



Research Article

Trauma of Abdominal Hollow Organs of Adolescents and Adults in Douala: Epidemiology, Clinical Features, Management and Complications

Traumatismes des Organes Creux de l'Abdomen chez les Adolescents et les Adultes à Douala : Épidémiologie, Caractéristiques Cliniques, Traitement et Complications

Engbang Jean Paul^{1,2}, Mantho Pauline^{1,2}, Nyanit Bob Dorcas³, Mvondo Onana Valery¹, Edima Gladys¹, Ntama Ambroise^{1,4}, Essola Basile¹, Essomba Noel^{1,2}, Marcelin Ngowe Ngowe^{1,3}

Affiliations

1. Faculty of Medicine and Pharmaceutical Science. The University of Douala, Douala, Cameroon
2. Douala Laquintinie Hospital, Douala, Cameroon
3. Faculty of Medicine and Biomedical Sciences. The University de Yaounde I, Yaounde, Cameroon
4. Douala Military Hospital, Douala, Cameroon

Auteur correspondant

Engbang Ndamba Jean Paul
Faculty of Medicine and Pharmaceutical Sciences. The University of Douala.
Tel: +237696770259
Email: jean_pen@yahoo.ca.

Key words: Trauma of hollow organs, abdomen, diagnostic, treatment, Douala

Key words: Traumatisme des organes creux, abdomen, diagnostic, traitement, Douala

ABSTRACT

Introduction. The aim of our work was to epidemiology, clinical features, management and complications of trauma to abdominal hollow organs in Douala. **Methodology.** We carried out a retrospective and analytical study in four hospitals in the city of Douala over a period of 10 years from January 1st, 2012 to December 31st, 2021.. **Results.** We included 101 files in our study. The average age was 32,3 years with a sex ratio of 4.94. Assaults were the most frequent circumstances of occurrence (49.5%). Abdominal wounds were found in 65.3% cases and signs of peritonitis were present 62.0% of patients. Anaemia was present in 52.5% of patients. All our patients underwent laparotomy and the small intestine was the most affected organ in 59.4% of cases. The morbidity rate was 12.9% and the mortality rate 7.9%. Pale conjunctiva (OR= 8.167; p<0.0001), moderate anaemia (OR= 8.750; p=0.032), duration of hospitalization between 6 and 10 days (OR= 8.000; p=0.033), between 11 and 15 days (OR=20.250; p=0.018) were significantly associated with morbidity. Mortality was significantly associated with: conjunctival pallor (OR=52.182; p<0.0001). **Conclusion.** In our study, hollow organ trauma, although infrequent, is the source of a high morbidity and mortality rate. Knowledge of the latter would undoubtedly improve the prognosis of this pathology.

RÉSUMÉ

Introduction. Les traumatismes abdominaux sont des lésions produites au niveau de la paroi abdominale et/ou de son contenu par un agent externe. Le but de notre travail était d'étudier les aspects épidémiologiques, cliniques, thérapeutiques et pronostiques des traumatismes des organes creux à Douala. **Méthodologie.** Nous avons réalisé une étude rétrospective et analytique dans quatre hôpitaux de la ville de Douala sur une période de 10 ans, du 1er janvier 2012 au 31 décembre 2021. **Résultats.** Nous avons inclus 101 dossiers dans notre étude. L'âge moyen était de 32,3 ans avec un sex-ratio de 4,94. Les agressions étaient les circonstances les plus fréquentes d'apparition (49,5%). Les plaies abdominales ont été retrouvées dans 65,3% des cas et des signes de péritonite étaient présents chez 62,0% des patients. L'anémie était présente chez 52,5% des patients. Tous nos patients ont subi une laparotomie et l'intestin grêle était l'organe le plus touché dans 59,4% des cas. Le taux de morbidité était de 12,9% et le taux de mortalité de 7,9%. La conjonctive pâle (OR= 8,167 ; p<0,0001), l'anémie modérée (OR= 8,750 ; p=0,032), la durée d'hospitalisation entre 6 et 10 jours (OR= 8,000 ; p=0,033), entre 11 et 15 jours (OR= 20,250 ; p=0,018) étaient significativement associées à la morbidité. La mortalité était significativement associée à : la pâleur conjonctivale (OR= 52,182 ; p<0,0001). **Conclusion.** Dans notre étude, les traumatismes des organes creux, bien que peu fréquents, sont la source d'un taux élevé de morbidité et de mortalité. La connaissance de ces derniers améliorerait sans aucun doute le pronostic de cette pathologie.

INTRODUCTION

Abdominal trauma (AT) is lesions produced at the level of the abdominal wall and or its contents by an external agent [1]. AT can either be closed (contusion) respecting the parietal continuity and responsible for visceral lesions or opened by rupture of the parietal continuity (wounds) [2].

