Global Scientific JOURNALS

GSJ: Volume 8, Issue 1, January 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

The incidence of Early Surgical Site Infection in Orthopaedic Implant Surgery: A Study of Two Tertiary Hospitals in Nigeria

Ukpoju E[1], Sough T[2],Imam A[3]

[1] *Department of Orthopaedics and Trauma, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria*

[2] *Department of Orthopaedics and Trauma, College of Health Sciences, University of Abuja, Abuja,Nigeria,*

[3]*Department of Community Medicine, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria.*

ABSTRACT

BACKGROUND: Surgical site infection (SSI) is a common complication in surgery. It is the third most common nosocomial infection. It places a significant burden on the patient, surgeon and the hospital resources.The presence of implants, also,increases the risk of SSI and makes the management difficult.

OBJECTIVE: The aim is to determine the incidence of early SSIin Orthopaedic implant surgeries in the University of Abuja Teaching Hospital (UATH) Gwagwalada and National Orthopaedic Hospital Dala(NOHD) Kano. To specifically determine the infection rate, distribution of the causative organisms and the pattern of antibiotic sensitivities.

METHODS:A prospective descriptive study of earlySSI in UATH Gwagwalada and NOHD Kano over a period of one year from May 2016 to April 2017.Clinically fit patients with no comorbidities were enrolled. Post-operatively, wounds were inspected on days 5, 14 and 30 for evidence of **early woundinfection.** Wound swab was taken for microscopy, culture and sensitivity.

RESULTS: The mean age of the patients was 42.17years.One hundred and five (66%) were males and 54 (34%) were females.The overall early SSIrate was 10.69%.The early SSI rates in UATH Gwagwalada and NOHD Kano were 8.2% and 11.8% respectively.Staphylococcus aureus was the most common causative organism sensitive to Augmentin and Levofloxacin in UATH Gwagwalada and NOHD kano respectively.

CONCLUSION: The incidence of early SSI in Orthopaedicimplant surgeries in UATH Gwagwalada and NOHD Kano is 8.2% and 11.8% respectively, which is high for clean implant surgeries.

KEY WORDS: Earlysurgical site infection;implant surgery, Nigeria

INTRODUCTION

Surgical site infection is one of the common complications in surgery.It is the 3rd most common nosocomial infection[1].It places a significant burden on the patient,surgeon and the hospital resources. It causes patients pains,longer hospital stay,increase in Hospital Bills and sometimes the patient may require a second surgey.[2,3,4,5]

The incidence of surgical site infection varies from one region to another depending on the type of wound and risk factors surrounding the creation of such wound.[1,2,6,7,8]

In Nigeria,the surgical site infection rate ranges from 7.5% to 16% [5,9].In other African countries,the incidence ranges from 9.16 to 18%[9,10] while in developed world its incidence ranges from 2 to 17%.[10]This shows that certain factors predict the development of SSI.

These factors can be grouped into preoperative like comorbidities (Diabetes mellitus,obesity,cigarette smoking,use of immunosuppressive drugs and other chronic systemic diseases)[11],preoperative patient preparation like preoperative hair shaving[12,13,14] antibiotic

prophylaxis,[15,16] theater environment [17],intra and post-operative factors include blood transfusions,length of surgeries,surgical techniques,aseptic technique,use of drains and postoperative surgical environment.

This report looks at the incidence of SSI in patients that have Orthopaedic implant surgeries in two major tertiary Hospitals in the Northern part of Nigeria.

PATIENTS AND METHODS:

The study was conducted at the University of Abuja Teaching Hospital and National Orthopaedic Hospital Dala Kano.A total of 159 patients who had Orthopaedic Implant surgery were recruited for a period of 1 year from May 2016 to April 2017.All age groups undergoing clean Orthopaedic and Trauma implant surgeries were included. Patients with co-morbidities such as sickle cell disease, diabetes mellitus,chronic liver and kidney diseases,patients on steroids,HIV/AIDS disease,open fractures and anaemia were excluded.Basic preoperative blood tests were done and all patients were fit for surgery.Prophylactic antibiotic, ceftriaxone, was given to all the patients at doses based on the weight of the patients within one hour of incision and repeated if surgery time exceeds three hours.Intraoperatively,skin was prepared using 10% povidone iodine paint and aseptic technique was observed.Redivac suction drains were inserted in patients with indications.

Post-operatively,wounds were inspected on days 5,14 and 30 for evidence of **early woundinfection** which was clinically defined as the presence of pus or a discharge yielding pathologic organism from a wound within 30 days.This was done by the author and trained senior Registrars in the Orthopaedic Units.Wound swab was taken with a swab stick by the Levine method for microscopy,culture and sensitivity from patients with features of early wound infection.

