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Mini Review

Nosocomial infections: surgical site infection in UCH Ibadan, Nigeria

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Abstract

Surgical wound infection is a good index of Hospital Acquired Infection (HAI). The programme of Surveillance of HAI in University College Hospital (UCH), Ibadan, Nigeria, started in January 1976. The last audit of the programme reported the situation between January 1989 and December 1991, whence the prevalence of HAI was found to be 4.9%.
The programme of Surveillance of HAI from year 1995 to 2004 was audited. All wound swabs/biopsies sent for microscopy, culture and sensitivity were analysed. Previous incidence of nosocomial Infection in the environment was obtained from literature.
The prevalence of HAI was 3.0%, Surgical Site Infection was the second most prevalent HAI. Surgical Site Infection was responsible for 27.9% of the nosocomial infections recorded. The ratio of Gram Positive to Gram Negative organisms was 1:2.3. Bacterial agents of Surgical Site Infection were *Staphylococcus aureus* 29.0%, Klebsiella spp 25.3%, Pseudomonas spp 21.7%, Proteus spp 11.7% *E. coli* 11.3%, *Streptococcus pyogenes* 0.6% and *Enterococcus faecalis* 0.3%.
A decrease from 4.9% to 3.0% in prevalence rate of HAI was observed, compared with the earlier review as a result of refresher courses in Controls of Hospital Infections. To reduce the menace of Surgical Site Infections, prophylactic antibiotic with short courses of quinolone is advocated as well as adequate wound surveillance and Hospital Workers' medical care.
Key Words: Nosocomial Infection, Surgical Site, UCH

Introduction

Hospital acquired infections (HAI) are infections that are found to be active or under active treatment which were not present or incubating at the time of admission to hospital[1]. Surgical wound infection is being used as a good index of nosocomial infection. It is a prototype of HAI and constitutes a serious problem. Postoperative Surgical Site Infections remain a major source of illness and a less frequent cause of death in the surgical patient[2]. The term for infections associated with surgical procedures was changed from surgical wound infection to Surgical Site Infection in 1992 by the Center for Disease Control and Prevention (CDC).[3] These infections are classified into incisional, organ, or other organs and spaces manipulated during an operation; incisional infections are further divided into superficial (skin and subcutaneous tissue) and deep (deep soft tissue-muscle and fascia). Detailed criteria for these definitions have been described [3]. These definitions should be followed universally for surveillance, prevention, and control of Surgical Site Infections.The WHO emphasises that each hospital should have a surveillance programme on HAI. In that vein, the University College Hospital's HAI programme was started in January 1976[4]. Periodically, an audit of the programme is worth while and had been done to alert the Health Care providers in this region on issues on HAI. The last audit reported the situation between January 1989 and December 1991[5], whence the prevalence of HAI was found to be 4.9%.
We set out to audit the programme from 1995 to 2004, by using surgical site infection as an index

Materials And Methods

The programme of Surveillance and Control of HAI which started in UCH, Ibadan, Nigeria in January 1976[4] , was audited. The wound swabs/biopsies sent to the Medical Microbiology Laboratory from January 1995 to December 2004 were analysed and presented. Routinely each specimen was gram stained and cultured on Blood , Chocolate and MacConkey agars, and then incubated at 37^0C overnight. Both the Blood and MacConkey agars were incubated aerobically while the Chocolate was in candle extinction jar. Pure colonies of isolated organisms on culture plates were characterised bio-chemically. Previous incidence of nosocomial Infection in the environment was obtained from literature[5]