Anatomically we have trauma of full organs and hollow organs (stomach, small intestines, bladder, uterus, colon,

and rectum) [3]. Trauma of hollow organs (THOs) is uncommon but potentially catastrophic conditions with high mortality and morbidity rates [3]. Closed trauma of hollow organs account for 3 to 5% AT in the world [3]. In the United States of America, opened trauma of hollow organs account for 11% [4]. In Niger, opened trauma of hollow organs account for 17.4% of AT [5]. A study done by Andrea et al. in 2017 showed that, the mean age of THOs was 40 years, dominated by male sex (79.2%) and

contusions was the predominant cause of THOs (81.6%) [6]. A study done by Lexandru et al. showed small bowel injury the most frequent in was 24 cases, a gastric injury in 4 cases, the remaining 11 cases were injury of colon [7]. According to Ndong A et al, a study in 2018, showed that in the group of contusion of THOs, the main aetiologies were road traffic accidents (RTA) (54.1%), followed by assaults (21.4%) and lastly falls and that of wounds were dominated by assault either with a knife (96.8%) or fire arm (3.2%) [8]. Taking into consideration that AT of hollow organs lead to peritonitis by perforation, signs are often progressive over 24 to 72 hours [9, 10]. Symptoms mostly encountered are pain [9, 10]. General signs are in relation with haemorrhagic shock (pale conjunctiva, intense thirst, sweating, tachypnoea, tachycardia and low blood pressure) [9, 10]. Physical signs we have; guarding, rebound tenderness, bowel sound absent, a violent pain in the Douglas pouch reflecting peritoneal irritation [9,10]. Biological investigations of all THOs are done as soon as possible [11]. Abdominal CT scan is the choice when we are face with an emergency [11]. Abdomino- pelvic ultrasound does not permit the characterisation of effusion in perforation of hollow viscus [11]. Diagnostic peritoneal lavage remains the best diagnostic means of blunt bowel and mesenteric injuries compared to the scan [12]. Plain abdominal x ray for detection of gas effusion [11]. Management of HVI begins from the transport of the patient to the specialised unit by immediate re-animation [13,14]. Association of clinical signs and radiological signs help the surgeon to decide between surgery and non-surgery treatment [13,14]. In case of haemodynamic instability, an abbreviated damage-control laparotomy (DCL) should be performed [13,14]. Surgical treatment of small intestine lesions, favours immediate repairs (simple suture, anastomosis resection). We have systemic and surgical complications in THO [13,14]. The prognosis depends on the severity of the organ injured, haemodynamic state of patient, associated extra-abdominal lesion and treatment efficiency [15]. In Cameroon, a study done by Savom et al. in 2021 in Yaoundé showed that the aetiologies of AT were dominated by road traffic accident (53%), contusions (69.56%) and wounds 30.44% of cases [16]. Engbang et al. carried out a study in two hospitals in the city of Douala from 2018 to 2020 showed 22% of AT, wounds represented 27.9% and contusions 72.1% with a male sex mostly affected and average age between 20 and 39 years [17]. Our study aimed to assess the cause, the pattern of injury, various management strategies used, clinical outcome and associated factors with the prognostic.

PATIENTS AND METHODS

It was a cross sectional and analytic study conducted at the general hospital of Douala, Laquintinie hospital of Douala and the Douala gynecologic-obstetric and pediatric hospital of Douala, and Military hospital of Douala, from the 1st of January 2012 to the 31st of December 2021. The study included all patients from 16 years and above admitted with abdominal trauma either blunt or penetrating and the clinical or radiological study or the post-operative findings show hollow viscus injuries

(contusion, serosa tear or perforation). We performed a sorting of files and registers of general surgery wards, casualty ward, theatre ward, surgical consultation register of the 4 hospitals of our study looking for data on patients with abdominal trauma and trauma of hollow organs. After finding the files, we proceeded by filling the data collection form in which inclusion criteria were included and hence exclusion criteria excluded. Missing information was obtained by making phone calls to patients. Files were selected accordingly to the inclusion and exclusion criteria's. Variables collected were: Socio-demographic, clinical and paraclinical, treatment and evolution.

