Prevalence of Nosocomial Infections in Surgical Ward at Butare University Teaching Hospital

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ABSTRACT

BACKGROUND: *Health care associated infections which include Nosocomial infection remain a foremost public health burden worldwide. Bacterial resistance is an increasing therapeutic challenge which is associated with nosocomial infections. Thus, the main objective of this study was to identify the prevalence of surgical site infections.*

METHODS: *A cross sectional quantitative study was conducted in surgery of CHUB. Patients undergone operation were recruited from January 2017 until we reach 221 patients. Clinicians followed patients on a daily basis until discharge. In case of clinical signs and symptoms of surgical site, biological specimen were collected and processed in laboratory for bacterial isolation.*

RESULTS: *Out of 221 patients operated in hospital, 6.8% were confirmed of bacterial nosocomial infections. The rate of surgical site infections is associated with the theatre, class of wound, where clean and clean/contaminated operations was 3.13% and 8.00% respectively which increase to 15.79% and 29.41% for contaminated and dirty/infected wound respectively. A total of 19 samples collected, Staphylococcus aureus was the identified in 6 samples accounting 37.50% and then Coagulase Negative Staphylococcus species at 25.00%.*

CONCLUSIONS: *Drug resistance of isolates to antimicrobials is an alarming risk of nosocomial infections considering the empirical prophylactic and treatment in places. adherence of aseptic surgical procedures and proper management of wounds is demanding in the process to counter the infection.*

INTRODUCTION

Nosocomial infection is a critical concern in health service provision(Disease, 2002); at present, Resistant strains are a global public health threats and the case is more critical in low income countries(Bizimana et al., 2016)(Wondimagegn, Gebre, Getnet, & Meku, 2012). According to WHO; nosocomial infections are defined infection acquired in the hospital by a patient who was admitted for a reason other than that infection. An infection occurring in a patient in a hospital or other health care facility in who the infection was not present or incubating at the time of admission(Xu et al., 2017). This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility(Baker, Dicks, & Durkin, 2017).

Nosocomial infections negatively impact the n public health. Apart from the increased number of hospitalized patients. Insufficient health facilities increase risks. Other factors which contribute considerably to the antibiotic resistance includes compromised immunity of patients, the emergence of new micro-organisms. In surgical ward settings, we cannot ignore associated risk as nutritional status, exposure to multiple antibiotics, insertion of catheters; ventilation as well as the duration of stay(Neill, 2014).

The present study investigated the prevalence of nosocomial infections, with focusing on surgical site and urinary tract infection in surgery of Butare University Teaching Hospital.

The antimicrobials and resistance is not limited to clinical microbiology as; thus, it requires rather strenuous efforts of the public. Other factors which contributes to the resistances include behaviours, such as hygienic habits or adherence to treatment, may have consequences that are global rather than individual (Tolera, Abate, Dheresa, & Marami, 2018).

The main risk factors for nosocomial infections are related to both hospital and patients. The maximum number of nosocomial infections is known to be caused by staphylococcus aureus including MRSA and VRSA. Similarly the major Surgical site infections are urinary tract infections, surgical site infections, respiratory infections and blood stream(Oliphant & Eroschenko, 2015).

Empirical treatment by medical doctors cause the increase of antibiotic resistance and lead to the selection of resistant bacteria within hospitals(Shoaei, Sali, & Yousefi, 2017). The multidisciplinary collaboration in anti-microbial resistance involves the implementation of

different policies on use of antibiotics and infection control measures. Detect, report and manage properly resistant stain is a crucial component which increase the effectiveness of the surveillances (Siddique, Farzand, Waheed, & Khan, 2012).

The management options for nosocomial infections depend upon the site and severity of infection. It includes single as well as the combination of antibiotic therapy. However, prevention and proper treatment strategies are more effective to resolve nosocomial infections problem.

Patients and public health in general bear a significant burden. Infections acquired in the hospital account for, major causes of morbidity and economic burden among the hospitalized patients. Moreover, the concept of combatting associated infections transmission takes on another meaning when patients' relatives have to take up temporary residence in the hospital as next kin of patient.

The general objective of the study is to investigate the prevalence of nosocomial infections in surgical ward at Butare University Teaching Hospital. The study focussed mainly on Surgical site infections and Urinary tract infections.

METHODS

A cross-sectional quantitative study was conducted in University Teaching Hospital of Butare southern Province, Rwanda, from January 2017 to May 2017. The southern province is an admistrative region of the country. University Teaching Hospital of Butare is a central hospital. It provides specialized health care services to the population of the province. It covers a catchment area of 13 district hospitals.

The recruitment include all patient admitted and operated in surgery department for the mentioned period and who had a clinical evidence of nosocomial infections were included in this study.

