

**MMED DISSERTATION**

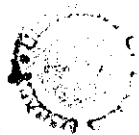
**DECEMBER 2007**

**A Study of Perforated Acute Appendicitis at the University Teaching  
Hospital, Lusaka, Zambia**

**BY**

**DR PETER SAMUEL PHIRI  
BSc (HB), MBCHB (UNZA)**

A Dissertation submitted to the University of Zambia in a partial fulfillment  
of the requirement for the degree of Master of Medicine in General Surgery.



(School of Medicine)  
**THE UNIVERSITY OF ZAMBIA  
LUSAKA**

THESIS  
M. MED  
PHI  
2007

## COPYRIGHT DECLARATION

I, PHIRI SAMUEL PETER, hereby declare that this dissertation represents my own work and that it has never previously been published in part or in full for a diploma or degree in any university.

02/06/08

Date: 30/6/8 .....Candidate signature: Samuel

I have read this dissertation and approve it for examination.

Date: 30/06/08 .....Supervisors signature: [Signature]

Supervisor: Prof Kosher Odimba  
Professor of surgery  
Department of surgery  
School of medicine  
University of Zambia



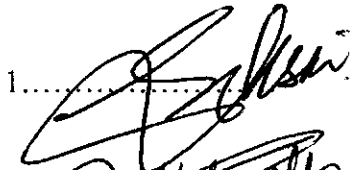
## APPROVAL

This dissertation of **DR PHIRI PETER SAMUEL** is approved in partial fulfillment of the requirements for the award of the Master of Medicine in Surgery by the University of Zambia.

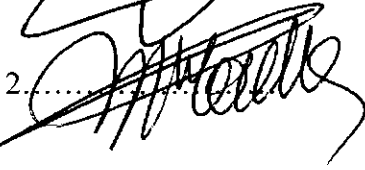
## EXAMINERS

Signature

Date

1.....

.....1/7/08

2.....

.....20.6.08

3.....

.....

4.....

.....

0273279

## **ABBREVIATIONS**

**BMJ:** British Medical Journal

**E. Afr. Med J:** East African Medical Journal

**UTH:** University Teaching Hospital

**USA:** United States of America

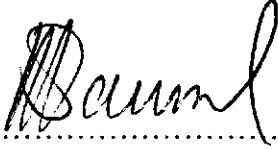
**SSI:** Surgical Site Infection

## **ETHICAL CONSIDERATION**

- I. Informed consent was obtained for the study.
- II. Standard management and operative techniques were used, so ethical consideration did not arise.

## ACKNOWLEDGEMENT

I would like to thank my supervisor Prof B.F.K. Odimba consultant general surgeon and coordinator of the Masters programme who guided me in the preparation, implementation and write up of this dissertation.

Candidate signature.....

## SUMMARY

A prospective descriptive study of perforated appendicitis as seen at The University Teaching hospital (UTH), Lusaka, Zambia, was carried out over a period of nine months.(1<sup>st</sup> March to 30<sup>th</sup> November 2007). The aim was to establish the appendiceal perforation rate, to describe some of the factors associated with perforated appendicitis as well as to describe the major associated early complications.

The inclusion criteria were a confirmed intra operative diagnosis of perforated or non perforated appendicitis. All Patients were recruited into the study until the sample size was reached. The details of each patient were entered on an evaluation form designed for the study. Each patient was followed up for four weeks.

A total of 71 appendicectomies were done. The appendiceal perforation rate was at 43.6 percent. 64.5 percent presented with generalized peritonitis necessitating laparotomy through the midline. The male to female ratio of perforation was 2.5:1. The commonest perforations were in the 30 to 40 year age group. The majority of those with perforation presented between the third and fifth days after the onset of symptoms whereas the majority of those with non-perforated acute appendicitis presented within the first forty eight hours. The main factor attributed to perforation was pre- hospital delay by the patient. 50 percent of those with perforation came from highly populated residential areas and with poor socioeconomic background and subsequent poor access to quality health care. 11 percent used traditional medicine prior to admission to UTH. There was no in-hospital delay attributed to the surgeons or surgery.

Perforation was associated with high levels of morbidity with a 33.3 percent wound infection and a further 22.2 percent requiring relaparotomies for intra abdominal abscesses. The overall mortality rate was 1.4 percent.

The high rate of perforated appendicitis is due to pre-hospital patients' delay, therefore, public education, specifically targeting those groups at risk, may provide a significant solution to the problem.

## LIST OF TABLES AND FIGURES

|                       |           |
|-----------------------|-----------|
| <b>Table 1 .....</b>  | <b>14</b> |
| <b>Figure 1.....</b>  | <b>14</b> |
| <b>Table 2 .....</b>  | <b>15</b> |
| <b>Figure 2.....</b>  | <b>15</b> |
| <b>Table 3 .....</b>  | <b>16</b> |
| <b>Figure 3.....</b>  | <b>16</b> |
| <b>Table 4 .....</b>  | <b>17</b> |
| <b>Figure 4.....</b>  | <b>17</b> |
| <b>Table 5.....</b>   | <b>18</b> |
| <b>Figure 5.....</b>  | <b>18</b> |
| <b>Table 6.....</b>   | <b>19</b> |
| <b>Figure 6.....</b>  | <b>19</b> |
| <b>Table 7 .....</b>  | <b>20</b> |
| <b>Figure 7.....</b>  | <b>20</b> |
| <b>Table 8 .....</b>  | <b>21</b> |
| <b>Figure 8.....</b>  | <b>21</b> |
| <b>Table 9 .....</b>  | <b>22</b> |
| <b>Figure 9.....</b>  | <b>22</b> |
| <b>Table 10 .....</b> | <b>23</b> |
| <b>Figure 10.....</b> | <b>23</b> |
| <b>Table 11.....</b>  | <b>24</b> |
| <b>Figure 11.....</b> | <b>24</b> |
| <b>Table 12 .....</b> | <b>25</b> |
| <b>Figure 12.....</b> | <b>25</b> |
| <b>Table 13 .....</b> | <b>26</b> |
| <b>Figure 13.....</b> | <b>26</b> |
| <b>Table 14.....</b>  | <b>27</b> |
| <b>Figure 14.....</b> | <b>27</b> |
| <b>Table 15.....</b>  | <b>28</b> |
| <b>Figure 15.....</b> | <b>28</b> |
| <b>Table 16.....</b>  | <b>29</b> |
| <b>Figure 16.....</b> | <b>29</b> |
| <b>Table 17.....</b>  | <b>30</b> |
| <b>Figure 17.....</b> | <b>30</b> |
| <b>Table 18 .....</b> | <b>31</b> |
| <b>Figure 18.....</b> | <b>31</b> |

**TABLE OF CONTENTS**

Certification.....i

Declaration.....ii

Approval.....iii

Abbreviations.....iv

Ethical consideration.....v

Acknowledgement.....vi

Summary.....vii

List of tables and figures.. .....viii

Table of contents.....ix

Dedication.....x

Definition of terms.....1

Introduction.....3

Objectives.....4

Rationale.....5

Literature review.....6

Patients and method.....9

Results.....12

Discussion.....32

Conclusion.....37

Recommendation.....38

Reference (Bibliography).....39

Appendix.....44

## **DEDICATION**

This work is dedicated to my wife Mildred and my two sons Peter and Juma who were so supportive during the study period.

## **DEFINITION OF TERMS**

The University Teaching Hospital is a referral hospital in the capital city, Lusaka, Zambia. It receives both referred and direct patients.

**(I) Total operations:**

Refers to all operations performed in the department of surgery.

**(II) Abdominal surgery:**

Was defined as all the operations performed in the abdominal cavity.

**(iii) Acute appendicitis:**

Patients who presented for the first time with typical features of appendicitis and were submitted for appendicectomy were all included under this.

**(iv) Generalized peritonitis:**

Patients who had appendicitis complicated by pus within the peritoneal cavity.

**(v) Laparotomy:**

Was defined as an opening of the peritoneal cavity.

**(vi) Perforated appendix:**

Was defined as an inflamed appendix complicated by macroscopic perforation of its wall.

**(vii) Wound infection:**

Was defined as inflammation and induration with or without abscess formation.

**(viii) Morbidity:**

Was defined as postoperative complication occurring within a month from the time of operation.

**(ix) Mortality:**

Was defined as death occurring within a month after the operation.

**(x) Short term complication:**

Was defined as a complication occurring within a period of four weeks from the time of operation.

**(xi) Prevalence**

Number of cases present in a population in a particular time.

**(xii) Incidence:**

Number of new cases which occur in a population over a defined period of time.

**(xiii) Rate:**

Number of events in a period of time

Statistical significance is defined as a probability of less than 1 in 20 of an event being the result of chance. i.e.  $P < 0.05$ .

Statistical analysis was confined to the use of basic tables accepting the converting level of  $p < 0.05$  as significant.

## **INTRODUCTION**

Perforation of the vermiform appendix is the most severe complication of acute appendicitis. This is associated with high levels of mortality and morbidity as compared to appendicectomy for simple appendicitis, the reason being that perforation is associated with the development of an appendicular abscess with subsequent septicaemia and shock or with the development of generalised peritonitis.<sup>1</sup> For the purpose of this study, perforation was defined as an appendix with a visible hole at Laparotomy.<sup>2</sup> The outcome of non-perforated appendicitis is favourable, and because the morbidity and mortality increases sharply with perforation, the priority in assessing patients with appendicitis should be to perform a prompt appendicectomy but if this is delayed in any way, perforation ensues. However, little is known on the factors that lead to high levels of perforation at the University Teaching Hospital, Lusaka, Zambia. This study addresses the issue.

### **OBJECTIVES:**

1. To determine the number of patients presenting with perforated appendicitis at The University Teaching Hospital.
2. To determine the main factors associated with high levels of perforated appendicitis at The University Teaching Hospital.
3. To compare the associated factors in those with perforated appendicitis to those presenting with non-perforated appendicitis.
4. To describe and compare the short-term complications associated with surgery in patients with perforated and non perforated appendicitis at The University Teaching Hospital.

## **RATIONALE**

Available data has demonstrated an appendiceal perforation rate of 32 % at the University Teaching hospital with rates of 46 % and 49 % in the very young and very old respectively. Authors do agree that perforation of the appendix is associated with high levels of morbidity and mortality. A study of this nature, which gives an insight into the contributing factors for such a high figure, gives useful information which in turn can be used as a starting point in intervening in an effort to reduce these levels.

## LITERATURE REVIEW

The first appendicectomy for perforated appendix was performed by Claudius Amyand in 1735 on an 11 year boy and the boy recovered well.<sup>3</sup> The second one was performed in 1848 on a 30 year old woman who had just delivered and presented with generalized peritonitis secondary to rupture of the appendix.<sup>4</sup> A similar operation was done by Lawson Tait on a 17 year old female patient in whom the pre-operative diagnosis of perforated appendix was already made.<sup>5</sup>

An outstanding contribution was from Fitz Gerald who in 1886 awakened the medical profession in America about the importance of the vermiform appendix undergoing inflammation and coined the term appendicectomy. He advocated for early appendicectomy.<sup>6</sup>

Controversy existed about the timing of operative intervention through out the first quarter of the twentieth century, particularly on the patients first seen with advanced disease. Mortality at that time was shockingly high varying from 5% to 50 %.<sup>6</sup>

In 1900, McBurney, popularly known for the McBurneys' point, emphasized on the importance of early diagnosis and prompt surgical intervention. Charles McBurney and other pioneering surgeons began to intervene early in acute appendicitis.<sup>7,8</sup> These clinicians advocated prompt clinical diagnosis and surgical intervention. Their surgical aim was to operate in a timely fashion before appendiceal perforation and peritonitis developed.