DATA ANALYSIS:

Statistical package for social sciences (SPSS version 21) was used to analyze the data and results were expressed in tables and statiscal charts.Significance level was set at p-value <0.05.

RESULTS:

SOCIO- DEMOGRAPHIC PARAMETERS

A total of 159 patients were studied with age range 5-96 years, mean age 42.53±17.49 years.One hundred and five of the patients (66.0%) were males and 54 (34.0%) were females. Forty-nine of the patients were recruited from UATH Gwagwalada and one hundred and ten from NOH-DALA.

Table 1: Age distribution of patients

Age grouping (years)	**Males**	**Females**	χ^2	***p-value***
1-20	*7*	6	2.179	*0.703*
21-40	*48*	24		
41 – 60	*33*	18		
61 – 80	*15*	6		
	2	0		
Total	**105**	**54**		

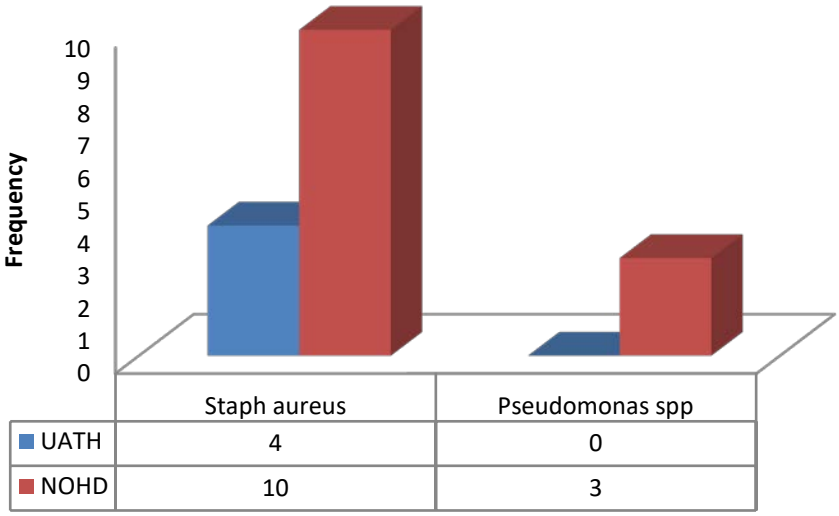
CENTRE AND INFECTION RATE

The total number of patients who had early surgical site infection in UATH Gwagwalada and NOH-DALA are four and thirteen and the infection rates were 8.2% and 11.8% respectively. The overall infection rate was 10.69%.(Table 2). Staphylococcus aureus and Pseudomonas were the common organism cultured with sensitivities to Augmentin and levofloxacin(Fig 2 and 3).

TABLE 2: CENTRE AND INFECTION RATE

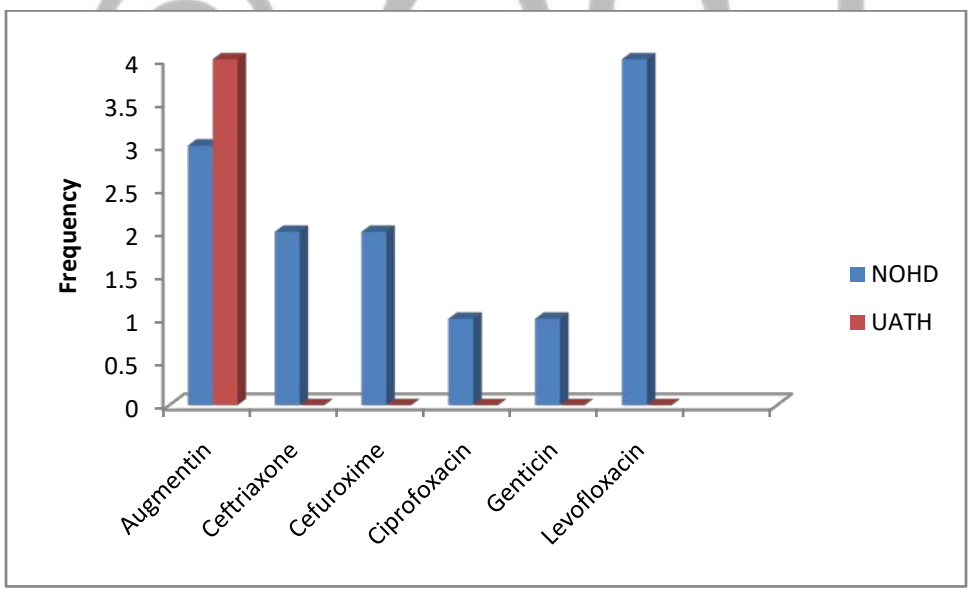
Centre	Infected	Not infected	Infection rate
UATH	4	45	8.2%
DALA	13	97	11.8%

p-value = 0.595; $\chi^2 = 5.373$



p–value 0.225; $\chi^2 = 9.409$

FIG 1: bar chart showing microscopy results from NOHD – Kano and UATH Gwagwalada.



