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## ORIGINAL RESEARCH

# Pattern of Abdominal Stab Injury in a Tertiary Hospital in Nigeria

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## Abstract

**Background:** Abdominal stab injury is a type of penetrating abdominal injury. The management may be operative or non-operative.

**Objectives:** To determine the pattern, treatment options and outcome in abdominal stab injuries.

**Methods:** This was a retrospective study carried out over 4 years between January 2014 and December 2017, at the University of Benin Teaching Hospital, Benin City, Nigeria. Patients aged 18 years and above formed the study population. The case files of the patients were retrieved from the medical record. The information obtained included age, gender, injury to arrival time (IAT), type of weapon, the abdominal injury sustained, clinical symptoms and signs, surgical intervention time (SIT), type of surgery carried out, operative findings and complications.

**Results:** Overall, there were 34 patients made up of 30 (88.2%) males and 4 (11.8%) females with a male to female ratio of 7.5:1. The mean age of the patients was  $30 \pm 8.9$  years with the age range of 17-50 years. The mean injury to arrival time (IAT) was  $2.0 \pm 1.6$  hours; surgery intervention time (SIT) was  $5.9 \pm 5.6$  hours. Twenty (58.8%) patients had laparotomy while 14 (41.2%) were successfully managed non-operatively. Post-operative complications included surgical site infection (SSI), entrance wound infection, intra-peritoneal abscess and intestinal obstruction. There was no mortality.

**Conclusion:** Abdominal stab injury was predominant among males and can be managed by the operative method or non-operative method in the absence of significant visceral injury. Selective non-operative management was effective in avoiding unnecessary laparotomy in more than one-third of the cases.

**Keywords:** Injury-to-arrival time, Laparotomy, Non-operative Treatment Outcome, Operative Treatment Outcome, Stab injury, Surgery-to-intervention time.

## Introduction

Stab injuries are low-velocity injuries. Abdominal stab injury (ASI) is one of the mechanisms of penetrating abdominal injury. Other mechanisms of penetrating abdominal injury include gunshot, bomb blast, fired arrow,

and impalement. Any object that can impale may inflict a stab wound. These objects are usually narrow, sharp, pointed and knife-like implements. Examples are scissors, knife, broken bottle, animal horn, pointed bones and any sharp metallic object. Such objects can injure any structure as it traverses the skin, muscles and

fascia, blood vessels and nerves, to solid organs or hollow viscus.

Penetrating trauma mechanisms account for less than 10% of all trauma evaluations at most modern trauma centres in the United States of America; with only a select few urban centres recording higher rates of 20-30%.<sup>[1]</sup> Among these penetrating trauma cases, approximately half (50%) are caused by stab wounds, with the majority being from intentional assaults.<sup>[2]</sup> Data from almost 900,000 admissions in the 2016 National Trauma Data Bank report found that stab wounds accounted for only 4.1% of all trauma incidents, with an associated case fatality rate of 2.2%.<sup>[3]</sup> In Nigeria, a study reported an increase in abdominal stab injury over one year period which was almost the same number as gunshot injury.<sup>[4]</sup> A far higher number of 186 cases over one year period was reported in South Africa by Navsaria *et al.*<sup>[5]</sup>

The management of ASI can be operative or non-operative if there is no significant visceral injury. The indications for surgery include shock, generalized peritonitis and evisceration. A significant visceral injury refers to an injury that warrants repair. Approximately 60% of patients with ASI that present with shock, generalized peritonitis or evisceration require immediate laparotomy.<sup>[6, 7]</sup> The management of the remaining 40% of patients who are without overt clinical symptoms with minimal or equivocal abdominal signs at initial clinical assessment remains controversial.<sup>[8]</sup> These patients with minimal or equivocal signs on abdominal examination following ASI may have sustained non-penetration to the peritoneal cavity or peritoneal penetration with no or insignificant injury to the viscera.

In the past, mandatory laparotomy for all cases of ASI resulted in unacceptably high rates of negative and non-therapeutic laparotomies.<sup>[9]</sup> However, the policy of selective non-operative

management (SNOM) by Shaftan in 1960 changed the view of mandatory laparotomy.<sup>[10]</sup> Selective non-operative management has been reported to be reliable, safe, and effective with a reduction in the rates of non-therapeutic and negative laparotomies. <sup>[ 11]</sup> Selective non-operative management entails serial clinical assessments, local wound exploration, abdominal CT scanning and diagnostic laparoscopy, to identify patients that would need delayed laparotomy. <sup>[1]</sup> Diagnostic peritoneal lavage (DPL) and Focused Assessment using Sonography in Trauma (FAST) are also diagnostic modalities that help detect intra-peritoneal visceral injury with FAST currently taking more pre-eminence over DPL.