During the next three decades, the mortality reduced to about 5% as a result of dissemination of information to the public and physicians on signs of appendicitis. In the following twenty five years, a combination of improved surgical technique, better pre and post operative care, advances in anesthesia, and the development of antimicrobials reduced the mortality rate to less than one percent.<sup>9,10</sup>

The patient usually presents with peri-umbilical pain which after a few hours shifts to the right iliac fossae. If no surgical intervention is offered, the initial pain which was aching in character suddenly becomes more severe, spreading over the remainder of the abdomen as diffuse peritonitis develops. The general condition of the patients deteriorates rapidly, the pulse rate increases and the temperature rises. Within a few hours, there

might be signs of circulatory failure. The patient looks ill, dehydrated and toxic.<sup>11</sup>

Peritonitis occurs as a result of free migration of bacteria from the inflamed or gangrenous appendix. Factors which promote this include extremes of age, immunosuppression, diabetes mellitus, faecalith obstruction and previous abdominal surgery. Current reports indicate that appendicectomy represents one percent of all surgical operations in the West.<sup>11</sup>

A few decades ago, intestinal obstruction was the leading cause of abdominal emergency admission in many tropical countries. There has been a change in pattern and acute appendicitis has become the major cause of emergency admission world wide.<sup>12</sup> Appendicitis is more common in the western world as compared to Africa. This has been attributed to high levels of refined diet in the West. However, Katzaski<sup>13</sup> in 1979 attributed the low levels in Zambians due to dual blood supply to the appendix in Africans. In the USA, the incidence of acute appendicitis is at 11 per 10 000 population, whereas in South Africa it is at 0.95 per 10 000 population.<sup>14,15</sup> In Bulawayo, Zimbabwe, only 20 cases were recorded by Oliver in one year in a population of 2.5 million people in 1987.<sup>16</sup> In Zambia, Haque<sup>17</sup> in 1997 showed that the incidence was at 0.79 per 10 000 population and that this accounted for 0.80 % of all the operations at UTH and that it comprised 11% of all abdominal operations at UTH. Appendicitis is more common in males than in females and predominantly occurs in the young people.<sup>11</sup> In Ethiopia; kottiso<sup>18</sup> in 1996 reported a male to female ratio of 1.6:1.

If not diagnosed and treated promptly, as shown above, acute appendicitis complicates by perforation. Nanda<sup>19</sup> in 2004 concluded that morbidity caused by acute appendicitis correlated directly with delay in treatment. This in turn can lead either to local or generalized peritonitis. This may be due to a number of reasons such as problems with access to care, failure by patient to interpret symptoms as important as well misdiagnosis by clinicians.

Madiba<sup>20</sup> in 1998 demonstrated a perforation rate of 43% in a South Africa population. In the same study, he also demonstrated that those who presented with right-sided

abdominal pain out-numbered the classical presentation of periumbilical pain. Mutupheni<sup>21</sup> within the same year had demonstrated a perforation rate of 25 % within the same population indicating differences according to location. Levy <sup>22</sup> in 1997 attributed perforations in black South Africans to delay in presentation though Walker <sup>23</sup> in 1989 had attributed this delay to the seeking of traditional treatment before presentation to hospital because throughout Africa, traditional healers are held in high esteem. He reported 35% seeking traditional treatment before seeking modern treatment. Out <sup>24</sup> in 1989 showed that patients with acute appendicitis presented late with a median of five days from the onset of symptoms with a perforation rate of 20%. Wilmore, <sup>25</sup> in 2001 in a Kenyan hospital attributed the perforation to pre hospital delay though he did not demonstrate the exact reasons for such a delay. On the other hand, Ofoegbu <sup>26</sup> attributed the perforations to time spent in private hospitals. In Zambia, Haque <sup>17</sup> in 1997 demonstrated a perforation rate of 32%. In the same study, it was shown that the perforation rate in the very young and very old was at 46 % and 49 % respectively.

A perforated appendix is associated with high levels of mortality and morbidity. Lee <sup>27</sup> demonstrated 28% morbidity and 2.3% mortality in those patients above sixty years presenting with perforated appendix. Walters <sup>28</sup> had earlier on demonstrated that 25 % of all cases of peritonitis at UTH were due to perforated appendix.

Madiba <sup>20</sup> demonstrated two percent mortality in patients with perforated appendix whereas here at UTH, Mwangala <sup>29</sup> demonstrated a 35% wound infection rate in those with generalized peritonitis and 25% mortality in this group. The incidence of perforated appendix has been on the increase and authors do agree that this is associated with serious morbidity. For now, little is known on factors contributing to this at UTH. The study addresses the issue.

## **PATIENTS AND METHODS**

This was a nine month prospective cross section descriptive study carried out at the University Teaching Hospital, Lusaka, Zambia from March to November 2007.

For participation in the study, the following criterion was followed.

- I. Consent by patient or guardian to participate in the study.
- II. A confirmed intra-operative diagnosis of perforated and non- perforated appendicitis.

Patients were recruited from the five general surgical units as well as from the paediatric surgical unit.

A questionnaire was administered to every recruited patient. Patients were seen on the day of recruitment (day 0) and were followed up until discharge. They were seen after a week and then at one month. The information included the sex, age, socioeconomic background, referring clinic, duration of illness, use of traditional medicine and surgical complications encountered.

### **Patient selection.**

All patients were recruited into the study until the sample size was reached. A total of 36 patients were recruited of whom half had perforated and the other half non-perforated appendicitis. The sex, age and nature of the appendicitis in those not formally recruited into the study was also taken and analyzed.

### **Pre operative care**

Patients for appendicectomy were admitted via casualty to either the male or female surgical wards upon making a diagnosis of acute abdomen. A detailed history was taken and full examination done at which a diagnosis of acute appendicitis or that of peritonitis was confirmed. This was primarily a clinical diagnosis and very few investigations were done. The patients were then assessed for fitness to undergo

general anesthesia. All patients were resuscitated before being taken for surgery depending on the general condition especially in those with peritonitis.

### **The operations**

All operations were preceded by standard skin preparation with savlon, iodine and methylated spirit. The patients were then covered with sterile drapes. For those with simple appendicitis, a right sided gridiron incision of about six to eight centimeters was made. For those with generalized peritonitis, a midline incision was used. The appendix was removed in a standard way which included the burying of the stump whenever possible. In the case of peritonitis, lavage with copious amounts of warm saline was done with some surgeons leaving a drain into the abdomen. Mass closure with nylon was done.

### **Post operative care**

Patient progress was monitored on the ward on a daily basis and complications recorded until the patients were discharged. They were reviewed after a week and then after a month although this was difficult as some never bothered to come back for the second review.

### **Ethical Considerations**

Permission to carry out a study involving human beings was sought from the research ethics committee of the University of Zambia. This study methodology has been used before in other studies and is well acceptable.

There was no manipulation of humans during the study. Operations were decided upon and done by the respective surgical units and their team of surgeons.

Permission was requested from relevant authorities i.e. from the UTH Managing director for data collection, from heads of concerned units and consent from the patients. Patients were also be given transport money for reviews.

The study subjects were treated with dignity and respect. Confidentiality was maintained i.e. Participants' names and their study were unlinked

## **Sample size**

A total of thirty two patients were recruited in the study. This was calculated using the following formulae;

$$N = pqz^2/d^2$$

Where N is the sample size

P is the prevalence

Q is 100-p

Z is 1.96

And d = 5

For this study, a prevalence rate of 1% was used. The calculated sample size was multiplied by two to take care of the perforated and non perforated appendicitis.

## RESULTS

During the study period, a total of seventy three appendicectomies were done of whom two were interval appendicectomies and so were not included in the study. Of the remaining seventy one, thirty one were perforated with either local or generalized peritonitis. The age ranged from six months to sixty years. Of those with perforation, 68 % had generalized peritonitis. Further analysis was only done in those formally recruited in the study. 18 of these had perforation and the other 18 had simple appendicitis.

Table 1 and figure 1 show the frequency of perforated appendix during the study period of 43.6%. Table 2 and figure 2 show the frequency of perforation according to age. Most of the perforations were in the age group between 30 and 40. Table 3 and figure 3 show the frequency of perforation according to sex. Most of the perforations were in males. Table 4 and figure 4 show the distribution of perforation according to residential area.

High rate of perforation was associated with people from highly populated areas. Table 5 and figure 5 show the frequency of perforation in relationship to duration of illness at home before admission to UTH. None of the patients with perforation came within the first twenty four hours as opposed to those with no perforation in whom over 60 % came within the first forty eight hours ( $p < 0.001$ ).

Table 6 and figure 6 show the frequency of perforation in relation to mode of admission to UTH. The mode of admission did not have an influence over perforation. Table 7 and figure 7 show the frequency of perforation according to time spent at the private clinic before referral to UTH. This did not contribute significantly as there was no delay attributed to private clinic consultation.

Table 8 and figure 8 show the frequency of perforation in relation to private clinic diagnosis. Table 9 and figure 9 show the frequency of perforation in relation to pre-admission antibiotic administration. Table 10 and figure 10 show the frequency of perforation in relation to use of traditional medicine.

11 percent of those with perforation used traditional medicine before admission to UTH. Table 11 and figure 11 show the frequency of perforation in relation to amount earned per month.

The majority of those with perforation earned less than five hundred thousand kwacha per month. Table 12 and figure 12 show the frequency of perforation in relation to family size. Perforation is associated with households of six or more people Table 13 and figure 13 show the frequency of perforation in relation to education level of patient or guardian. Most of the patients with perforation were associated with education level of less than grade seven.

Table 14 and figure 14 show the frequency of perforation in relation to period spent at UTH before actual surgery. The majority of the people from the two groups were taken to theatre for the actual surgery after four hours.

Table 15 and figure 15 show the complications associated with appendicectomy. 33.3% in the perforated group had wound infection and 22 % had re-laparotomy done between the fourth and the tenth post operative day.

Table 16 and figure 16 show the frequency of admission to intensive care unit. Table 17 and figure 17 show the duration of post operative hospital stay after surgery. The majority of those without perforation were discharged between the third and fifth post operative day as opposed to those with perforation who were discharged after the sixth post operative day with 22.2 % going beyond the tenth day.

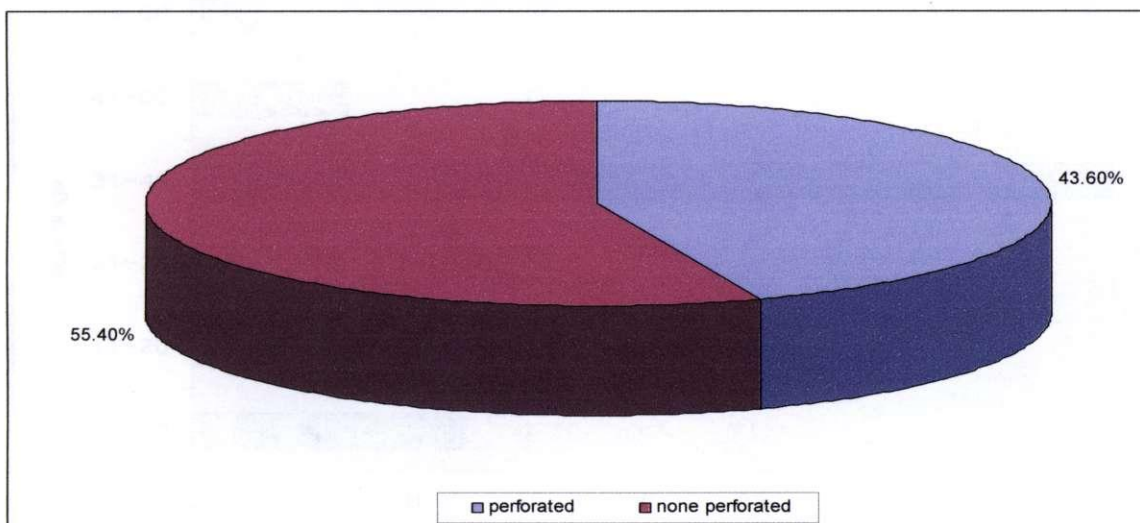
Table 18 and figure 18 show the mortality associated with appendicectomy. 3.2 % of the perforated group died where as none of the patients with simple appendicitis died. The charts following the tables are a graphical presentation of the results in the tables.

