Journal of Advances in Medical and Pharmaceutical Sciences
13(2): 1-7, 2017; Article no.JAMPS.31291
ISSN: 2394-1111

SCIENCEDOMAIN *international*
www.sciencedomain.org

Retrospective Study on the Prevalence of Surgical Wound Infections in Specialist Hospital Sokoto – North West Nigeria

A. S. Shuaibu[1*], Y. K. E. Ibrahim[1], B. O. Olayinka[1], R. F. Atata[2], J. Oyeniyi[2] and B. A. Shuaibu[3]

[1]Department of Pharmaceutics and Pharmaceutical Microbiology, Ahmadu Bello University, Zaria, Nigeria.
[2]Department of Pharmaceutics and Pharmaceutical Microbiology, Usmanu Danfodiyo University, Sokoto, Nigeria.
[3]Department of Veterinary Microbiology, Usmanu Danfodiyo University, Sokoto, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors ASS, YKEI and BOO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author RFA managed the analyses of the study. Authors JO and BAS managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMPS/2017/31291
Editor(s):
(1) Hamdy A. Sliem, Internal Medicine, Suez Canal University, Egypt and College of Dentistry, Qassim University and EL-Jouf University, Saudi Arabia.
Reviewers:
(1) Donald E. Fry, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA.
(2) Carlo de Werra, University of Naples Federico II, Italy.
(3) Maria Rosanova, Hospital Garrahan, Argentina.
Complete Peer review History: http://www.sciencedomain.org/review-history/19010

Original Research Article

Received 30th December 2016
Accepted 18th February 2017
Published 11th May 2017

ABSTRACT

Introduction: Nosocomial surgical site infections remain a key drawback in health care facilities, resulting in extended length of stay, significant morbidity and mortality, elevated excess of cost, and less regular basis of death in the surgical patient.
Aim: The objective of the study is to determine the rate of occurrence of surgical site nosocomial infections in surgical patients in Specialist Hospital Sokoto, Nigeria.
Study Design: Retrospective study.

**Corresponding author: E-mail: suleykestler2@gmail.com;*

Place and Duration of Study: A 2-year retrospective study of nosocomial surgical site infections (June 2011 to May 2013) was carried out in Specialist Hospital Sokoto, Nigeria.
Methodology: Patients' folders and microbiology laboratory records were used for the determination of prevalence of nosocomial infections in. Data was analyzed using SPSS version 20.
Results: Result of the retrospective study of surgical site infection in the hospital showed that surgical site nosocomial infections are frequent in the hospital, with a prevalence rate of 4.7% (2011/2012) and 7.6% (2012/2013).
Conclusion: Despite the fact that this study is limited to nosocomial surgical site infections in three surgical wards only, surgical site infection exists as a major problem hospital. The results of this study are consistent with reports of similar studies in Nigeria and other parts of the world.

Keywords: Surgical wounds; nosocomial infections; surgical site infection; infection rate.

1. INTRODUCTION

Surgical site infection is a type of infection at the surgical site, occurring as a result of wound incision or surgical operation at the site. Infections developed after surgical operation of a patient while the patient is still admitted in a hospital or medical facility is said to be surgical site Nosocomial infections, especially if it develops within 30 days of operation [1].

Microorganisms occupy and colonize surgical wounds, burns, bruises, cuts and open sores in the event of any breach in septic procedures [2]. The organisms are either of endogenous or exogenous origin: Exogenous surgical site infection takes place when natural pathogens from surroundings colonize and multiply within the wounds and endogenous when resident flora gain access from their natural habitats into these wounds [3]. An extensive array of organisms are identified to infect wounds, they comprise, the Gram positive cocci and bacilli, Gram negative cocci and bacilli, spore-formers and non-spore formers, aerobes and anaerobes with Staphylococcus aureus leading the bunch in incidence of occurrence. Risk factors other than microbiological include decreased host resistance, local wound and operative characteristics [4].

Surgical site infections (SSI) are the third most frequent hospital-acquired infections and account for 14% to 16% of all such infections.Surgical site infections are further defined by their anatomic location into three;

i. Superficial infections (occurring in 47% of cases) involve only skin or subcutaneous tissue of the incision
ii. Deep infections (occurs about 23% of cases) involve the fascia and muscle layers.
iii. Organ space infections (occurs in 30% of cases) involve any part of the anatomy (other than the incision) that was opened or manipulated during the operation [4].

