

Etiologies, Clinical Presentation and Outcome of Adult Patients Presenting with Bowel Obstruction on a Virgin Abdomen

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Abstract

Context: Generally in Africa, BO remains the leading cause of acute abdomen. We therefore sought to study the current etiological factors of intestinal obstruction on a virgin abdomen or unhealed abdomen at the central hospital of Yaoundé in order to better understand the main causes and to better anticipate and improve the diagnosis, management and the evolution of intestinal obstruction on a virgin abdomen. **Method:** The patients were prospectively included from June 2021 to May 2022, these patients were recruited from the digestive and emergency surgery units of the Yaoundé Central Hospital during the study period and who met the inclusion criteria, with suspicion of partial or total intestinal obstruction or those with an intraoperative confirmed diagnosis were enrolled. **Results:** We recruited 73 patients including 43 (60.3%) men and 29 (39.7%) women whose mean age was 42.5 years with extremes ranging from 16 to 70 years. Most of them consulted after 72 hours, *i.e.* 65.2% of cases due to self-medication or even prior consultations in the lower level center at the Central Hospital of Yaoundé. The patients retained for this work presented in majority the symptoms according to the abdominal pains, the stop of the materials and gases; meteorism and vomiting. Abdominal wall hernias with incarcerated intestinal loops were the most common cause of intestinal obstruction in an unscarred abdomen in adults at 38.4% of cases, followed by digestive tumors 23.3% and adhesions 17.8%. Exceptionally, a cluster of roundworms was found as the cause of intestinal obstruction in two of our patients. Complications occurred in 25 patients or 31.5% of cases and were dominated respectively by nausea and hematoma (36%), local infections (24%) and malaria (24%). Death occurred in 5 of our patients, or 6.8% of cases, and was mostly caused by hypovolemic shock (40%)

and pulmonary embolism (40%). **Conclusion:** Intestinal obstructions on the abdomen without scarring remain the prerogative of young adults and are caused by strangulated hernias with incarcerated intestinal loops, tumors and adhesions. The rate of complications remains high and they are dominated by infectious pathology. Their mortality is clearly improving.

Keywords

Acute Abdomen, Intestinal Obstructions, Etiologies

1. Introduction

Intestinal obstruction (OI) is defined as an alteration or cessation of the normal flow of intestinal contents from the mouth to the anal canal. This obstruction can be located in the small intestine where it is called upper bowel obstruction or in the large intestine where it is called lower bowel obstruction. Also, some authors have classified bowel obstruction according to the duodenojejunal junction, all obstructions above this junction are called upper bowel obstruction, below the junction are called lower bowel obstruction. This obstruction can be mechanical intestinal obstruction which is defined as conditions that arise when there is failure in the spread of intestinal contents due to obstruction or strangulation, associated with intra-abdominal hypertension and abdominal compartment syndrome. It can also be non-mechanical bowel obstruction which refers to the symptoms of bowel obstruction occurring due to dysfunction of the enteric nerve, smooth muscle, or contraction weakness, including dynamic bowel obstruction, acute enteric vascular ischemia [1]. The etiological factors of OI vary by geographic location with dependence on a people's diets, lifestyles, genetics, and health-seeking behavior as well as access to surgical services [1] [2]. In advanced surgical medical systems such as the United States, the leading cause of obstruction is adhesions (74%), followed by Crohn's disease, neoplasms and hernias [3] and this is similarly reflected in Greece where adhesions (64.8%), hernias (14.8%) and tumors of the large intestine were common etiologies with 76% of patients having low bowel obstruction while 24% had upper bowel obstruction [4]. In low-resource or developing countries, the tendency is for hernias, malignant tumors, adhesions and the unique presence of tuberculous stenoses with a frequency of 14.7% in India [5], while in West Africa West, the main etiologic factor noted was obstructed inguinal hernia (45.7%) with an increased proportion of obstruction due to tumors [6]. Some etiologies are unique to Africa, such as in Mulago five decades ago, *Ascaris Lumbricoides* was found to be a common cause of obstruction [7]. Also in Ethiopia, the most common cause of small bowel obstruction was intussusception (30.9%), followed by small bowel volvulus (30.3%). Large bowel obstruction was caused by sigmoid volvulus (69.0%) followed by colonic tumor (13.8%) [8]. However, although the etiology varies from country to country and there are similar trends, for example, studies

