



Research Article

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Prevalence of surgical site infection and antibiotic susceptibility pattern among post-operative patients at a tertiary hospital in Lafia Nasarawa state, Nigeria

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Abstract

Background: Surgical site infection is a common challenge to both the surgical patients and the surgical specialists and may lead to morbidity and mortality. The aetiologic agents vary from one place to the other, ditto the antibiotic sensitivity pattern. This study determined the prevalence of surgical site infection, the aetiologic agents and the antibiotic susceptibility pattern in a tertiary health facility in Lafia. **Methods:** The study was carried out over 5 (2015 – 2019) year period on post operative patients at the Dalhatu Araf Specialist Hospital (DASH) in the surgical and obstetrics and gynaecological wards. Swab taken from infected wounds were cultured using 2 plates of blood agar, MacConkey agar and Mannitol salt agar. The antibiotic susceptibility testing was done using Kirby Bauer technique. The data was analysed using SPSS version 23. Results obtained were presented in tables. Significant p value is < 0.05. **Results:** The mean age of the respondents is 28.6 ± 11.2 years. Of the 408 surgical patients seen within the 5 year period, 15 (3.7%) had surgical sites infection given a prevalence of 3.7%. A total of 6.6% of the patients who had undergone surgeries were immune-compromised. *Escherichia coli* and *Klebsiella* species were the two cultured organisms accounting for 75% and 25% respectively. Antibiotic susceptibility revealed that all (100%) were sensitive to the quinolone (ciprofloxacin). **Conclusion:** Surgical site infection is most common in the third decade of life with a mean age of 28.6 ± 11.2 years. There is a low prevalence of surgical site infection from this study. *Escherichia coli* and *Klebsiella* species were the two common organism isolated with both having a good sensitivity to ciprofloxacin.

Keywords: SURGICAL site infection, Micro-organisms, Antibiotics susceptibility.

INTRODUCTION

Surgical site infection is a common challenge in surgical patients as well as the surgical specialists and may lead to morbidity and occasionally mortality [1, 2]. It may result from contamination from organs in the body or the exterior from surrounding skin, hospital staff, and the environment [3]. A patient may be predisposed to surgical site infection from malnutrition, poor immunity, breach in aseptic procedures and emergency procedures [4, 5].

Aetiologic agents of surgical site infection vary from centre to centre [6-8]. There may be resistance to antibiotics hence the need to identify common aetiologic agents and their antibiotic sensitivity to improve management of surgical site infection.

This study aims to determine the prevalence of surgical site infection, types of aetiologic agents and the antibiotic susceptibility.

MATERIALS AND METHODS

It was a hospital-based retrospective study of patients with surgical site infection managed at the Dalhatu Araf Specialist Hospital Lafia (DASH) from January 1st 2015 to December 31st 2019. The study spanned five year (2015 – 2019) period among surgical patients at the surgical (children surgical, male and female

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surgical) and obstetrics (post natal) and gynaecological wards of the Dalhatu Araf Specialist Hospital (DASH) Lafia Nasarawa State.

Dalhatu Araf Specialist Hospital is the only state owned tertiary hospital. It is located in Lafia, the state capital of Nasarawa State. The state is one of the six North-Central states. It has border with Federal Capital Territory Abuja, Benue, Kogi, Taraba, Plateau and Kaduna States respectively.

Swab from infected wounds noticed between days 3 to 5 postoperatively were taken. The organisms were then cultured using 2 plates of blood agar MacConkey agar and Mannitol salt agar. The bacterial pathogens were identified using selective and differential media. The antibiotic susceptibility testing was done using Kirby Bauer technique. The discs of 8 commonly used antibiotics of different concentrations were placed on the nutrient agar.

Data were extracted from the patient's medical records and operation theatre registers. These data included age, sex, occupation, duration of wound discharge, preoperative diagnosis, operation findings and post-operative complications. Those excluded from the study were patients with missing medical records. The results were analyzed and presented as frequency and percentages table. The mean and standard deviation of continuous variables that are normally distributed were done. The data was analysed using SPSS version 23. Results obtained were presented in tables. A significant p value is < 0.05.

RESULTS

The mean age of the respondents was 28.6 ± 11.2 years. Majority of the patients (82.9%) were married, more of the patients (32.8%) had tertiary level of education with most of the respondents (40.0%) being business persons Table 1.

Table 1: Socio-demographic characteristics

Variables	Frequency	Percentages
Sex		
Male	52	12.7
Female	356	87.3
Age: Mean (SD)	28.6 ± 11.2 years	
Marital status		
Single	61	14.9
Married	338	82.9
Divorced/Separated	1	0.2
Widowed	8	2.0
Educational level		
None	93	22.7
Primary	69	16.9
Secondary	112	27.4
Tertiary	134	32.8
Occupation		
Unemployed	14	3.4
Civil servant	56	13.7
Business	163	40.0
Farmer	30	7.4
Others	144	35.2

Of the 408 patients seen in the period 2015-2019, 15 of the surgical sites were infected given a prevalence of 3.7%. Care of surgical site was done using normal saline, methylated spirit and hydrogen peroxide with majority of the patients, 361 representing 88.5% using methylated spirit. All patients had wound dressing daily. Very few (0.5%) of the

patients were diabetic, 0.7% had sickle cell anaemia and 5.4% had HIV hence indicating 6.6% of the patients who had undergone surgeries were immune-compromised.