Surgical site infection (SSI) is the most studied and most recurrent type of infection in low- and middle income countries with incidence rates ranging from 1.2 to 23.6 per 100 surgical procedures and a collective incidence of 11.8%. By difference, SSI rates differ between 1.2% and 5.2% in developed countries [5]. For instance, nearly half of studies focusing on explicit types of infections were associated with SSI most likely because it can be identified more easily according to clinical criteria. SSI appears to be in addition the most frequent Hospital Acquired Infection world-wide in low and middle income countries and more than 10% of operated patients typically develop SSI. In general this degree of risk for patients going through surgical procedures is considerably higher in developing countries than in developed countries which may account for elevated surgical site infection rates. For instance, SSI incidence reached 30.2% in the surgical unit of a university hospital in Brazil. In Africa the reported incidence of surgical site infections varies from 23.60% to 30.90% in Nigeria, 19% in Kenya, 21% in Ethiopia, 10% in Uganda and in Tanzania 19.40% [5].

Surgical Site Infections complicate 2% of major operations. Patients who develop SSIs are 60% more probable to spend time in an intensive care unit, five times more probable to be readmitted to the hospital, and twice more likely to die than patients without these infections [6].

Surgical site Nosocomial infection poses a risk of increased morbidity and mortality to patients; it increases the length of hospital stay thereby increasing cost of treatments. The hospital and

hospital environment have been incriminated as a significant factor [7]. It is the most frequent hospital-acquired infection, where two-third occurs in deep incision surgery and one-third in organ spaces accessed [2].

The estimated problem of SSIs in Health care facilities in the United States in terms of morbidity is about 300,000 SSI per year. It is estimated to be 22% of all HAIs, two to five percent of patients undergoing inpatient surgery acquire SSI and each SSI is associated with approximately 7-10 additional postoperative hospital days. The mortality rate is about 3% that is to say that there are 2-11 times higher risk of death from SSI compared with operative patients with no SSI. Over 8% of the HAIs were linked with death in the United States [8].

In terms of costs, local data on the cost of surgical site infection in Nigeria is scanty, but in the United States of America the estimated cost per infection ranges from $11,000 - $35000 [9].

In accordance with the current dollar to Naira exchange rates, $1=₦460 on the parallel market, the above estimate will be; ₦5,060,000 – ₦16,100,000.

If surgical site infection management costs this much in developed country like the United States of America, one can only imagine how much it could cost in a developing country like Nigeria, where there are heterogeneous groups with extreme variability in medical resources, inconsistent medical practices, limited awareness of infection control measures, inadequate resources and basic supply for wound care [10].

Data on prevalence of Nosocomial SSI is scanty in this part of the country (North West), and there is no documentation of the situation in Sokoto, particularly the Specialist Hospital, it therefore becomes important to establish base line information on the prevalence of surgical site nosocomial infections in the hospital. This study thus aims to accomplish a retrospective study on SSI in Specialist Hospital Sokoto by review of medical records of the hospital.

2. METHODOLOGY

2.1 Study Center

The Specialist Hospital situated in Sokoto metropolis, Sokoto State was selected as the sample collection centre. This is a Secondary health care institution. The hospital was established in 1932. Between 1983 and 1989, the Hospital served as the Temporary Site for the Usmanu Danfodiyo University Teaching Hospital, after which it reverted back as a health care center for the state. It became a specialist hospital in 1982. The hospital is compartmentalized into several units. The major units are the accident and emergency units, patient's wards, which includes the male and female surgical wards, medical laboratory department, outpatient consultation unit and pharmacy department. The female and male surgical wards admit each on average 30 patients per month.

2.2 Ethical Consideration

Ethical clearance was obtained from the hospital management.

2.3 Retrospective Study

A retrospective study was carried out by reviewing the medical records (patients' folders and Microbiology Laboratory records) kept with the medical records Department of the hospital covering the period of month of June 2011 to May 2013 (2 years).

The following information was obtained from the folders: patients' hospital_numbers, age, gender, date of admission, diagnosis on admission, Ward to which they were admitted, specimen sent to the microbiology laboratory and results, type of organisms isolated, susceptibility of the isolates to the antibiotics tested, antibiotics prescribed, second diagnosis and interval between the first and second diagnosis.

