2%)	1.21	0.41 - 1.51	

(*) Reflects a statistically significant link.

diet (OR [IC 95%] = 2.37 [1.05 - 2.86]; $p = 0.044$) were associated with IBS (**Table 4**). As for psychological disturbances, stress and anxiety were associated with IBS with respectively $p < 0.001$ each (**Table 5**).

In the multivariate analysis, male gender ($p = 0.047$), regular physical activity ($p < 0.001$), and sleep time greater than 6 hours ($p < 0.001$) were protective factors. In addition, the older the age, the less exposed the subjects were. Dendi and Otamari ethnicity and smoking were the most significant predictive factors, with risks estimated at 11.081 and 12.732 respectively (**Table 6** and **Table 7**).

3.6. Impact on Daily Life

IBS symptoms were most often associated with daily life disturbances such as gurgling (31.3%), impact on professional life (28.1%) and absenteeism (25%).

4. Discussion

Through a questionnaire, including the ROME IV diagnostic criteria, the Bristol scale, and two psychic evaluation scales, we were able to describe the epidemiological profile of IBS in Cotonou population. We also determined its associated factors and its impact on the daily life of affected subjects. In our study, IBS prevalence was estimated at 4.2%. This result was close to the ones found by Makharia *et al.* [13] in 2011 (4%), by Zhao *et al.* [14] in 2010 (4.6%) and by Dapoigny *et al.* [15] in 2004 in France (4.7%). However, many other authors found a higher prevalence: Van den Houte *et al.* [6] 5.5% in 2018, Boucekkine *et al.* [16] 5.8% in 2011, Meharich *et al.* [17] 33.6% in 2014. This difference could be explained by the difference in the studies' methods as well as the types of population considered. This variation could also be due to the effect of socioeconomic, nutritional and psychological factors on the onset and development of IBS.

The exposed subjects were of young age. Similar results were reported by Chatila *et al.* [9] in Lebanon, Okeke *et al.* [18] in Nigeria and Guo *et al.* [10] in

Table 4. Study in univariate analysis of the link between lifestyle and IBS.

	IBS		Univariate analysis		
	Yes	No	OR	IC (95%)	p-value
Physical activity					0.0523
None	12 (4.9%)	234 (95.1%)	1	-	
Occasionally	11 (4.8%)	218 (95.2%)	0.98	0.42 - 1.53	
One time	5 (5.2%)	92 (94.8%)	1.05	0.36 - 1.46	
Over three times	3 (3.6%)	80 (96.4%)	0.73	0.20 - 1.22	
Three times	1 (2.0%)	48 (98.0%)	0.41	0.05 - 1.05	
Two times	0 (0.0%)	64 (100.0%)	-	-	
Sleeping time					0.850
More than 6 h	20 (4.0%)	478 (96.0%)	0.89	0.43 - 1.54	
Less than 6 h	12 (4.4%)	258 (95.6%)	1	-	
Alcohol					0.572
Yes	19 (3.8%)	478 (96.2%)	0.78	0.38 - 1.46	
No	13 (4.8%)	258 (95.2%)	1	-	
Tabac					<0.001*
Yes	7 (20.0%)	28 (80.0%)	7.08	2.82 - 16.83	
No	25 (3.4%)	708 (96.6%)	1	-	
Salty foods					0.001*
Regularly	28 (6.3%)	420 (93.8%)	5.26	1.83 - 6.23	
Irregularly	4 (1.3%)	316 (98.8%)	1	-	
Sweet foods					0.100
Regularly	23 (5.3%)	411 (94.7%)	2.02	0.92 - 2.51	
Irregularly	9 (2.7%)	325 (97.3%)	1	-	
Fatty foods					0.044*
Regularly	24 (5.5%)	411 (94.5%)	2.37	1.05 - 2.86	
Irregularly	8 (2.4%)	325 (97.6%)	1	-	
Cereals					1.000
Regularly	31 (4.2%)	707 (95.8%)	1.27	0.16 - 1.18	
Irregularly	1 (3.3%)	29 (96.7%)	1	-	
Fruits					0.672
Regularly	23 (3.9%)	561 (96.1%)	0.80	0.36 - 1.44	
Irregularly	9 (4.9%)	175 (95.1%)	1	-	
Dairy products					0.589
Regularly	15 (3.7%)	388 (96.3%)	0.79	0.39 - 1.47	