in Ghana have shown that hernias (59%) followed by adhesions and intussusceptions were the most common causes of obstruction [9], while in Nigeria this was similarly reflected with hernias (35%), adhesions (26%) and malignant tumors (9.4%) causing an obstruction [10] [11], usually in Africa, OI remains the main cause of acute abdomen [12]. We therefore sought to study the current etiological factors of intestinal obstruction on a virgin abdomen or an unscarred abdomen at the Central Hospital of Yaoundé in order to better understand the main causes, to better anticipate, to improve the diagnosis, the management load and evolution of intestinal obstruction in a virgin abdomen.

2. Methodes

We conducted a prospective descriptive study at the Central Hospital of Yaoundé from May 2021 to June 2022 which consisted of researching the etiological, clinical and therapeutic factors of patients with intestinal obstruction on a virgin abdomen respecting the inclusion criteria which were (patients of 16 years and above, patients with no prior abdominal surgery). All pediatric cases were excluded as well as patients with metabolic pathology. A pre-established data collection form was used to collect the relevant data (**Appendix 1**). We obtained ethical approval from the Ethics Committee of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé to conduct a prospective observational study with surgical patients admitted to the departments and viceral surgical unit and emergency unit of the Central Hospital from Yaounde, all patients who agreed to participate and who signed the consent form (**Appendix 2**) were recruited. Data were compiled and analyzed using EPI INFO software version 7 and Microsoft Excel 2007. The Chi-square test was used to test the association between variables

3. Results

3.1. Sociodemographic Profile

- Sex

During our study we recruited 73 patients, we had 44 men and 39 women, *i.e.* a sex ratio of 1.5:1 M/F as seen in **Figure 1**.

- Age

Their average age was 42.5 ± 12.9 years with an age varying from 16 to 70 years.

The main group was young adults aged 31 to 40 (28.9%). **Figure 2** shows the age distribution of our patients.

3.2. Clinical and Paraclinical Presentation of Patient

Reason for consultation

The patients mainly presented with abdominal pain (98.63%).

The physical examination of the patients revealed ill-appearing patients with an absence of stools (98.63%), a distended abdomen (97.26%). **Table 1** shows the most frequent complains of our patients during consultation.

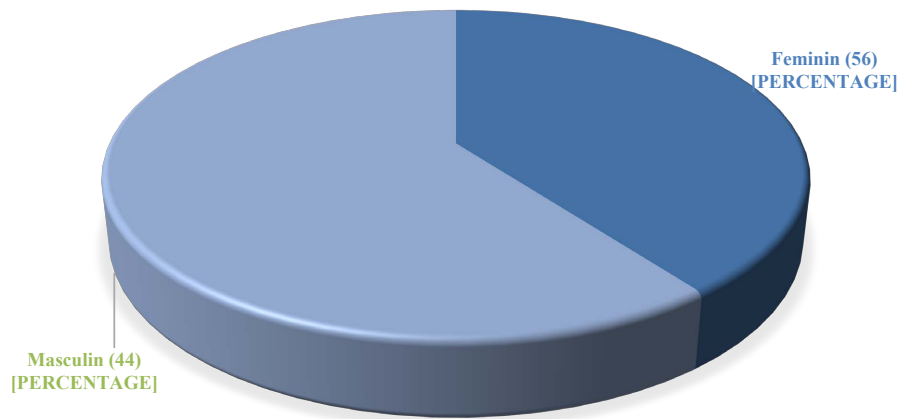


Figure 1. Distribution of patients by gender.