For an infection to be classified as nosocomial, the following criteria recommended by WHO/CDC (2002) were used:

1. Time interim between the first and second diagnosis is at the very least 48 hours
2. Positive culture results in the first and second diagnosis
3. Isolated pathogen in second diagnosis is different from the first isolated pathogen.

2.4 Determination of Infection Rates

The infection rate was calculated by dividing total number of patients infected by total number of patients discharged and expressed as a percentage.

$$Infection\ rate = \frac{\text{Number of patients infected}}{\text{Total number of patients discharged}} \text{ X } 100$$

3. RESULTS

The results of the retrospective analysis of nosocomial infections in the three wards where surgical patients are admitted are presented in Tables 1 to 4.

The result presented in Table1 indicates that the infection rate varied from month to month and ranges from the lowest rate of 1.9% in the month of February to the highest rate of 9.5% in December, 2011. In 2012/2013, the highest incidence of 22.0% occurred in the February 2013 and the lowest incidence (2.1%) was recorded in March, 2013.

Table 1. Monthly distribution of surgical site infection cases in the Specialist Hospital Sokoto from June 2011 to May 2013

Month	Percentage incidence	
	2011/2012 (n=849)	2012/2013 (n=813)
June	4.6	4.3
July	4.4	3.9
August	6.0	3.5
September	3.1	7.1
October	3.5	10
November	5.6	6.4
December	9.5	10
January	7.0	8.1
February	1.9	22.2
March	6.2	2.1
April	4.9	4.6
May	2.4	12.2
Average	4.7	7.6

Table 2 reveal an average infection rate of 3.9% in the male surgical ward in 2012/2013 with the highest incidence (9.7%) in December 2011while the lowest was (1.3%) in May, 2012. It shows that the average SSI rate in the female surgical ward is 4.1%, with the highest rate (25%) occurring in the month of May, 2012 and the lowest in the month of September, 2012. Data could not be obtained for seven months in this ward. In the O & G ward, tremendous increase in infection rate was observed –an incidence rate of 10.9%. The highest rate (9.5%) was in December, 2011 with a least rate of 1.9% in February, 2012.

Table 3 shows an average rate of 5.1% in the Male surgical ward with the highest rate (24.4%) occurring in the month of February, 2013 and lowest (1.7%) in the month of July, 2012 in the female Surgical Ward, the average infection rate was 7.0% with the highest incidence (33.3%) in October, 2012 and lowest rates (10.0%) in July and December 2012. in O & G ward high infection rates were observed 57.0% occurred in December, 2012 while the lowest figure (9.0%) was recorded in November, 2012. The average infection rate for this ward was 26.3%. As previously observed in the 2011/2013 period, data was unable for some months; four months in the Male surgical ward and five months in the female surgical wards.

Table 2. Monthly distribution of nosocomial surgical site infection in some wards of Specialist Hospital Sokoto in the period of June 2011 to May 2012

Month	Infection rate (%)		
	Male surgical ward (n=660)	Female surgical ward (n=118)	O&G surgical (n=73)
June, 2011	6.3	Nd	4.6
July, 2011	Nd	Nd	4.4
August, 2011	5.2	Nd	6.0
September,2011	2.4	7.6	3.1
October, 2011	3.1	Nd	3.5
November, 2011	4.6	Nd	5.6
December, 2011	9.7	12.5	9.5
January , 2012	5.3	15.4	7.0
February, 2012	2.3	Nd	1.9
March, 2012	5.6	11.1	6.2
April, 2012	4.6	Nd	4.9
May, 2012	1.3	25.0	2.4
Average	3.9	4.1	10.9%

Table 4 presents the distribution of bacterial organisms isolated from nosocomial surgical sites in those wards showed that gram-positive organisms mostly *Staphylococcus and Streptococcus spp*. were the predominant causative organism of nosocomial infection. Three species of the Enterobacteriacea family (*Escherichia coli, Klebsiella spp., and Proteus spp*.) were also frequently isolated as surgical site nosocomial pathogens.

4. DISCUSSION

All over the world, nosocomial infection is perceived as a noteworthy source of public health problem, because it continues to hamper effective management of infections in hospitals. World Health Organization [5]. Surveillance put

the rate of infection at 5-10% of hospital admissions.