## TABLES AND FIGURES

Table 1. Frequency of perforated appendix during the study period.

|                                   |        |
|-----------------------------------|--------|
| Total appendicectomies done       | 71     |
| Number of perforated appendicitis | 31     |
| Percentage                        | 43.6 % |

Figure 1. Frequency of perforated appendix during the study period

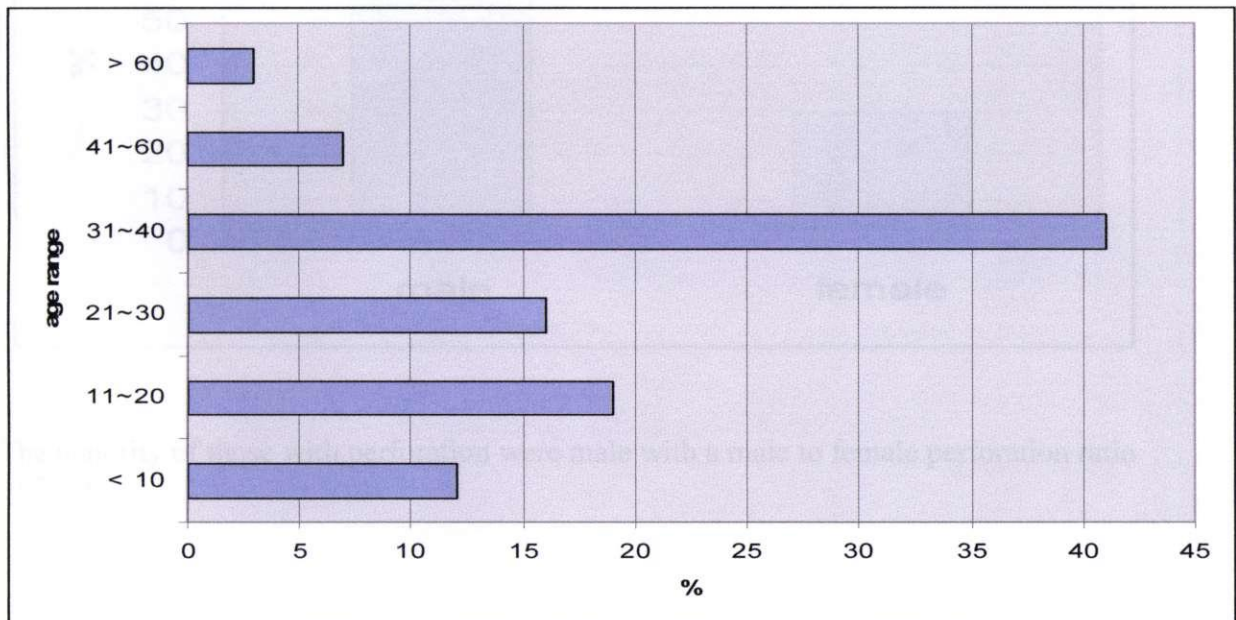


The perforation rate was at 43.6 %

Table 2. Frequency of perforation according to age.

| Age   | Total number of appendicectomies | Perforated | Percentage of total perforations | Perforation rate for the age group |
|-------|----------------------------------|------------|----------------------------------|------------------------------------|
| < 10  | 08                               | 04         | 12.9                             | 50                                 |
| 11-20 | 10                               | 06         | 19.3                             | 60                                 |
| 21-30 | 19                               | 05         | 16.1                             | 26.3                               |
| 31-40 | 24                               | 13         | 41.9                             | 54.1                               |
| 41-60 | 09                               | 02         | 06.4                             | 22.2                               |
| > 60  | 01                               | 01         | 03.2                             | 100                                |
| Total | 71                               | 31         |                                  |                                    |

Figure 2 Frequency of perforation according to age.

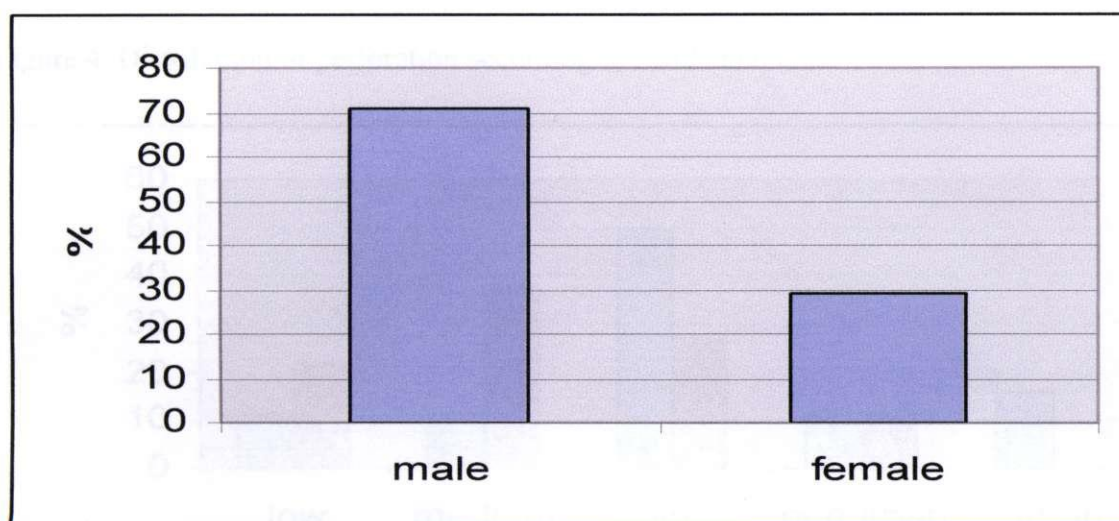


The highest perforation rate was between the 30 to 40 age group and those below 20 and above 60 had the highest chance to perforate.

Table 3. Frequency of perforation according to sex

| Sex    | Perforated | Percentage |
|--------|------------|------------|
| Male   | 22         | 70.9       |
| Female | 09         | 29.1       |

Figure3. Frequency of perforation according to sex.

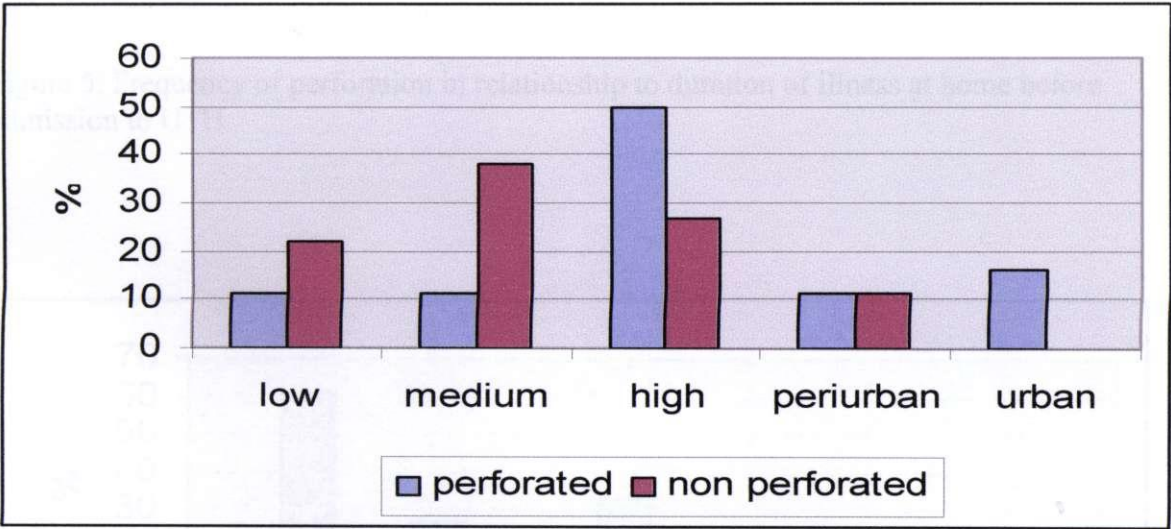


The majority of those with perforation were male with a male to female perforation ratio of 2.5:1.

Table 4. Distribution of perforation according to residential area.

| Residential area    | Low density |    | Medium density |    | High density |    | Peri-urburn |    | Rural |    |
|---------------------|-------------|----|----------------|----|--------------|----|-------------|----|-------|----|
|                     | No.         | %  | No.            | %  | No.          | %  | No.         | %  | No.   | %  |
| Perforated appendix | 02          | 11 | 02             | 11 | 09           | 50 | 02          | 11 | 03    | 16 |
| Non-perforated      | 04          | 22 | 07             | 38 | 05           | 27 | 02          | 11 | 00    | 00 |

Figure 4. Distribution of perforation according to residential area.

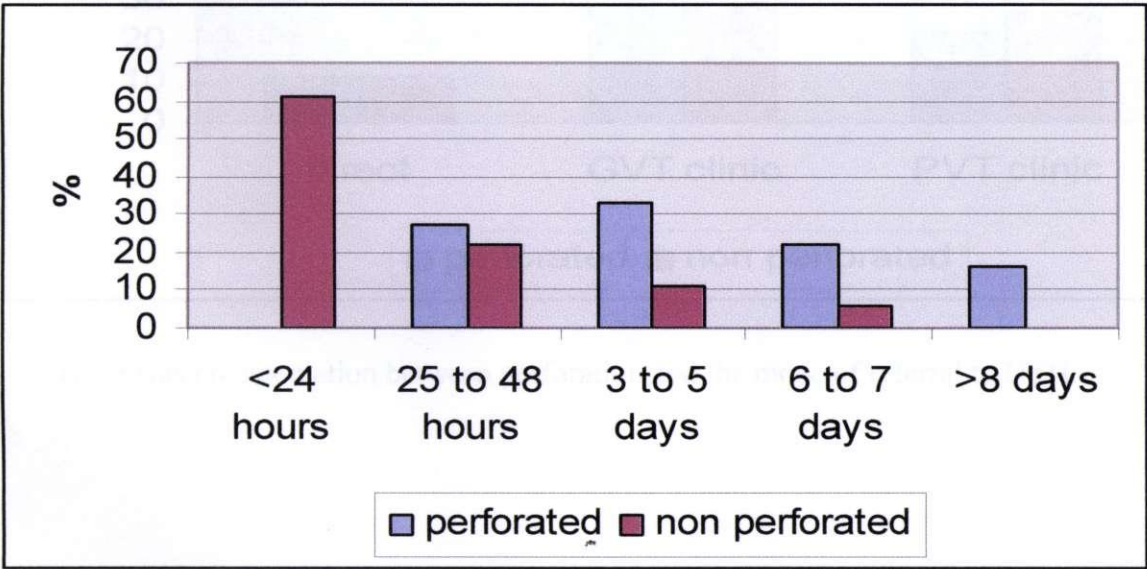


50% of those presenting with perforation were from highly populated residential areas.