Continued

Irregularly	17 (4.7%)	348 (95.3%)	1		
Tea or coffee					0.588
Regularly	13 (3.6%)	346 (96.4%)	0.77	0.38 - 1.46	
Irregularly	19 (4.6%)	390 (95.4%)	1	-	
Soft drinks					0.467
Regularly	11 (3.5%)	306 (96.5%)	0.73	0.35 - 1.41	
Irregularly	21 (4.7%)	430 (95.3%)	1	-	
Vegetables					0.150
Regularly	11 (3.0%)	353 (97.0%)	0.57	0.27 - 1.31	
Irregularly	21 (5.2%)	383 (94.8%)	1	-	

(*) Reflects a statistically significant link.

Table 5. Study in univariate analysis of the link between psychological disturbances and IBS.

	IBS		Univariate analysis		
	Yes	No	OR	IC (95%)	p-value
Stress level					<0.001*
Very low	1 (0.7%)	138 (99.3%)	1	-	
Low	10 (2.2%)	442 (97.8%)	3.12	0.40 - 1.49	
Raised	20 (11.5%)	154 (88.5%)	6.29	3.01 - 13.16	
Very high	1 (33.3%)	2 (66.7%)	11.83	1.04 - 134.10	
Anxiety level					<0.001*
Normal	4 (1.3%)	299 (98.7%)	1	-	
Moderate	13 (4.0%)	309 (96.0 %)	0.945	0.46 - 1.94	
Average	14 (10.6%)	118 (89.4%)	4.07	1.97 - 8.41	
Strict	1 (9.1%)	10 (90.9%)	2.34	1.29 - 18.87	
Depression level					0.375
Normal	27 (4%)	651 (96%)	1	-	
Moderate	4 (5.3%)	72 (94.7%)	1.33	0.46 - 1.58	
Average	1 (7.7%)	12 (92.3%)	2.01	0.25 - 1.29	
Strict	0 (0%)	1 (100%)	-	-	

(*) Reflects a statistically significant link.

China. A female predominance was observed in our study as previously reported by several authors including Chatila *et al.* [9] in Lebanon, Van den Houde *et al.* [6] in Belgium and Assogba [19] in Benin. Few studies noted a male predominance of IBS; 53.66% of male predominance with Shah *et al.* [20] in India in 2001

Table 6. Study in multivariate analysis of the socio-demographic factors associated with IBS.

	Coef	Multivariate analysis			
		T-Wald	p-value	OR ajusté	IC (95%)
Dendi and relatives	2.405	6.409	0.011*	11.081	1.721 - 71.331
Otamari and relatives	2.544	8.410	0.004*	12.732	2.281 - 71.058
Unschooling	0.809	2.947	0.086	0.086	0.892 - 5.655
Age	-0.090	29.578	<0.001*	0.914	0.885 - 0.944
Male gender	-0.617	3.928	0.047*	0.540	0.293 - 0.993

(*) Reflects a statistically significant link.

Table 7. Study in multivariate analysis of the link between lifestyle and IBS.

	Coef	Multivariate analysis			
		T-Wald	p-value	OR ajusté	IC (95%)
Frequency of physical activity High	-2.362	95.969	<0.001*	0.094	0.059 - 0.151
Sleep time \geq 6 h	-2.180	82.762	<0.001*	0.113	0.071 - 0.181
Tobacco use	0.739	1.816	0.008*	2.093	1.715 - 6.131

(*) Reflects a statistically significant link.

and 52.9% with Okeke *et al.* [18] in 2009 in Nigeria. The Dendi and Otamari ethnic groups and the origin of Alibori were associated with irritable bowel syndrome with $p = 0.015$ and $p = 0.043$ respectively. This could be explained by the fact that the Dendi and Otamari are usually found in the north of Benin and therefore have a similar lifestyle. Their relocation to the south of Cotonou with the lifestyle changes and the stress resulting from those could have favored the occurrence of IBS. Similarly, dietary habits specific to these ethnic groups and regions could be involved and deserve to be documented. Furthermore, the lower the level of education, the higher the risk of developing IBS. In Benin, the education level of the head of the household strongly influences the living conditions of the household. Low living conditions could therefore be a source of stress and permanent anxiety that could promote the occurrence of this disease.

