

Original Research Article

Surgical wound infections in Obstetrics and Gynecology ward in Specialist Hospital Sokoto – North West Nigeria

ABSTRACT

Background: Surgical site infection (SSI) is the second most common infectious complication and account for 14% to 16% of all such infections. About 8.9% of Cesarean deliveries results in surgical site infections. It is the most commonly undergone abdominal surgery among women in developed and developing countries. Infections following caesarean section causes of prolonged hospital stay and the widespread aversion to caesarean delivery in Sokoto State.

Aim: Our aim is to determine the occurrence of surgical site nosocomial infections in O and G ward of specialist hospital Sokoto.

Methods: This was a prospective study of surgical patients admitted into the Obstetrics and Gynecology (O and G) ward for the period of January to July 2014. SSI was diagnosed and classified according to the CDC system of standardized surveillance criteria for defining surgical site infection. Wound swabs were collected and processed as per standard operative procedures; and susceptibility testing was carried out using a disc diffusion technique. Data was presented in tables and analyzed using Statistical Package for Social Sciences (SPSS) software (version 20.0, SPSS Inc, Chicago, IL).

Results: The overall incidence of SSI was 10.4 %. Patients of age less than 20 years were not only the predominant patients that underwent surgical operations, but also had the highest incidence of infection rate (14.3%).Emergency cesarean section had a greater rate of infection (14.1%). *Staphylococcus* spp. was the most common.

Conclusions: Surgical Site Infection complicates surgeries in the Obstetrics and Gynaecology ward of Specialist hospital Sokoto and a system for surgical site infection surveillance with feedback of appropriate data to surgeons is highly recommended.

Keywords: Surgical Wounds, Nosocomial infections, surgical site infection, infection rate

INTRODUCTION

Nosocomial infection is as a localized or systemic condition that results from adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present or incubating at the time of admission to the hospital (NNIS, 2004).

Surgical site infections (SSI) are the third most common hospital-acquired infections (HAI) and account for 14% to 16% of all such infections. It is an infection occurring within an operative area 30 days of a procedure (Anderson *et al.*, 2014).

These infections can be defined by their anatomic location into Superficial infections (occurring in 47% of cases), Deep infections (occurs about 23% of cases) and Organ space infections (occurs in 30% of cases) (Ikeanyi *et al.*, 2015). It is the most surveyed and most frequent 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 pooled incidence of 11.8%. By contrast, SSI rates vary between 1.2% and 5.2% in developed countries (WHO, 2011). For example, almost half of studies focusing on specific types of infections were related to SSI probably because it can be identified more easily according to clinical criteria.

Postoperative SSI remains a major source of illness and a less frequent cause of death in surgical patients, accounting for approximately a quarter of all nosocomial infections. The incidence of infection varies from surgeon to surgeon, from hospital to hospital, from one surgical procedure to another, and most importantly from one patient to another (infectious), from time to time. Thus, emerging and re-emerging, again and again (Yunzhou *et al.*, 2014). It also varies from 0.5 to 15%, depending on the type of operation and underlying patient status (Maazuddin and Arshad, 2014).

Cesarean section (CS) is the most commonly undergone abdominal surgery among women in developed and developing countries. The principal sources of Morbidity after cesarean section in Nigeria are anemia and sepsis. A coalition of various risk criteria including; Type of wound, surgical skill maternal immunity, age, and weight, hypertensive disorders, the amount of vaginal investigation, Virulence of the microorganisms and premature rupture of membrane, are associated with surgical site infection following cesarean section (Dhar *et al.*, 2014).

Although there are various risk criteria for surgical site infections, Bacteria remains the major cause of the infection, it does not occur in its absence. The higher number of bacteria presents the higher the risk of infection (Laxminarayan *et al.*, 2013)

Our aim is to determine the occurrence of surgical site nosocomial infections in O and G ward of specialist hospital Sokoto with a view of providing baseline information about the infection, minimizing their incident and attendant health problems.

Materials and Methods

This was a prospective study of surgical patients admitted into the Obstetrics and Gynaecology (O and G) ward for the period of January to July 2014.

Sample Collection Center

The Specialist Hospital located in Sokoto metropolis, Northwest Nigeria is a Secondary health care institution 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 in the state. It became a specialist hospital in 1982. The hospital is compartmentalized into various units. The major units are the accident and emergency units, patient wards, which includes the male and female surgical wards, medical laboratory department, outpatient consultation unit and pharmacy department. Each ward has a bed size capacity of 36 beds.

Ethical consideration

Ethical clearance was obtained from the hospital management. Informed consent was obtained from all the patients recruited for the study before clinical samples were taken.

Inclusion and exclusion criteria

All patients of different ages who delivered by CS in the hospital and consented to the study were included in the study. Patients who were not willing to participate in the study and those who died during the procedure or immediately after CS were excluded from the study.