Table 5. Frequency of perforation in relationship to duration of illness at home before admission to UTH

| Duration at home before admission to UTH | <24 hours |    | 25-48 |    | 3-5 days |    | 6-7 days |     | >8 days |    |
|------------------------------------------|-----------|----|-------|----|----------|----|----------|-----|---------|----|
|                                          | No.       | %  | No.   | %  | No.      | %  | No.      | %   | No.     | %  |
| Perforated appendix                      | 00        | 00 | 05    | 27 | 06       | 33 | 04       | 22  | 03      | 16 |
| Non perforated                           | 11        | 61 | 04    | 22 | 02       | 11 | 01       | 5.5 | 00      | 00 |

Figure 5. Frequency of perforation in relationship to duration of illness at home before admission to UTH

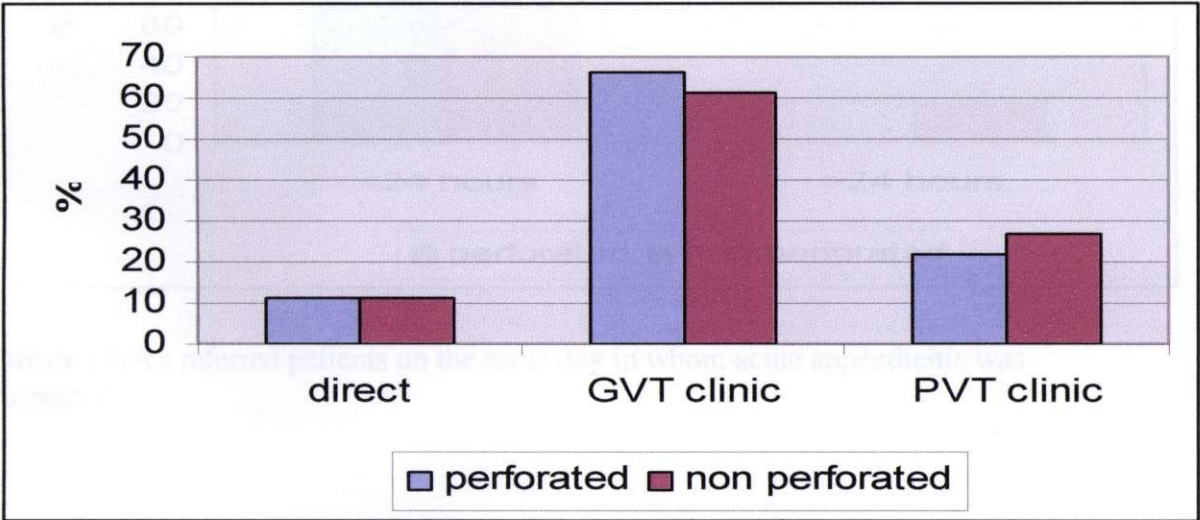


None of those with perforation came to UTH within the first 24 hours as compared to those without perforation in whom 60 % came within the first 24 hours.

Table 6. Frequency of perforation in relation to mode of admission to UTH

| Item                | Direct admission to UTH |    | Referral from GVT clinic |      | Referral from PVT clinic |      |
|---------------------|-------------------------|----|--------------------------|------|--------------------------|------|
|                     | No.                     | %  | No.                      | %    | No.                      | %    |
| Perforated appendix | 2                       | 11 | 12                       | 66.6 | 4                        | 22   |
| Non-perforated      | 2                       | 11 | 11                       | 61.1 | 5                        | 27.7 |

Figure 6. Frequency of perforation in relation to mode of admission to UTH

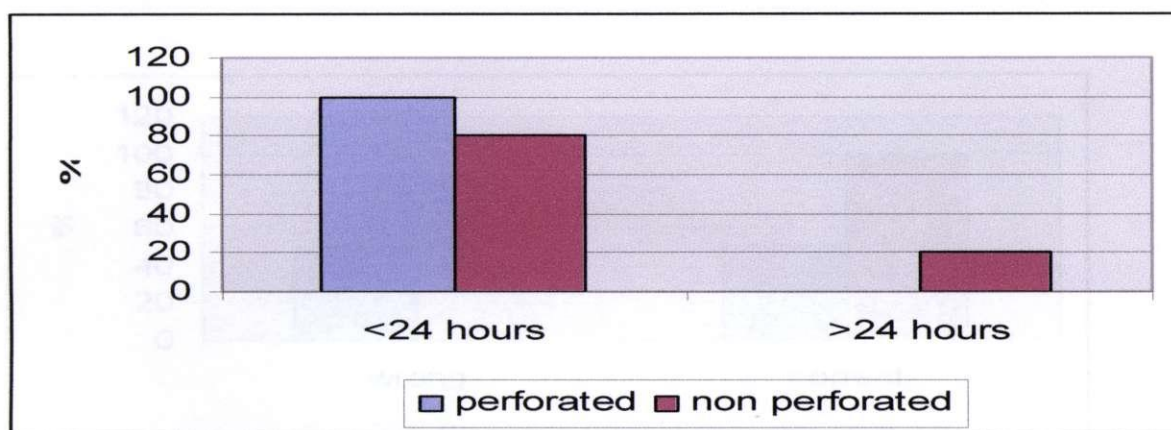


There was no association between perforation and the mode of referral to UTH.

Table 7. Frequency of perforation according to time spent at the private clinic before referral

| PVT clinic delay before referral to UTH | Less than 24 hours |     | More than 24 hours. |    |
|-----------------------------------------|--------------------|-----|---------------------|----|
|                                         | No.                | %   | No.                 | %  |
| Perforated                              | 4                  | 100 | 0                   | 0  |
| Non perforated                          | 4                  | 80  | 1                   | 20 |

Figure 7. Frequency of perforation according to time spent at the private clinic before referral.

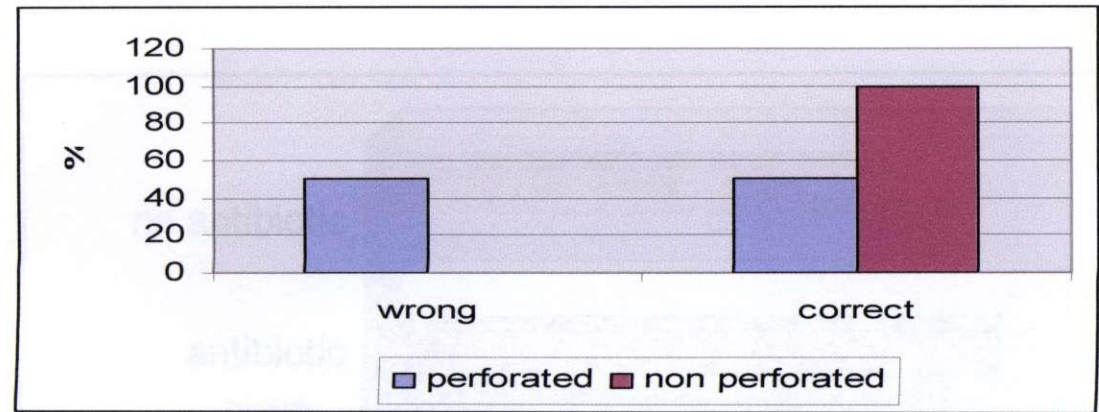


Private clinics referred patients on the same day in whom acute appendicitis was suspected

Table 8. Frequency of perforation in relation to private clinic diagnosis

| item           | Correct diagnosis |     | Wrong diagnosis |    |
|----------------|-------------------|-----|-----------------|----|
|                | No.               | %   | No.             | %  |
| Perforated     | 2                 | 50  | 2               | 50 |
| Non perforated | 5                 | 100 | 0               | 0  |

Figure 8. Frequency of perforation in relation to private clinic diagnosis.

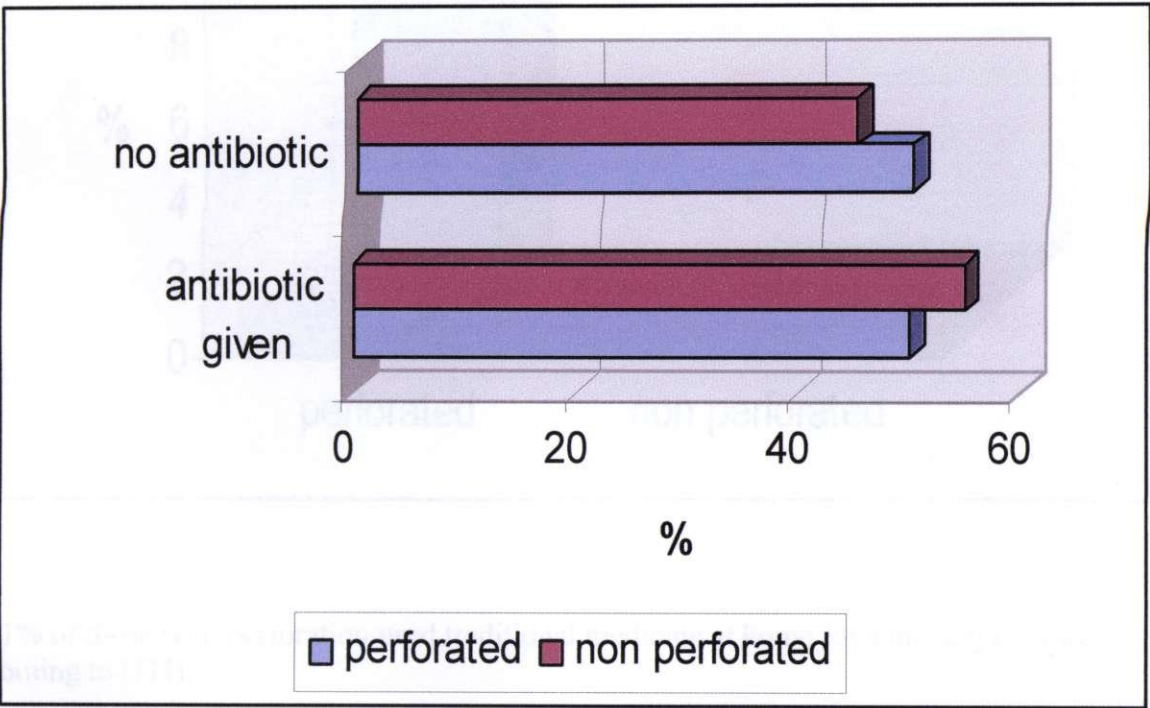


All those with perforation had the correct diagnosis made at the private clinics.

Table 9. Frequency of perforation in relation to preadmission antibiotic administration.

| Antibiotic given before referral | Antibiotic |    | No antibiotic |    |
|----------------------------------|------------|----|---------------|----|
|                                  | No.        | %  | No.           | %  |
| Perforated                       | 9          | 50 | 9             | 50 |
| Non perforated                   | 10         | 55 | 8             | 45 |

Figure 9. Frequency of perforation in relation to preadmission antibiotic administration.