This study aimed to determine the pattern, treatment options (operative or non-operative) and outcome of the patients with abdominal stab injuries to recommend the optimal treatment option.

## **Methods**

This was a retrospective, descriptive study of patients with abdominal stab injuries that were admitted into the Accident and Emergency Department of the University of Benin Teaching Hospital, Benin City between January 2014 and December 2017. The University of Benin Teaching Hospital is located in Ugbowo, Benin City, Edo State, Nigeria with a bed capacity of over 900 beds. The medical records of the patients with abdominal stab injuries were retrieved from the medical records department. The information obtained included age, gender, injury to arrival time (IAT), type of weapon, the abdominal injury sustained, clinical symptoms and signs, surgical intervention time (SIT), laparotomy findings, type of surgery carried out and complications.

On admission, the unit protocol includes resuscitation with intravenous Normal saline,

analgesics and broad-spectrum antibiotics. All the lacerations were sutured and the wounds healed satisfactorily. A nasogastric tube is inserted and aspirated to decompress the stomach. Blood samples for haematological and biochemical parameters are taken for laboratory tests. Radiological investigations such as abdominal ultrasound and CT scan are also carried out. However, patients who are haemodynamically unstable to undergo radiological investigations will be taken immediately for emergency laparotomy. Patients who are haemodynamically stable with no peritonitis or evisceration are managed according to the policy of selective non-operative management (SNOM) [10] by the Consultant General Surgeon. SNOM is an active process that entails the Consultant General Surgeon's review of the patient and admission into the surgical ward. Other measures include resuscitation with intravenous Normal saline infusion, broad-spectrum antibiotics to cover for both Gram-positive and Gram-negative organisms as well as anaerobes, analgesics, nasogastric decompression of the stomach, and urethral catheterization to monitor urinary output. A local wound exploration may be carried out to determine if there is a breach of the peritoneum in patients with equivocal features of peritoneal penetration. Blood samples are obtained for Full Blood Count, serum electrolytes, urea and creatinine and random blood sugar. A urine sample is obtained for urinalysis. Radiological investigations (abdominal ultrasound/abdominal CT scan) are also carried out. The patient's neuro-vital signs {Glasgow coma score (GCS), pulse rate, blood pressure, respiratory rate, body temperature and oxygen saturation (Spo<sub>2</sub>)}, are monitored four-hourly for the first 48 hours. If these are within normal limits, the monitoring will be reduced to eight-hourly till discharge. General and abdominal examinations are carried out twice daily for the first 48 hours. If normal, the frequency is reduced to once daily till discharge.

Haematocrit/haemoglobin is also monitored every six hours for the first 48 hours. If these are within normal limits, monitoring is reduced to 12 hourly for another 24 hours and if within normal limits, a daily check is carried out until discharge. An hourly urinary output is recorded for the first 48 hours and if within normal limits, it is reduced to daily checks till the patient is discharged. The anaesthetist will review the patient so that if SNOM fails, an urgent laparotomy will be carried out. The patients are thoroughly counselled on SNOM and if it fails, surgery will suffice. Patients who are stable on SNOM by the fifth day of admission are discharged and followed up in the Out-patient Clinic.

For this study, the abdomen was anatomically divided into anterior, posterior and flanks. The anterior abdomen was bordered by the costal margins superiorly, groin crease inferiorly and the anterior axillary lines laterally. The posterior trunk was bordered superiorly by a line joining the inferior angles of the scapula, the iliac crest inferiorly and the posterior axillary lines laterally. The thoraco-abdomen was bordered by the nipple line superiorly, costal margins inferiorly and between the midline and posterior axillary lines. The flank was bordered by the costal margin superiorly, iliac crest inferiorly and between the anterior and posterior axillary lines.

For this study, the injury to arrival time (IAT) was defined as the interval between abdominal stab and arrival in the hospital while surgical intervention time (SIT) was defined as the interval between arrival in hospital and induction of anaesthesia. Shock on admission was defined as a systolic blood pressure less than 90mmHg and pulse rate greater than 100 beats/minute. A laparotomy was considered negative if there was no visceral injury and positive if there was a visceral injury. A non-therapeutic laparotomy means there may be an insignificant visceral injury that does not require repair on laparotomy.

