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Original Research Article

Retrospective Study of Antibiotic Prophylaxis in Appendectomy in 6 Hospitals in Yemen

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Abstract: Surgical site infection (SSI) is a common source of Nosocomial infection that represents a significant adverse outcome of the health care system. It results in some additional postoperative days, added cost and spread of drug resistant bacteria. Among many processes that decrease SSI rates, the effect of preoperative administration of antibiotic prophylaxis (AP) has been demonstrated most extensively and evidence based guidelines are followed in many developed countries. This paper is intended to investigate the antibiotic prophylaxis pattern, the rate of SSI and the antibiotic used in 6 hospitals in Yemen. In a retrospective study design involving 6 hospitals as shown in the 3 governorates in Yemen, Aden, Lahj & Dhala, representing a teaching hospital, rural hospitals and private clinics. Patients' record files were collected for all patients who went under appendectomy during the period 2008 to 2015 in those hospitals. A total of 436 patient records were analysed, (Male 276 (63.30%) and female 160 (36.7%)). The data that was obtained from the files of all the selected cases in predesigned format to obtained specific indicators using Excel 2010 spread sheet for analysis. In a retrospect study in 6 hospitals, the medical records of 436 patients who went under appendectomy during the period 2008 to 2015 were examined to investigate the antibiotic prophylaxis pattern, the rate of SSI and the antibiotic used. There is no common pattern for neither in the selection nor in the use of antibiotics as a prophylactic measure. All hospitals gave treatment rather than prophylaxis. There is no evidence based guideline for the selection or use of antibiotic, over 22 types of antibiotics are used by different surgeons in the same hospital. All patients had long hospital stay, range 3 to 10 days. Algamhouriah which is the teaching hospital had the longest hospital stay. There was no difference in practice seen between rural or urban hospital nor between private and public hospital, there was a large difference in the cost of appendectomy in the private and the public sector. There is obvious need for a revision of therapeutic policy for all hospitals as a patient safety issue. Follow up of discharged patients is neglected which may indicate a higher infection rate.

Keywords: Surgical site infection, appendectomy, antibiotic prophylaxis.

INTRODUCTION

Surgical site infection (SSI) accounts for 31% among surgical patients [3]. It is one of the serious complications of surgery. It results in an increase hospital stay, cost and patient suffering and even death – SSI is inevitable but, can be minimized. An estimated 40%–60% of SSIs are preventable [4] by two ways:

A. Controlling the risk factors that contribute to it occurrence

i. Patient Characteristics: age, comorbidity, obesity and mal-nutrition and other medications such as steroid use, malnutrition: no epidemiological association
ii. Pre- and Intra-Operative Related to operation room conduct adherence to proper guidelines and check list.

B. Antibiotic prophylaxis: There are a lot of evidence based studies that show a significant reduction in SSI rate using antibiotic prophylaxis when used properly [5, 6]. There are evidence based guidelines established for each specific type of operation at national and institution levels. Mostly used is NICE and CDC [7] guidelines. The guidelines try to establish protocols depending on:

a. Type of organism
b. Sensitivity
c. Type of operation
d. Choice of prophylactic antibacterial agent
e. Mode and time of administering the agent

Appendectomy is chosen for this study as a typical surgical class 3 i.e. contaminated acute, non-purulent inflammation where antibacterial prophylaxis is justified and because it is a type of operation that is performed in all hospitals in Yemen. In the NHSN report (2006–08) [1] the rate for appendectomy reported 1.15% (60 of 5211). Overuse, underuse, improper timing, and misuse of antibiotics occurs in 25%–50% of operations. The most common microorganisms isolated

from SSIs after appendectomy are the anaerobic Gram-negative enteric organisms and *Bacteroides fragilis, E. Coli* the most frequent aerobics indicating that the bowel flora constitutes a major source for pathogens. Endogenous (50%) auto-Infection, HCAIs Patient/Staff - Cross Infection (35%), (Greatest source of potential danger) Environment - Exogenous (15%) (Air-5%; Instruments-10%).

The antibacterial agents used are, any single agent or combination of agents that provides adequate gram-negative and anaerobic coverage. Usually a Second-generation Cephalosporin's or Third-generation Cephalosporin's with partial anaerobic activity (cefotaxime). Cefoxitin was significantly superior to ampicillin + metronidazole.

The risk of SSI begins at the time of incision so effective tissue concentration must be reached at that time. This depends on pharmacokinetic of the drug and the route of administration. Ideally 30 minutes within induction of anaesthesia. For best surgical practice and rational use of antibiotics. It is important that heath institutions work in accordance to written policies and guidelines. No study has been conducted for the efficacy of antibiotic prophylaxis or risk of SSI in patients undergoing appendectomy in Yemen. This study is meant to be an exploratory investigation of current practices

Objective

To investigate the SSI Prophylaxis practice in a sample of hospitals in Yemen and to explore the guidelines is followed. The study was restricted to the use of Antibiotics and not any other risk factors that contribute to SSI, and to obtain a preliminary idea of the surgical infection rate in rural and urban setup.

