Surgical Site Infection; A Study Of Incidence, Risk Factors and Causative Organisms in Emergency Abdominal Surgeries in Kasr Al-Ainy Hospital

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ABSTRACT

Introduction: *Surgical site infection is a serious complication associated with considerable morbidity and it has been reported that over one-third of postoperative deaths are related at least in part, to SSI. SSI can double the length of postoperative hospital stay, increase the rate of readmissions after discharge as well as increase the likelihood of ICU admission, and thereby increase the costs of provided health care services[1]. The prevalence of SSI varies greatly between countries. In Western countries, SSI occurs at a rate of 2-15% in general surgery [2]. However, in developing countries, the frequency of SSI among general surgery patients can reach up to 26.8% in Egypt [3].* ***Patients and Methods:*** *This study evaluates the perioperative conditions responsible for the occurrence of SSI following emergency abdominal operations in the Emergency Department, Kasr Al-Ainy University Hospitals. It is a descriptive prospective case series study including 42 cases aged 20 to 60 years for a period of 6 months from 1 January, to 30 June, 2016.* ***Results:*** *SSI occurred in 42.9% of the study group with count 18 of total 42 patients. SSI occurrence was found to be higher in cigarette smokers and hashish smokersas well as tramadol abusers. E. coli was the most isolated micro-organism which was constituted 10 out of 23 organisms and a percent of 43.5%.* ***Conclusion:*** *Pre-existing medical illness, prolonged operating time, the wound class, and wound contamination strongly predispose to wound infection. A very high incidence of SSI is found at Kasr Al-Ainy Emergency Hospital reaching 42.9%, E. coli was the most frequently isolated micro-organism, with emergence of drug resistant strains. Old age, lengthening of the operation, smoking hashish, abuse of tramadol and HCV are all found to increase the incidence of SSI.*

Kewy Words: Surgical site infection, Wound class, Incidence, Risk factors, Causative organisms

INTRODUCTION

Surgical site infection is a serious complication associated with considerable morbidity and it has been reported that over one-third of postoperative deaths are related at least in part, to SSI [1]. Moreover, SSIs can double the length of postoperative hospital stay, increase the rate of readmissions after discharge as well as increase the likelihood of ICU admission, and thereby increase the costs of provided health care services (Health Protection Agency Annual Report and Accounts, 2011/12). The prevalence of SSI varies greatly between countries. In Western countries, SSIs occur at a rate of 2-15% in general surgery [2]. However, in developing countries, the frequency of SSI among general surgery patients can reach up to 26.8% in Egypt[3]. Although complete elimination of SSI in surgical patients is impossible, a reduction in its incidence to a minimal level can produce great benefits for the patients and would economize resources[4].

The infection of a wound can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defences, leading to cellulitis, lymphangitis, abscess and bacteraemia. The criteria used to define surgical site infections have been standardized and described three different anatomic levels of infection: superficial incisional surgical site infection, deep incisional surgical site infection and organ/space surgical site infection[5].

Multiple risk factors and perioperative characteristics can increase the likelihood of superficial surgical site infections. Important host factors include; diabetes mellitus, hypoxemia,

hypothermia, leucopenia, nicotine, long term use of steroids or immunosuppressive agents, malnutrition, nares contaminated with Staphylococcus Aureus and poor skin hygiene. Perioperative/environmental factors are operative site shaving, breaks in operative sterile technique, early or delayed initiation of antimicrobial prophylaxis, inadequate intraoperative dosing of antimicrobial prophylaxis, infected or colonized surgical personnel, prolonged hypotension, poor operative room air quality, contaminated operating room instruments or environment and poor wound care postoperatively. Wound infections usually appear between fifth and tenth postoperative day, but they may appear as early as first post-operative day or even years later. The first sign is usually fever. The patient may complain of pain at the surgical site. The wound rarely appear severely inflamed, but edema may be obvious because the skin sutures appear tight[5].