p-value 0.001, $\chi^2 = 102.892$

FIG 2: Bar chart showing Centre and antibiotics sensitivities

Table 3: RELATIONSHIP BETWEEN AGE AND INFECTION RATE

Age	Infected	No infection	Infection rate (%)
< 41 years	8	77	10.39
41-60 years	4	47	8.51
> 60 years	4	19	21.05

p-value = 0.431, $\chi^2 = 5.929$

ASSOCIATION BETWEEN GENDER ANDWOUND INFECTION

Female patients and patients older than sixty years had higher burden of surgical site infections.

TABLE 4: GENDER VS SURGICAL SITE INFECTION

Gender	Infected	No infection	Infection rate (%)
Male	7	98	7.14
Female	9	45	20

*p-value = 0.047**

DISCUSSION:

The mean age of the patients studied was 42.53 years which is in consonance with the active age group of the population exposed to trauma and requiring surgical intervention.Most of the patients were of the male gender (66%) which are the most active of the population.Thismay be due to the study being in Abuja and Kano cities in the Northern parts of Nigeria where females are usually indoors and require the permission of their husbands to go to public places.

Early postoperative wound infection rate in implant surgery in this study was 21.05% in patients greater than 60 years of age.This is higher than in patients between 41-60 years and those less than 40 years which are 8.51 and 10.39% respectively.This is comparable to a study by Kaye et al [18] who noted an increase in the surgical infection in patients greaterthan 65 years of age.Utsumi et al[19]also demonstrated a direct linear trend of increasing surgical site infection among adults until 65 years of age.

The infection rate among females in this study was 20% as compared to 7.14% among males.This was statistically significant and comparable to study by Corinna et al [20] in Germany that recorded a high surgical site infection rate in women who had cardiac surgeries compared to males.The results from this study is in contrast to a study by Mckean et al[21],Pergola et al[22] and Thanni et al[5] working in a similar tertiary centre in Nigeria who showed higher level of Surgical site infection among male gender.Mckean et al [21]proposed that it may be due to the Bateman principle which states that "selection favoured an improved immune function in females in order to ensure reproduction and that male immune suppression is the immunological cost of increased sexual activity".Pergola et al [22] in their studies found out that testosterone in males suppresses phospholipase D which affects the biosynthesis of leukotriene in human monocyte that are central effector cells in immunity.These reasons are inconclusive thus more studies are needed to unravel the cause of gender differences in the risk of surgical site infections.

The incidence of early surgical site infection in the University of Abuja Teaching Hospital and National Orthopaedic Hospital Dala Kano in this study were 8.2% and 11.8% respectively while the overall incidence in the study is 10.69%.This is comparable to other studies in Nigeria,[3,4,24].This is higher than the acceptable rate of wound infection in clean wounds which is 2 %.However, these could be attributed to multiple factors including the limited ventilation systems in our theaters,large number of personnel in our theaters during implant procedures and poor ward conditions.

The most common causative Organism of early surgical site infection in implant surgery in University of Abuja Teaching Hospital and National Orthopaedic Hospital Dala Kano was *Staphylococcus aureus*.This is similar to several studies in Nigeria and other countries [3,4,5,15,23].The second commoner cultured organism is *Pseudomonas aureginosa* which is in agreement with the study in Jos,Nigeria by Onche et al [23].These findings are not unusual as

Staphylococcus aureus is the most common flora carried by most adults hence translocating into the wounds causing infection.Also, it has been noted that bedsheets,instrumentations and dressings are found to act as reservoir for Staph aureus [24].

The cultured Organisms were sensitive to Penicillins (Augmentin) in the University of Abuja Teaching Hospital and Quinolone(Levofloxacin) in National Orthopaedics Hospital Dala Kano.This is in constrast to a study by Onche et al [24] in Jos Nigeria who noted Cephalosporin as the most potent antibiotics against *Staphylococcus aureus spp*.

LIMITATION OF THE STUDY:

1.The small number of sample size is a major limitation, as such, large number of cases need to be studied to come to a generalized conclusion

CONCLUSION:

The incidence of early post-operative wound infection in implant surgery in the University of Abuja Teaching Hospital and National Orthopaedic Hospital Dala Kano are 8.2% and 11.8% respectively.The commonest causative organism of early surgical site infection in implant surgery is *Staphylococcusaureus* which is mostly sensitive to Augmentin and Levofloxacin.