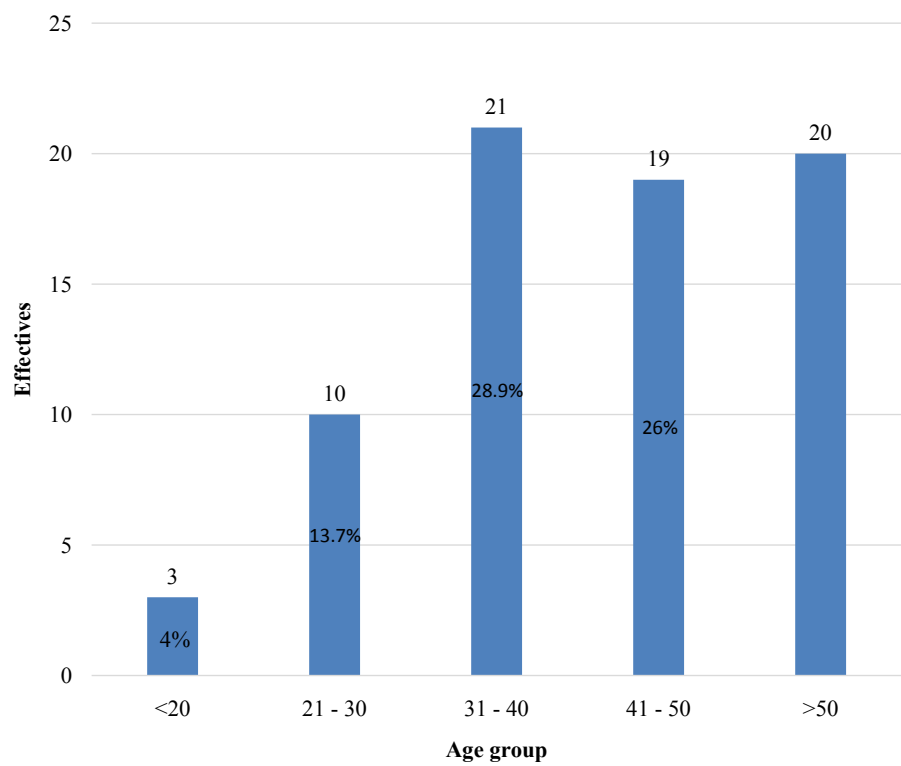


Figure 2. Age distribution.

Table 1. Presentation of patient complaints.

Clinical sytoms	Workforce(n)	Percentage (%)
Abdominal pain	72	98.63
No stool	72	98.63
Distended abdomen	71	97.26
Vomitting	42	57.53
Ill looking	73	100.0 %
Abdominal pain	73	100.0 %

- Duration of symptoms

Most of our patients consulteds 72 hrs after the onset of symptoms giving us 42.9%. **Table 2** shows us the duration of the syptoms.

- Imaging

Most of the patients did not perform any imaging work-up, *i.e.* 54.9%. **Table 3** shows us the percentages of patients who carried out imaging works, which ones they did and those who did none.

Nevertheless, as seen in **Table 4** there was a good concordance between imaging results and intraoperative results in 84.8% of cases.

3.3. Etiologies of Intestinal Occlusions on Virgin Abdomen Found

- Etiologies found

Intraoperative findings of bowel obstruction on a virgin abdomen were dominated by non-tumor etiologies at 74%, the first was obstructed hernias at 38.4%. **Table 5** shows us the divisions between tumoural and non tumoral etiologies and the more detail the specific etiologies found.

Tumor etiologies were dominated by digestive tumors at 23.3%.

Table 2. Duration of symptoms in patients.

Duration	Workforce	Percentage (%)
<24 hours	19	27.1
24 - 48 hours	22	30
>72 hours	32	42.9
Total	73	100

Table 3. Medical imaging performed for diagnostic confirmation of bowel obstruction.

Paraclinical exams	Workforce	Percentage (%)
None	40	54.9
CT scan	14	19.2
Plain abdomnal X-ray	11	15.1
Ultrasound	8	10.8
Total	73	100

Table 4. Consistency of imaging and intraoperative findings.

