

Perforated Peptic Ulcer in Rwanda: Epidemiology and Outcomes at a Tertiary Hospital in Kigali, Rwanda-A Retrospective Study

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ABSTRACT

INTRODUCTION: Perforated peptic ulcer (PPU) is a serious complication of Peptic Ulcer Disease (PUD).

This study aims to present the experience of managing patients with PPU over a multi-year period at the University Teaching Hospital of Kigali (CHUK).

METHODS: A retrospective chart review was performed on all the charts of patients treated for PPU at CHUK from 2013-2017. Descriptive analysis, such as percentages and frequencies, were reported, and the relationship between variables was assessed using chi-square.

RESULTS: Over the 66 months, 142 patients were admitted to CHUK with PPU. 81% were male and 19% were female. The mean age was 40, with a range of 13 to 79 years. Abdominal distension (89%) and rebound tenderness and guarding (63%) were the most common presenting findings. The mean duration of symptoms was four days and most of the patients (70%) presented 24 hours after the onset of the symptoms. 96% of the patients had no associated comorbidities, and the pre-pyloric site (32%), was the most likely to perforate. Intraoperatively, inflammatory (turbid) fluid (42%), was the most common intra-abdominal fluid found. All patients underwent modified Graham's repair. Sepsis (28%) and pneumonia (20%) were the most common post-operative complications. The mortality rate was 28%. The risk of mortality increased with the occurrence of any complication ($p < 0.001$), and older age more than 61 ($p = 0.03$).

CONCLUSION: Perforated peptic ulcers are not rare in Rwanda. PPU are associated with high morbidity and mortality. A system-based initiative aiming to improve the management of these patients is indicated.

Keywords: Peptic Ulcer, Epidemiology, Complications, Mortality

INTRODUCTION

Peptic ulcers that occur in the stomach and duodenum result from an imbalance between the stomach acid-pepsin system and the mucosal barriers in the stomach or duodenum. In rare cases, they occur in ectopic gastric mucosa areas, e.g. Meckel's diverticula [1]. The bacterium *Helicobacter pylori* (*H. pylori*) plays a role in the genesis of the peptic ulcer [2]. The incidence of peptic ulcer diseases has steadily decreased in developed countries due to the introduction of some preventive measures

including proton pump inhibitors, H2 antagonists, and the treatment of *H. Pylori* infections/colonization [3]. PUD continues to be common in low- and middle-income countries (LMIC). PUD's three life-threatening complications, bleeding, perforation and gastric outlet obstruction, continue to challenge surgeons in these settings. This study will focus solely on peptic ulcer perforation, a complication that occurs in 2-14% of patients with PUD globally [6,7]. PPU is associated with a mortality of up to 25% [1,8,9].

Multiple factors, such as patient's age, comorbidities, delay in surgi-

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cal consultation, and the patient's condition upon arrival in the hospital, affect the outcomes of patients treated with perforated peptic ulcers [7].

In Africa, PPU accounts for 4.6% to 29.7% of emergency surgery operations and has a mortality rate ranging from 10.7-19.3% [3,5,8,10]. In a report on emergency abdominal surgeries performed at CHUK, perforated peptic ulcers were responsible for 27.3% of peritonitis cases. Only intestinal perforations caused more cases of peritonitis [11]. There are scanty data regarding PPU in Rwanda. This study is an attempt to address this deficiency.

METHODS

This is a retrospective study of all patients with perforated peptic ulcer disease managed at the University Teaching Hospital of Kigali (CHUK) from January 2013- June 2018. CHUK is a tertiary care referral hospital in Rwanda located in the capital city, Kigali. It is the largest hospital in Rwanda and serves both the city's local population and functions as a referral hospital for most of the country. It is the main teaching hospital for the University of Rwanda [11]. CHUK has a total of 500 beds, 120 of which are allocated to the department of surgery. There are 8 operating rooms. The surgical beds and operating rooms are shared among all surgical units: general surgery (including trauma), orthopedics, urology, plastic surgery and neurosurgery [12].