Surgical site infection still causes considerable morbidity and high cost to the health care system and is becoming increasingly important in medico-legal aspects. Infections increase the discomfort and disability experienced by patients following surgical procedures. Moreover, the most severe form may endanger life. In this study it has been tried to find out the rate, address the risk factors and the isolation of the common organisms responsible for surgical site infections following emergency abdominal operations at Kasr Al-Ainy University Hospital. In addition, the sensitivity patterns of the microorganisms were ascertained. Assumingly, application of the recommendations of this study in our field of practice will have a repercussion on the rate of surgical site infections in our hospital and thereby will improve surgical outcome, patient safety, satisfaction and consequently the costs of healthcare services provided through our resources and facilities.

MATERIALS AND METHODS

This study aims to evaluate the perioperative conditions responsible for the occurrence of SSI following emergency abdominal operations, which will be helpful in reducing the rate of surgical site infection in the Emergency Department, Kasr Al-Ainy University Hospitals. This is achieved through the determination of the rate of occurrence of surgical site infections in our emergency department with specification of common risk factors and causative micro-organisms responsible for SSI in our facility.

It is a descriptive prospective case series study, in the Emergency Department, Kasr Al-Ainy University Hospitals for a period of 6 months from 1 January, to 30 June, 2016. It included 42 cases aged 20 to 60 years, chosen fulfilling the following criteria: (a) Clean emergency abdominal surgeries [class I operative wounds] (b) Clean contaminated emergency abdominal surgeries [class II operative wounds]. The cases that were excluded from the study were those having: (a) Contaminated emergency abdominal surgeries [class III operative wounds] (b) Dirty emergency abdominal surgeries [class IV operative wounds]. Comorbidities in the form of, COPD, diabetic, corticosteroids dependent, immunosuppressed patients were also excluded, as well as those with BMI> 40 or <18.5 and bilirubin>1.2.

The whole study was totally observational without any interference from the researcher in the decisions, procedures or medications. After admission short history was taken and physical examination was conducted on patients admitted in the emergency ward of surgery. Only very essential investigations were done urgently for taking correct decision about the management. Patients requiring emergency abdominal surgery and fulfilling the inclusion criteria were offered to participate in the study. All the necessary information regarding the study was explained to the patients. Data collection sheets were filled in by the investigator himself, these sheets were designed to cover all the aspects needed to be studied. During the postoperative period all the patients were closely monitored everyday up to the discharge of the patient from the hospital. If any symptom or sign of infection appear during this period then proper investigation was instituted for the diagnosis of infection and to assess the type and severity of the infection. If any collection of pus identified it was drained out and sent for culture and sensitivity test. Proper antibiotic was given to every patient both preoperative (Prophylactic antibiotic for all cases was unintentionally the same "Cefotax") and post-operative periods [6]. Antibiotic was changed where necessary after getting the report of culture and sensitivity test.

All patients were given an explanation of the study and about the investigative and operative procedures with their merits and demerits, expected results, and possible complications. If he/she agreed then the case had been selected for this study. The study did not involve any additional investigation or any significant risk. It did not cause economic burden to the patients. The study was approved by the council of the surgery department and the scientific committee.

Besides the main outcome measured, which is the occurrence of surgical site infection (SSI), a number of other important factors were noted in our study. These factors include; age, sex, smoking and addiction (Hashish-tramadol), lab results (Hemoglobin – total leucocytic count – platelets – prothrombin concentration–liver and renal functions–albumin), trauma, type of anasthesia, operative procedure, incision, duration of procedure and diagnosis. The nature of SSI itself was evaluated according to operative wound class, postoperative antibiotics used, micro-organisms involved and the sensitivity of the micro-organisms to antibiotic. The duration for SSI to become evident was recorded as well.

Data analysis was done both manually and by using computer. Calculated data were arranged in systemic manner, presented in various table and figures and statistical analysis was made to evaluate the objectives of this study with the help of Statistical Package for Social Science (SPSS).

RESULTS

This descriptive, Prospective case series study was carried out to determine *incidence, risk factors and causative organisms* responsible for surgical site infections following emergency abdominal operations that will be helpful in reducing rate of surgical site infections. A Six-month prospective surveillance study of surgical site infections (SSI) in the period from January to June, 2016, forty two patients with emergency abdominal operations were selected from Emergency Department, Kasr Al-Ainy University Hospital, an indicator of healthcare quality. Surgical Site Infections were classified according to American Centre for Disease Control (CDC) criteria and identified by active bedside surveillance and post discharge follow-up.