In our study, a family history of IBS was associated with its occurrence. Here again, lifestyle, familial environment and stress during childhood could play a role. A similar result was reported by Ibrahim *et al.* [21] in Saudi Arabia. Furthermore, Zucchelli *et al.* [22] had shown in two independent cohorts from Sweden and the USA that the rs4263839 G allele of the TNFSF15 gene associated with the risk of Crohn's disease was also significantly associated with an increased risk of IBS ($p = 0.00022$; OR = 1.37) and more pronounced in IBS-C ($p = 0.0000087$; OR = 1.79). Immunologic and generic factors were not addressed in this study.

Clinically, abdominal pain was the predominant GI symptom followed by bowel movement disorders, abdominal discomfort and abdominal bloating. Similar findings have been reported elsewhere by Van den Houte *et al.* [6] in Belgium, Koussoube [23] in Mali and Assogba [19] in Benin. Migraine and asthenia found as predominant extra-digestive signs in our study are quite characteristic as they have also been reported by several studies as dominant extra-digestive signs [16] [19] [24]. The GI dysfunctions found in our study are also reported by several authors including Boucekkine *et al.* [16], Assogba [19], Sehonou *et al.* [24]. These disorders allowed us to declare IBS with predominant diarrhea as the most frequent subtype with a proportion of 34.4%. Van den Houte *et al.* [6] found a similar result in Belgium. However, the mixed subtype was predominant in the study of Ibrahim *et al.* [21] in Saudi Arabia and the predominantly constipated subtype in the study of Boucekkine *et al.* [16] in Algeria. It is therefore difficult to state the predominance of one subtype over another one. Nineteen subjects (59.4%) meeting the Rome IV criteria reported factors that aggravated the symptoms. Diet was reported as an aggravating factor in 46.9% of cases (n = 15). Stress and lack of sleep were reported in 31.3% and 15.6% of cases, respectively. The incriminated foods were: glutinous sauces (40%), meat (26.7%), vegetable sauce (26.7%), oilseeds (13.3%), cassava flour (13.3%), alcohol (6.67%). Sehonou *et al.* [24] in Benin and Koussoube [23] in Mali reported similar results in their studies.

Regarding the patients' lifestyle, regular physical activity, and sleep time greater than 6 hours were protective factors while smoking was a risk factor for the disease. Similar results were reported by Guo *et al.* [10] in China and by Chatila *et al.* [9] in Lebanon. Tobacco use, although primarily a fashion and environmental effect, could also be the result of psychological disturbances or be maintained by them. These disturbances could cause IBS. However, this finding in our study may be due to the link between IBS and ethnicity. Indeed, IBS was related to certain northern ethnic groups in Benin in which tobacco could be frequently consumed because of the tropical climate of their region, which is colder than the equatorial climate of the South. Further studies could therefore investigate possible links between these ethnic groups and tobacco consumption.

Also, in our study there was a statistically significant association between IBS and high-salt and high-fat diet. Similar results have been reported by several authors including Song *et al.* [25] in Korea, Sehonou *et al.* [24] in Benin and Adeniyi *et al.* [26] in Nigeria. Food hypersensitivity was identified as a risk factor for IBS by several authors [17] [21] [26]. Our results are in line with this, as food was identified as the primary factor aggravating IBS symptoms in our study. This only confirms the role of diet in the occurrence of IBS. Moreover, the fact that a diet low in FODMAPs, fats and gluten can significantly reduce symptoms, proves that their involvement in the occurrence of IBS symptoms is not negligible.

Finally, psychological disturbances were also present in our study. Thus, subjects with a high to very high level of stress were the most exposed, as well as those with a moderate to severe level of anxiety. However, there was no link be-

tween IBS and depression. Similar results were reported by Baniyadi *et al.* [27] in Iran and Assogba [19] in Benin. We did not find any studies that reported no association between IBS and psychological disturbances. Our study therefore confirms the significant role of psychological disturbances in the occurrence of IBS. It is important to highlight that the symptomatology of depression in black Africans is different from that of Westerners: somatic symptoms dominate the picture, and the inhibition syndrome is not very marked. The Hospital Anxiety and Depression Scale (HADs) is a scale created based on Western realities and is not adapted to the Black African context. This raises concerns about the appropriate depression diagnostic tools for black Africans. A practical and reliable diagnostic scale should therefore be developed to truly evaluate the role of depression in IBS in Benin.