Data were collected by a medical student team using paper-based forms after receiving ethical clearance from the CHUK ethics committee (Ref: EC/CHUK/733/18). Patient's privacy and confidentiality were ensured.

the study purposes. Secondary data were collected for all the patients with peritonitis caused by perforated peptic ulcers until the sample size needed for statistical significance was reached. Data collected included patient demographics, clinical features at presentation, an operation performed, perioperative findings, operator and anesthesia provider qualification, and outcomes. Data were analyzed using Stata 14.1. Categorical results were reported as frequencies and percentages. Continuous data were reported as medians and interquartile ranges (IQR). Chi-square was used to assess the association between variables and a p-value below 0.05 was considered significant.

RESULTS

During the study period, there were 142 patients with PPU. 115 (81%) were male and 27 (19%) were female for a male to female ratio of 4 to 1. Most patients were 20-30 years old (27%) and 31-40 years old (26%), respectively. The majority of patients, 84 (59%), were younger than 40 years old. The vast majority of the patients came from Kigali (31%), the Eastern Province (27%), and the Northern Province (26%). Most patients had some kind of health insurance (Table 1).

The few patients had co-morbidities, and the duration of symptoms before presentation ranged from 1 to 7 days with a mean time of 4 days. Hypotension was uncommon. Most of the patients (70%) presented at the hospital 24 hours after their first symptoms (like abdominal pain, fever, nausea and vomiting). Only 29 (20%) presented with a fever while 99 (70%) had tachy-

Table 1: Demographic data

		Frequency (N)	Percentage (%)
Gender	Male	115	81
	Female	27	19
Age group	Below 20	9	6
	20-30	38	27
	31-40	37	26
	41-50	22	15
	51-60	18	13
	Above 61	18	13
Province	Kigali	44	31
	Eastern	38	27
	Northern	37	26
	Western	12	8
	Southern	11	8
	community-Based Health Insurance	114	80
Health insurance	Others	15	11
	None	4	3
	Not documented	9	6

cardia. The most common clinical finding was abdominal distention and all patients had findings consistent with generalized peritonitis either rebound and/or guarding. Almost half of the patients were ASA Class II 64 (45%) (Table 2).

The study showed that 48% of the patients developed complications with a mortality rate (28%). Among the developed complications, sepsis was (28%), followed by pneumonia (20%), unplanned re-operation (15%), Surgical Site Infection (10%) and DVT/PE (1%) while ICU admission was (22%) with a length of hospital stay ranging from 1 to 45 days (Table 3).

Our study showed that the risk of mortality increased with the development of any post-operative complication ($p < 0.001$), sepsis ($p < 0.001$), old age (more than 61) ($p = 0.03$), pneumonia ($p = 0.007$), unplanned re-operation ($p < 0.001$), not having insurance ($p = 0.034$) and operator qualification ($p = 0.003$) (Supplementary data).

Our study showed that residents in anesthesiology 70 (49%) were the most common anesthesia providers followed by non-physician anesthetists 66 (47%), while the anesthesiologist was physically involved in only 6 (4%) of patients. Consultant surgeons were present in the operating room in only 27 (19%) cases, whereas most of the patients 115 (81%) were operated on by residents. The most common intraperitoneal fluid found at laparotomy was turbid fluid. Pus, gastric contents, and bilious fluid were less frequently found, and pre-pyloric 46 (32%) was the most common perforation site.