RESULTS

In our series, we identified among the 371 files of patients with abdominal trauma, 141 files of patients with hollow organ damage. Which represents a prevalence of 38.05%. In total, 84 (83.2%) cases were men; 20 to 30 year olds were the most represented with 38 (37.6%) cases. The average age of our study population was 32 ± 12.7 years with a median age of 30 years and extremes ranging from 18 to 78 years. In men, we had an average age of 30.88 ± 11.66 years. Among women, the average age was 39.7 ± 15.28 years. All our patients consulted in the emergency department after having been victim of an assault, in 50(49.5%) cases, which took place in most cases between 6pm and 12pm in 34(34.0%) cases. Assault with sharp objects (knife, glass) were the most recurrent in 45(44.6%) cases. The means of transport from the scene of accident to the hospital mostly used was motorcycles with 59(58.4%) cases. The vast majority of our cases had no medical past history in 93(92.1%) cases, had never been operated in 99(99.0%) cases and 91(90.0%) did not consume tobacco. Meanwhile in the past surgical history, the 2(2.0%) cases represented hernia repair. Abdominal pain was present in all our patients. Its location was mostly generalised with 22(21.8%) cases, followed by vomiting in 19(18.8%) cases. All of our patients at entrance were afebrile and for the vast majority were hemodynamically stable with normal blood pressure in 78(78.8%) of cases. The mean of the Glasgow score was 14.56 ± 1.28 . The state of consciousness was normal in 86(85.1%) of patients. Abdominal wounds were the most common with 66 (66.3%) cases and were mainly located at the Periumbilical region in 15(22.7%) cases and linear in shape in 14(48.3%) cases. The majority of our patients presented guarding in 65(65.0%) of cases. Rebound tenderness orienting to peritonitis was observed in 62(62.0%) of our patients. Dullness was the most frequent sign on percussion with 58(57.4) cases and diminished peristalsis was observed in 50(58.9%) of cases. In our study, anaemia was present in 53(52.8%) of our patients and level of white blood cells count was normal in 80(79.2%) of cases. Ultrasound was performed in 37(37.8%) of our patients and the vast majority were normal that is 11(29.3%) patients. In patients with an ultrasound abnormality, gas effusion was the most encountered in 20(76.9%) cases. Plain abdominal x-ray was performed in 21(20.8%) of patients and among these patients 16(76.2%) presented gas under the diaphragm.

The chest x-ray was performed in 7(6.9%) of patients and among these patients, 5(71.4%) had a pneumothorax. Finally, computed tomography scan (CT-Scan) was performed in 7(6.9%) of our patients and 5(71.4%) presented a hemoperitoneum. 2 (28.6%) had an associated solid organ lesion. In our study, Peritonitis was the most encountered diagnostic in 71(70.3%) cases. Some patients came with evisceration (15, 14,8%). Orthopaedics lesions were associated with trauma of hollow organs in 10(9.9%) cases. Ninety-two patients (91.0%), arrived at the emergency department less than 6hours after the injury. All patients' received painkillers and 2nd line pain killers was the most frequently used in 89(88.1%). Di-antibiotic therapy was mainly used in 54(54.0%) of our patients and most received an imidazole in 94(94.0%). The majority were operated 6 hours after the injury (69 cases; 69.0%) and with a mean delay time of 5.41±3.50 hours, all had undergone a laparotomy. The most affected organ was the small intestines with 60(59.4%) cases. The most affected part of the small intestines was the Ileum with 33(55.0%) The colon was affected in 32(31.7%) cases among which the ascending colon was the most affected with 9(28.1%) cases (**Table I**).

Table I. Distribution of patients according to surgical characteristics

Variables	N	%
Surgical delay time(hours)		
[0- 6[69	69.0
[6- 12[24	24.0
[12- 18[6	6.0
[18- 24[1	1.0
Type of surgery		
Laparotomy	100	100.0
Laparoscopy	-	-
Injury organs		
Small intestines	60	59.4
Ileum	33	55.0
Jejunum	26	43.3
Duodenum	1	1.7
Colon	32	31.7
Ascending colon	9	28.1
Sigmoid colon	8	25.0
Transverse colon	7	21.8
Cecum	6	18.8
Descending colon	2	6.3
Stomach	21	20.8
Rectum	1	1.0

The most encountered associated organ damage was the liver with 3(2.9%) cases. A primary suture of perforation was frequent with 86 (85.1%) cases (**Tableau II**).

Table II. Associated lesion and surgical gestures

Variables	N	%
Associated Lesion		
Liver	3	2.9
Kidney	1	0.9
Spleen	2	2.0
Bladder	2	2.0
Gestures		
Suture of perforation	86	85.1
Resection Anastomosis	10	10.0
Stomy	5	4.9