Result

During the study period, a total of 93,909 patients were discharged. Of these, 2,234 had Nosocomial infections giving a prevalence of 3.0%. This rate is lower than that of 4.9% from the audit of 1989 – 1991. The distribution of Nosocomial Infections by ward and service is shown in table 1.Of the 2234 patients with Nosocomial infections, 623 (27.9%) had Surgical Site Infections. The distribution of Surgical Site Infections by ward and service is shown in table 2. The surgical ward has the highest with 69.8%, then O & G 20.2%. Paediatric 7.2%, and Medicine 2.7%. Of the 1121 cases of nosocomial infections in the surgical wards, 435 (38.8%) had Surgical Site Infections. Table 3 shows the bacterial pathogens of Surgical Site Infections during the study period. A total of 648 bacterial isolates were cultured from the 623 cases of Surgical Site Infections.The ratio of Gram Positive to Gram Negative organisms was 1:2.3. *Staphylococcus aureus* was the single leading causative agent of Surgical Site Infections (29.0%). This was followed closely by *Klesiella* spp 25.3%, *Pseudomonas* spp 21.7%, *Proteus* spp 11.7% and *E. coli* 11.3%. It is pertinent to note that Gram Positive organisms like *Streptococcus pyogenes* and *Enterococcus faecalis* constituted minor agents of Surgical Site Infections, being 0.6% and 0.3% respectively

Table I: Distribution Of Nosocomial Infections By Ward And Service In Uch, Ibadn, Nigeria, 1995 – 2004.

Ward/service (No Discharged)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL	% by ward	% of HAI
Surgery 21,502	85	93	148	104	157	121	84	135	67	127	1121	5.2	50.2
O & G 18,417	22	36	39	24	40	23	32	54	36	18	324	1.8	14.5
Medicine 21,120	29	38	59	43	56	40	48	44	43	35	435	2.1	19.5
Paediatric 12,870	25	27	34	44	57	33	36	51	26	21	354	2.8	15.8
TOTAL 93,909	161	194	280	215	310	217	200	284	172	201	2234	3.0	100

Table II: Surgical Site Infections By Ward And Service in UCh, Ibadan, Nigeria, 1995 – 2004.

Ward/service (Not Discharged)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL	% by ward	% of SSI
Surgery 21,502	25	35	60	49	50	46	30	44	36	60	435	2.0	69.8
O & G 18,417	11	10	14	6	17	11	14	16	19	8	126	0.7	20.2
Medicine 21,120	-	1	-	-	-	-	3	4	7	2	17	0.1	2.7
Paediatric	3	3	11	5	2	7	3	4	3	4	45	0.4	7.2

12,870 TOTAL 93,909	39	49	85	60	69	64	50	68	65	74	623	0.7	100

Table III: The Bacterial Pathogens Of Surgical Site Infection In Uch, Ibadan, Nigeria, 1995 – 2004.

Bacterial Isolates	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL	**%**
Klesiella spp	8	14	27	10	21	14	14	12	18	26	164	25.3
E. coli	4	2	13	-	2	5	9	2	18	18	73	11.3
Proteus spp	1	6	10	5	6	6	2	-	5	2	43	6.6
Proteus mirabilis	8	7	2	-	-	1	1	4	4	3	30	4.6
Proteus rettg.	-	-	2	1	-	-	-	-	-	-	3	0.5
Pseudomonas spp	3	-	3	5	10	1	1	1	2	2	28	4.3
Pseudomonas aeruginosa	9	15	18	11	2	15	8	6	17	12	113	17.4
Staph. aureus	10	8	21	13	26	26	17	11	23	33	188	29.0
Strept. Pyogenes	3	1	-	-	-	-	-	-	-	-	4	0.6
Enterococcus faecalis	-	-	-	-	-	1	-	-	-	-	1	0.2
BHS	-	-	-	1	-	-	-	-	-	-	1	0.2
Total	46	53	96	46	67	69	52	36	87	96	648	100
GN	33	44	75	32	41	42	35	25	64	63	454	70.1
GP	13	9	21	14	26	27	17	11	23	33	194	29.9

Discussion

In this review, between 1995 and 2004, the prevalence rate of nosocomial infection in UCH, Ibadan, Nigeria was 3.0%. This is a decrease when compared with the audit of year 1989 to 1991[5] when the rate was found to be 4.9%. This decrease in rate reflects the effect of the knowledge gained by the Health workers during the yearly Refresher courses in Surveillance and Control of Hospital Infections. This course is organised for Health Workers within and outside the hospital by the Infection Control Unit of the Department of Medical Microbiology of the University College Hospital. We therefore recommend that hospital workers should be encouraged to attend similar courses to reduce nosocomial infections in their respective health institutions, and this should be built into the Continuous Education Programme for the Health workers.