Patient recruitments

The study patients were prospectively recruited consecutively from patients admitted for Surgery. The patients were informed and their consent to participate in the study were obtained. Recruited patients were observed and monitored for the development of surgical site infection right from the pre-operative stage through the postoperative period to the time of discharge from the hospital. Particular attention was paid to patients who developed postoperative SSI (septic wound) during the study period.

SSI was diagnosed and classified according to the CDC system of standardized surveillance criteria for defining surgical site infection. Patients were assessed for systemic (fever, chills) and local (pain, redness, warmth, swelling, purulent drainage) signs of infections and also if the sample obtained from the patients yielded a positive culture for Nosocomial pathogens upon microbiological examinations.

Media preparation

All bacteriological media were prepared according to the manufacturer's instructions. An appropriate quantity of dehydrated media was suspended in distilled water and dissolved by heating on a hot plate. They were autoclaved at 121°C for 15 minutes, allowed to cool and stored in the refrigerator until required. They were melted and dispensed into sterile plates when required.

Bacteriological Study of Surgical Sites

Immediately after the closure of the operated site, it was swabbed using a sterile swab stick. The swab was then inoculated into 9ml sterile peptone water from which 1ml each was inoculated on Nutrient agar and MacConkey agar. The plates were incubated aerobically at 37°C for 24 hours. The colonies that developed after incubation were sub-cultured onto Nutrient agar slant and stored in refrigerator for further characterization.

Detection of Surgical Site Infections (SSI)

The patients were examined regularly along with the medical team, the operation sites were inspected for signs of infection. Folders were also checked regularly for information that might indicate signs of infection in the surgical sites.

An operation site is classified positive for SSI if

- There is a purulent discharge from the incision.
- An organism is isolated from the culture of fluid or tissue from the incision.
- At least one of the following is noticed: pain, tenderness, or heat
- An infection that occurred within 30 days after operative procedures

Instances where any of the above was noticed, the sites were swabbed using a sterile swab stick, inoculated in sterile peptone water broths, inoculated on Nutrient agar and MacConkey and incubated at 37^{OC} for further analysis.

Characterization of Bacteria Isolates

All specimens were processed in accordance with the standard operating procedures of the laboratory. The isolated bacteria were characterized based on their cultural, morphological and biochemical reactions as described by Cowan and Steel, (1974) and Cheesbrough, (1991). Cultural characterization of the isolates was based on their morphological and growth characteristics on media (Cowan and Steel, 1974). Odour and pigmentation were used for the preliminary identification of isolated bacterial species. Identification of bacteria was done using conventional physiological and biochemical methods. Gram staining was performed on the isolates as described by Cheesbrough, (2006). Biochemical tests that were performed on the isolates included: Catalase test Citrate utilization, Triple sugar iron test, Coagulase Test, Indole Test, Methyl Red and Voges-Proskauer Test, Oxidase Test and Urease test (Cheesbrough, 2006).

Statistical Analysis

Analysis of data was done using Statistical Package for Social Sciences (SPSS) software (version 20.0, SPSS Inc, Chicago, IL). The percentages were used to calculate the prevalence and incidence rates. Chi-square test was used to compare the rates of infection with the months, the age of patients, and type of surgeries. P value <0.05 was considered significant.

Results

The results of the prospective studies of nosocomial infections in the O & G ward where surgical patients are admitted are presented in the following tables.

Table 1 shows the monthly distribution of SSI in O& G ward in the Specialist Hospital. The table reveals that infection rate varied from month to month from 4.7% in the month of May, 2014 at the highest rate of 16.7% in the month of January, 2014. The table also reveals an incidence rate of 10.4 %.

Table1: Monthly frequency of Nosocomial surgical site infection in Obstetrics and Gynaecology ward of Specialist of Hospital, Sokoto.

Month	Total No. of patients	Total no. Infected	Incidence rate%
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January	18	3	16.7
February	27	4	14.8
March	11	1	9.1
April	11	1	9.1
May	21	1	4.7
June	13	1	7.6
July	4	0	0.0
Total	105	11	10.4

Table 2 shows the age distribution of patients with surgical site infection in the obstetrics and gynaecology wards from January to July, 2014. It reveals that patients of age less than 20 years were not only the predominant patients that underwent surgical operations, but also had the highest incidence of infection rate (14.3%). Patients over fifty years were few and had no infections at the surgical sites.

Table 2: Age distribution of patients with SSI in Obstetrics and Gynecology ward from January to July 2014

Age group	Total number of Cases	No surgical SSI	Infection rate
≤20	42	6	14.3
21-30	35	3	8.6
31-40	23	2	8.7
41-50	5	0	0.0
Total	105	11	10.4

Table 3, reveals that patients that underwent emergency Cesarean Section had a greater rate of infection (14.1%) than elective Cesarean Section (4.8%).