REFERENCES:

1. David E, James A .Reducing surgical site infection: Areview. Revobstet Gynaecol.2009;2(4):212-221
2. Schatzker J, Tile M (eds).The rationale of operative fracture care. Berlin Springer verlag. 1996; p10-11.
3. Ameh EA, MshelbwalaPM,Nasir AA, Lukong CS, Jabo RA, Anumah MA e tal. Surgical site infection in children: Prospective analysis of the burden and risk factors in a Sub-Saharan African setting. Surg infect .2009; 10:105-9
4. Ikeanyi U O. Chukwuka CN, ChukwananukwuTO . Risk factors for surgical site infection following clean Orthopaedic Operations. Niger J Clin Pract. 2013; 16(4):443-447
5. Thanni LO, Aigoro NO. Surgical site infection complicating internal fixation of fractures. J Natl Med Assoc.2004; 96:1070-2. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Centre for disease control

and prevention (CDC).Hospital infection control practice Advisory committee .Am J infect. Control; 27: 97-132

6. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Centre for disease control and prevention (CDC).Hospital infection control practice Advisory committee .Am J infect. Control; 27: 97-132
7. Jjuko G, Moodley J. Abdominal wound sepsis associated with Gynecological surgery at King Edward VIII Hospital Durban. Sub-African J. Surg;40 (1):4-11
8. Amenu F, Pullter G, VanLaarhoven CJ, David BC. Incidence of surgical site infection following Adult spine deformity surgery. An Analysis of patient risk. Eur spine J;19(6):982-8
9. Madu KA, Enweani UN, Madu AJ, Aguwa EN. Implant associated surgical site infection in Orthopaedics: a regional Hospital Experience. Niger SJ Med. 2011;20(4):435-9
10. Olsen MA ,Nepple JJ, Riew KD, Lenka LG, Bridwell KH, Mayfield J et al. Risk factor for surgical site infection following Orthopaedic spinal operation. JBone Joint Surg AM.2008; 1:62-9
11. Ganon R. Can tight blood glucose control reduce postoperative surgical wound complication? JWound care .16(2):87-90
12. Tanner J , Wooding D, Moncaster K .Preoperative hair removal to reduce surgical site infection (review).Cochrane Database system Rev 3:(D004122)
13. Alexander JW. Fisher JE, Palmquist M, Morris MJ. The influence of hair removal methods on wound infection. Arch surg 1983; 118:347-52
14. Kjonniksen, Anderson, Sondenaa, Sogedal. Preoperative hair removal ..A systemic literature review. AORN; 75(5):928-940
15. Pavel A, Smith RL, Ballard A, Larsen IJ. Prophylactic Antibiotics in clean Orthopaedicsurgery.J Bone Joint Surg. Am 1974;56:777-82
16. Hottman PD. Antibiotic prophylaxis .J AM Acad. Orthop Surg 2006;14:98-100
17. Grunenberg MF, Companer GL, Solo CA, Ortolan EG. Ultraclean air for prevention of post operative infection after posterior spinal fusion with instrumentation. A Comparison between surgery with and without vertical exponential filtered air flow system. spine 2004;29:2330-4

18. kayeKS ,Schmit K ,Pieper C, Sloane R, Caughlan KF, Sexton GJ et al. The effect of age on the risk of surgical site infection .J Infect Dis.2005;191(7):1056-62
19. UtsumiM ,Shimuzu J, Miyamota A, Umeshita K, Kabayashi T ,Monden M et al .Age as an independent factor for surgical site infection in a large gastrointesteinal surgery cohort in Japan .J Infect 2010 Jul;75(3):183-7
20. Corinna L ,Carolin M, Christine G. Gender specific difference in surgical site infection:An analysis of 438,050 surgical procedure from the German National nosocomial infection surveillance system, Viszeralmedizin 2014 Apr,30(2):114-117
21. Mckean KA, Nunney L. Bateman's principle and immunity: phenotypically plastic reproductive strategies predict change in immunological sex difference. Evolution 2005;59:1510-1517.
22. Pergola C, Rogge A, Dodt G, Northoff H, Weinigel C, Barz D et al. Testosterone suppresses phospholipase D, causing sex difference in leukotriene biosynthesis in human monocyte. FASEB J 2011;25:3377-3387.
23. OncheI ,Adedeji O . Microbiology of postoperative wound infection in implant surgery. Niger J Surg 2004; 6(1-2):37-40
24. Singh R: Prevalence and Antibiotic sensitivity pattern of bacteria isolated from nosocomial infection in Orthopaedics patient. J Orthopaedics.2010;7(2):153-159.