Thirty-four patients (35.4%) cases had a hospital stay of between 6 and 10 days. The morbidity in our series was 13(12.9%) cases, among the 13 who presented a post-operative complication, 8(61.5%) cases were an infection at the site of operative wound and which thus represented the most frequent complication. Mortality was 8(7.9%) cases. The most common cause of death was septic shock in 6(75.0%) cases. We decided to look for factors related to postoperative morbidity. the bivariate analysis showed us that, among the patients who presented a complication, the majority were aged between 20 and 30 years, i.e. 6 (46.2%) cases and of male sex with 9 (69.2%) cases. There was no association between age, sex and morbidity. Among the patients who had complications, the majority, 7 (53.8%) patients, clinically had pale conjunctiva on arrival at the emergency room. Pale conjunctiva was statistically associated with morbidity (OR= 8.167; p=0.001). There was no relationship between the Glasgow score, the presence of hemodynamic instability, evisceration, type of abdominal trauma, causative agent and morbidity he majority of 3 (42.9%) patients who presented a complication had moderate anaemia. Duration of hospitalization ≥20 days was more frequent in patients who presented a complication with 5 (38.5%) cases. Moderate anaemia (OR= 8.750; p=0.032), hospital stay between 6 and 10 days (OR=8.000; p=0.033) hospital stay between 11 and 15 days (OR=20.250, p =0.018) were factors statistically associated with morbidity. The majority of patients who developed a complication did not receive an emergency transfusion that is 8 (61.5%) patients. There was no relationship between transfusion and complications. Bivariate analysis for the search for factors related to mortality showed that, among the deceased, patients aged between 30 and 40 years were the most common, that is 5 (62.0%) patients. The calculation of the link between age and death could not be made due to the small size of our sample. Male patients mostly died 5 (62.5%) cases. There was no relationship between gender and mortality (p=0.121). Among the deceased patients, 7 (87.5%) had pale conjunctiva on clinical examination, 4 (50.0%) had a normal Glasgow score, 5 (71.4%) a hemodynamic instability. Conjunctival pallor (OR= 52.182; p = 52.182), Glasgow score between 11 and 9 (OR=6.833; p=0.022), hypotension (OR= 20.5; p=0.001) were statistically associated with mortality. There was no association between the type of trauma, the causative agent and mortality. Severe anaemia accounted for the majority of deaths in 4 (66.7%) patients. Patients who received a blood transfusion had a higher mortality rate of 6 (75.0%) patients. Complications were more frequent in deceased patients, 5 (62.5%) cases. Severe anaemia (OR=48.0, p=0.002); transfusion at emergency (OR=18.462; p<0.001), the presence of complications (OR=17.708; p<0.001) were significantly associated with mortality. After multivariate analysis, pale conjunctiva, moderate anaemia, length of hospitalisation between 6 and 15 days were not independently significantly associated with morbidity

DISCUSSION

In our study, we identified 371 cases of abdominal trauma and 141 cases of patient files with trauma of hollow organ which gives us a prevalence of 38.05%. Which is closed to the results found by Dembele et al., who found a prevalence of trauma of hollow organs to be 23% among the abdominal traumas [18]. Our result is different from those found by Choua et al in 2019 in Chad who found a prevalence of 65.78% [19]. This difference could be explained by the fact that the latter had as a study population not abdominal trauma but penetrating wounds of the abdomen responsible for a greater damage to abdominal hollow organs. The age group in our study was from 16 years and above. Mean age was 32.3 ± 12.7 years and the age group most found was from the third decade of life (age group 20 to 30) with a percentage of 37.6%. This is the most productive age group. This result is in line with that of R.B Dhaded et al. in India in 2016, age group most found was 21 to 30 with a percentage of 38,3%) and that of Reina Khadilar et al. in 2015 in India which showed maximum number of cases was between 21 to 30 years of age (48%) [20,21]. Moreover, in line with a study done by Bushra K et al. in Pakistan in 2018 showed the mean patient age to be 31 ± 13 years and with Cameroon a study done by Engbang C et al. in 2021 showed most affected age group to be 20 to 39 years with a percentage of 63% [17,22]. This similarity with these several studies is indicting that young people are more susceptible to trauma of hollow organs, this frequency peak corresponds to the stage of life where medico-legal acts through delinquency or violence are frequent in our country. As a result, they are exposed to assault from the street. But results are inferior to the study of Aarab et al. in Morocco and Sakoumy et al. Also in Morocco, and can be explained due the limited sample size [23, 24]. In our study, the results found a male predominance at 83.2% compared to female sex 16.2% with a sex ratio of 0.2. This is comparable with Reina Khadilkar et al. in India, which also showed hollow organs trauma more common in males. Engbang et al. in Cameroon in 2021, Dembele BT et al. in Mali, which also showed it is more common in males [17, 18, 21]. It is consistent with data from literature that showed trauma of hollow organs to be more frequent in male than in female because they are the principal users of motorcycle, bicycle, cars, assault.

