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Assessment of Factors Associated with Surgical Wound Infection among Patients Operated in Surgical Ward at Kiryandongo General Hospital

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ABSTRACT

Surgical wound infection is defined as infections that occur at or near surgical incision within 30 days of operation or after 1 year if an implant is placed. This study determined factors associated with Surgical wound infection among patients operated in Surgical ward at Kiryandongo general Hospital. This was a descriptive cross-sectional study design which employed both quantitative and qualitative methods in data collection. The study found out that of the 100 patients who underwent major surgical procedures in Kiryandongo General Hospital, 15 (15.0%) had surgical site infection. Host factors associated with Surgical Site Infection among participants were Age(P-value,0.001), Sex(P-value,0.032), Level of education (P-value,0.002), weight (P-value,0.027), BMI(P-value,0.006), Level of blood sugar (P-value,0.001), erythrocyte sedimentation rate (P-value,0.041) and temperature (P-value,0.005). The study also revealed that surgical site infection was associated with duration of hospital stay (P-value,0.004), Cadre of the operating surgeon(P-value,0.000), Duration of the operation(P-value,0.003), type of antibiotic used pre-operatively(P-value,0.041), type of sutures used(P-value,0.023) and cleanliness of wounds(P-value,0.007). Surgical site infections continue to be a major public health problem. The risk factors associated with Surgical wound infection were age, male gender, level of education, height, weight, BMI, blood sugar, nutrition, erythrocyte sedimentation rate, fever, duration of hospital stay, type of incision, cadreof surgeon, duration of the procedure, type of the operation, antibiotics, type of the sutures used and type of wound.

Keywords: factors, surgical wound, infection,surgical ward

INTRODUCTION

Surgical wound infection is defined as infections that occur at or near surgical incision within 30 days of operation or after 1 year if an implant is placed. Post-surgical wound infection can be classified assuperficial, deep and organ surgical site infection based on the involved tissues or organs. Surgical wound infections are the most common postoperative complications which accounts for $3.2 billion in contributable cost per year in hospitals which are giving acute care. Surgical wound infections are the most common reason to be (20%) unplanned admitted after discharging of the patient to their home[1, 2].

Surgical wound infections are a major cause of morbidity and mortality worldwide, affecting 5.6% of surgical procedures in developing countries [3, 4, 5]. According to a World Health Organization (WHO) report, the incidence of surgical wound infections ranges from 1.2 to 23.6 per 100 surgical procedures [6]. Worldwide, it has been re-ported that more than one-third of post-operative deaths are related to surgical wound infections [7, 8, 9]. In addition, surgical wound infections threaten the lives of millions of patients each year and contribute to the spread of antibiotic resistance [10].

The incidence of surgical wound infections is higher in developing countries relative to developed nations [11], reported as the second most common cause of hospital acquired infection (HAI) in Europe and the United

States of America (USA) [12, 13]. Approximately 2–5% of surgical patients worldwide have developed surgical wound infections [14, 15, 16]. surgical wound infections are the most frequent type of HAI in low and middle income countries (LMICs) and affect up to one third of patients who have undergone a surgicalprocedure [17, 18]. In LMICs, the pooled incidence of surgical wound infection was 11.8 per 100 surgical procedures [19]. In Africa, surgical wound infections were the leading infections in hospitals and incidence ranged from 2.5–30.9% [20, 21].

In East Africa, past studies have reported different rates of surgical wound infection ranging from 35% to 19.1% [22, 23]. This variability noted, compounded with limited publications, prompts for further research into the magnitude of the problem in various settings as well as noting trends in surgical wound infections over time. Various perioperative risk factors have been associated with acquiring surgical wound infection. They include patient related factors and surgery related factors [3]. Antibiotic therapy plays a crucial role in prevention of surgical [24, 25, 26, 27]. Therefore, the choice of antibiotics in both prevention and treatment of surgical site infection should consider the common pathogens responsible for surgical site infection [28].