The data were collated and analysed on a personal computer using the Statistical Programme for Social Sciences version 22 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to analyse the data.

**Results**

A total of 34 patients made up of thirty (88.2%) males and four (11.8%) females were studied. The

male-to-female ratio was 7.5:1. The mean age of the patients was 30±8.9 years with a range of 17-50 years. The median injury to arrival time (IAT) was one and half hour with a range of 0.5-2 hours while the median surgery intervention time (SIT) was 5.5 hours with a range of 1-24 hours. Twenty (58.8%) patients had laparotomy while 14 (41.2%) were successfully managed non-operatively based on the policy of selective non-operative management.

**Table I: Clinical features of the patients with abdominal stab injuries**

<i>Features</i>	<i>Frequency (%)</i>
<b>Age distribution (Years)</b>	
11-20	3 (8.8)
21-30	18 (52.9)
31-40	8 (23.5)
41-50	5 (14.7)
<b>Reason for stab</b>	
Conflict (Fighting, Altercation)	26 (76.5)
Robbery	4 (11.8)
Self-stab (Mental health problem)	4 (11.8)
<b>Location of the stab wound</b>	
Anterior abdomen/Epigastrium	15 (44.1)
Left hypochondrium	6 (17.7)
Right hypochondrium	5 (14.7)
Umbilical	5 (14.7)
Left lumbar	2 (5.9)
Right lumbar	0 (0.0)
Posterior trunk	1 (2.9)
<b>Number of abdominal stabs</b>	
One	33 (97.0)
Two	1 (3.0)
<b>Weapon used</b>	
Knife	26 (76.5)
Broken bottle	6 (17.6)
Scissors	2 (5.9)
<b>Intervention</b>	
Negative laparotomy	8 (40.0)
Positive laparotomy	12 (60.0)

Out of the 14 that were successfully managed using SNOM, seven had omental evisceration while five had bowel evisceration (Figure 1). The indications for surgery in patients that had laparotomy included generalized peritonitis (2; 10%), shock (2; 10%) and omental/bowel evisceration (16; 80%). Out of the 20 patients that had laparotomy, 12 had positive laparotomy while eight had negative laparotomy. Four out of these eight patients with negative laparotomy had evisceration (omentum - 3, small bowel - 1), but there was no significant visceral injury in any of them. The indication for surgery in the remaining four patients was equivocal abdominal signs. Twenty-six (26) stab cases occurred outdoor (public space) while the remaining eight occurred at home (indoor). Post-operative complications included surgical site

infections (SSI) in five patients, entrance wound infection in two patients, intra-peritoneal abscess and intestinal obstruction from bands and adhesions in a patient each.

The patients with SSI and entrance wound infection had a daily dressing of the wound with honey and antibiotics and the wound healed. The intra-peritoneal abscess was drained and the patient was treated with antibiotics (Cefuroxime and Metronidazole) for seven days and was discharged following resolution. The patient with bands and adhesions was managed non-operatively and it resolved. All the patients were discharged in good condition. No mortality was recorded. Other results are shown in Tables I, II and III.

**Table II: Clinical manifestations of abdominal stab injury**

<i>Symptoms</i>	<i>Frequency (%)</i>	<i>Signs</i>	<i>Frequency (%)</i>
Abdominal pain	34(100.0)	Localized peritonitis	10 (29.4)
Abdominal distension	4 (11.7)	Omental evisceration	10 (29.4)
Haematemesis	3 (8.8)	Bowel evisceration (small bowel)	6 (17.6)
Vomiting	2 (5.8)	Generalized peritonitis	2 (5.8)
Nausea	1 (2.9)	Shock	2 (5.8)
		Haemothorax	1 (2.9)
		Retained knife	1 (2.9)

## Discussion

In the present study, the average annual number of stab injury cases was nine. This is almost similar to ten cases per year reported by Osinowo *et al.* [12] in Lagos, Nigeria and by Ohene-Yeboah, *et al.* [13] in Ghana. However, higher figures were reported in South Africa and Australia compared to the present study. [14, 15] In Iceland, stab injuries are reportedly uncommon with an average of four cases per year. [16]

The present study revealed a male predominance (88%) with a male to female ratio of 7.5:1. This male predominance has also been observed in previous reports. [17, 18] In the African setting where the man is commonly the bread-winner for the family, moving from place to place in search of resources, may predispose him to injuries and conflicts.[19]