Examinations carried out	Number achieved	Consistent with the operating findings	Percentage
CT scan	14	12	85.7
Plain abdomnal X-ray	11	11	100.0
Ultrasound	8	5	62.5
Total	33	28	84.8

Table 5. Distribution of patients according to the etiologies found.

Etiology	Workforce (n)	Percentage (%)
A. Non-tumorous	54	74
Strangulated hernias	28	38.4
Peritoneal adhesions	13	17.8
Volvulus	07	9.4
Intussusception	04	5.5
Ascariis	02	2.7
B. tumors	19	26
Digestive tumours	17	23.3
External tumours	02	2.7
Total	73	100

3.4. Etiologies Found According to Sex

In men, the most found etiology was strangulated hernias, *i.e.* 43.2%, while in women, the most found etiology was adhesions. **Table 6** shows us the frequencies of etiology per gender.

3.5. Etiologies Found According to Age

The most represented age group were the young adults of 31 - 40 years with a percentage of (42.8%) having strangulated hernias. **Table 7** shows the age distribution per etiology.

3.6. Patient Care

- Directions

All the patients we received had an acute surgical abdomen for which a diagnosis of bowel obstruction was made. Therefore, surgery was indicated for bowel obstruction syndrome.

3.7. Anesthesia

All our patients, after clinical confirmation and/or imaging of their intestinal obstruction, were evaluated by the anesthetist team.

3.8. ASA Score

The most found ASA score of our patients was ASA 3, *i.e.* 50.7%. **Table 8** shows the variation in the ASA score of our patients.

3.9. Type of Anesthesia

The majority of our patients received general anesthesia. **Table 9** breaks down the different type of anesthesia received by our patients.

3.10. Surgical Procedure

The surgical procedures performed on our patients depended on the intestinal viability and the level of damage to the intestines. The main procedure performed

Table 6. Distribution of etiologies found according to sex.

Etiology	Men		Women	
	N	%	N	%
Strangulated hernia	19	43.2	09	31.0
Digestive tumours	12	27.3	05	17.2
Adhesions	04	9.1	09	31.0
Volvulus	04	9.1	03	10.3
Intussusception	03	6.8	01	3.5
	00	0.0	02	7.0
Ascaris	02	4.5	00	0.0

Table 7. Distribution of etiologies according to age.

Variable	Age group									
	<20 years		21 - 30 years		31 - 40 years		41 - 49 years		>50 years	
	N	%	N	%	N	%	N	%	N	%
Strangulated hernias	02	66.6	02	20	09	42.8	06	31.5	09	45
Digestive tumours	00	0.0	00	0.0	07	33.3	04	21.05	06	30
Adhesions	01	33.3	04	40	04	19.05	04	21.05	00	0.0
Volvulus	00	0.0	01	10	00	0.0	03	15.7	003	15
Intussusception	00	0.0	01	10	01	4.76	01	5.2	01	5
External tumours	00	0.0	00	0.0	00	0.0	01	5.2	01	5
Ascaris	00	0.0	02	20	00	0.0	00	0.0	00	0.0

Table 8. Distribution of patients according to ASA score.

Score ASA	Workforce	Percentage (%)
1	0	0.0
2	22	30.1
3	37	50.7
4	14	19.2
5	0	0.0
Total	73	100

Table 9. Breakdown by type of anesthesia.

Type of anesthesia	Workforce	Percentage (%)
Spinal anesthesia	4	5.5
General anaesthesia	69	94.5

was bowel resection and anastomosis. **Table 10** demonstrates the different procedures carried out.

3.11. Outcome of Operated Patients

Complications

Poor results were mainly associated with bowel obstruction, delay in consultation and poor preoperative score.

A total of 25 patients developed complications, *i.e.* 31.5%. **Table 11** shows us the frequency of the different complications that our patients presented. **Table 12** shows us the complications per etiology. In **Table 13** we see the onset of the different complications per etiology. Finally **Table 14** shows us frequency of complication in relation to the duration of symptoms.