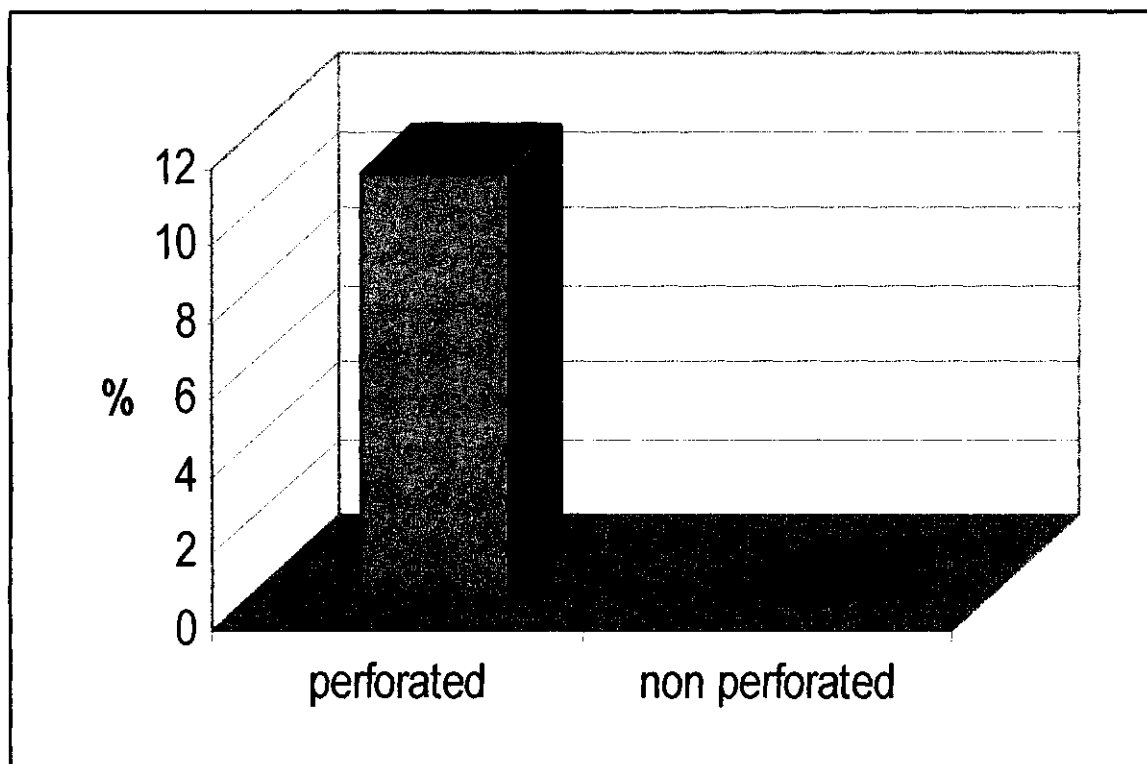


50% of those with perforation had preadmission antibiotics given for a few days compared to 55% of those with simple appendicitis. There was no significant difference between the two groups in relation to pre-hospital antibiotic administration.

Table 10. Frequency of perforation in relation to use of traditional medicine.

| Item           | Use of traditional medicine |    | No use of traditional medicine |     |
|----------------|-----------------------------|----|--------------------------------|-----|
|                | No.                         | %  | No.                            | %   |
| Perforated     | 2                           | 11 | 16                             | 89  |
| Non perforated | 0                           | 0  | 18                             | 100 |

Figure 10. Frequency of perforation in relation to use of traditional medicine



11% of those with perforation used traditional medicine at home for some days before coming to UTH.

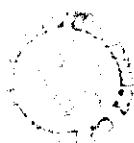
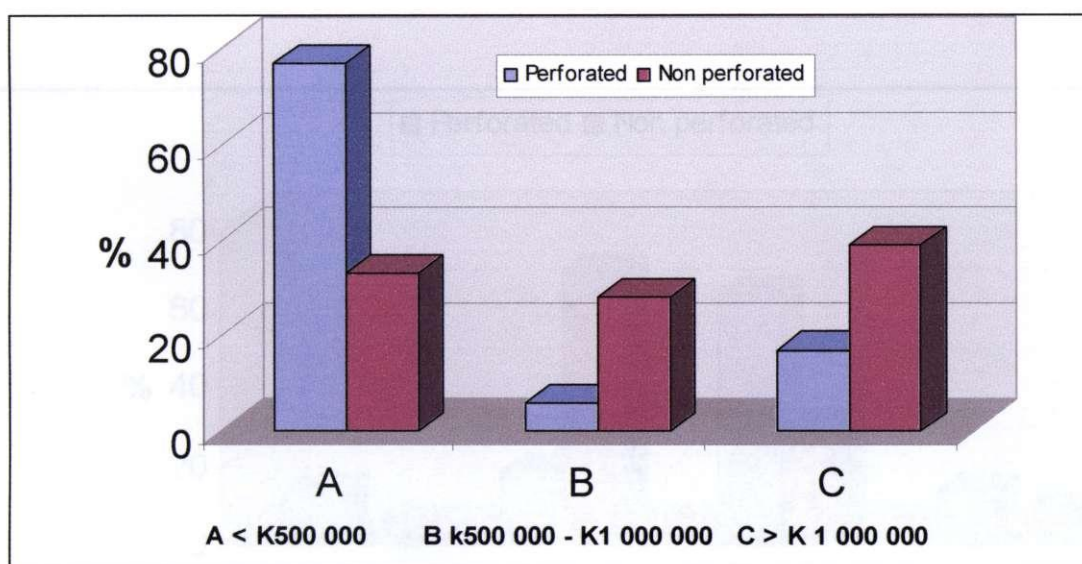


Table 11. Frequency of perforation in relation to amount earned per month.

| Amount earned in Kwacha | < 500 000 |      | 500 000 to 1 000 000 |      | > 1 000 000 |      |
|-------------------------|-----------|------|----------------------|------|-------------|------|
|                         | No.       | %    | No.                  | %    | No.         | %    |
| Perforated appendix     | 14        | 77.7 | 1                    | 5.5  | 3           | 16.6 |
| Non perforated          | 6         | 33.3 | 5                    | 27.7 | 7           | 38.8 |

Figure 11. Frequency of perforation in relation to amount earned per month.

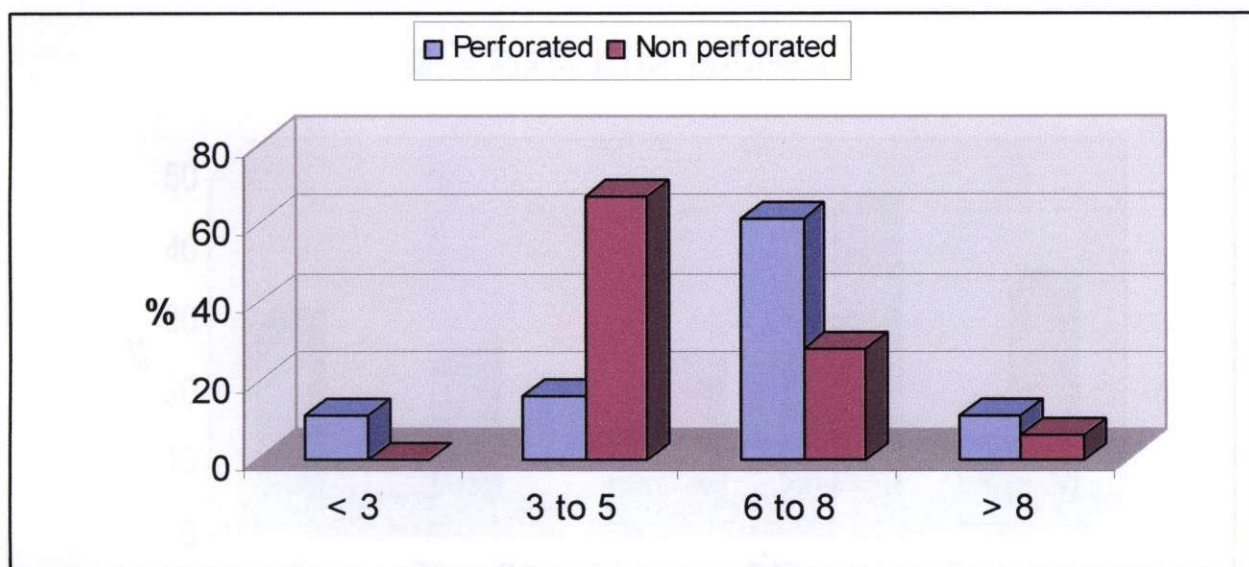


77% of those with perforated appendicitis live on less than K500 000 per month.

Table 12. Frequency of perforation in relation to family size.

| Family size         | < 3 |    | 3 - 5 |      | 6 - 8 |      | > 8 |     |
|---------------------|-----|----|-------|------|-------|------|-----|-----|
|                     | No. | %  | No.   | %    | No.   | %    | No. | %   |
| Perforated appendix | 2   | 11 | 3     | 16   | 11    | 61   | 2   | 11  |
| Non perforated      | 0   | 0  | 12    | 66.6 | 5     | 27.7 | 1   | 5.5 |

Figure 12. Frequency of perforation in relation to family size.

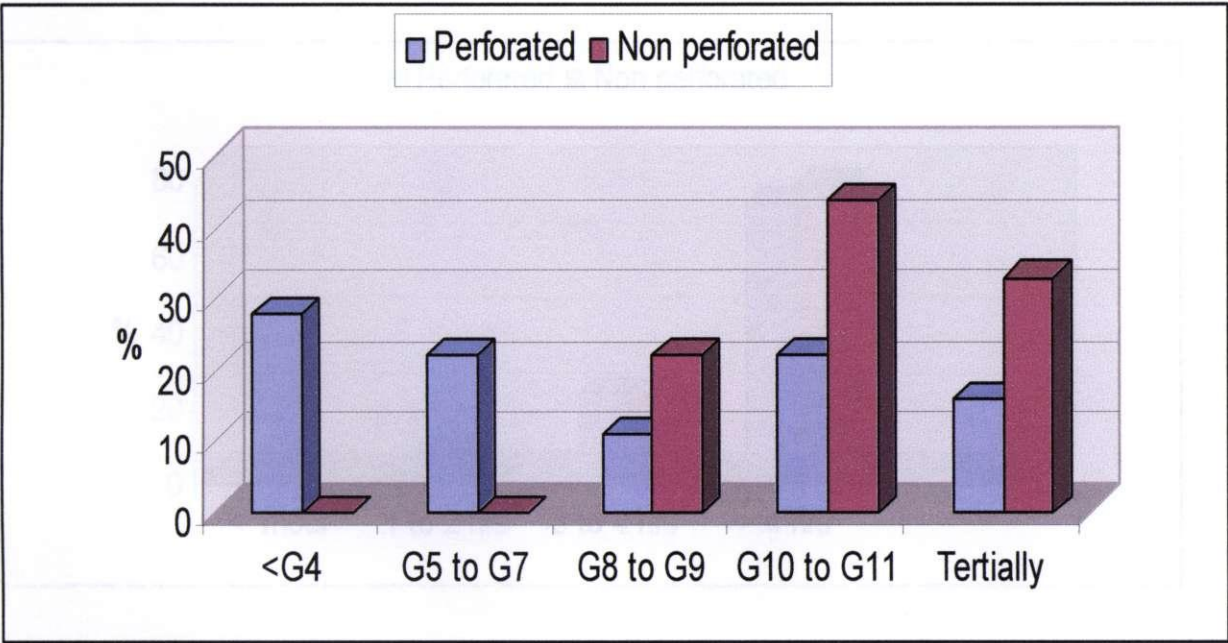


The majority of those with perforation (72%) were coming from house holds with six or more people whereas 60% of those with simple appendicitis were coming from house holds of three to five people.