More than half of the stab injuries in the present study occurred in the third decade of life. This is similar to the finding in a study of 97 patients with stab injuries by Cardi *et al.* [20] This age group

forms the most dynamic and economically productive group and by their activities are prone to interpersonal violence, vehicular accidents, occupational hazards, and sports which explain their vulnerability to stab injuries.<sup>[17]</sup> A majority (77%) of the stab cases in the present study occurred outdoor, in public locations. This is similar to the finding in a study<sup>[21]</sup> carried out in Tehran-Iran but differs from the report on stab injuries in Iceland where the majority occurred indoor from domestic violence.<sup>[16]</sup> In the former, where the climate is

warmer, people spend more time outdoor unlike in the latter where people stay indoors due to the cold weather with most of the stab cases occurring from domestic violence. The main reason for the stab in the present study was unresolved personal conflict/fights. Osinowo *et al.* also reported fighting to settle scores as the major reason for the stab in their study.<sup>[12]</sup> They opined that arguments among young men may be settled by violence in form of knife or broken bottle stabs.

**Table III: Site of the stab, injuries and treatment in patients with positive laparotomy findings**

Patient	Site of abdominal stab	Injury sustained	Surgical treatment
1	Epigastrium	Grade I liver injury, gastro-colic omentum laceration	Liver sutured and <i>surgicel</i> applied. Omental laceration sutured.
2	Right hypochondrium	Grade II liver injury Mesenteric contusion	Liver injury sutured with Vicryl and <i>Surgicel</i> applied.
3	Umbilicus	Transaction of ileum	Ileal segment resected and end-to-end anastomosis carried out.
4	Epigastrium	Laceration of the left lobe of the liver	Laceration sutured with Vicryl
5	Left lumbar	Multiple perforations of the ileum, 58cm from ileocaecal junction	Ileal segment resection with end-to-end anastomosis carried out.
6	Epigastrium	Grade III transverse colon injury and jejunal perforation	Resection of transverse colon segment with colo-colic anastomosis. Closure of jejunal perforation.
7	Left thoraco-abdomen	Grade I transverse colon injury Zone I retroperitoneal haematoma, non-pulsatile and non-expanding	Closure of transverse colon injury. Retroperitoneal haematoma left intact.
8	Posterior trunk	Grade II rectal injury, zone III retroperitoneal haematoma and urinary bladder contusion	Repair of rectal injury, Hartmann's colostomy carried out. Retroperitoneal haematoma left intact.
9	Epigastrium	A non-viable segment of jejunum. Grade I gastric injury	Resection of a non-viable segment of bowel with end-to-end anastomosis. Repair of gastric injury with Vicryl.
10	Umbilicus	Multiple perforations in the ileum	Ileal segment resected with end-to-end anastomosis.
11	Left hypochondrium	Grade I gastric and jejunal perforations	Repair of perforations with Vicryl.
12	Epigastrium	Grade I gastric perforation	Perforation closed with Viryil.

The mean IAT for the patients was two hours with a median of one and a half hour. This delay may be attributed to the unavailability of ambulance services or an efficient transport

system to convey patients to the hospital. Osinowo *et al.* in Lagos University Teaching Hospital, Lagos, Nigeria, reported a similar prolonged IAT in the management of stab

injuries. [12] The reason for the longer IAT included inefficient ambulance service, difficult transportation at night and delays following transfer from a private hospital where initial medical care was rendered. Elsewhere, a lower IAT of 30 minutes has been reported with good outcome. [24] This was attributed to the role of paramedics in the "scoop and run" of penetrating trauma victims to the trauma centre.

In the present study, SIT was approximately six hours with a median of about five and a half hours, which was prolonged. A SIT of less than one hour is recommended in Level 1 trauma centres. [24] The observed delay was probably the time spent on resuscitation, carrying out relevant investigations and securing theatre space for surgery. The protocol of the study centre is surgical intervention time within one hour of stab injury. A guideline of 15 minutes for abdominal stab injury patients with indications for immediate laparotomy has been recommended as ideal.[7] A similar longer SIT of between nine and ten hours in abdominal stab injury was also reported in another study. [12] This prolonged SIT was due to the time spent in the performance of laboratory tests and other investigations, procurement of blood for blood transfusion and waiting for theatre space and support personnel.

The most common weapons in stab injury in the present study included knife and broken bottles. This agrees with other studies that reported the same as the most common weapons in stab injuries. [25, 26] These objects are readily accessible in various homes hence their availability for assault on a victim.