Table 2: Clinical characteristics data

		Frequency (N)	Percentage (%)
Comorbidities	None	136	96
	HTN*	1	1
	DM*	2	1
	Gastritis	1	1
	Others	1	1
Duration of symptoms in days (Mean, Range)		4 (1-7) days	
Hypotension (SBP* < 90mmHg)	Yes	4	3
	No	138	97
The onset of symptoms to consultation	Below 24 hrs (≤ 24 hrs.)	42	30
	Above 24 hrs, (> 24 hrs.)	100	70
Fever (37.5°C)	Yes	29	20
	No	113	80
Tachycardia (>100bpm)	Yes	99	70
	No	43	30
Abdominal distension		126	89
Guarding		89	63
Rebound		89	63
ASA* Class	I	29	20
	II	64	45
	III	28	20
	IV	8	8
	Not documented	13	9

DM*: Diabetes Mellitus, HTN*: Hypertension, SBP*: Systolic Blood Pressure, bpm*: beat per minute, ASA*: American Society of Anesthesiology.

All of our study population underwent modified Graham's perforation repair using a pedicled omentum and washout (Table 4).

Table 3: Outcomes

	Frequency (N)	Percentage (%)
Complications	68	48
Mortality	40	28
Length of Hospital stay in days (Mean, Range)	9 (1-45)	
Sepsis	40	28
ICU* admission	31	22
Pneumonia	29	20
Unplanned Re-operation	22	15
SSI*	14	10
DVT/PE*	1	1

ICU*: Intensive Care Unity, SSI*: Surgical Site Infection, DVT/PE*: Deep Venous Thrombosis/Pulmonary Embolism

DISCUSSION

Between Jan 2013- June 2018 (66 months period), 142 patients with perforated peptic ulcers were treated in CHUK's surgical service. The male to female ratio of the patients was 4:1, comparable to other developing countries [7,12]. The most affected age group was 20-30 years (27%) and 31-40 years (26%), respectively, which is similar to other studies from Ethiopia and Tanzania [3,9,13]. Most of the patients with PPU came from the nearby provinces. The fewest cases came from the Southern Province, most likely because there is another university teaching hospital in that province. The fact that 80% of the patients in this cohort had Community Based Health Insurance (CBHI) is consistent with national statistical data, which indicates that more than 80% of Rwandans have CBHI [14].

Compared to other studies done in other LMICs, our study population had few comorbidities associated with a likelihood of perforation of peptic ulcers [10]. This is likely because the majority of the Rwandan population is younger, with 43.4% of all Rwandan population is under 15 years [15]. The median duration of symptoms for our patients was 3 days and most of the patients presented 24

Table 4: Intraoperative findings and qualification of healthcare provider

	Frequency (N)	Percentage (%)	
Anesthesia provider			
Resident	70	49	
No physician anesthetist	66	47	
Anesthesiologist	6	4	
Operator			
Resident	115	81	
Consultant	27	19	
Operation	Modified Graham's repair	142	100
Types of intra-abdominal fluids			
Inflammatory fluids (turbid)	59	42	
Pus	44	31	
Gastric contents	31	22	
Bilious fluids	8	6	
Location of perforation			
Prepyloric	46	32	
D1*	31	22	
Antrum	28	20	
Lesser curvature	20	14	
Body of the stomach	12	8	
Not documented	5	4	

D1*: First part of Duodenum

hours after their first symptom, which is similar to the study done in Northwestern Cameroon [16]. This may be related to a lack of skills by healthcare professionals to detect peritonitis to refer to. Abdominal distension and features of peritoneal irritation (including guarding and/or rebound tenderness) were the most common signs of PPU, similar to another study done by Dongo and colleagues in Nigeria [5]. As our study patients had fewer comorbidities, most of them were in ASA class II, similar to Gona and colleagues [10]. Anesthesiologists and surgical consultants infrequently participated in the care of these seriously ill patients.

Intraoperative findings differed from other studies. Our patients mostly had turbid "inflammatory" fluid in the peritoneal cavity. In contrast, intraperitoneal pus was commonly found in Ethiopia studies [3], while bile-like fluids were commonly found in Ivory Coast [10]. Pre-pyloric is the most common site of perforation in this series, which is strikingly different from the location of peptic ulcer perforations in other reports from Sub-Saharan Africa [8]. This discrepancy cannot be easily explained.