It is pertinent to note that about half (50.2%) of the cases of nosocomial infections were in surgical ward. Medicine, Paediatric and O & G followed in decreasing order. Of all the patients admitted into the surgical wards 5.2% had nosocomial infections.

This is important in the sense that 5 of every 100 patients in the surgical wards will have prolong hospital stay, increase cost of management, morbidity and mortality, as well as acting as sources of infection to other

patients in the wards. This calls for adequate source isolation methods in the surgical wards.

Surgical Site Infection was the second most frequent nosocomial infection in this hospital. This is in agreement with previous finding that Surgical Site Infections was the second most frequent nosocomial infection in most hospitals and are an important cause of increased cost, morbidity and mortality[6]. In this study, 2% of all surgical patients came down with Surgical Site Infection. Efforts geared towards control of Surgical Site Infections will definitely reduce the 50% prevalence rate of nosocomial infections in the surgical wards.

In Surgical Site Infections, the ratio of Gram Positive to Gram Negative organisms was 1:2.3. This is similar to the pattern of the previous review when it was 1:3 %[5], but quite different from the finding of Odugbemi and Coker who obtained a ratio of 4:1 in the Lagos University Teaching Hospital (LUTH), Lagos[7], in the same Geographical location. This difference may be due to the different antibiotic policies in the two hospitals as well as differences in the composition of microbial population in the two hospitals. 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[8]..

Surgical Site Infection depends on the host susceptibility, condition of the wound and the amount and type of microbial contamination of wound. In this review, Staphylococcus aureus was the single most prevalent (29%) agent of surgical wound infection In earlier review [4,5] , it constituted 30.3% of the isolates from surgical wound site. It still remains the single most prevalent organism over the period of ten years. This may reflect the degree of carriage of Staphylococcus aureus as a member of the skin flora of the patients, as well as nasal carriage by the Surgeons and other Health Workers. This calls for periodic screening of members of the Surgical team for nasal carriage of Staphylococcus aureus and treatment if need be. Other common organisms included Klebsiella spp 25.3%, Pseudomonas spp 21.7%, Proteus spp 11.7% and *E. coli* 11.3%. The minor ones were Streptococcus pyogenes and Enterococcus faecalis.The pathogens isolated from infections differ, primarily depending on the type of surgical procedure. In clean surgical procedures, in which the gastrointestinal, gynecologic, and respiratory tracts have not been entered, Staphylococcus aureus from the exogenous environment or the patient's skin flora is the usual cause of infection. In other categories of surgical procedures, including clean-contaminated, contaminated, and dirty, the polymicrobial aerobic and anaerobic flora closely resembling the normal endogenous microflora of the surgically resected organ are the most frequently isolated pathogens[9]. Anaerobes were not included in this report, because anaerobic culture was not done routinely during the period of review.

- , Klebsiella spp, Pseudomonas spp Proteus spp and Escherichia.coli will be desirable in this region. It has been documented that there is weakness in activity of Ceftazidime and Ceftriazone against bacteria from clinical specimens and good susceptibility of these Gram negative and Staphylococcus aureus (including MRSA) to the quinolones [10] ,

The complications of surgical wound infection include longer hospitalization, increase in cost, morbidity and mortality despite all the advances in surgical techniques and the rigorous precaution taken in the operating room and on the wards[6]. The most critical factors in the prevention of postoperative infections, although difficult to quantify, are the sound judgment and proper technique of the surgeon and surgical team, as well as the general health and disease state of the patient [8].