Table 3. Monthly distribution of SSI in three surgical Wards of Specialist Hospital Sokoto in the period of June 2012 to may 2013

Month	Infection rate (%)		
	Male surgical ward	Female surgical ward	O&G Surgical
June, 2012	Nd	Nd	20.0
July, 2012	1.7	10.0	11.0
August, 2012	2.8	Nd	12.0
September, 2012	2.3	20.0	28.6
October, 2012	5.1	33.3	37.0
November, 2012	3.7	16.7	9.0
December, 2012	Nd	10.0	57.0
January, 2013	6.1	12.5	25.0
February, 2013	24.4	Nd	38.0
March, 2013	Nd	Nd	12.0
April, 2013	Nd	Nd	33.3
May, 2013	Nd	11.1	40.0
Average	5.1	7.0	26.3%

Key= Nd = no data

Table 4. Bacterial pathogens recorded from the patient's records in surgical wards of Specialist Hospital Sokoto from June 2011 to May 2013

Isolates	Percentage frequency	
	2011/2012 (n=62)	2012/2013 (n=52)
Staphylococcal spp.	33.9%	32.7%
Streptococcus spp.	25.8%	30.8%
Escherichia coli	19.4%	13.5%
Klebsiella spp.	8.1%	17.3%
Proteus spp.	12.9%	7.7%

The incidence rate of 4.7% and 7.6% obtained for 2011/2012 and 2012/2013 respectively in the study is in order with the 5-10% global prevalence rates [5]. These rates varied widely from one month to another. There was no statistically significant relationship between the infection rates and the months in which they occurred ($P > 0.05$). The grounds for the fluctuations in infection rate during these months might be due to seasonal atmospheric change. The high rates in some months may be due to the fact that they coincided with the period of dusty harmattan winds during which high concentration of dust particles in the atmosphere settles on surfaces and these particles easily resuspend in the air during cleaning. This could have created a situation where dust-laden bacterial particles suspended in the air and equally re-suspended from the operating room or ward floors would have easy access to surgical wounds. This concurs with the findings and conclusions of [11-13].

The general nosocomial surgical site infection rates in the male and female wards are in agreement with the findings of [14], who reported infection rate of 2.7% in Ife while [15] reported 3.8% in Lagos and 4.2% in Ilorin.

The incidence rate reported in the O & G ward in 2012/2013 (10.9%) though relatively higher compared with the values for the male and female wards are also in agreement with the 9.1% reported from Kano by [16] and 9.3% reported from Lagos [17]. It is also similar to the 9.9% also reported from United Kingdom by [18] and 10% reported from Ilorin by [19]. The O & G incidence rate for 2012/2013 (26.3%) is higher than the 23.4% reported from Ile-Ife by [20] but lower than 29.4% reported in Saudi Arabia by [21]. It is also much higher than the range of 2.9% to 17.9% reported in a multi-centre collaborative study of post caesarean section wound infection in south west Nigeria and the UK by [22]. The rates high of infections recorded in the retrospective study could be attributed limitations such as lack of patient's data and recruitment criteria.

Records of distribution of bacterial organisms isolated *from surgical* sites in this study showed that gram-positive organisms mostly Staphylococcus and Streptococcus spp. were the predominant causative organism of nosocomial infection. Three species of the Enterobacteriacea family (*Escherichia coli, Klebsiella spp., and Proteus spp*.) were also frequently isolated as surgical site nosocomial pathogens. These pathogens have been identified in several studies as the agents of nosocomial infections [6,7,11].

A notable limitation of this work was that no post-discharge infections were recorded for this survey. Several patient folders in the medical records department of the hospital were missing and may have resulted in an underestimation SSI rate.

5. CONCLUSION

Despite the fact that this study is limited to nosocomial surgical site infections in three

surgical wards only, surgical site infection exists as a major problem hospital. The results of this study are consistent with reports of similar studies in Nigeria and other parts of the world. The Government and Hospital management should provide adequate resources needed in operating theater to ensure the prevention of surgical site infections.

CONSENT

It is not applicable.