Socio-demographic distribution of the patients:

The age groups were classified into four age intervals; the most frequent age group was 21:30 years which constituted 50% of the study group, while the least frequent age group was 51:60 years which constituted 2.3% of the study group. (Mean age was: 29 years). Male to female presentation was 30:12 patients respectively. Special habits observed included; smoking, hashish and tramadol abuse. Out of 42 patients, only 6 patients had co-morbidities including (asthma, DVT, Htn-RHD, HCV).

Table 1: Socio-demographic characteristics

Character		*Number (total=42)*	*Percent*
Age (years)	21:30	21	50%
	31:40	10	23.8%
	41:50	10	23.8%
	51:60	1	2.4%
Sex	Male	30	71.4%
	Female	12	28.6%
Special habits	Smoking	20	47.6%
	Hashish	8	19.0%
	Tramadol	5	11.9%
	Free	22	52.3%
Co-morbidities	Asthma	1	2.4%
	DVT	1	2.4%
	HTN-RHD	2	4.8%
	HCV	2	4.8%
	Free	36	85.6%

Surgical characters of the studied patients:

Presentation of the patients was classified into pathological and traumatic. Different types of procedures were included in the study, appendectomy was the most encountered procedure with incidence 33.3% (15 patients). 3 types of anesthesia were found (general, spinal and local infiltration), general anesthesia predominated (39 cases). Regarding the type of the incision used midline laparotomy was the most encountered with a count of 23 cases. Wound classes included in the study were I & II, class II wounds were the most prevalent (31 cases). Sorting the patients according to the time spent in their operations has shown that most of the operations took less than 2 hours (22 patients) which is convenient with the damage control principle,

Incidence of SSI and related characters:

SSI occurred in 42.9% of the study group with count 18 of total 42 patients. Whereas; 57.1% of the study group were free of SSI with count 24 of total 42 patients.

It was observed that the surest sign of SSI occurrence was wound discharge. It was present in all cases with SSI with count 18 of 18 cases. Fever, local redness and discharge appeared as early as the third day and up to the tenth day in 61.1%, 55.6% and 100% of cases respectively. Elevated TLC occurred from the second day with percent 55.6%. The fourth day was the commonest for the appearance of signs of SSI.

Table 2: SSI early detection sign

Day no.	SSI early detection signs											
	Fever			Rising TLC			Local redness			Discharge		
	No. of cases	% within fever	% within SSI	No. of cases	% within TLC	% within SSI	No. of cases	% within redness	% within SSI	No. of cases	% within discharge	% within SSI
1	0	0%	0%	0	0%	0%	0	0%	0%	0	0%	0%
2	0	0%	0%	1	10%	5.5%	0	0%	0%	0	0%	0%
3	3	27.1%	16.6%	1	10%	5.5%	1	10%	5.6%	2	11.1%	11.1%
4	4	36.2%	22.3%	4	40%	22.2%	3	30%	16.6%	5	27.9%	27.9%
5	0	0%	0%	2	20%	11.2%	3	30%	16.6%	4	22.2%	22.2%
6	0	0%	0%	0	0%	0%	1	10%	5.6%	1	5.5%	5.5%
7	1	9.2%	5.5%	0	0%	0%	1	10%	5.6%	2	11.1%	11.1%
8	0	0%	0%	0	0%	0%	0	0%	0%	0	0%	0%
9	1	9.2%	5.5%	0	0%	0%	0	0%	0%	0	0%	0%
10	2	18.3%	11.2%	2	20%	11.2%	1	10%	5.6%	4	22.2%	22.2%
total positive	11	100%	61.1%	10	100%	55.6%	10	100%	55.6%	18	100%	100%
Absence of sign	7		38.9%	8		44.4%	8		44.4%	0		0%
Total	18		100%	18		100%	18		100%	18		100%
No SSI	24		57.1%	24		57.1%	24		57.1%	24		57.1%
Grand total	42		100%	42		100%	42		100%	42		100%