Swab was taken from all infected site with microorganism cultured in all. The cultured microorganisms were *Escherichia coli* and *Klebsiella* species in 75% and 25% of the cases respectively. Antibiotic susceptibility was examined for the microorganism and we found all (100%) were sensitive to Ciprofloxacin, 50% were sensitive to Ofloxacin and 50% were sensitive to Perfloxacin. Also, Gentamycin and Ceftriaxone were found to be sensitive Table 2.

Table 2: Co-morbidities and burden of Surgical Site Infection among the patients

Variables	Frequency	Percentage
Diabetic		
Yes	2	0.5
No	406	99.5
HIV		
Yes	22	5.4
No	386	94.6
Sickle cell anaemia		
Yes	3	0.7
No	405	99.3
Type of surgery		
Caesarian section	272	66.7
Thyroidectomy	3	0.7
Ex-laparotomy	51	12.5
Appendectomy	11	2.7
Myomectomy	20	4.9
Herniography	7	1.7
Mastectomy	3	0.7
Below knee amputation	4	1.0
Cystectomy	5	1.2
Suture repair	3	0.7
BTL + Repair	3	0.7
TAH + BSO	3	0.7
Others	23	5.6
Surgical procedure		
Emergency	235	57.6
Urgent	22	5.4
Semi-elective	40	9.8
Elective	111	27.2
Surgical site		
Clean	393	96.3
Infected	15	3.7
Antibiotics administered		
Yes	404	99.0
No	4	1.0
Swab taken		
Yes	15	3.7
No	393	96.3
Microorganism seen		
Yes	9	2.3
No	399	97.7
Type of microorganism seen		
<i>E. coli</i>	7	77.7
<i>Klepsiella spp</i>	2	22.2

Antimicrobial sensitivity		
Ciprofloxacin	9	100.0
Ofloxacin	5	55.5
Perfloxacin,	5	55.5

BTL = Bilateral Tubal Ligation, TAH = Total Abdominal Hysterectomy, BSO = Bilateral Salpingo-Oophorectomy, *E. coli* = *Escherichia coli*.

The result of the chi-square test of association between surgical site infection and some socio-demographic characteristics were as follows; Association exists between Surgical Site Infection (SSI) and sex with $X^2=2.714$, $df=1$ and $p=0.020$ similarly association between SSI and level of education exist with $X^2=8.254$, $df=3$ and $p=0.041$ Table 3.

Table 3: Chi-square test of association between surgical site infection and socio-demographic

Surgical site infection	Chi-square	df	p-value
Sex	2.714	1	0.020
Level of education	8.254	3	0.041

Age was found to predict surgical site infection with Odds ratio = 1.036, Confidence interval = 1.00 - 1.08 and $p = 0.077$, Sex was equally found to predict surgical site infection as male were more likely to have surgical site infection than female with OR = 2.614, CI = 0.80 - 8.54 and $p = 0.114$. Educational level was found to predict surgical site infection as patients with primary education were more than two times more likely to develop surgical site infection after a surgical procedure with OR = 2.071, CI = 0.56 - 7.65 and $p = 0.102$ and type of surgical procedure done was found to predict surgical site infection with OR=1.345, CI = 0.93-1.96 and $p = 0.121$ Table 4.

Table 4: Predictors of surgical site infection

	OR	Confidence interval	p-value
Age	1.036	1.00-1.08	0.077
Sex			
Male	2.614	0.80-8.54	0.114
Female			
Education			
Primary	2.071	0.56-7.65	0.102
Secondary	0.806	0.20-3.31	0.274
Tertiary	0.164	0.02-1.49	0.764
None			
Type of surgical procedure	1.345	0.93-1.96	0.121

OR = Odds ratio

DISCUSSION

Surgical site infection has a prevalence of 3.7% in this study. This is much less compared to the prevalence of surgical site infection in a study in University of Abuja Teaching hospital of 15.6% and 13.58% for years 2013 and 2014 respectively [8,9]. It is also much less compared with other studies of 24.6%.

Escherichia coli was the most common microorganism cultured, followed by *Klebsiella* spp in this study. This is in contrast to the most prevalent pathogen which is *Staphylococcus aureus* in the study done in University of Abuja Teaching hospital. *E. coli* and *Klebsiella* specie were also prevalent in some earlier studies between years 2013 and 2014 at the University of Abuja [8,9]. *E. coli* was the most common pathogen followed by *Pseudomonas aeruginosa* in a study in Patil Medical College, India on Surgical Site Infections [10]. Some other study from the Journal of Hospital Infection showed *Staphylococcus aureus* as the predominant organism [11]. A study in Rwanda had *Klebsiella* as

the most common pathogen of surgical site infection followed by *E. coli* [12].

The organisms were found to be sensitive to ciprofloxacin (100%) and also other quinolones, gentamycin and ceftriaxone in this study. This is in contrast to the antibiotic sensitivity to majorly amikacin and gentamycin in the study of surgical site infection in Patil Medical college where they also had low sensitivity to cephalosporins and flouroquinolones [10,11]. Amikacin and Impinem were the effective antibiotics while there was resistance to ceftriaxone and amoxicillin – clavulanic acid in a study of surgical site infection in a tertiary hospital in Rwanda [12].

CONCLUSION

Surgical site infection is most common in the third decade of life with a mean age of 28.6 ± 11.2 years. There is a low prevalence of surgical site infection from this study. *Escherichia coli* and *Klebsiella* species were the two common organism isolated with both having a good sensitivity to ciprofloxacin.

Ethical Approval

Ethical approval was obtained from the Dalhatu Araf Specialist Hospital Research Ethics Committee. Confidentiality of data strictly adhered to through use of de-identifiers and codes,

Conflict of interest

There is no conflict of interest

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