Other factors influence the development of postoperative wound infection, especially in clean surgical procedures, for which the infection rate (<3%) is generally low. Infections in these patients may be due solely to airborne exogenous microorganisms [8].

Prevention should be emphasized and done according to the, CDC's Health Care Infection Control Practices Advisory Committee published revised guidelines for the prevention of infections of 1999[12]. Emphasises are placed on the following:

- Treatment of any identified bacterial infection before surgery.
- Ensuring short hospital stay.
- Bathing patients before operation.
- Hair care: except if the hair is too thick, shaving may not be required. If need be this should be done aseptically.
- Preparation and maintenance of operating room – where possible the ideal is a positive pressure relative to the surrounding area.
- Antibiotic Intake:- In view of the common agents of Surgical Site Infections, parenteral antibiotic that are active against Staphylococcus aureus

  [11.]. Consequently we recommend the quinolone as drug of choice. This should be given within an hour before the operation or at the time just prior to the surgical incision to maintain high tissue levels of the antibiotic for the duration of the procedure and shall not be given for a period exceeding 24 hours.
- Adequate wound surveillance.

- Staff health services – including periodic screening and treatment of health workers for nasal carriage of Staphylococcus aureus.

In the developing countries like ours, the problem of scarcity militates against prevention and control of Surgical Site Infections. Dealing with problems of scarcity involves

(1) The provision of electrically operated oven and small electric sterilizer as well as provision of generating plant to supply electricity for autoclaving of surgical materials.

(2) Constant storage of water in big receptacles is advocated for cases of water shortage[6], since regular washing of hands and instruments is essential in the Control of Infections.

References

1. National prevalence of survey of hospital acquired infection definitions. (1993). A preliminary report of the steering group of the second National Prevalence Survey Journal of Hospital Infection. 24(1): 69 – 76.
2. Nichols RL. (1998).Postoperative infections in the age of drug-resistant gram-positive bacteria. Am J Med;104:11S-16S.
3. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. (1992).CDC definitions of nosocomial surgical site infections: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiol 1992;13:606-8.
4. Montefiore D. G. Alausa K. O. Cooke A. R. et al (1979). Epidemiological surveillance of Hospital acquired wound infection.; 9: 289 – 293.
5. .A. A. Oni, R. A. Bakare, A. O. Okesola, H. A. Ogunlowo and A. E. Ewete. (1997). Pattern of bacterial pathogens in surgical wound infections. Afri. J. Med. med. Sci. 26, 139 – 140.
6. Eunice I. Iwuchukwu-Sobayo A Manual on Infection Control for Hospitals in Developing Countries. Ibadan University Press. 2005; 83 – 90.
7. Tolu Odugbemi and A. O. Coker. Prevalence of Hospital acquired infection in Nigeria. Prevention and Cure. Postgraduate Doctor. Middle East. 11(7): 332 – 339.
8. Renald Lee Nichols (2001) Preventing Surgical Site Infection: A Surgion's perspective. Emerging Infectious Diseases. Vol.7,No2. Mar – April
9. Nichols RL. (1984). Prevention of infection in high risk gastrointestinal surgery. Am J Med;76:111-9.
10. Oni A.A., R.A. Bakare, A.O. Arowojolu, R.A. Toki and N.A. Fasina. (2001) Comparative in-vitro activities of commonly available quinolones and other antibiotics on bacterial isolates in Ibadan. Nigeria. Afr. J. Med. Med. Sci. ; 30 : 35-37 .
11. Okesola A. O., Oni A. A. and Bakare R. A. (1999). Prevalence and Antibiotic sensitivity pattern of Methicillin Resistant Staphylococcus aureus in Ibadan, Nigeria. The journal of Hospital Infection. Vol 41(1) ; 74 – 75.
12. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, (1999). The Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection 1999. Infect Control Hosp Epidemiol;20:247-80
13. .