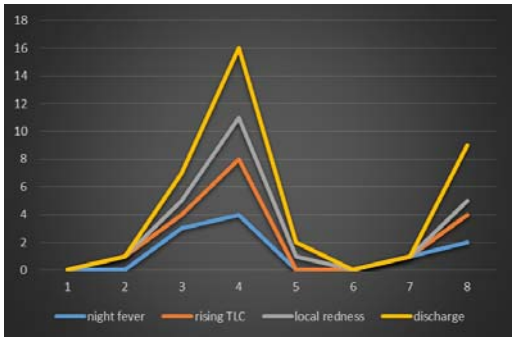

Fig. 1: SSI signs

Appearance of discharge from the wound was recorded in all cases with SSI (18 of 18 cases) and it was found that purulent discharge is the commonest to appear with count 10 of 18 cases and an incidence of 55.6%.

The commonest day of SSI occurrence was the fourth day with count 7 of 18 cases and incidence 38.9%.

Table 3: Day of occurrence of SSI

Day SSI		*Number of cases*	
		Count	**%**
Day SSI	1	0	0%
	2	0	0%
	3	2	11.1%
	4	7	38.9%
	5	2	11.1%
	6	1	5.5%
	7	2	11.1%
	8	0	0%
	9	0	0%
	10	4	22.3%
	Total positive	18	100%
	% positive		42.9%
	No SSI	24	57.1%
Grand Total		42	100%

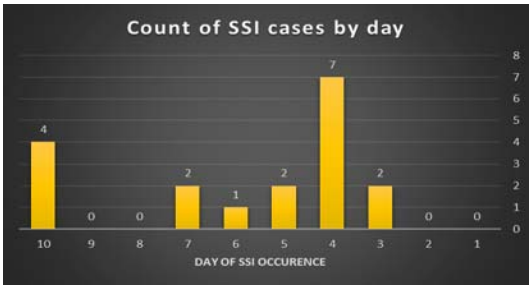

Fig. 2: Day of occurence of SSI

Regarding the causative organism; E. coli was the most isolated micro-organism which was constituted 10 out of 23 organisms and a percent of 43.5%. Also it had been noted the evolution of antibiotic resistant strains: extended-spectrum beta-lactamases (ESBLs) (appeared in 12 cases), AmpC beta-lactamases (appeared in 5 cases) and Multiple Drug Resistance (MDR) (appeared in 3 cases 2 of them are due to infection with acientobacter bacteria) (Figure 3).

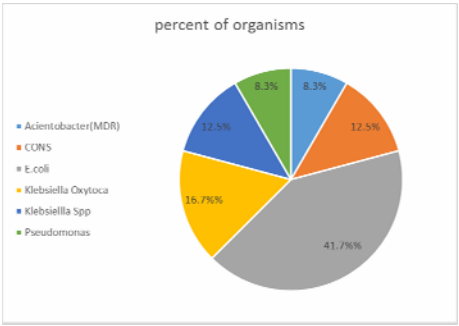

Fig. 3: Percent of organisms isolation

As regards antibiotic efficacy, some antibiotics were completely ineffective to organisms isolated: Ampicillin, Cefepime, Cefoperazone, Ceftriaxone, Cefuroxime, Erythromycin and Oxacillin. While others have shown to be fully functional: Colistin, Polymyxin B, Vancomycin and Tigecycline.

Relation between SSI and patients' characters:

SSI incidence was lowest among the age group 21:30 years old 23.8%. On the other hand it was highest among the age group 41:50 years with incidence 63.6%, with the exception of the age group 51:60 years old 0% "Low presentation, only one patient" there is gradual increase of SSI incidence with advancement of age.

SSI occurrence was found to be higher in cigarette smokers to nonsmokers (45% to 40.9%), also was higher in hashish smokers to nonsmokers (50% to 41.2%), moreover it was higher in tramadol abusers to free patients (60% to 40.5%).