Our study showed that all patients were admitted at the emergency, brought in by a non-medical entourage on a moto bicycle or car (58.4%). These results can be compared with that of Choua et al. in 2019 in Chad were the method of transport was mostly private cars with 85% of cases [19]. Assault with sharp objects (knives, glass etc) accounted for 44.6% of aetiologies. This result is close to the results found by Ndong et al in Senegal, Ouchemi et al. in Chad, Dembele et al., which also found assault with sharp objects where the most frequent with percentages of 54.4%, 37.5% and 39.5% respectively [8, 18, 19]. This might be due to the easy acquisition and handling of sharp objects. Unlike Sanjay et al. [25] in India, Kommunuri et al in 2021 in New Zealand, Matsushima et al. in 2021 in the United states of America, found public road accident as the most frequent aetiology at respective percentages of 74%, 92%, 73% [25-27]. This difference could be

explained by the better development of road infrastructures and a greater number of vehicles circulating in the west, thus increasing the frequency of accidents on public roads. Also, in Pakistan in study done by Bushra et al in 2018 showed firearm to be the first injuring agent which can be explained with attack by terrorists [22]. Abdominal pain was the main symptom found in our study and was present in 100% of our patients, followed by vomiting 15.5%. Findings are also comparable with the study of Dhaded et al, showing abdominal pain in 85%, followed by distension in 50% and Shrihari et al reported pain in abdomen (96%) and Abdominal distension (50%) was the second most common symptom [20, 28]. The mean of the score of Glasgow in our study was 14.56 ± 1.28 and only 1.0% of our population had a Glasgow score less than 8. Our results are contrary to those found by Mingoli et al in 2017 in Italy, who found a mean of 10.2 and those of Matsushima et al in 2021 in the United State of America, who found a frequency of 18% for a Glasgow score < 8 [5, 27]. This could be explained by the fact that in their studies, road accident was the most encountered aetiology and are most often associated with other extra-digestive disorders unlike assault with sharp objects which was the most encountered in our study.

Abdominal wounds were the most common type of trauma with 65.3% of cases, which is similar to the results of Dembele et al, Mingoli et al in Italy, Katsushima et al. in United State of America, also found abdominal wounds with respective percentages of 62.8%, 81.6%, and 64.7% [6, 18, 27]. Hemodynamic instability with hypotension was found in 15.2% of our patients. Our results are similar to those found by Essomba et al. in Cameroon in 2000, Wadhwa et al. in 2021 in India, Mingoli et al. in 2017 in Italy, who respectively found a state of hemodynamic shock with hypotension in 22.22%, 18.0%, 11.2% [6,29,30]. Contrary to Omer et al. in 2014 in Sudan, who found a higher percentage of 27.1%, this could be explained by the fact that in this study the most frequent aetiology was firearm injury responsible for much more serious lesions than those with sharp objects [31]. On clinical examination, pallor was found in 17.8% of our patients, this is similar to the result found by Choua et al., who found pallor traumatised abdominal hollow organs at 11.1% [19] The peri-umbilical region was the most affected region in our study with 22.7 of cases. Choua et al, also reported result with a predominance at the umbilical region with 25.7% [19]. On palpation, tenderness was present in 62% of our patients; we noted the presence of signs of peritoneal irritation in 65% of our patients. This is comparable to the results of Essomba, Dembele et al, Sanjay et al., who respectively found signs of peritoneal irritation in 50%, 58.1%, and 61% [18, 25, 29]. This could be explained by the fact that, lesion of hollow organs causes discharge of liquids either bloody, faecaloid, or gas in the peritoneum, responsible for irritation and inflammation of the peritoneum. Anaemia was present in 53.2% of our patients and the mean of haemoglobin level was 11.482 ± 2.40 g/dl. Our results are similar to those of Ndong et al. in Senegal in 2019, who found an average haemoglobin level of 12.7 ± 2.1 g/dl, and