5. Conclusion

IBS is a common disease in Cotonou and the predominant diarrheic form was the most frequent. IBS is a disease of young women who grew up in the north of Benin and/or have psychological disorders. The modifiable risk factors identified were smoking, high-fat or high-salt diet, stress, and anxiety. Protective factors such as a high level of sleep and regular physical activity were found. Taking these protective factors into account and avoiding risk factors could lead to a considerable reduction in IBS symptoms.

Authors' Contributions

All authors participated in the active writing and editing of the article. All authors read and approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Quigley, E., Fried, M., Gwee, K.A., *et al.* (2016) World Gastroenterology Organisation Global Guidelines Irritable Bowel Syndrome: A Global Perspective Update September 2015. *Journal of Clinical Gastroenterology*, **50**, 704-713.
<https://doi.org/10.1097/MCG.0000000000000653>
- [2] Ducrotté, P. (2009) De la colopathie fonctionnelle à la neurogastroentérologie. *Gastroentérologie Clinique et Biologique*, **33**, 703-712.
<https://doi.org/10.1016/j.gcb.2009.07.006>
- [3] Ducrotté, P. (2013) Physiopathologie des TFI et implications thérapeutiques. *Post U*, 189-196.
<http://www.fmcgastro.org/wp-content/uploads/file/pdf-2013/intestin-irritable.pdf>
- [4] Zisimopoulou, S. and Guessous, I. (2012) Syndrome de l'intestin irritable: Un diagnostic d'exclusion? *Revue Médicale Suisse*, **8**, 1821-1825.
- [5] Sabaté, J.-M. and Jouët, P. (2016) Conseil de pratique. Prise en charge du Syndrome

- de l'Intestin Irritable (SII). Société Nationale Française de Gastro-entérologie. 1-8. <https://www.cnp-hge.fr/syndrome-de-lintestin-irritable/>
- [6] Van den Houte, K., Carbone, F., Pannemans, J., Corsetti, M., Fischler, B., Piessevaux, H. and Tack, J. (2019) Prevalence and Impact of Self-Reported Irritable Bowel Symptoms in the General Population. *United European Gastroenterology Journal*, **7**, 307-315. <https://doi.org/10.1177/2050640618821804>
- [7] Ikechi, R., Fischer, B.D., DeSipio, J. and Phadtare, S. (2017) Irritable Bowel Syndrome: Clinical, Manifestations, Dietary Influences, and Management. *Healthcare*, **5**, Article 21. <https://doi.org/10.3390/healthcare5020021>
- [8] Uzzan, B., Bouchoucha, M., Julia, C., Sabate, J.-M. and Benamouzig, R. (2013) Facteurs nutritionnels dans le syndrome de l'intestin irritable. *Hépatogastro et Oncologie Digestive*, **20**, 335-341.
- [9] Chatila, R., Merhi, M., Hariri, E., Sabbah, N. and Deeb, M.E. (2017) Irritable Bowel Syndrome: Prevalence, Risk Factors in an Adult Lebanese Population. *BMC Gastroenterology*, **17**, Article No. 137. <https://doi.org/10.1186/s12876-017-0698-2>
- [10] Guo, Y.-B., Zhuang, K.-M., Kuang, L., Zhan, Q., Wang, X.-F. and Liu, S.-D. (2015) Association between Diet and Lifestyle Habits and Irritable Bowel Syndrome: A Case-Control Study. *Gut and Liver*, **9**, 649-656. <https://doi.org/10.5009/gnl13437>
- [11] Pickett-Blakely, O. (2014) Obesity and Irritable Bowel Syndrome: A Comprehensive Review. *Gastroenterology & Hepatology*, **10**, 411-416.
- [12] Saito, Y.A. (2011) The Role of Genetics in IBS. *Gastroenterology Clinics of North America*, **40**, 45-67. <https://doi.org/10.1016/j.gtc.2010.12.011>
- [13] Makharia, G.K., Verma, A.K., Amarchand, R., *et al.* (2011) Prevalence of Irritable Bowel Syndrome: A Community Based Study from Northern India. *Journal of Neurogastroenterology and Motility*, **17**, 82-87. <https://doi.org/10.5056/jnm.2011.17.1.82>
- [14] Zhao, Y., Zou, D., Wang, R., *et al.* (2010) Dyspepsia and Irritable Bowel Syndrome in China: A Population-Based Endoscopy Study of Prevalence and Impact. *Alimentary Pharmacology and Therapeutics*, **32**, 562-372. <https://doi.org/10.1111/j.1365-2036.2010.04376.x>
- [15] Michel, D., Jérôme, B., Bruno, B., *et al.* (2004) Irritable Bowel Syndrome in France: A Common, Debilitating and Costly Disorder. *European Journal of Gastroenterology & Hepatology*, **16**, 995-1001. <https://doi.org/10.1097/00042737-200410000-00008>
- [16] Tadjeddine, B., Nekkrouche, M., Baïod, N., *et al.* (2011) Épidémiologie du syndrome de l'intestin irritable de l'adulte à Alger. Société Algérienne d'hépatogastroentérologie (SAHGEED). <http://www.sahgeed.com/upload/files/JE2010/10-BOUCEKKINE.pdf>
- [17] Rachid, M., Mohamed, T., Salwa, O., Fz, B., Fouad, H., Wafa, H., Ahmad, B. and Wafaa, B. (2014) Syndrome de l'intestin irritable: Prévalence et consommation de soins chez un échantillon de la population marocaine. Société Nationale Française de Gastro-Entérologie. <http://www.snfge.org/content/syndrome-de-lintestin-irritable-preval>
- [18] Okeke, E., Ladep, N., Adah, S., Bupwatda, P.W., Agaba, E.I. and Malu, A.O. (2009) Prevalence of Irritable Bowel Syndrome: A Community Survey in an African Population. *Annals of African Medicine*, **8**, 177-180.
- [19] Patrick, A.C. (2018) Syndrome de l'intestin irritable chez les étudiants de l'Université d'Abomey-Calavi: Prévalence, aspects cliniques, thérapeutiques et facteurs associés. Thèse de doctorat en médecine, Faculté des sciences de la santé, Cotonou, 48-67.
- [20] Shah, S.S., Bhatia, S.J. and Mistry, F.P. (2001) Epidemiology of Dyspepsia in the General Population in Mumbai. *Indian Journal of Gastroenterology*, **20**, 103-106.