3.12. Mortality

We had 5 cases of death among our patients, a mortality rate of 6.8%. **Table 15** shows us the complications with highest mortality found in our patients. **Table 16** shows us that tumoral etiologies presented with highest mortality and in **Table 17** we see the specific etiology with the highest mortality. Finally in **Table 18** shows us the mortality risk which is elevated with late consultation.

Table 10. Distribution according to surgical procedures.

Procedure	Workforce	Percentage (%)
Herniorrhaphy only	13	17.8
Intestinal resection. anastomosis and herniorrhaphy	13	17.8
Intestinal resection and anastomosis	07	9.6
Intestinal resection and stoma	13	17.8
Bowel emptying and suturing	02	2.7
Resection by adhesiolysis and anastomosis	12	16.4
Intestinal detorsion only	02	2.7
Detorsion and resection	05	6.8
External tumor resection	02	2.7

Table 11. Distribution according to the various complications found.

Complications	Frequency (N = 25)	Percentage (%)
Urinary tract infection	04	16
Surgical site infection	06	24
Deep vein thrombosis	02	8
Malaria	06	24
Bleeding	09	36
Enterocutaneous fistula	04	16

Table 12. Distribution of complications according to etiology.

Intraoperative diagnosis	Workforce	Percentage (%)
Strangulated hernias	06/28	21.1
Peritoneal adhesions	05/13	38.4
Digestive tumours	07/17	41.2
Intussusception	00/04	0.0
External tumours	02/02	100.0
Volvulus	02/07	28.6
Ascaris	01/02	50.0

Table 13. Breakdown by onset of complications.

Variables	Period					
	Immediate		Early		Late	
	N	%	N	%	N	%
Intraoperative diagnosis						
Clogged hernia	01	50	04	23.5	02	33.3
Peritoneal adhesions	00	0.0	05	29.4	01	16.7
Digestive tumours	00	0.0	04	23.5	03	50
Intussusception	00	0.0	00	0.0	00	0.0
External tumours	01	50	01	5.9	00	0.0
Volvulus	00	0.0	02	11.8	00	0.0
Ascaris	00	0.0	01	5.9	00	0.0

Table 14. Frequency of complications according to duration of symptoms.

Duration of symptoms	Frequency	Percentage	P value
<24 hours	02/19	10.5	
24 - 72 hours	06/21	28.5	0.018
>72 hours	17/33	61	

Table 15. Breakdown by cause of death.

Complications	Workforce	Percentage (%)
Bleeding and hematoma	02/05	40
Pulmonary embolism	02/05	40
Septic shock	01/05	20

Table 16. Distribution of mortality according to etiology.

Etiology	Workforce	Percentage (%)
Tumor	3/19	15.8
Non-tumorous	2/17	11.6

Table 17. Distribution of mortality according to etiology.

Intraoperative diagnosis	Workforce	Percentage (%)	P value
Clogged hernia	00/28	0.0	
Peritoneal adhesions	01/13	7.7	
Digestive tumours	02/17	11.8	0.020
Intussusception	01/04	25	
External tumours	01/02	50	
Volvulus	00/07	0.0	
Ascaris	00/02	0.0	

Table 18. Mortality according to duration of symptoms.

Duration des symptômes	Workforce	Percentage (%)	P value
<24 hours	0/19	0.0	
24 - 72 hours	1/21	4.8	0.280
>72 hours	4/30	13.3	

4. Discussion

4.1. Socio-Demographic Profile

4.1.1. Sex

In our study, a total of 73 patients were identified with a male predominance. Our result joins the other results of other authors in Africa like that of Nakanwagi *et al.* in Uganda also with the results obtained by MC Adam *et al.* in Mulango where the male sex was the most dominant [1] [4]. The male predominance can be explained by the fact that men are more involved in heavy work.