ACKNOWLEDGEMENTS

My sincere thank you to Shola Araromi of the department of Obstetrics and Gynecology, Specialist Hospital Sokoto, Nigeria and Sani Safiyanu Kanoma of the Department of Clinical Pharmacy Usmanu Danfodiyo University Sokoto, Nigeria for his continuous encouragement and for his help in collection of the current data.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Barie PS. Surgical site infections: Epidemiology and prevention. Surgical Infections. 2002;3:9-21.
2. Amoran OE, Sogebi AO, Fatugase OM. Rates and risk factors associated with surgical site infections in a tertiary care center in South-Western Nigeria. International Journal of Tropical Disease & Health. 20133(1):25-36.
3. Heinzelman M, Scott M, Lam T. Factors predisposing to bacterial invasion and infection. American Journal of Surgery. 2002;183(2);179-190.
4. Ikeanyi U, Chukwuka CN, Chukwuanukwu T. Risk factors for surgical site infections following clean orthopaedic operations. Nigerian Journal Clinical Practical medicine. 2015;16:443-7.
5. World Health Organization. Report on the burden of endemic health care-associated infection worldwide; 2011.
6. Stephan H, Peter R. Daniel L. Hoffmeyer P and Pittet D, Preventing surgical site infections. Expert reviews on anti-infective therapy. 2010;8(6):657-670.
7. Atata RF, Ibrahim YKE, Akanbi IA, Abdul LF, Giwa A. Gwarzo MS. Jodi SM. Retrospective study of nosocomial infections in six private Hospitals in Kwara state, Nigeria. Journal of Medicine and Medical Sciences. 2010;4(7):30-32.
8. Deverick JA, Keith S, David K, Arias KA, Kelly P, David P, Coffin S, Erik R, Fraser V. A compendium of strategies to prevent healthcare-associated infections in acute care hospitals, Infection Control and Hospital Epidemiology. 2008;29:51-61.
9. Scott DR. The direct medical costs of Healthcare-associated infections in U.S. Hospitals and the benefits of prevention. Division of Healthcare Quality Promotion National Centre for Preparedness, Detection, and Control of Infectious Diseases Coordinating Centre for Infectious Disease Control and Prevention. 2009;8(4)1-13.
10. Muchuweti D, Jönsson KU. Abdominal surgical site infections: A prospective study of determinant factors in Harare, Zimbabwe. International Wound Journal. 2015;12(5):517-522.
11. Nwankwo EO, Edino S. Seasonal variation and risk factors associated with surgical site infection rate in Kano, Nigeria. Turkish Journal of Medical Sciences. 2014;44:674-680.
12. Njoku O. Ogiegbe GC. Bacterial air contamination of operating theatres and surgical wards of a university teaching hospital. African journal of Medical Science. 1993;22:19–23.
13. Ibrahim MK, Salama MS, Mustafa RM. Studies on surgical wound nosocomial infections. Journal of Union Arabian Biologyl Cairo. 1998;6:115–128.
14. Onipede AO, Oluyede CO and Aboderin AO. A survey of hospital acquired infections in Obafemi Awolowo University Teaching Hospital, Ile-Ife. African Journal of Clinical Experimental Microbiology; 2004.5(1):108-118.
15. Odimayo MS, Nwabuisi C, Adegboro B. Hospital acquired Infections in Nigeria. Tropical Journal of Health Sciences; 2008. 15(1):49-54.
16. Jido TA, Garba ID. Surgical Site Infection Following Caesarean Section in Kano Nigeria. Annals of Medical Health Sciences. 2012;2:33-36.
17. Ezechi OC, Edet A, Akindele H, Gab-Okafor CV, Herbertson E. Incidence and risk factors for Caesarean section wound

infection in Lagos, Nigeria. BMC Research Notes. 2009;1186–1500.
18. Graffiths J, Demianczuk N, Cordoviz M, and Joffe AM. Surgical site infection following Caesarean section: A case-control study of post-discharge surveillance. Journal Obstetrics Gynaecology. 2005;27:340-344.
19. Fasuba O, Ogunniyi SO, Dare FO, Isawunmi AI, Ezechi OC. Uncomplicated Caesarean section: Is prolonged hospital stay necessary? East African journal of Medicine. 2000;77:36-39.
20. Makinde OO. A review of caesarean section at the University of Ife Teaching Hospital. Tropical Journal Obstetrics and Gynaecology. 1987;6(2):26-30.
21. Nada AA, Jehan MA, Muayed MY, Hani A. O, Hassan AH, Rehab Al, Ali A. Significant reduction in the post cesarean delivery surgical site infection rate after use of prophylactic antibiotics in Madinah Maternity Hospital, Saudi Arabia. Life Science Journal. 2014;11(7):40-53
22. Ward VP, Charlett A, Fagan J, Crawshaw SC. Enhanced surgical site infection surveillance following Caesarean section: Experience of a multi-centre collaborative post discharge system. Journal Hospital Infection. 2008;70:166-173.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/19010