Regarding co-morbidities found SSI occurred only in patients with HCV of all the co-morbidities occurring in 2 of 2 patients with incidence of occurrence 100%. (Table 4)

Table 4: Relation between SSI and socio-demographic characteristics

Character		*Number of affected cases (total=18)*	*Percent (to SSI)*	*Percent (to category)*
Age (years)	*21:30*	5	27.8%	23.8%
	31:40	6	33.3%	60%
	41:50	7	38.9%	63.6%
	51:60	0	0%	0%
Sex	*Male*	14	77.8%	46.7%
	Female	4	22.2%	33.3%
Special habits	*Smoking*	9/20	45%	
	Hashish	4/8	50%	
	Tramadol	3/5	60%	
Co-morbidities	*Asthma*	0/1	0%	
	DVT	0/1	0%	
	HTN-RHD	0/2	0%	
	HCV	2/2	100%	

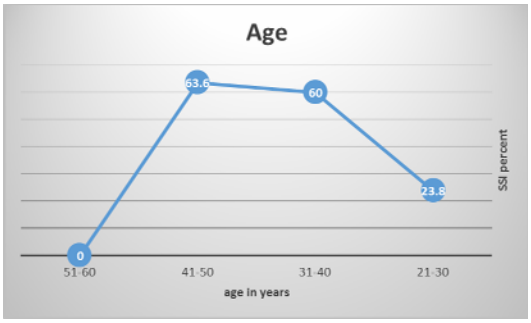

Fig. 4: SSI in different age groups

Relation between SSI and surgical characters:

It was observed that indication of surgery was due to a pathological or traumatic cause, with the incidence of SSI being higher within traumatic operations (50% to 41.7%).

Different types of procedures were included in the study, highest incidence of SSI occurrence was recorded in delivery for ectopic pregnancy with incidence being 100% (low presentation only 1 case), followed by exploration for intestinal obstruction with SSI incidence 80%.

Regarding anesthesia; Incidence of SSI occurrence in case of general anesthesia was 46.1% SSI incidence in class I and II was 45.5% and 41.9% respectively.

Sorting the patients according to the time spent in their operations had shown gradual increase in the incidence of occurrence of SSI with the increase in the operation time starting from 31.8% (< 2:00 hrs) then 38.4% (2: 3 hrs) after that there was a dramatic increase to 80% (3: 4 hrs) to finally reach 100% in operations more than 4 hours.

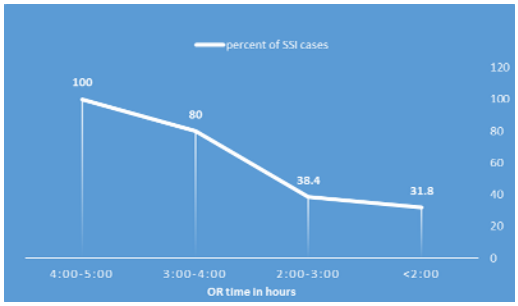

Fig. 5: relation between operative time and SSI

Fig. 6: Mild SSI

Figure 6 shows the wounds of two studied cases with superficial SSI, diagnosed by purulent discharge from the wound.

DISCUSSION

Patients in this study were highly selected in which any patient who has a co-morbidity or a risk factor that would hinder immunity or increase infection risk was dropped from the study. That is why choosing a patient fitting the inclusion criteria was not that easy. Some factors was not included in this study like blood transfusion, use of drains and duration of hospital stay, these factors definitely affect SSI and needs further assessment in a wider study.

SSI occurred in 42.9% of the study group with count 18 of total 42 patients. Whereas; 57.1% of the study group were free of SSI with count 24 of total 42 patients. The rate of SSI varies greatly worldwide and from hospital to hospital. The present study found that the overall rate of SSI in emergency abdominal surgery was 42.9 %. This is indeed a higher rate than the results of 2 studies made in Egypt, the first in Alexandria with SSI incidence 17% [8]. The other study which took place at Cairo University found an SSI incidence to be 9%[9]. Another recent international study took place in India found an SSI incidence 12.6%[10].

It has to be noted that our study focused on emergency surgeries which are known for their higher SSI incidence than elective ones. This was evident in the study took place at India proving the risk of SSI to be less in elective surgeries (6.5%) than the emergency (26.3%) surgeries like acute abdomen [11,12].