different from those of Mingoli et al in 2017 in Italy who found lower average of haemoglobin level of 10.2 g/dl [6, 25]. This could be explained by the fact that in their study, the most frequent aetiology of trauma of hollow organs was public road accident contrary to ours, which was assault with sharp objects and in which polytrauma was associated in 40.2% of their patients. Plain abdominal x-ray was performed in 20.8% of our patients which is close to the results found by Omer et al, that is 24.9% of patients. Unlike Essomba et al. in 2000, in Cameroun where plain abdominal x-ray was done in 66.66% of patients [29, 31]. This could be explained by the fact that this study dates from the 2000s at this time there was less accessibility to other diagnostic imaging modalities and plain abdominal x-ray was thus the main pillar for the radiological diagnosis of hollow organ trauma. In our study, air under the diaphragm was observed in 76.2% of cases, which is closed to the results of Dembele, who found a percentage of 75%. Contrary to the results found by Essomba, Sanjay et al, who found air under the abdomen in 33.33% and 30% of patients respectively [18, 25, 28]. Regarding management, 18.8% of patients benefited from a per-operative transfusion. Our result differ from those of Abebe et al. who had found a percentage of transfusion of the order of 36.4% because in his study, abdominal trauma and particular orthopaedic lesions were frequently associated due to a greater frequency or public road accident which was also the most frequent aetiology in his study [32]. The average surgical delay time of our study was 5.41 ± 3.50 h with the median of 4.07h. Our results are closed to that of Omer et al., who found a mean of 2.6 ± 0.8 h. But different to those of Wadhwa et al., who found a median of 12 hours, Mingoli et al who found an average of 12 ± 8 hours, Mnguni in South Africa, an average of 11.7h [6, 30, 31, 33]. Abebe et al. in 2019 in Ethiopia who found a longer average time of 16.7 hours [32]. All our patients benefited from a laparotomy, which is close to the results of Jha et al in 2014 in India where the majority of patients that is 87.5% benefited from it. The small intestine was the most affected hollow organ as described in the literature in general [18, 20, 25, 34]. The average length of hospitalization of our patients was 13.6 ± 8.31 days. This result is close to the results found by Essomba et al, Wadhwa et al, who have respectively found the length of hospitalisation of 13 days and 12.2 days [29, 30]. Unlike, Kommunuri et al, Watts et al who found longer average length of 22 days and 19 days respectively [3, 26]. This can be explained by the fact that in developing countries the patients were discharged a little earlier than in western countries in order to limit the costs linked with hospitalisation. The morbidity in our study was evaluated at 12.9%, which is close to the results of Choua et al, Mnguni et al who found the presence of complication in 11.1%, 12.2% respectively [19, 33]. Unlike Sanjay et al, Mingoli et al, Kommununi et al, who found a morbidity rate of 39%, 36.1%, 82% respectively [6, 25, 30]. This could be explained by the greater frequency of associated lesions in these studies, thus increasing the risk of the appearance of postoperative complications. The most common complication was infection at the site of

operation, and this accounted for 61.5% of all complications. Similar results have been found by a large number of authors in the literature, and this could be explained by the fact that during trauma of hollow organs, the faecaloid digestive content rich in microbes contaminates the surgical wound, thus making it septic. Mortality in our study was 7.9%. similar to the data found by, Abebe et al, Sanjay et al, Jophia et al, who respectively found a postoperative mortality rate of 8.5%, 7%, 5% [25, 26, 32]. Unlike Choua et al, who found a slightly higher mortality rate of around 11.9%, which can be explained by a lower quality of the technical platform [19]. In our studies, there was no correlation between sex and morbidity ($p=0.150$), sex and mortality ($p=0.526$). Similar results were found by Arikanoğlu et al either with a $p=0.711$ morbidity and $p=0.357$ mortality, Mingoli et al that is a $p=0.360$ for morbidity and 0.814 for mortality [6, 35]. The Glasgow score was not associated with morbidity in our study but rather with mortality where patients with a Glasgow score between 11-9 had a significantly higher death rate compared to patients with normal Glasgow ($p=0.022$). Our results are similar to those of Mingoli et al did not find a relationship between the Glasgow score and complications $p=0.059$ but rather between the Glasgow score and mortality $p=0.000$ [6]. Watts et al in 2010 in the United State of America found no correlation between the Glasgow score and mortality ($p=0.837$) [3]. Hemodynamic instability was not associated with complications $p=0.318$ in our study but with mortality $p=0.001$. Similar results were found by Arikanoğlu et al who found no association between a state of shock and the occurrence of complications ($p=0.469$) [35]. But rather with mortality ($p=0.0428$). the same was true for Mingoli et al where the respective p-values for morbidity and mortality were 0.823, 0.016 [6]. Abebe et al, and Mnguni et al also found an association between mortality and hemodynamic shock with p-values of 0.041 and 0.000 respectively [32, 33]. Watts et al. did not find any relationship between hemodynamic instability and death $p = 0.132$ [3]. In our study, there was a relationship between moderate anaemia and morbidity $p=0.032$, between severe anaemia and mortality $p=0.002$. Mingoli et al did not find any relationship between anaemia and complication ($p=0.134$) but a relationship between anaemia and mortality $p<0.001$ [6]. Mnguni et al also found a link between anaemia and mortality $p = 0.020$ [32]. We found a relationship between emergency transfusion and mortality $p=0.000$ and no relationship between transfusion and morbidity $p=0.062$. which is similar to the results of Mnguni et al., which did not find a link between blood transfusion and complication $p = 0.062$ but rather with mortality $p < 0.001$ [33]. Abebe et al also found a relationship between transfusion and mortality $p=0.0138$ [32]. The multivariate analysis to search for independent factors associated with morbidity and mortality could not be calculated due to the small sample size.

CONCLUSION

The trauma of hollow organs are pathologies, although infrequent, but mainly affected young men, the cause is mainly assault with sharp objects. Pain is the main

symptom and most of our patients had signs of peritoneal irritation on admission. Small intestine is the most affected organ and a primary suture of the lesion is the most performed surgical procedure. There is a significant morbidity and mortality. Conjunctival pallor, moderate anaemia, duration of hospitalization between 6 and 10 days, between 11 and 15 days are factors significantly associated with morbidity. With regard to mortality, the following is significantly associated: hemodynamic instability on admission, the Glasgow score between 11 and 9, conjunctival pallor, severe anaemia, transfusion at the emergency department, the presence of complications.