Sample size

The sample size is calculated based on the formula

$$n = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

Where

n=Sample size with finite population

N= Population size

Z=statistic for a level of confidence (for95% it is 1,96)

P=Expected proportion (in proportion of one: 0,01)

..d= precision (in proportion of one 0,05)

In our study, the population size is considered as average annual number of patient operated in surgery, (N=1420),

$$n = \frac{1420.(1,96)^2 0,01(1-0,01)}{(0,05)^2(1420-1)+(1,96)^2 0,01(1-0,01)} = 209,7$$

As conclusion, the sample size will be 210 Patients

The final sample size was determined to be 210. The study participants were picked sequentially until the required number is reached.

Clinicians followed prospectively all patients admitted and operated in Surgical department at CHUB for the development of NIs. Patients were assessed for SSIs and UTIs, as per the Center for Disease Control and Prevention criteria (Berriós-Torres et al., 2017). Professional nurses collected data from selected patients and filled questionnaires. A data collection sheet was developed from different kinds of literature. Clinical specimens such as urine, blood or wound swab, were collected in case of need, labelled and transported to the Laboratory for further analysis. Patient operated in other hospital rather than CHUB and refereed for further management was excluded in our study.

In vitro, we identified bacteria using standard culture and biochemical tests as described(Tolera et al., 2018). In brief, each specimen was cultured onto selective culture media (Oxoid, Ltd., UK), including MacConkey agar, cystine lactose electrolyte deficient agar, mannitol salt agar and 5% sheep blood agar, for investigation of bacteria. Strains of bacteria isolated were characterized based on colonial morphology, pigmentation of the colony, and cell morphology.

Data were entered into the SPSS software and analyzed. prevalence of NIs was presented in percentage along with the 95% confidence interval (CI). Microsoft word 2016 for text writing. Bivariate analysis was then conducted using chi square test to identify risk factors

and statistical association of infection with particular risk variable and P –values less than 0.05 were considered significant.

				Urinary Tract Infections			Surgical site infection		
		Frequency	Percent %	Yes N	%		Yes N	%	
Operation Room	Room A	77	34.84	1	1.30	X2=0.435	1.00	1.30	X2=14.233
	Room B	60	27.15	1	1.67	df=3	2.00	3.33	df= 3
	Room C	32	14.48	1	3.13	Pvalue=0.933	3.00	9.38	pvalue=0.003
	Room D	52	23.53	1	1.92		9.00	17.31	
	Total			4	1.81		15.00	6.79	
Referal	Yes	196	88.69	3	1.53	x2=0.963	11.00	5.61	x2=3.782
	No	25	11.31	1	4.00	Df=1' Pvalue=0.383	4.00	16.00	Df=1' Pvalue=0.052
Number of Previous surgery	0	171	77.38	2	1.17		9.00	5.26	
	1	26	11.76	2	7.69	X2=5.899	4.00	15.38	X2=4.634
	2	18	8.14	0	0.00	df=5	2.00	11.11	df= 6
	3	4	1.81	0	0.00	Pvalue=0.316	0.00	0.00	pvalue=0.462
	4	1	0.45	0	0.00		0.00	0.00	
	7	1	0.45	0	0.00		0.00	0.00	
Open wound surgery	Yes	41	18.55	1	2.44	x2=0.112	5.00	12.20	x2=2.327
	No	180	81.45	3	1.67	Df=1 Pvalue=0.738	10.00	5.56	Df=1' Pvalue=0.127
Anaesthesia type	Local	5	2.26	0	0.00	X2=0.238	1.00	20.00	X2=1.587
	Spinal	73	33.03	1	1.37	df=2	4.00	5.48	df=2
	General	143	64.71	3	2.10	Pvalue=0.888	10.00	6.99	Pvalue=0.452
Surgery category	Urgent	37	16.74	2	5.41	x2=3.233	6.00	16.22	x2=6.245
	Planed operation	184	83.26	2	1.09	Df=1 ; Pvalue=0.072	9.00	4.89	Df=1 ; Pvalue=0.012
Wound Class	Clean	160	72.40	2	1.25	X2=2.894	5.00	3.13	X2=19.638
	Clean/ Contaminated	25	11.31	1	4.00	df=3	2.00	8.00	df=3
	Contaminated	19	8.60	0	0.00	Pvalue=0.408	3.00	15.79	Pvalue<0.001
	Dirty/infected	17	7.69	1	5.88		5.00	29.41	
Post op antibiotic	Cloxacillin	19	8.60	1	5.26		1.00	5.26	
	Cefotaxim	19	8.60	1	5.26	X2=4.497	1.00	5.26	X2=3.541
	Ceftriaxone	85	38.46	2	2.35	df=4	9.00	10.59	df=4
	Other	11	4.98	0	0.00	Pvalue= 0.343	0.00	0.00	Pvalue=0.472
	None	87	39.37	0	0.00		4.00	4.60	
Urinary catheter inserted	Yes	28	12.67	2	7.14	x2=5.131	5.00	17.86	x2=6.210
	No	193	87.33	2	1.04	Df=1 ; Pvalue=0.024	10.00	5.18	Df=1 ; Pvalue=0.013
Duration of	0-30	30	13.57	0	0.00		3.00	10.00	