Age of the patients ranged from 20 to 60 years old, with the most frequent encountered age group 21:30 years old (50%) and least encountered age group 51: 60 years old (2.3%), mean age was 29 years old due to selection of SSI risk free population. Incidence of SSI was highest within the age group 41:50 years old (63.6 %) and lowest among the age group 21:30 years old (11.9%). These results indicate a gradual increase of SSI incidence with advancement of age.

This finding is similar to that from a study conducted in Duke University by Keith stating that Increasing age independently predicted an increased risk of SSI until age 65 years[13]. At ages >65 years, increasing age independently predicted a decreased risk of SSI.

Observing patients' special habits (smoking cigarettes, hashish, and tramadol abuse); incidence of SSI was found to be 45%, 50% and 60% respectively being higher than free patients. A study confirms this results published in 2012 states that Postoperative healing complications occur significantly more often in smokers compared with nonsmokers and in former smokers compared with those who never smoked. Perioperative smoking cessation intervention reduces surgical site infections, but not other healing complications [14]. Another study claims the need for at least four weeks of preoperative smoking cessation is at least for the restoration of oxygen levels in the tissues, decreased oxidative stress, reduction of the negative impact on the function of macrophages and increased levels of vitamin C and collagen [15]. On the other hand the impact of hashish and tramadol abuse on wound infections is not yet well established by evident studies.

On classifying indication of surgery into pathological and traumatic; incidence of SSI was higher in traumatic in contrast to pathological reasons with percent 50% to 41.7% respectively. No studies could be found to support this result as each entity is studied separately.

Several co-morbidities were included in this study (asthma, HCV, DVT, Htn, RHD), the only association with SSI that could be deducted is that with HCV positive patients, having an incidence of occurrence 100%. Few studies investigated the relation between liver disease and SSIs. However, Tang conducted a study to identify the risk factors for SSI in patients undergoing elective resection of the colon and rectum and reported no significant association between liver disease and SSI. No other co-morbidities could be related to SSI occurrence, this is attributed to excluding any co-morbidity that could increase SSI incidence[16].

Different types of procedures were included in the study, appendectomy was the most encountered procedure 15 case with SSI incidence 20%, while the highest incidence of SSI occurrence was recorded in delivery for ectopic abortion with incidence being 100% 'low presentation, one case only", followed by exploration for intestinal obstruction with SSI incidence 80%. With midline laparotomy having the highest SSI rate 65.2%. Rochak, also found the same finding showing the highest incidence of SSI in laparotomies rather that the other procedures with incidence 31.2%, while Mutemi, found it to be 27.4% [10, 12].

Sorting the patients according to the time spent in their operations has shown that most of the operations took less than 2 hours (22 patients) which is convenient with the damage control principle, also it has shown a gradual increase in the incidence of occurrence of SSI with the increase in the operation time starting from 31.8% (<2:00 hrs) then 38.4% (2: 3 hrs) after that there was a dramatic increase to 80% (3: 4 hrs) to finally reach 100% in operations more than 4 hours.

Prolonged duration of surgical procedures was related to SSI occurrence in many studies and is usually a surrogate marker of procedures of unusual complexity [7]. Hemant B Janugade, (2016) Found that the incidence of infection in the cases with a duration of surgery <1.5 h is 5.1% and with 1.5-4 h is 26.8% [11]. The incidence of infection increased with the duration of the procedure. Furthermore, Afifi, concluded that the duration of surgery for more than 2 hours was associated with increased risk of SSI in orthopedic patients at Tanta University Hospital in Egypt [17].

Our study showed that the surest sign of SSI occurrence was the wound discharge since it is present in every case had SSI with count 18 of 18 cases (100%), on the other hand night fever, local redness and rising TLC appeared with percent 61.1%, 55.6% and 55.6%. Nargis study showed that the entire infected group (100%) complained of redness. (68%) complained of pain, meanwhile, 30% suffered from fever and 20% had discharge[9]. On classifying the patients according

to the type of the discharge it was found that purulent discharge is the commonest to appear rather than greenish and turbid discharges with a ratio 10:4:4.