Conflict of interest

The authors declare no conflict of interest Funding There is no current funding source for this research

Ethical considerations

Our research was submitted to the ethics committee of the University of Douala and we obtained a ethical clearance. Authorizations from those responsible for the structures sanitary facilities were granted. The study was conducted in accordance with the principles fundamentals of medical research. Confidentiality was respected and the data sheets data collection was all destroyed.

Contribution of the authors

- Jean Paul Engbang , Pauline Mantho, Dorcas Bob Nyanit , Valery Onana Mvondo, Gladys Edima, Ambroise Ntama, Basile Essola, Noel Essomba, contributed to the design of the study and writing of the manuscript;
- Marcelin Ngowe Ngowe contributed to the reading critical ;
- Gladys Edima collected ethical clearance and authorizations from those responsible for the structures.

All authors have read and approved the final version of the manuscript. Thanks The authors would like to thank all the staff of health structures involved in this study for their availability and collaboration.

REFERENCES

- Gad MA, Saber A, Farrag S, Shams ME, Ellabban GM. Incidence, patterns and factors predicting mortality of abdominal injuries in trauma patients. *North American J*. 2012; 3(4): 129-134.
- Menegaux F. Plaies et contusions de l'abdomen. *Encycl Emc-Chirurgie*. 2004; (18)31:19-21.
- Watts DD, Fakhry SM. East multi-institutional hollow viscus injury research group. Incidence of hollow viscus injury in blunt trauma: An Analysis from 275,557 trauma admissions from the East multi institutional trial. *J Trauma Inj Infect Crit Care*. 2003; 54(2):289- 94.
- Gorchynski J, Dean K. Analysis of urobilinogen and urine bilirubin for intra-abdominal injury in Blunt trauma patients. *West JEM*. 2009; 10(2):85-9.
- Sani R, Ngo-Bissemb NM, Illo A. La plaie abdominale. *Revue de dossiers à l'hôpital National de Niamey-Niger. Med Afr Noire*. 2005; 51(10):381-4.
- Mingoli A, Torre M, Brachini B, Costa G, Balducci G, Frezza B, Spazini G, Cirillo B. Hollow viscus injury: Predictors of outcome and role of diagnostic delay. *Therapeutic and clinical risk management J*. 2017; 13:1069-1076.
- Carap AC, Cracium RI, Ion PS. Current management of colon trauma at a level II trauma Centre: A Single centre review of cases from the last two Decades. *Chirurgia J*. 2021; 116: 718-724.
- Ndong A, Seye Y, Gueye ML, Diallo CA. Aspects diagnostiques et thérapeutiques des traumatismes abdominaux. *Afr Chir Digest J*. 2018; 18(2): 2474-2478.
- Borgialli DA, Ellison AM, Ehrlich P. Association between the seat belt sign and intra-abdominal injuries in children with blunt torso trauma in motor vehicle collisions. *Acad Emerg Med*. 2014; 21(11):1240—1244.
- Sokolove PE, Kuppermann N, Holmes JF. Association between the "seat belt sign" and intra-abdominal injury in children with blunt torso trauma. *Acad Emerg Med*. 2005; 12(9): 808-813.
- Brofman N, Atri M, Hanson JM, Grinblat L, Chughtai T, Breneman F. Evaluation of bowel and mesenteric blunt trauma with multi-detector CT. *Radiogr Rev Publ Radiol Soc N Am Inc*. 2006;26(4):1119-1131.
- Ekeh AP, Saxe J, Walusimbi M, Tchorz KM, Woods RJ, Anderson HL, McCarthy MC. Diagnosis of blunt intestinal and mesenteric injury in the era of multi-detector CT technology. *J Trauma*. 2008; 65: 354-359.
- Mitsuhide K, Junichi S, Atsushi N. Computed tomographic scanning and selective laparoscopy in the diagnosis of blunt bowel injury: A prospective study. *J Trauma*. 2005; 58(4):696-670.
- Sitnikov V, Yakubu A, Sarkisyan V, Turbin M. The role of video-assisted laparoscopy in management of patients with small bowel injuries in abdominal trauma. *Surg Endosc*. 2009; 23(1):125-129.
- Traoré A, Diakite L, Togo A, Dembélé B, Kante L, Maiga AL, et al. Hémopéritoine non opératoire dans les traumatismes fermés de l'abdomen(CHU Gabriel Touré). *Journal Africain d'Hépatogastroentérologie*. 2010; 4: 225-229
- Savom EP, Bang GA, Biwole BD, Bitang A, Bwelle M, Ekani B, Ngo NB. Surgical management of abdominal trauma: Indications and outcomes in two emergency units with limited infrastructure resources in Yaoundé. *Surgical Science J*. 2021; 12: 339-349.
- Engbang JP, Beughuem CC, Bekolo F, Motah, Moukoury TJK, Ngowe NM. Epidemiology, diagnostic and management of abdominal trauma in two hospitals in the city of Douala, Cameroon. *Int Surg J*. 2021; 8(6): 1686-1693
- Dembele BT, Togo A, Diakite I, Kante L, Traore A, Cisse F, Coulibaly Y, Keita M, Diallo G: Perforation traumatiques d'organ creux intra-abdominaux a CHU Gabriel-Toure. *Afr J Hepatol-Gastroenterol*. 2011(5); 290-292.
- Choua O, Moussa KM, N'djanone K, Ahmat MO, Aboulghassim O, Sadie IG, Kanbel D. Post traumatic hollow viscus perforation at the General hospital of national reference of N'djamena (Chad). *Afr J Chir Digest*. 2019; 19(12): 2769-2774.
- Dhaded RB, Malra S. Clinical study, evaluation and management of blunt abdominal trauma hollow viscus and solid organ injuries. *SAS J Surg*. 2016; 2(1):53-59.
- Khadiikar R, Yadav AS, D'silva A. A clinical study to evaluate and manage solid organ injuries in blunt abdominal trauma. *CIBT J Surg*. 2015; 4(1):5-9.
- Bursha k, Sughra P, Tanweer A, Iqbal K, Imran K, et al. Visceral injuries in patients with blunt and penetrating abdominal trauma presenting to a tertiary care facility in Karachi, Pakistan. *Cureus*. 2018;10(11).