- [21] Ibrahim, N.K., Al-Bloushy, R., Sait, H.S., *et al.* (2016) Irritable Bowel Syndrome among Nurses Working in King Abdulaziz University Hospital, Jeddah, Saudi Arabia. *Libyan Journal of Medicine*, **11**, Article 30866. <https://doi.org/10.3402/ljm.v11.30866>
- [22] Zucchelli, M., Camilleri, M., Andreasson, A.N., *et al.* (2011) Association of *TNFSF15* Polymorphism with Irritable Bowel Syndrome. *Gut*, **60**, 1671-1677. <https://doi.org/10.1136/gut.2011.241877>
- [23] Seydou, K. (2008) Aspects épidémiologiques et sémiologiques des troubles fonctionnels intestinaux dans les centres de santé de référence à Bamako. Thèse de doctorat en médecine. Faculté de Médecine, de Pharmacie et d'Odonto-Stomatologie de l'université de Bamako, Bamako, 33-79.
- [24] Sehonou, J. and Dodo, L.S.R. (2018) Profil clinique et facteurs associés au syndrome de l'intestin irritable chez les étudiants en médecine à Cotonou (Bénin). *Pan African Medical Journal*, **31**, Article 123. <https://doi.org/10.11604/pamj.2018.31.123.16336>
- [25] Song, S.-W., Park, S.-J., Kim, S.-H. and Kang, S.-G. (2012) Relationship between Irritable Bowel Syndrome, Worry and Stress in Adolescent Girls. *Journal of Korean Medical Science*, **27**, 1398-1404. <https://doi.org/10.3346/jkms.2012.27.11.1398>
- [26] Adeniyi, O., Lesi, O., Olatona, F., Esezbor, C. and Ikobah, J. (2017) Irritable Bowel Syndrome in Adolescents in Lagos. *Pan African Medical Journal*, **28**, Article 93. <https://doi.org/10.11604/pamj.2017.28.93.11512>
- [27] Baniasadi, N., Dehesh, M., Mohebbi, E., Abbasi, M. and Oghabian, Z. (2017) Assessing the Sleep Quality and Depression-Anxiety-Stress in Irritable Bowel Syndrome Patients. *Arquivos de Gastroenterol*, **54**, 163-166. <https://doi.org/10.1590/s0004-2803.201700000-08>