4.1.2. Age

The age of the patients varied from 16 to 70 years old, with a mean age of 42.5 ± 12.9 years old, the most represented age group was young adults from 30 to 40 years old leading to all the different etiologies. This was very similar to that of Archampong *et al.* in Ghana [13] who had young adults aged 30 - 45 as the main age group, but contrasted sharply with that of Van Steensel *et al.* in America who found that the main patient age group was >60 [7].

4.1.3. Clinical Presentation

The most common symptoms that presented were colicky abdominal pain, vomiting, abdominal distension and relative constipation. Physical examination of our patients revealed ill-appearing patients with tender abdomens. We had 42.9% who presented after 72 hours of symptoms, only 27.1% of participants presented within 24 hours, this was similar to the results of Nakawangi *et al.* in Uganda and also that of MC Adam in Mulango [1] [4] where most patients presented after 72 hours after onset of symptoms, but was very different from the results of Van Steensel *et al.* America [7] and that of Souvika *et al.* in India where most of

patients consulted within 24 hours. This can be explained by the fact that most of our patients were unemployed, and in our healthcare systems we have direct patient payment, this tends to delay consultation as most patients are struggling financially by compared to those working in the United States with an insurance payment method.

4.1.4. Etiologies

This study showed that hernias were the most common etiology across all areas, contrasting sharply with the findings of Collom ML *et al.* in Europe showing peritoneal adhesions as the most common cause of bowel obstruction [14] and also with that of Pavlidis *et al.* in America who described hernia as a rare etiology of intestinal obstruction [15]. However, our results were very similar to those of Nakanwagi *et al.* in Uganda, where hernias were the main etiology [1]. This finding also reflects the African continent where hernias are the leading cause of bowel obstruction, which may be due to the fact that most young adults are involved in heavy labor such as agriculture, masonry and many more others.

Digestive tumors (23.3%) were the second most predominant etiology in our community more common in young adults 31 - 40 years old, this finding was similar to that of Shittu OB *et al.* in Ibadan where digestive tumors were the second etiology after hernia [3]. This result is also very similar to all the studies carried out in our country by Eloumou AF *et al.* in 2020 which show that patients < 40 years old are more exposed to digestive tumours, in particular colorectal cancer [16]. Nevertheless, it was different from the studies carried out in Europe which rather portray patients > 60 years as being more exposed to digestive tumors [17].

Third, we had peritoneal adhesions (17.8) which were more common in women. This finding was similar to a study in Accra by Archampong *et al.* who had peritoneal adhesions as the third most common cause in women [6]. This could be explained by the high incidence of sexually transmitted infections in our community.

Exceptionally, we had cases of intestinal obstruction by ASCARIS lumbricoides which were similar to the results of Mc Adam *et al.* in Mulango where ascaris obstruction was always a cause. This could be explained by the low knowledge and practice of the population in terms of deworming. Our result was extremely different from that of Van Steensel *et al.* in the United States where roundworm was not found among the etiologies of bowel obstruction (Table 5).

4.2. Imaging

Most of our patients did not perform imaging work up (54.9%), the main reason being financial constraints. However, the CT-scan was performed the most (19.2%) in the emergency room of our hospital, because it gave clearer and more detailed information on the pathology. These results are similar to the results of Souvika in India who present CT as a good imaging workup that gives details on the type, location and nature of the obstruction [18].



4.3. Surgical Procedure

Most patients underwent bowel resection with anastomosis or stoma. This can be explained by late consultations accelerated by intestinal necrosis.

4.4. Outcome of Operated Patients

An overall complication rate of 31.5% was described in our patients. The main complications being bleeding and hematoma (36%) followed by local complications (24%). Complications occurred mainly in young adults aged 31 to 40 who consulted 72 hours after the onset of symptoms. Consultation time was statistically significant with a p-value of 0.018. This result was similar to studies conducted in Ethiopia by Yousef amara *et al.* and in Uganda by Nakawanji *et al.*, in both studies patients who consulted after 72 h after the onset of symptoms were more prone to develop complications [1] [18], this could be explained by the delay of patients seeking care in our community. But our results were very contrasted with those of collom Ml *et al.* in London who had very few complications, however the complications were not due to the time of the consultation because most of their patients consulted within 24 hours of the consultation onset of symptoms [14]

In addition, a large majority of patients who developed complications were diagnosed with digestive tumors (30.4%), this result is similar to a study conducted in university teaching hospitals in our community which shows that patients diagnosed with a digestive tumor are at high risk of complications.