The most common complications in our series were sepsis (40%), pneumonia (29%), and unplanned re-operation (22%). Intensive Care Unit admissions (31%) occurred mostly due to complications developed like sepsis and the re-operated cases because since they had disturbed hemodynamics and more than one failing organ. Surgical Site Infections (SSI) were relatively uncommon, occurring in only 14% of the patients. This is opposed to other published series such as the study conducted by Dodiya-Manuel and

Wichendu PN in southern Nigeria, where SSI was (19.4%) [8]. It has been suggested that the high mortality rate (28%) and the high incidence of post-operative complications maybe due to the limited experience of the operating surgeons, who were mostly residents. However, there are many other factors to consider, including the systems in place for these seriously ill patients' post-operative care. In fact, the death rate among patients operated on by consultants was nearly twice that of residents' procedures. This can be justified by a consultant's presence for the very seriously sick patients that cannot be operated by residents. The length of hospital stay was between 1 and 45 days with a mean time of nine days, which is likely related to the high frequency of post-operative complications.

The high incidence of death and complications in patients with this, unfortunately common, a surgical problem in Rwanda clearly shows the need for further study and innovations to improve our results.

Our study had some limitations while interpreting the results. As our study used retrospective chart review, data were missing for some variables due to incomplete patient chart documentation. Some variables, like the use of non-steroids anti-inflammatory drugs, smoking and alcohol consumption, were not reported; and a prospective study is recommended to explore these factors more. However, the results are still relevant to Rwanda and in the region as CHUK receives more than 50% of all transfers across the country.

CONCLUSIONS

Perforated peptic ulcers are not rare in Rwanda. The University Teaching Hospitals should put a system-based initiative of pre, post, and intraoperatively care of PPU to improve the results. The high morbidity and mortality rates associated with this problem are unacceptable. In addition to addressing the surgical issues, efforts

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Supplementary data: Relationship between variables and outcomes

Variable		Death: N (%)	Survivor: N (%)	p value
Age group(years)	Below 20	0(0)	9(100)	0.034
	20-30	11(29)	27(71)	
	31-40	7(19)	30(81)	
	41-50	6(27)	16(73)	
	51-60	6(33)	12(67)	
	Above 61	10(56)	8(44)	
Gender	Male	32(28)	83(72)	0.85
	Female	8(30)	19(70)	
Insurance	Community Based Health Insurance	29(25)	85(75)	0.03
	No insurance	3(75)	1(25)	
	Not documented	5(56)	4(44)	
	Others	3(20)	12(80)	
Presentation since symptoms onset	≤ 24 hrs.	12(63)	7(37)	0.36
	> 24 hrs.	90(73)	33(27)	
ASA Class	I	8(28)	21(72)	0.13
	II	13(20)	51(80)	
	III	13(46)	15(54)	
	IV	3(37)	5(63)	
	Not documented	3(23)	10(77)	
Types of intra-abdominal fluids	Bilious fluids	2(25)	6(75)	0.23
	Inflammatory fluids	12(20)	47(80)	
	Pus	17(39)	27(61)	
	Gastric contents	9(29)	22(71)	
Location of perforation	Pre-pyloric	14(30)	32(70)	0.84
	D1	7(23)	24(77)	
	Antrum	7(25)	21(75)	
	Body of the stomach	5(42)	7(58)	
Operator qualification	Consultant	12(44)	15(56)	0.03
	Resident	28(24)	87(76)	
DVT/PE		1(100)	0(0)	0.07
Pneumonia		14(48)	15(52)	0.007
SSI		4(29)	10(71)	0.97
Dehiscence		5(63)	3(37)	0.002
Unplanned Re-operation		12(55)	10(45)	0.003
Sepsis		29(73)	11(27)	<0.001
Complications		40(28)	102(72)	<0.001