METHOD AND MATERIALS

Box 1

Number of patients,
Gender
Complicated cases
Infected cases,
Antibiotics used,
Timing of AB administration
Duration of use,
Hospital stay,
Cost of prophylaxis,
Operation. Cost,
Hospital cost
Medication on discharge
Follow up.
Hospital management provided information regarding:
Infection control
Antibiotic policy
Hospital charges.

In a retrospective study design, the medical records of patients who went under appendectomy in 6 hospitals in Aden, Lahj and Dhala hospitals representing private and public hospital and also rural and urban setup. A total of 436 patients (male 276 (63.30%) and female 160 (36.7%)) who had an appendectomy during the period 2010 to 2015. Patients with complicated appendicitis and cases with conditions prone to get infected such as diabetics were excluded from the study. A specially designed form is used for extracting the required data from each file.as shown in box.1 and fed into Excel spread sheet. The study was cleared ethically by the Ministry of Public Health and population office, and the management of the hospital involved. The patients' files were examined for available information listed in box 1. Hospital management were questioned for written evidence for the existence of infection control strategy, and antibiotic policy and hospital charges. Antibiotics prices were obtained from the private pharmacies.

RESULTS

The following features are common to all hospitals involved in this study:

- No written infection control strategy and there is no antibiotics policy.
- There are no special protocols to be followed for surgical antibacterial prophylaxis, it is up to the discretion of the surgeon.
- Medical records system is not complete.
- No follow up for the patient after discharge
- Medications after discharge are not included in the patients file, it is written as an outpatient prescription to be purchased from private pharmacies
- The information obtained from the files is in tables 1 and 2.

Infection rate and he use of Antibiotics

Table 1 shows the infection rate at individual hospital, the average infection rate was 4.1%, Dhala hospital which is a rural hospital have the highest rate (8%), the teaching hospital (Algmhouria) has 3.8%, Lahj hospital has 0% but few patients are seen there because it is close to the capital city Aden. In all the six hospitals the number of Antibiotics used were 2 -3 drugs with an average of less than 3 drugs except Dhala the number used in all patients were 3 drugs. Lahj hospital used the least number of drugs, the range of 1 to 2 drugs with an average of less than 2 drugs.

Table 1: Infection rate while using antibiotic in appendectomy prophylaxis in six hospitals in Aden

Hospital	No. Of	Infected	%	Average Number of	Number of days in

	cases	cases	infection	Antibiotics& range	hospital ( ) Range
Mayo 22	96	2	2.1	1.7	3 -7 (3.5)
Ben kheldoon	21	0	0.0	1.4 (1-2)	3.5 (3-7)
Alrazi	51	3	5.9	2(2-3)	(3.1) 3-5
Dhala	98	8	8.2	3 (3)	4.2 (7-3)
Alwali	89	4	4.5	1.6 (2-3)	3.2 (2-7)
Algamhuriah	78	3	3.8	1.7 (2-3)	3.6 (3-10)
Total	433	20			
Average			4.1	19	3.55

Table 2: Duration of antibiotic use in the 6 hospitals

Hospital	Average duration of AB use	Maximum No. days	Minimum No. days
Mayo 22	3.4	10	2
Ben khaldoon	3.4	7	2
Alrazi	3.4	7	3.2
Dhala	3	3	3
Alwali	4.2	7	2
Algamhuriah	3.6	10	2
General average. 3.5 days		Range 2 to 10 days	

Antibiotic is administered before the patient is taken to the operation room. There is no record of Antibiotic use after discharge. There is no limit of what antibiotic can be used. Table 3 shows the range of antibiotics that were used in those six hospitals, it included Penicillin, Cephalosporin, Aminoglycosides and others.

Table 3: Range of antibiotics brands used by each of the individual hospital

Generic	Brand	Generic	Brand name
Amoxicillin	Amoxicilinx	Ceftriaxone	Oralax
Amoxicillin+clavonic acid	Augmentin	Ceftriaxone	Megacef
Ampicillin+cloxacillin	.ampiclox	ceftriaxone	.forcef
Cefipime	Aspine	cefuroxime 1	.zinnet
Cefipime 4	.exipim	cefuroxime 3	.ceftrixone 2
Cefixime	Zimaks	ciprofloxacin	Ciproflocin
Cefixime	Loprax	erythromycin	Erythromycin
Cefotaxime	.primocif	gentamycin	.gentanicin
Cefradine	Cefradine	metronidazol	.motvonidaze
Ceftriaxone	Ciplacef	vancomycin	Vancomycin
Ceftriaxone	Rociflex		

Costing

Costing is based on the average hospital days in each hospital and prophylaxis cost is based on the average treatment for antibiotics alone, which 2543 Yemeni riyal per day. Urban hospital YR 1500, rural hospital free. In the private sector hospital bed cost YR 6000 per day, operation cost in the range of YR 20,000 open surgery to YR 55,000 laparoscopic operation.