In the present study, the anterior abdominal region was involved in 97% of cases. Issa *et al.* reported the involvement of the anterior abdominal wall in 93.7% of their cases. [22] Other series reported anterior abdomen involvement ranging from 55% to 66.6%. [27, 28] The victims of stab injury are usually in front of their attackers

and facing them, thereby justifying the frequent involvement of the anterior region of the abdomen.

Prominent clinical symptoms and signs recorded in the patients in the present study included abdominal pain in all patients, distension, haematemesis and vomiting while the signs were localized peritonitis, omental and bowel evisceration. Similar symptoms and signs had earlier been reported in other studies. [12, 22] The small bowel was the most common abdominal organ injured in the present study. Dodiya-Manuel *et al.* also reported small bowel involvement as the most commonly injured organ in their study on abdominal injuries at the University of Port-Harcourt Teaching Hospital, Nigeria. [17] The small intestine is the most commonly injured organ following penetrating abdominal injury. [29] This is because of its central location and free mobility in the abdominal cavity. This, however, is discordant with the finding of Cardi *et al.* [20] that reported the stomach as the most common organ involved in stab abdominal injury.

There are specific management guidelines for abdominal stab injuries (ASI). [30] It is generally agreed that patients with shock, generalized peritonitis and evisceration should have an immediate laparotomy. [7] This is because there is a 65% chance of visceral injury in such patients with an attendant need for therapeutic laparotomy. [7] Additional indications for immediate laparotomy include impalement, retained knife/object, multiple abdominal stabs and a large abdominal stab wound greater than 10cm in length. [30] The evisceration of the omentum/bowel alone may not be an absolute indication for laparotomy. [31] The eviscerated omentum/bowel is returned into the peritoneal cavity and the abdominal defect closed if there was no significant visceral injury. This gives credence to the statement that evisceration alone may not be an absolute indication for laparotomy



[31] and further supports the policy of SNOM, which when carefully implemented would go a long way in avoiding unnecessary laparotomies with its attendant complications. This differed from the work of Biffl *et al.* that carried out laparotomy in all their patients with bowel evisceration.<sup>[6]</sup>

In this study, SNOM was effective in managing some patients with ASI. All the patients that were offered SNOM had good clinical outcome and were discharged by the fifth day of admission. This was attributable to the strict compliance with the unit policy on SNOM. Any patient that fell short of the SNOM criteria was excluded and operated according to traditional practices.

Injury to arrival time imparts on SNOM. With prolonged IAT, an evolution of abdominal and other clinical signs may become evident. This may likely indicate a patient that would succeed or not with SNOM. The prolonged IAT in the present study may have contributed to selecting patients that fitted into SNOM accurately, thereby avoiding surgery.

The frequency of negative laparotomy in this study is higher than what was reported elsewhere. <sup>[1, 2]</sup> Four out of the eight patients that had negative laparotomy in this study had bowel evisceration. The evisceration may have been the urgent trigger for laparotomy by the surgeon without actually establishing if there was a significant visceral injury.



**Figure 1: Abdominal Stab in the Epigastrium with the evisceration of the stomach and omentum**

The postoperative complications recorded in the present study included surgical site infection (SSI), wound entrance infection, intra-peritoneal abscess and intestinal obstruction from bands

and adhesions. The SSI and entrance wound infection resolved with daily dressing with honey and antibiotics therapy. The intra-peritoneal abscess was drained and antibiotics

were administered for seven days with a good outcome. The case with bands and adhesions was managed non-operatively with a good outcome. [32] Surgical site infection was the most common complication in this study similar to the report by Ayoade *et al.* [33] and Dodiya-Manuel *et al.* [17] The bowel injuries noted in the study may have contributed to wound contamination and infection.

There was no mortality in the present study. The presence of a dedicated Trauma Unit with a clear-cut protocol in managing trauma cases may have accounted for the good outcome recorded in the present study. Osinowo *et al.* [12] reported a mortality rate of 4% in Lagos, Nigeria while Johannesdottir *et al.* reported a mortality rate of 4.1% in Iceland. [16] Higher mortality of 15% was reported at a major Australian urban centre with severe trauma. [34] The higher mortality may be explained by the severity of the injuries and the injured body parts.

### Conclusion

Abdominal stab injury occurs predominantly in males in their third decade of life with the knife being the most common weapon used. Treatment could be operative or non-operative if there was no significant visceral injury. Selective non-operative management was effective in avoiding unnecessary laparotomy in more than one-third of the cases and the outcome was generally good with no mortality in this series.

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