TABLE 13. Frequency of perforation in relation to education level of patient or guardian.

| Education level     | < grade 4 |      | Grade 5 – 7 |    | Grade 8 – 9 |      | Grade 10 – 12 |      | Tertially education |      |
|---------------------|-----------|------|-------------|----|-------------|------|---------------|------|---------------------|------|
|                     | No.       | %    | No.         | %  | No.         | %    | No.           | %    | No.                 | %    |
| Perforated appendix | 5         | 27.7 | 4           | 22 | 2           | 11   | 4             | 22   | 3                   | 16   |
| Non perforated      | 0         | 0    | 0           | 0  | 4           | 22.2 | 8             | 44.4 | 6                   | 33.3 |

Figure 13. . Frequency of perforation in relation to education level of patient or guardian

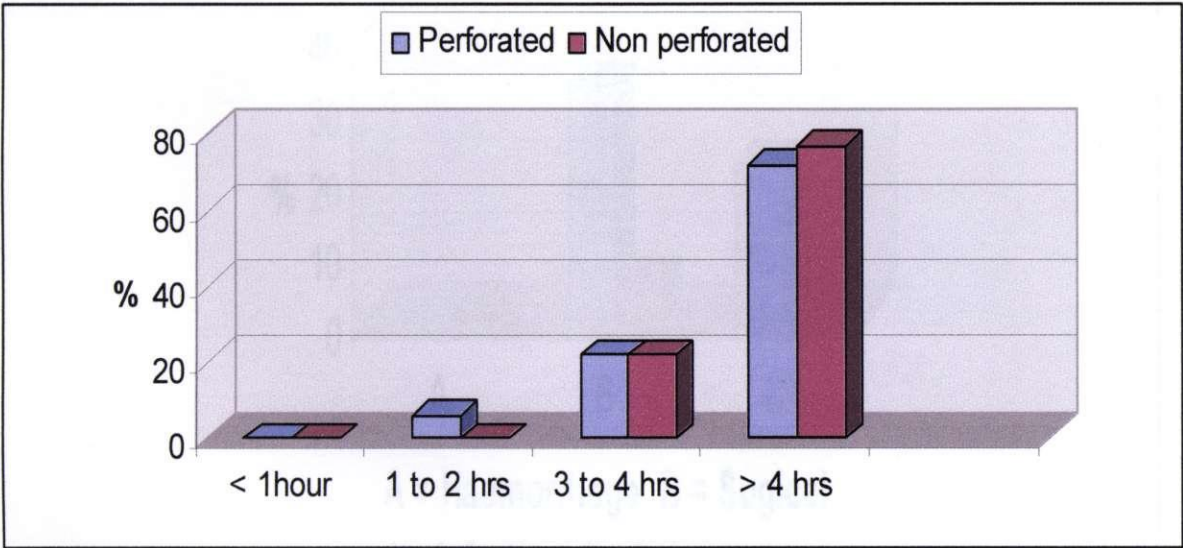


Half of those with perforation or their guardians for those less than 18 years of age had primary education alone whereas those without perforation went beyond the level of primary education.

Table 14. Frequency of perforation in relation to period spent at UTH before actual surgery

| Period before surgery | < 1 hour |   | 1 – 2 hours |     | 2 – 4 hours |      | > 4 hours |      |
|-----------------------|----------|---|-------------|-----|-------------|------|-----------|------|
|                       | No.      | % | No.         | %   | No.         | %    | No.       | %    |
| Perforated appendix   | 0        | 0 | 1           | 5.5 | 4           | 22.2 | 13        | 72.2 |
| Non perforated        | 0        | 0 | 0           | 0   | 4           | 22.2 | 14        | 77.7 |

Figure 14. Frequency of perforation in relation to period spent at UTH before actual surgery.

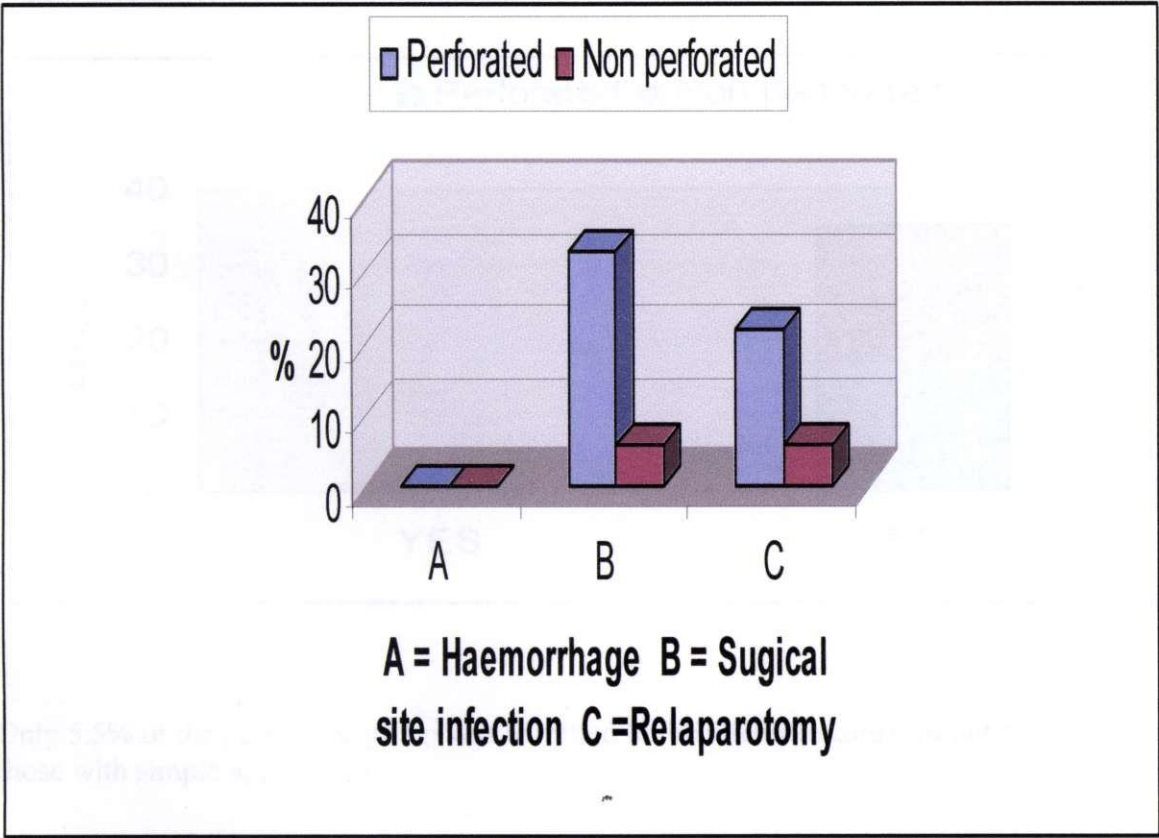


The majority of the patients from the two groups (> 60%) were taken for the actual surgery more than four hours after being admitted to UTH.

Table 15. Complications associated with appendicectomy.

| Complication        | Haemorrhage |   | Surgical site infection |      | Re-Laparotomy for intra abdominal abscess |      |
|---------------------|-------------|---|-------------------------|------|-------------------------------------------|------|
|                     | No.         | % | No.                     | %    | No.                                       | %    |
| Perforated appendix | 0           | 0 | 6                       | 33.3 | 4                                         | 22.2 |
| Non perforated      | 0           | 0 | 1                       | 5.5  | 1                                         | 5.5  |

Figure 15. Complications associated with appendicectomy

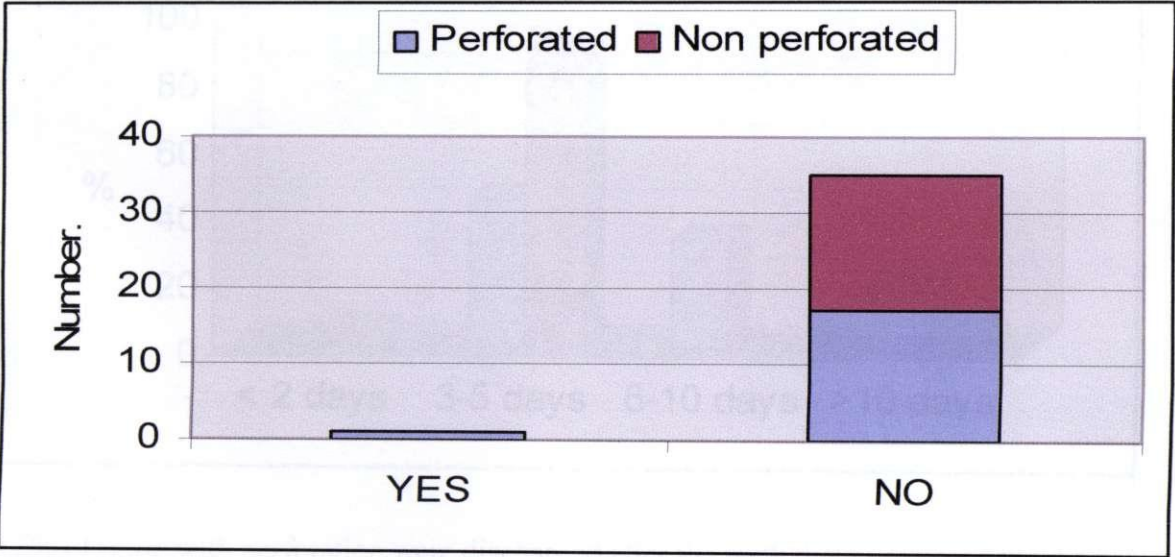


There was a 33.3% wound infection rate in those with perforation as compared to 5.5 % in those with simple appendicitis. 22.2 % had re-Laparotomy for intra abdominal abscess formation as compared to 5.5% who had re-Laparotomy in the non perforated group.

Table 16. Frequency of admission to intensive care unit.

| Admission to intensive care unit | Yes |     | No  |      |
|----------------------------------|-----|-----|-----|------|
|                                  | No. | %   | No. | %    |
| Perforated appendix              | 1   | 5.5 | 17  | 94.4 |
| None perforated                  | 0   | 0   | 18  | 100  |

Figure 16. Frequency of admission to intensive care unit.

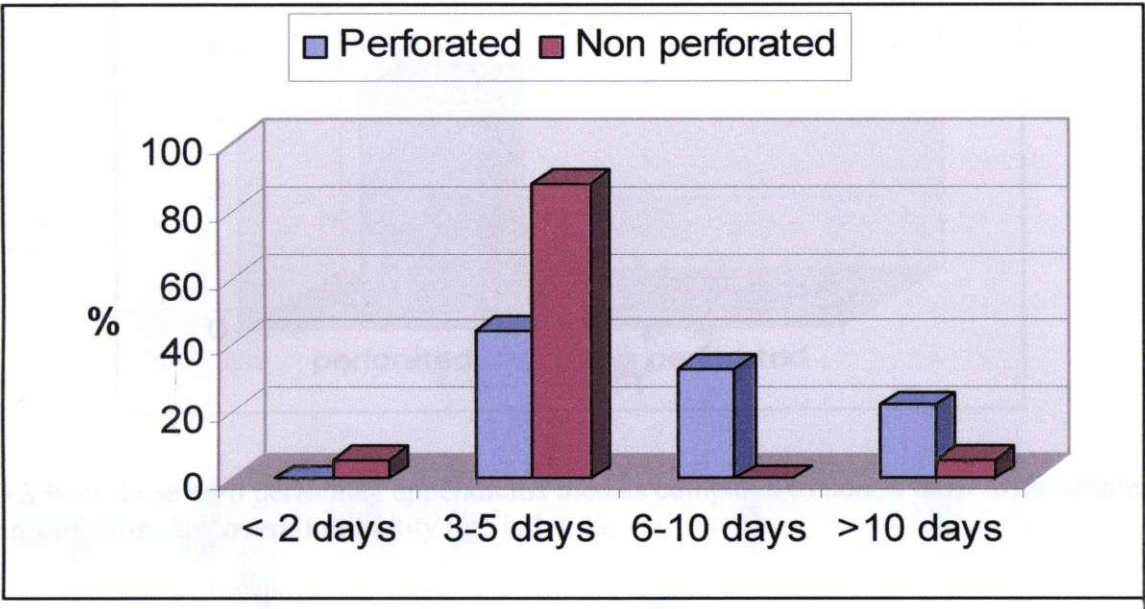


Only 5.5% of the perforated group was admitted to the intensive care unit but none of those with simple appendicitis.