The commonest day of SSI occurrence in the present study was the fourth day with count 7 of 18 cases and incidence 38.9%, followed by the tenth day 4 cases (22.3%). Hemant Found that in most cases wound infection was seen on the 5th post-operative day which is close to our finding (fourth post-operative day)[11].

Regarding the causative organism; E. coli was the most isolated micro-organism which was constituted 43.5% of the infected cases followed by Klebsiella then CONS while pseudomonas and Acientobacter were least presented. Also it had been noted the evolution of antibiotic resistant strains: extended-spectrum beta-lactamases (ESBLs) (appeared in 12 cases), AmpC beta-lactamases (appeared in 5 cases) and Multiple Drug Resistance (MDR) (appeared in 3 cases 2 of them are due to infection with acientobacter bacteria).

Hemant, found that Pseudomonas infection was more prevalent followed by Klebsiella, then coagulase positive staphylococci, after that Escherichia coli, and diphtheroid infection [11]. While the study done by Nargis found that the most frequent SSI isolates detected were E. coli (29.8%), followed by Staph. aureus (17.1%) [9]. Acinitobacter and Pseudomonas each represented 12.8%. Klebsiella accounted for (10.6%), while each of Enterobacter, Citrobacter and Proteus accounted for 2%. However, in another study of incidence and risk factors of SSIs in Egypt, Staph. aureus was isolated most frequently and accounted for 42.6% of isolates. K. pneumonia accounted for 14.9%, CONS and pseudomonas each for 10.6%, Enterococci for 6.4%, while K. oxytoca, E. coli and Candida albicans each for 4.3% and Acinitobacter for 2% [3].

These variations in the microbiology of SSIs may reflect the nature of operations being performed. For example, when a gastrointestinal organ is opened during an operation and is the source of pathogens, gram-negative bacilli (e.g. Escherichia coli), gram-positive organisms (e.g. Enterococci) and sometimes anaerobic organisms (e.g. Bacteroides fragilis) are the typical SSI isolates [19].

As regards antibiotics efficacy; some antibiotics were completely ineffective to organisms isolated: Ampicillin, Cefepime, Cefoperazone, Ceftriaxone, Cefuroxime, Erythromycin and Oxacillin. While others have shown to be fully functional: Colistin, Polymyxin B, Vancomycin and Tigecycline, next in sensitivity was piperacillin tazobactam 77.8%, then meropenem 70%, followed by imipenem and amikacin 66.7%.

This finding further supports the well-known high prevalence of multiple antibiotic resistant nosocomial pathogens in our environment and may reflect the widespread abuse of antibiotics in the general population.

Though limited by the influence of perioperative antimicrobial use and narrow range of antimicrobial sensitivity tested, the high resistance to most antimicrobials found is a cause of significant concern, making choice of empiric antibiotic use more difficult [20].

This study has been carried out over a limited period of time with a limited number of patients. Some factors were not included in this study like blood transfusion, use of drains, times and type of dressing and duration of hospital stay. These factors might influence SSI occurs, which require further assessment in a larger scale study.

CONCLUSION

Surgical site infection is increasingly recognized as a measure of the quality of patient care by surgeons, infection control practitioners, health planners and public. Although surgical site infections cannot be completely eliminated, a reduction in the infection rate to a minimal level could have significant benefits, by reducing postoperative morbidity and mortality, and wastage of health care resources. A pre-existing medical illness, prolonged operating time, the wound class, and wound contamination strongly predispose to wound infection. A very high incidence of SSI is found at Kasr Al-Ainy Emergency Hospital reaching 42.9%, E. coli was the most frequently isolated micro-organism, with emergence of drug resistant strains.

Advancement in age, lengthening of the operation, Smoking hashish, abusive of tramadol and HCV are all found to increase the incidence of SSI. The fourth day was the commonest day for the occurrence of SSI with discharge being the most predominant sign of SSI with midline laparotomy wounds having highest incidence of

SSI and intestinal obstruction cases. Therefore, revision of the whole infection control system should be put in action.

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