Our study also revealed that patients with a high ASA score had a greater tendency to develop complications. This was statistically significant with a p-value of 0.032.

4.5. Mortality

We observed a total mortality rate of 6.8%. Most of our deceased cases had tumor etiologies (60%) with a mortality rate of 15.8%. This result is similar to recent studies conducted in our country by Eloumou *et al.* which show a high risk

of morbidity and mortality in late diagnosis of digestive tumors [16]. This result was very far from the mortality rate of 2.8% in the study by Pavilidis *et al.* in America [15]. This is mainly because most of their patients consulted and were taken care of early.

We also noticed that cases of death were more frequent in patients who consulted after 72 hours (13.3%). this was very similar to the results of Nakawangi *et al.* in Uganda [1]. This can be explained by the fact that most of these patients had severe intestinal lesions and progressive sepsis. This result was statistically significant with a p-value of 0.280

All of our deceased patients had an ASA score of 4 (100%). Which was statistically significant with a p-value of 0.032.

The main complication associated with the death of our patient was attributed to an embolism. This was closely followed by bleeding leading to anemia.

But some causes of death could not be assessed or purely attributed to post-operative complications due to the immunocompromised state of our patients.

5. Conclusion

Bowel obstruction remains a cause of acute abdomen in our community; it seemed appropriate to us to know the causes and to determine the outcome in patients who have never been operated on. Thus it is found mainly in men aged 31 to 40 years. Most patients presented with abdominal pain, constipation, distension and tenderness, presenting after 72 hours. We experienced a low rate of imaging workups performed by our patients, which was attributed to lack of finance and knowledge. Strangulated hernia first, closely followed by digestive tumors and peritoneal adhesions were the most frequent etiologies. Complications and mortality depend on time of consultation, etiology and ASA score.

Recommendations

- To ministry of public health
 - To organise campaigns for the distribution of albendazole in our rural areas.
- To the FMBS
 - Further studies should be carried on BO-VA in our community.
- To the physicians
 - Faster actions should be posed on patients presenting with BO-VA.
 - Pre operative reanimation such as blood transfusion and post operative reanimation to avoid complications should be done in patients with especially with etiologies of digestive tumours to ameliorate outcome.
 - Close follow up of patients with tumoral in post operative as they are at high risk of developing complications.
 - Patients with ASA score of 4 should be systematically sent to intensive care unit after surgery.
- To hospital administration.
 - To encourage the insurance paying method especially at the emergency unit. As this will accelerate the management of patients.

Conflicts of Interest

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

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Appendix 1: Questionnaire

DATA COLLECTION SHEET

Number of file:

Date:

Phone Number:

N°	Question	Code	Answer
SECTION 1: Identification and sociodemographic parameters			
Q1	Place of recruitment (SERVICE)	1 = CHIPED 2 = VISCERAL 3 = BU 4 = FONTAN	
Q2	Age\SEX		
Q3	Nationality	1 = Cameroonian 2 = Other	
Q4	If cameroonian what region	1 = Adamaoua 2 = Center 3 = East 4 = Extreme North 5 = Littoral 6 = North 7 = Northwest 8 = West 9 = South 10 = South west	
Q5	Marital status	1 = Married 2 = Single 3 = Divorced 4 = Cohabitation 5 = Widow	
Q6	Level of education	1 = No level 2 = Primary 3 = Secondary 4 = University	
Q7	Profession	1 = Student 2 = Housewife 3 = Liberal 4 = Non liberal 5 = Other	
	If other, specify		
Q8	Religion	1 = Catholic 2 = Protestant 3 = Pentecostant 4 = Muslim 5 = other	
	If other, specify		
SECTION 2: PAST HISTORY			
Past medical history			
Q27	Diabetes	1 = Yes 2 = No	
Q28	HTN	1 = Yes 2 = No	
Q29	Tuberculosis	1 = Yes 2 = No	
Q30	Blunt Abdominal trauma		
Q31	Pancreatitis		
Q32	Tubo-ovarian abcess		
Q33	Others, if yes precise		
Past Surgical History			
Q34	Have you ever been operated	1 = Yes 2 = No	
Toxicology			
Q35	Alcohol	1 = Yes 2 = No	
Q35a	If yes alcohol calculate Index		