Operation	30-1h	74	33.48	2	2.70	X2=2.230	5.00	6.76	X2=8.207
	1h-1h30	69	31.22	2	2.90	df=6	1.00	1.45	df=6
	1h30-2h00	23	10.41	0	0.00	Pvalue=0.897	2.00	8.70	Pvalue=0.223
	2h00-2h30	10	4.52	0	0.00		1.00	10.00	
	2h30-3h00	6	2.71	0	0.00		1.00	16.67	
	3h00 and More	9	4.07	0	0.00		2.00	22.22	

RESULTS AND DISCUSSION

		fequency	**Percentage %**
Age	11-20 years	23.00	10.41
	21-30 years	112.00	50.68
	31 years and above	86.00	38.91
Sex	M	127.00	57.47
	F	94.00	42.53
SSI	Yes	15.00	6.79
	No	206.00	93.21
UTI	Yes	4.00	1.81
	No	217.00	98.19
isolated bacteria (n=19)	Staphylococcus aureus	6.00	37.50
	Staphylococcus coagulase	4.00	25.00
	Klebsiella pneumonia	3.00	18.75
	Neisseria epidermis	1.00	6.25
	No bacteria	5.00	31.25

Table 1: Basic presentation of the sample

For the total of 221patients in the study. Their gender distribution, age group and prevalence of infection are in table1, most of the participants are male (n=127; 57,47%). The prevalence of surgical site infection is at 6.8% while the most isolated germ is S. aureus (n=6; 37.5%).

Table 2: Epidemiological and clinical presentation of patient

From the sample of 221 patients, one out of 77 (1.30%) operated in the theatre Room A; one out of 60 (1.67%) operated in the theatre Room B; one out of 32 (3.13%) operated in the theatre Room C and one out of 52 (1.92%) operated in the theatre Room D; exhibited symptom of Urinary tract infections. The chi-square test revealed that the urinary tract infection is not statistically significantly associated with operating room (X^2=0.435; df=3 and P=0,933).

From the sample of 221 patients, one out of 77 (1.30%) operated in the theatre Room A; two out of 60 (3.33%) operated in the theatre Room B; three out of 32 (9.38%) operated in the

theatre Room C and nine out of 52 (17.31%) operated in the theatre Room D; exhibited symptom of surgical site infections. The chi-square test revealed that the surgical site infections is statistically significantly associated with operating theatre (X^2=14.233; df=3 and P=0,003).

From the sample of 221 patients, three out of 196 (1.53%) admitted from referral system; one out of 25 (4.00%) admitted at hospital as first admission exhibited symptoms of Urinary tract infections. The chi-square test revealed that the urinary tract infection is not statistically significantly associated with operating room (X^2=0.963; df=1 and P=0,383). From the sample of 221 patients, eleven out of 196 (5.61%) admitted from referral system; four out of 25 (16.00%) admitted at hospital as first admission exhibited symptoms of surgical site infections. The chi-square test revealed that the surgical site infection is not statistically significantly associated with the admission (X^2=3.782; df=1 and P=0,052).

From the sample of 221 patients, two out of 171 (1.17%) didn't undergone any previous surgery; two out of 26 (7.69%) underwent one previous surgery exhibited symptoms of Urinary tract infections. The chi-square test revealed that the urinary tract infection is not statistically significantly associated with previous condition of surgery (X^2=5.899; df=5 and P=0,316). From the sample of 221 patients, nine out of 171 (5.26%) didn't undergone any previous surgery; four out of 26 (15.38%) underwent one previous surgery and two out of 18 (11.11%) underwent two previous surgery revealed symptoms of surgical site infections. The chi-square test proved that the surgical site infection is not statistically significantly associated with the number of previous operation. (X^2=4.634; df=6 and P=0,462).

In our study, the prevalence of surgical site infections was at the rate of 6.8%(n=15) while urinary tract infection is 1.82%. there is a statistical significance association with the theatre (Pvalue=0.003), with the category of surgery (Pvalue=0.012), with wound class (Pvalue<0.001) and with use of catheter. However, no significant association with the administered antibiotic either preoperative or post-operative. This confirm the efficiency of the existing protocol of antibioprophylaxis.

In conclusion, the prevalence of culture-confirmed bacterial NIs in this study was comparable with other similar study findings. The study elucidated 6.8% (n=15). most common infections were surgical site and *S. aureus*. However, the study still open for the wide range of antibiotic susceptibility of isolated germ and else include other type of nosocomial infections as respiratory, blood stream and others.

Ethical Statement: The study was approved by the Butare University Teaching Hospital scientific and research committee and College of Medicine and Health Sciences Institutional Review Board(CMHS-IRB)

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