Table 17. Duration of post operative hospital stay after surgery.

| Duration of admission | < 2 days |     | 3 – 5 days |      | 6 – 10 days |      | > 10 days |      |
|-----------------------|----------|-----|------------|------|-------------|------|-----------|------|
|                       | No.      | %   | No.        | %    | No.         | %    | No.       | %    |
| Perforated appendix   | 0        | 0   | 8          | 44.4 | 6           | 33.3 | 4         | 22.2 |
| Non perforated        | 1        | 5.5 | 16         | 88.8 | 0           | 0    | 1         | 5.5  |

Figure 17. Duration of post operative hospital stay after surgery.

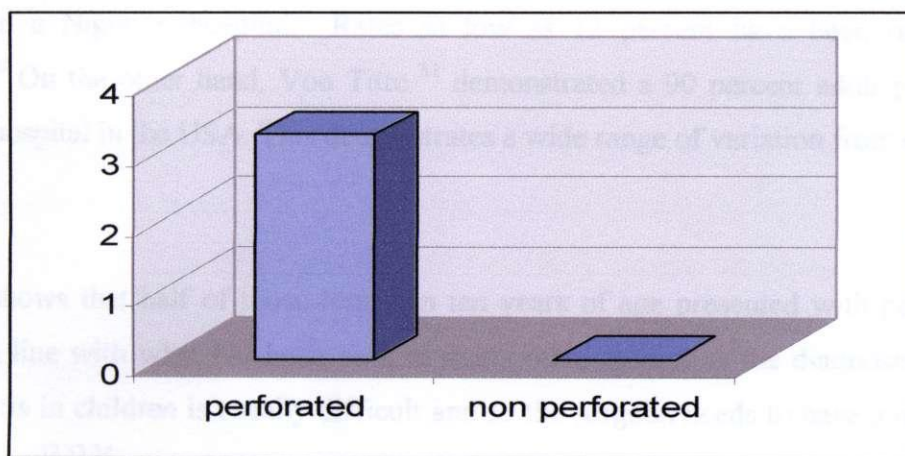


55.5% of those with perforation were discharged after the sixth day as opposed to 88.8 % of those with simple appendicitis who were discharged between the third and fifth postoperative day.

Table 18. Mortality associated with appendicectomy

| Item           | Total number | Mortality | Percentage |
|----------------|--------------|-----------|------------|
| perforated     | 31           | 01        | 3.2        |
| Non perforated | 40           | 00        | 00         |
| Total          | 71           | 01        | 1.4        |

Figure 18. Mortality associated with appendicectomy



3.2 % of those with perforated appendicitis died as compared to non in those with simple appendicitis. The overall mortality rate is 1.4 %.

## DISCUSSION

This study has clearly demonstrated an appendiceal perforation rate of 43.6%. This is well above the 31.6% that was observed 10 years ago<sup>17</sup> This increase can be attributed to the increasing incidence of acute appendicitis as more people resort to a more refined diet. This figure is of course similar to figures obtained in other African countries. Madiba<sup>20</sup> in 1998 had shown a perforation rate of 43 percent in a study done in South Africa. This figure is of course higher than what has been reported in other studies. Mutuphei,<sup>21</sup> for example, demonstrated a perforation rate of 25 percent in the same year in a different part of South Africa. Willmore<sup>25</sup> demonstrated a perforation rate of 22 percent in a Nigerian hospital. Rates as low as 12 percent have been reported in Sweden.<sup>30</sup> On the other hand, Von Titte<sup>31</sup> demonstrated a 90 percent adult perforation rate in a hospital in the USA. This demonstrates a wide range of variation from country to country.

Table 2 shows that half of those less than ten years of age presented with perforation. This is in line with what has been seen in many other studies as the diagnosis of acute appendicitis in children is usually difficult and so the surgeon needs to have a high index of suspicion.<sup>32,33,34</sup>

Of those above the age of 40, only 30 percent presented with perforation. This is not in line with what has been reported in other studies where the majority of those above 40 present with perforation. Just like in children, elderly patients are predisposed to perforation due to low immunity.<sup>11</sup>

Perforations were more common in the male than female patients with a ratio of 2.5: 1. However, it was noted that a bigger percentage of the female patients with acute appendicitis came with perforation. This could be attributed to the pain being linked to other gynecological conditions such as pelvic inflammatory disease.

Half of all those patients with perforation were from highly populated residential areas where as those with no perforation were from low or medium populated areas. The former was also associated with households of more than six people. The possible explanation for this could be that people from highly populated areas are associated with poor socioeconomic background and so might have problems in accessing medical care. This is in line with what has been demonstrated in other series where those with no proper medical insurance were at a higher risk of presenting with perforation because of issues of access to health.<sup>35,36,37</sup> Hjortsberg<sup>38</sup> in a study done here in Zambia in 2003 concluded that individuals were influenced by income, insurance and distance from a health center on the decision to seek medical care for various conditions.

78 percent of those with perforation came after the third day of symptoms at home as opposed to 60 percent of the non-perforated who presented within the first 24 hours ( $p < 0.001$ ). This clearly demonstrates that pre-hospital delay is the main factor associated with perforation. Bickell<sup>39</sup> in 2006 showed that the risk of rupture increases by 5 % every twelve hours after the thirty sixth hour from the onset of the symptoms. Omundesen<sup>40</sup> reported no complications in those who presented within a period of 24 hours. The question that arises therefore is why the prehospital delay by the patients. From this study, it can be concluded that the delay could be attributed to the low socioeconomic status of the patients. Firstly, 77 percent of those with perforation live on less than 500 000 thousand kwacha per month yet have house-holds composed of six or more members. Secondly, over half of the patients or guardians of those who presented with perforation never went beyond the seventh grade and so may lack the initiative to interpret the symptoms of acute appendicitis as important.

There was no difference in the perforation rate between the two groups according to the mode of admission to UTH. The perforation rate was the same in those who referred themselves straight to the Emergency Department and those who were referred by the government clinics. This does not agree with what was observed by Robert<sup>41</sup> in a study done in the USA in which those who referred themselves straight to the Emergency

Department had a lesser chance of perforation as opposed to those who were referred from other health sources or centers.

Consultation to private clinics or hospitals prior to admission to The University Teaching Hospital did not contribute significantly to the prehospital delay. All the patients with suspected acute appendicitis from the private institutions were referred to UTH on the same day. This was not in line with what was observed by Ofoegbu <sup>26</sup> in a Nigerian hospital in which the prehospital delay was attributed to the consultation of private clinics before coming to public institutions.

11 percent of those with perforation used traditional medicine before seeking modern medicine as opposed to none in the other group. This again is in line with what was demonstrated by walker <sup>23</sup> in which prehospital delay was associated with the seeking of traditional medicine before seeking orthodox medicine. A study done here at UTH showed that 75 percent of all patients take traditional medicine before presenting to UTH.<sup>42</sup> Despite this low figure, there is still need to educate our tradition healers on the need for early referral when ever they are in doubt.

The administration of antibiotics before referral did not contribute significantly on prevention of perforation as half of each group was given these before referral. This, also, did not have a bearing on the postoperative complications. All patients were routinely put on triple antibiotics after surgery. Peri-operative antibiotics in acute appendicitis play an important role and this can never be over emphasized. Lack of antibiotic administration by the referring clinics did not in any way contribute to an increase in perforation.

The other issue of concern is the in-hospital delay by the surgeon, that is, between the time the diagnosis is made and the time the patient is taken to theatre for the actual surgery. In this study, over 90 percent of patients from both groups were taken for surgery after a period of over 4 hours on the ward. This could be due to the need to resuscitate the patients before surgery. There was no difference between the two groups in terms of in hospital delay; therefore it can not be associated with the high levels of

perforation observed in this study. The longest period of delay was observed on one patient who was admitted wrongly to a medical ward and was treated as a case of peptic ulcer disease. The surgeons saw the patient after three days but the poor state of the patient could not allow immediate surgery. This was done ten days post admission to UTH. Physicians should be encouraged to seek early surgical opinion whenever in doubt. Our findings do not agree with what other authors have stated that perforation is a surgeon dependant variable. To this effect, it can be concluded that the appendiceal perforation rate of a particular institution can not be used as a way to assess the effectiveness of a hospital in delivering its services as has been postulated by other authorities, at least, not in a developing country like ours.

Perforation of the appendix is associated with high levels of morbidity and mortality. 64.5 percent of those with perforated appendicitis had generalized peritonitis requiring access into the abdomen through the midline. Such an operation demands more time, material and also increases the morbidity as compared to a small right sided incision used for simple appendicitis.

One third of the patients with perforated appendicitis had surgical site infection as compared to 5.5 percent of those with no perforation. This is in line in what has been seen in other studies worldwide in which perforation is associated with high levels of complications. This is in agreement with what was observed by Von Titte<sup>31</sup> in whom 60 % of those with perforated appendicitis presented with major complications. This definitely has a bearing on the hospital post operative stay.

22.2 percent of those with perforation had re-laparotomies done for intra abdominal abscesses between the fifth and tenth post operative day. One patient had two re-laparotomies for peritonitis; however, all these patients recovered well. The only thing of note was that the post-operative hospital stay was prolonged in the group with perforation. Most of these patients were discharged after the sixth post operative day with 22.2 percent going beyond the tenth day. 89 percent of those without perforation were discharged between the second and fifth postoperative day. This clearly demonstrates that

patients with complicated appendicitis are more prone to post operative complications. This of course increases the morbidity and has a bearing on the hospital budget. On the other hand, only one patient with simple acute appendicitis had a re- laparotomy on the fifth post-operative day. He had a leak from the appendicular stump. This complication was primarily attributed to the surgical technique.

From all the appendicectomies done during the study period, there was only one mortality giving an overall mortality rate of less than two percent. This figure is in line with what has been documented in other parts of the world. Despite the high appendiceal perforation rate, the mortality rate is within acceptable levels.

This study had several important limitations. The diagnosis of acute appendicitis was primarily based on what the operating surgeon reported. This was never confirmed by histology. Some of them recruited as acute appendicitis may not, after all, have been inflamed. The other thing is that the number of patients recruited was not very large. There is still need to do a similar study with a large sample size.

## **CONCLUSION**

Having looked at perforated appendicitis for a period of nine months; and having had compared some of the associated factors in those with and without perforation, the following conclusions can be drawn:

1. The perforation rate is 43.6 % which clearly shows that there is an increase from the figures described a decade ago of 32 %.
2. Perforation is common in those between 30 and 40 years.
3. Perforations are more common in the males than females with a perforation ratio of 2.5: 1.
4. The main factor associated with perforation of the appendix is pre hospital delay by patient related factors.
5. Those coming from high density residential areas are prone to perforation as compared to those coming from low or medium populated areas.
6. Perforation is more likely in those with house holds of six or more people and also those living on less than five hundred thousand kwacha per household per month.
7. Lack of education beyond the seventh grade predisposes people to rupture when they have acute appendicitis.
8. In hospital delay by surgeon related factors was not the cause of perforated appendicitis.
9. Form the aforementioned factors, it can be deduced that the pre hospital delay by the patient is linked to poor access to quality health care.
10. The commonest complication associated with appendicectomy in those with perforation is surgical site infection with a good percentage requiring relaparotomy for intra abdominal abscesses.
11. Perforation increases the post operative hospital stay; this has a direct implication on the hospital budget.
12. Despite an increase in the rate of appendiceal perforation, the overall mortality is still less than two percent.