Table 4: The cost(In Y. Reyals) of Hospitalization and prophylaxis in the 6 hospitals

Hospital	Cost of prophylaxis	Cost of prophylaxis/ day	Operation. Cost	Hospital bed/day	Grand Total
Mayo 22	7,023.60	2,006.74	1,500.00	1,500.00	8,523.60
Ben kheldoon	8,325.00	2,378.57	1,500.00	0	9,825.00
Alrazi	6,805.90	1,944.54	55,000.00	6,000.00	67,805.90
Dhala	10,593.90	3,026.83	1,500.00	0	12,093.90
Alwali	9,259.10	2,645.46	55,000.00	6,000.00	70,259.10
Algamhuriah	11,386.20	3,253.20	5,000.00	1,500.00	17,886.20
		2,542.56			

DISCUSSION

During the last quarter of the 20th century the term “Evidence base” started to emerge as a mandatory

tool for professional disciplines. It became now almost synonym to Good Practice. In Pharmacy and in Medicine a good practice is the one that is bard on evidence coming from well peered reviewed clinical trials. Antibiotic use in SSI prevention is described as best surgical practice when based on evidence base Guidelines. The goals of prophylactic administration of antibiotics to surgical patients are to reduce the incidence of surgical site infection, rational use of antibiotics, and minimize adverse effect without compromising patient safety and comfort.

It is important to emphasise that surgical antibiotic prophylaxis is an adjunct to, not a substitute for good surgical technique, but, it should be regarded as one component of an effective policy for the control of healthcare associated infection Guidelines by many health institutions, professional bodies such as CDC (Centre for Disease Control [3], (FRAF), Food & Drugs Administration and (NICE) [4].

The objective of this small study is an attempts to explore the surgical practice in our hospitals along those guidelines, in particular the choice, duration of antibiotic use and the awareness of the importance of such practice. In spite of the difficulties in obtaining accurate data and incomplete patients medical records, the obtained results are significant enough to call for serious look and review procedures and practice in this area.

The finding of this study indicate that all the hospitals have the following in common

a. There are no written surgical prophylaxis protocols
b. No infection control strategy nor antibiotic policy

The findings of the exploratory research, focus on four important issues:

Incidence of infection

An infection rate of 4.1% in spite of heavy and continuous use of antibiotics, still seems an optimistic estimate, because those infection cases developed before the patient was discharged and probably due to drug resistant bacteria. It is likely that more infection cases could be deducted if a follow up system for discharged patients is in practice. This is because by definition SSI develop within 30 days post operation.

Prophylactic practices

Ideally, a single dose of the suitable antibiotic 30 to 60 minutes prior to incision is sufficient cover for most operations, in our findings the patient was put on average of two antibiotics during hospital stay which was in the range of 3 to 10 days (average 3.5 days) The patient will be at risk of getting Health Care Associated infection (HCAi) in addition to SSI with drug resistant bacteria and unnecessary more expenses spent by the patient.

There is some evidence that there is a link between SSI incidence and the length of hospital stay [9] which in turns promotes hospital acquired infection caused mainly by *S aureus*, particularly methicillin resistant. Consequently, the infection becomes very expensive to treat, life threatening and could spread the infection outside the hospital. Normally, a simple non-complicated appendicitis without accompanying patient related risk factors (accompanying comorbidity) can be discharged within 6 hours after operation with instruction for revisit. It is not practical to put the patient under observation. All hospitals in the study shows a minimum of 3 days stay after operation. The best thing in this case is follow up in out-patient. By definition SSI is any infection after operation, whether superficial, in deep tissue or organ infection that may develop within 30 days after operation.

The choice of antibacterial

There are a lot of evidence base studies that shows a significant reduction in SSI rate using antibiotic prophylaxis when used properly taking in consideration the type of organism, sensitivity and the type of operation. In appendectomy the most common microorganisms isolated from SSIs after appendectomy the most commonly cultured are Anaerobic and Gram-negative enteric organisms. *Bacteroides fragilis*. *E. Coli* the most frequent anaerobic indicating that the bowel flora constitutes a major source for pathogens[10,11]. Most suitable antibiotics are single agent or combination of agents that provides adequate gram-negative and anaerobic coverage such as (Third-generation Cephalosporin's with partial anaerobic activity (cefotaxime) with metronidazole.

Prophylactic practices

In all studied cases two or three drugs were administered to the patient from day 1 up to 7 or 10 days. On the belief that this will compensate for the existence of risks factors related to environment and design of the operation rooms, human and technical factors. But, it should be understood that antibiotics also carry a risk and should not be considered a substitute for clean environmental and human skill and strict regulatory measures. The range of antibiotics used cover almost the whole range of antibiotics classes (table 4. over 20 brands).

Hospitalisation and operation expenses

There is obvious difference in the expenses between public and private hospitals, but this is largely due patient choices. Private rooms cost more (YR 6000/day) and (YR1500 in urban hospitals) and it is free in rural hospitals.

Appendectomy using laparoscope that is practiced in private hospitals cost much more than open surgery. Cost of drugs is paid for by the patient in all hospitals which amounts on the average YR 2,542.56. It is therefore obvious the longer the patient stays in the hospital the more money is spent and more risk for them to get an infection.

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