Table 3: Incidence of surgical site infection in Obstetrics and Gynaecology ward from January to July 2014

Type Of Surgery	Number of Surgery	Number Infected	Rate (%)
Emergency CS	64	9	14.1
Elective CS	41	2	4.8
	105	11	10.4

Table 4 shows five (5) species of surgical site bacterial pathogens were identified at the surgical site of patients admitted into the O & G wards of the Hospital. *Staphylococcus* spp. constituted the majority among the isolates, though Enterobacteriaceae organisms as a group accounted for almost half of the isolates.

Table 4: Distribution of pathogens at the surgical site from January to July, 2014

Isolated pathogen	Occurrence	% frequency
<i>Staphylococcus</i> spp.	5	38.5
<i>Enterobacter</i> spp.	1	7.7
<i>Escherichia coli</i>	2	15.4
<i>Klebsiella</i> spp.	2	15.4
<i>Pseudomonas</i> spp.	3	23.1
Total	13	100

Discussion

All over the world, nosocomial infection is distinguished as a foremost source of public health problem, because it continues to impede the successful management of infections in hospitals. World Health Organization (WHO, 2011) Surveillance put the rate of infection at 5-10% of hospital admissions. The incidence of SSIs following Caesarean Section obtained from this study is 10.4%, which falls within the average global CS infection rate of 15% (Zimlichman., *et al* 2013). This rate is, however, lower than previously reported in Tanzania which ranged from 21.4% to 31.8%. Data obtained from the prospective studies of the age distribution of SSI of

patients in obstetrics and gynaecology ward revealed a higher rate of infection (14.3%) among patients of age 20 and below. There was no statistically significant relationship between the patient's age and the rate of infection ($P > 0.05$). This finding is similar to what was reported by Dalhatu *et al.*, (2014) about the same age group. The result is also similar to the report of Jido *et al.*, (2012) This contradicts the finding of Kaye *et al.*, (2005) where an increase in age independently predicted an increase risk of SSI. Higher rates of infections due to increasing age are associated with greater likelihood of certain chronic conditions and decreased immunity with delayed healing, which is not the case in this study. The marital age of patients (≤ 20) in this region may have contributed to the high rate of infection among this age group. The highest rates of infection occurred with patients that underwent emergency cesarean section (CS) with a rate of 14.1% compared to those who underwent elective CS with a rate of 4.8%. There was no statistically significant difference between the rate of SSI and the type of surgery ($P > 0.05$). This shows that emergency surgical interventions increased the rate of SSI. The highest infection rate in emergency operation can be attributed to inadequate preoperative preparation and the severity of the underlying condition that necessitated emergency procedure. This agrees with the findings of Nwankwo *et-al* (2010). Preoperative antibiotic prophylaxis are an important risk factor for SSI. Early administration reduces the colonization pressure of microorganisms to a level that the patient's immune system will be able to overcome. Because emergency surgeries are carried out in a hurry, prophylaxis may not have been administered early enough to achieve the required serum and tissue concentrations. This may have led to the high rate of postoperative infection in emergency surgeries (Eyk and Schalkwyk, 2012).

Another reason that has been advanced to explain high rates of infection in emergency surgeries is the development of subcutaneous wound hematomas (a blood clot within tissues). Damage to smaller vessels that was not apparent during emergency surgeries is a major cause of the hematoma. This suggests lapses in complete haemostasis during the wound closure (Perkins and Pattillo, 2009). The blood clot may provide a medium for bacterial growth and as a result cause post operative surgical site infection (Dhar *et-al.*, 2014).

The array of different surgical site infection pathogens obtained in this study could be associated with the fact that the microbial aetiology of post caesarean section SSI has been shown to be diverse, being associated with both vaginal microorganisms such as *E. coli*, *Enterococcus* spp., or with nasopharyngeal flora such as *Staphylococcus aureus*, or skin flora such as *Staphylococcus epidermidis*. *Staphylococcus aureus* has been found to be the most common cause of SSI post CS (Filbert *et-al.*, 2014). Other organisms such as *Escherichia coli*, *Klebsiella* spp., *Pseudomonas aeruginosa*, *Enterobacter* spp., *Enterococcus* spp., have also been implicated as surgical site pathogens in post CS cases (Filbert *et-al.*, 2014).

CONCLUSION

Surgical Site Infection complicates surgeries in the Obstetrics and Gynaecology ward of Specialist hospital Sokoto (10.4 %) consequent of *Staphylococcal* spp. It mostly occurred in emergency surgical procedures and patients of ages 20. Until such a time that optimal infection control measures and guidelines for post operative surgical site infection is feasible, a system for surgical site infection surveillance with feedback of appropriate data to surgeons is highly recommended.

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