## **RECOMMENDATIONS**

1. The high rate of perforated appendicitis with its subsequent sequelae of increased morbidity and resource expenditure is the primary result of patient delay in seeking medical attention and not the result of diagnostic dilemma or surgical delay, therefore, public education, specifically targeting those groups at risk, may provide a significant solution to the problem.
2. There is need to sensitize the community as well as the primary health workers on the signs and symptoms of common surgical emergencies like acute appendicitis in order to cut down on the pre- hospital delay.
3. A large study, with special emphasis on factors causing pre- hospital delay in patients with acute appendicitis, is strongly advised.

## **BIBLIOGRAPHY**

1. Kelvin P, Appendix: Sabiston Textbook of surgery Sixteenth edition. 2001. WB. Sandler company, London.
2. CD-9 CM-540-1(1987). International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)
3. Creese PG (1953). The first appendicectomy. Surg cryecol obstet 97: 643.
4. Hannock H (1848). Disease of the appendix coeci cured by operation lancet 2:380
5. Tait L (1890). surgical treatment of typhylitis. Birmingham med Rev 27:26.
6. Fitze RH (1886). Perforating inflammation of the vermiform appendix, with special reference to its early diagnosis and treatment. Trans Assoc Am Physicians 1886; 1:107-144.
7. McBurney C (1889). Experiences with early operative interference in cases of diseases of the vermiform appendix. NY Med J 1889; 50:676-684.
8. Murphy JB (1904). Two thousand operations for appendicitis, with deductions from his personal experience. Am J Med Sci 1904; 128:187-211.
9. Ellis H (1991). Early operative treatment of acute appendicitis. Contemp Surg 38(1)35.
10. Anderson BR, Cleave FL, Anderson HK (2003) Antibiotics versus placebo for prevention of postoperative infection after appendicectomy. Cochrane Database Syst Rev. 2005 jul 20 ;(3) CD001439.

11. Ronan P (2004) The vermiform Appendix: Love and Bailey. Principals of surgery twenty fourth edition. 2004. Gouldy company, India.
12. Ajao O G (1981) Br J Surg May 68(5):345-7. Abdominal emergencies in tropical Africa.
13. Katzaski M, Gopal Rao, Brandy K (1979) Blood supply and position of the appendix in Zambians. Med Y Zambia 1978 Apr-May: 13 (2) 32-4
14. Addis DG, Shaffer N, Tauxe RV (1990). The epidemiology of acute appendicitis and appendectomy in United States, American journal of epidemiology. 123 (5): 916-25.
15. Fulton J, Lazarus C (1995). Acute appendicitis among black south Africans. S Afr J Surg. 1995 Dec; 33(4): 165-6.
16. Oliver MJ (1987). Generalised peritonitis due to appendicitis. The proceedings of the association of East Africa 10: 26-27.
17. Haque ME (1997). A study on the incidence of appendectomy in the university teaching hospital, Lusaka, Zambia. M.Med dissertation.
18. Kottiso B, Messele G (1996). Acute appendicitis in Ethiopia. E Afr. Med. J. 73(4); 251-252.
19. Nanda K (2004). Delay in surgery for acute appendicitis. ANZ journal of surgery Vol 74 issue 9 p773- Sept 2004.
20. Madiba TE, Haffeje AA, Mbete DL, Chaitina H (1998). East Frica Med J. 1998 Fed ;75 (2); 81-4 Appendoectomy among African Population at king Edward IV hospital , Durban South Africa.

21. Muthupheni MN, Morwamoche P (1998). The surgical pathology of the appendix in South Africa. *Central Africa jr med* 1998 jcol (4): 9-11.
22. Levy RD, Degiannis E, Kantarovsky A, Marbeti PM, Wello M, Hartitheo C (1997). Audit of acute appendicitis in black South African population. *S Afr J surg* 1997 Nov 35 (4): 198- 202.
23. Walker AR, Walker BF, Mantsi B, Tsotetsi NG, Segal I (1989). Appendicitis in Soweto: Traditional healers and the Hospital. *JR soc Health* 1989 Dec ; 109(6); 190-2.
24. Out AA (1989). Tropical surgical abdominal emergency: Acute appendicitis. *Trop Geogr Med* 1989: 41 (2) 118-22.
25. Willmore WS, Hill AG (2001). Acute appendicitis in Kenya hospital. *East Afr Med J*. 2001;78(7) 355-7.
26. .Ofoegba CK, Odi T, Ogundipe O, Taimoz, Solagberu BA (2005). Epidemiology of non-trauma deaths. *West Afr J. med* (2005) oct-dec: 24(4) 321-4.
27. Lee J F, Leon CK, Lan WY (2000). Appendicitis in the elderly. *ANT Surgery*. 2000 Aug; 70(8):593-6.
28. Watters D (1988). Severe peritoneal sepsis. *Baillieerels clinical tropical medicine and communicable diseases*, 3(2): 275-95.
29. Mwangala MM (1993) .The acute abdomen in the university teaching Hospital: A comparative study of surgery in HIV seropositive and seronegative patients, Lusaka, Zambia, M.Med dissertation.
30. Anderson RE (1992). Diagnostic accuracy and perforation rate in appendicitis with age and sex. *Eur. J Surg* 1992 Jan 158; 1337-41.

31. Von Titte SN, McCabe CJ, Ottinger LW (1996). Delayed appendectomy for appendicitis: causes and consequences. *Am J Emerg Med* 1996 Nov;14(7):620-2.
32. Nance ML, Adamson WT, Hendrick HL. (2000). Appendicitis in the young child: a continuing diagnostic challenge. *Pediatr Emerg Care*. 2000 Jun; 16(3): 160-2.
33. Rajendra S, Feargal Q, Prem P (1995). Appendicitis in preschool children. *Pediatric Surgery International*, vol 10, Nun 2-3, Feb, 1995.
34. Colvin JM, Bachur R, Kharbanada. (2007). The presentation of appendicitis in preschool children, *Pediatr Emerg Care*, Dec; 23(12):849-55.
35. Susan L, Charles M ( 2000). Acute Appendicitis Risks of Complications: Age and Medicaid Insurance *PEDIATRICS* Vol. 106 No. 1 July 2000, pp. 75-78.
36. O'Toole SJ, Karamanoukian HL, Allen JF, Caty MG ( 1996). Insurance-related differences in the presentation of pediatric appendicitis, *Pediatric Surg*. 1996 Aug; 31(8): 1032-4.
37. Susan LB, Charles MH, John HT (2000). Acute Appendicitis Risks of Complications: Age and Medicaid Insurance. *PEDIATRICS* Vol. 106 No. 1 July 2000, pp. 75-78.
38. Hjortsberg C (2003). Why do the sick not utilize health care? The case of Zambia. *Health Econ*, 2003 Sep; 12(9):755-70.
39. Bickell NA, Aufses AH, Rojas M. (2006). How time affects the risk of rupture, *J Am Coll Surg*, 2006 Mar 20; 202(3):401-6.
40. Omundsen M, Dennett E (2006). Delay to appendectomy and associated morbidity: a retrospective review. *ANZ J Surg* 2006 Mar;76(3):153.

41. Robert G, Janet D, Dean K (1999). The risk of appendiceal rupture based on hospital admission source. Academic emergence medicine vol. 6, number 6, 596-601.
42. Horan T C. (1999). Guideline for prevention of surgical site infection: A Special Report. <http://premerinc.com>.

## APPENDIX I

### DATA COLLECTION SHEET

PATIENT ID NO:.....

DATE:.....

1.SEX: M ☐ F ☐

2.AGE: < 5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 21 –30 ☐ 31-40 ☐ 41-60 ☐ > 60 ☐

3.RESIDENTIAL AREA: LOW ☐ MEDIUM ☐ HIGH ☐ PERIUBURN ☐ RURAL ☐

#### 4.DURATION OF ILLNESS BEFORE ADMISSION TO UTH

< 6HOURS ☐

7-12 HOURS ☐

13-24 HOURS ☐

25-72 HOURS ☐

3 –5 DAYS ☐

5-7 DAYS ☐

> 7 DAYS ☐

#### 5.PREADMISSION CARE:

DIRECT ADMISSION TO UTH Y ☐ N ☐

REFERAL FROM: PVT CLINIC Y ☐ N ☐ GVT CLINIC Y ☐ N ☐

ANTIBIOTICS; Y ☐ N ☐

TRADITION MEDICINE Y ☐ N ☐

#### 6.SOCIOECONOMIC STATUS

##### AMOUNT EARNED PER MONTH:

< K100 000 ☐ K100000-500 000 ☐ 500 000 –1 MILLION ☐ > 1 MILLION ☐

#### 7.FAMILY SIZE

< 3 ☐ 3-5 ☐ 5-8 ☐ > 8 ☐

#### 8.DURATION BEFORE BEEING TAKEN TO THEATRE

<1 HOUR ☐ 1-2 HOURS ☐ 2-4 HOURS ☐ > 4HOURS ☐

**INTRAOPERATIVE FINDINGS:**

***PERFORATED*** ☐

**NON-PERFORATED** ☐

***POSTOPERATIVE PERIOD***

**MICU:** YES ☐ NO ☐

**MOBILITY**

**1.HAEMORRHAGE:** Y ☐ NO ☐

**2.SURGICAL SITE INFECTION** Y ☐ N ☐

**3.WOUND DEHISCENCE** Y ☐ N ☐

**4.RELAPAROTOMY;** Y ☐ N ☐ DAYS [    ]

**DURATION BEFORE DISCHARGE**

1-2 ☐

3-5 ☐

6-10 ☐

>10 ☐

**DEATH** Y ☐ N ☐

**PRIVATE CLINIC CONSULTATION;**    Y ☐ N ☐

**IF YES HOW MANY DAYS BEFORE REFERAL** ☐

**WORKING DIAGNOSIS:**.....

## APPENDIX II

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Criteria for defining surgical site infection (SSIs) developed by CDC's NNIS system<sup>42</sup></b></p> <p><b>Superficial incisional SSI</b><br/> Infection occurs within 30 days after the operation <i>and</i> infection involves only skin or subcutaneous tissue of the incision <i>and</i> at least <i>one</i> of the following:</p> <ol style="list-style-type: none"> <li>1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.</li> <li>2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.</li> <li>3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative.</li> <li>4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.</li> </ol>                                                                                                                                              |
| <p><b>Deep incisional SSI</b><br/> Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation <i>and</i> infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision <i>and</i> at least <i>one</i> of the following:</p> <ol style="list-style-type: none"> <li>1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.</li> <li>2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (<math>&gt;38^{\circ}\text{C}</math>), localized pain, or tenderness, unless site is culture-negative.</li> <li>3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.</li> <li>4. Diagnosis of a deep incisional SSI by a surgeon or attending physician.</li> </ol> |
| <p><b>Organ/space SSI</b><br/> Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation <i>and</i> infection involves any part of the anatomy (e.g., organs or spaces) other than the incision, which was opened or manipulated during an operation <i>and</i> at least <i>one</i> of the following:</p> <ol style="list-style-type: none"> <li>1. Purulent drainage from a drain that is placed through a stab wound into the organ/space.</li> <li>2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.</li> <li>3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.</li> <li>4. Diagnosis of an organ/space SSI by a surgeon or attending physician.</li> </ol>                                                                                                                          |