Continued

Q36	Smoking	1 = Yes 2 = No
Q36a	If yes calculate pack years	
Mode of life		
Q37	Physical activity. If yes which	1 = Yes 2 = No
Q37a	Jogging	1 = Yes 2 = No
Q37b	Walking	1 = Yes 2 = No
Q37c	Running	1 = Yes 2 = No
Q38	Consumption of vegetables	1 = Yes 2 = No
Q39	Consumption of Fruits	1 = Yes 2 = No
Q40	Excessive Consumption of sugar	1 = Yes 2 = No
Family history		
Q41	Are they diabetics in 1 st Degree family	1 = Yes 2 = No
Q42	If yes Type 1	1 = Yes 2 = No
Q43	Type 2	1 = Yes 2 = No
Q44a	MALIGNANCIES	1 = Yes 2 = No
Q45b	If yes specify	
Section 4: Functional signs		
Q46	VOMITING	1 = Yes 2 = No
Q47	CONSTIPATION	1 = Yes 2 = No
Q48	ABDOMINAL PAIN	1 = Yes 2 = No
Section 5: HISTORY OF COMPLAINTS		
Q49	Duration of symptoms	State
Section 6: Physical examination		
	1) BP:	
	2) pulse:	
	3) respiratory rate	
	4) temperature	
	5) Anesthesiste score	
Q50	Diagnosis at entry	
		1 = ultrasound
Q51	Workup done	2 = CT scan
		3 = Plain abdominal xray
Q52	RESULTS OF WORKUPS	
Q53a	PER OPERATORY DIAGNOSIS	
Q53b	DISCOVERIES	
Q53c	GESTURES	
Q54	COMPLICATIONS	1 = YES 2 = NO
	IF YES STATE THE COMPLICATION WITH RESPECT TO TIME OF ONSET	
	1 = IMMEDIATE (0 - 24 HRS)	
	2 = EARLY (DAY2 - DAY5)	
	3 = LATE (>DAY5)	

Appendix 2: Participant Consent Form

(English version)

Mr./Mrs./Ms.....

Title: "AETIOLOGIES OF BOWEL OBSTRUCTION ON A VIRGIN ABDOMEN IN THE CENTRAL HOSPITAL OF YAOUNDE".

The final year Medical Student, **EL ALAOUI MOUNJID Khadija Emmanuella**, proposed to me to participate in a study they are carrying out at the Yaounde Central Hospital (HCY) in view of her M.D. Thesis. This study has as main aim to

She précised to me that I was free to accept or refuse the proposal. I have received and understood the following information:

- The aim of this study
- The procedure
- Possible constraints and risks

I accept that my medical records be consulted by the research personnel and used for research purposes only. My medical record will be discussed with me at the end of the study. My participation can be interrupted at any time if the principal investigator deems it necessary or if I wish. All data concerning me will be strictly confidential. Only the research personnel, and eventually a health authority representative will be given access to my data. The research protocol for this study has been reviewed and validated by the institutional committee of research and ethics of the Faculty of Medicine and Biomedical Sciences. At any time, I can ask for supplementary information from the student investigator **EL ALAOUI MOUNJID Khadija Emmanuella**, using the phone number: **651744547**.

I hereby accept to participate in the study under the aforementioned conditions. A signed copy of this consent form will be given to me and will serve its purpose in time of need.

Date:/...../.....

Investigator's signature

Volunteer's signature