23. Aarab A. Traitement non opératoire des traumatismes de l'abdomen au service de Chirurgie Viscérale CHU Mohamed VI de Marrakech [Thèse Med]. Marrakech 2016 ,95p
24. Sakoumy N. Pathologie traumatique digestive : Quelles indications chirurgicales en urgence ? [Thèse Med]. Marrakech 2016; 59,61-68.
25. Sanjay J, Dinkar M, Songra MC. Clinical study of hollow viscus injury in abdominal trauma. *Int surg J.* 2018; 5(1): 39-44
26. Kommunuri JS, Loto AE, Harmston C. Incidence, outcomes and effect of delayed intervention in patients with hollow viscus injury due to major trauma in the Northern region of New Zealand. *ANZ Surg J.* 2021; 91(6):1148-1153.
27. Matsushima K, Mangel PS, Schaefer EW, Frankel HL. Blunt hollow viscus and mesenteric injury: Still underrecognized. *World J. Surg.* 2013;37:759–65.
28. Shrihari V, Jayran J, Sabira S. Clinical study of blunt trauma abdomen. *Ind J Res.* 2015;4(1):123-6
29. Essomba A, Masso MP, Oyono JM, Sosso MA, Malonga E . Les ruptures jejuno-ileales : A propos de 18 observations à l'hôpital Centrale de Yaoundé Médecine d'Afrique noire 2000 ;47 (1) : 30-33.
30. Wadhwa M, Kumar R, Trehan M, Singla S, Sharma R, Ahmed A, Sharma R. Blunt Abdominal Trauma With Hollow Viscus and Mesenteric Injury: A Prospective Study of 50 Cases. *Cureus.* 2021 Feb 12;13(2)
31. .Omer MY, Hamza AA, Musa MT. Penetrating abdominal injuries: Pattern and Outcome of Management in Khartoum. *Int. J. Clin. Med.* 2014;05:18–22
32. Abebe K, Bekele M, Tsehaye A, Lemmu B, Abebe E. Laparotomy for abdominal injury indication & outcome of patients at a Teaching Hospital in Addis Ababa, Ethiopia. *Ethiop. J. Health Sci.* 2019; 29:503–12
33. Mnguni MN, Muckart DJJ, Madiba TE. Abdominal trauma in Durban, South Africa: Factors influencing outcome. *Int. Surg.* 2012; 97:161–8.
34. Jha NK, Yadav SK, Sharma R, Sinha DK, Kumar S, Kerketta MD, Sinha M, Anand A, Gandhi A, Ranjan SK, Yadav J. Characteristics of Hollow Viscus Injury following Blunt Abdominal Trauma; a Single Centre Experience from Eastern India. *Bull Emerg Trauma.* 2014 Oct;2(4):156-60
35. Arikanoğlu Z, Turkoglu A, Taskesen F, Ulger B V, Uslukaya O, Basol O, et al. Factors affecting morbidity and mortality in hollow visceral injuries following blunt abdominal trauma. *Clin. Ter.* 2014; 165:23–6.