In Uganda, taking a bath before surgery, closing the door to the operating theatre and ensuring surgeons clean their hands properly can be the difference between life and death. A study involving more than 650 surgical patients, showed the rate of infections halved after new measures were introduced. As a result, patients are spending less time in hospital, resulting in cost-savings for both the patient and the hospital [29].

METHODOLOGY

Study Design and Rationale

This was an Institutional descriptive and analytic cross-sectional study. Quantitative methods of data collection were used. The cross-sectional study design was chosen because it allowed the researcher to study both the predictors and the outcome at the same time without having to follow up the study participants thereby making it easy to sample a large number of participants in a relatively shorter duration of time hence cheaper.

Study Area

Kiryandongo District is bordered by Nwoya District to the north, Oyam District to the northeast, ApacDistrict to the east, and Masindi District to the south and west.

Study Site

The study was conducted from the surgical ward at Kiryandongo general hospital.

Study Population

Patients with surgical wounds admitted to the surgical ward at Kiryandongo general hospital constituted the study population.

Sample size determination.

The sample size was determined using Fisher's (1990) method in which the sample size is given by the expression.

$$n = \frac{Z^2 pq}{d^2}$$

n= Desired sample size

Z= Standard normal deviation usually set as 1.96 for maximum sample size at 95% confidenceinterval.

P=16.4% (constant) or 0.164% according to a study among surgical patients at Mbarara RegionalReferral Hospital, South Western Uganda [30].

Q= 1-p =1-0.164= 0.836 and,

d=degree of accuracy desired 0.05 or 0.05 probability level (at 95% confidence level)

Therefore by substitution in the formula,

$$n = \frac{1.96^2 \times 0.164 \times 0.836}{0.05^2} = 210$$

Therefore, data was collected from 210 study participants

Sampling Techniques

This study employed simple random sampling procedure to obtain the sample size for the study. Theresearcher gave all potential respondents who met study criteria an opportunity to participate in the study by picking papers from an enclosed box and any respondent who picked a paper with the wordYES written on it was requested to participate in the

study. This continued until the total of 210 respondents was achieved.

Inclusion Criteria

All surgical patients having surgical wounds admitted to surgical ward and who consented to take partin the study were included.

Exclusion Criteria

- Those who were less than 18 years of age.
- Those who were too ill to answer questionnaires.

Data Collection Procedure

All questions were responded to by research participants after written informed consent was obtained. Questionnaires were issued to participants and explained to them how to fill it. After filling, the questionnaires were collected and data recorded. Each questionnaire had a code number.

Data analysis

Data was cleaned, coded, and entered using Epidata 3.1 and exported to STATA version 14.0 for analysis. A descriptive analysis was performed to summarize the data, followed by bivariate logistic regression analyses. Test for normality (Kolmogorov) was used to establish if the variables were normally distributed. Univariate analysis was conducted to describe the background characteristics of the study participants. Continuous variables were summarized using proportions, means and standard deviations.

At both bivariate analysis and multivariate analysis, the association between independent variables and surgical wound infection was examined.

Ethical Consideration

The researcher obtained an introductory letter from Kampala International University faculty of Clinical Medicine and dentistry, introducing the researcher to the administration of Kiryandongo general hospital and seeking permission to carry out the study. Respondents were assured of maximum confidentiality and only numbers instead of names were used to identify the respondents [31]. Information collected contained individual identity so as to avoid a breach of confidentiality. Completed questionnaires were coded, and the information collected was kept in lockable safes only accessible to the principal investigator for use. The study only commenced after the objectives of the study had been well explained to participants and they had consented to participate in the study. Positive steps were taken to ensure that risks to the study participants were minimized.

RESULTS

The study found out that of the 100 patients who underwent major surgical procedure in KiryandongoGeneral Hospital, 15 (15.0%) had surgical site infection.

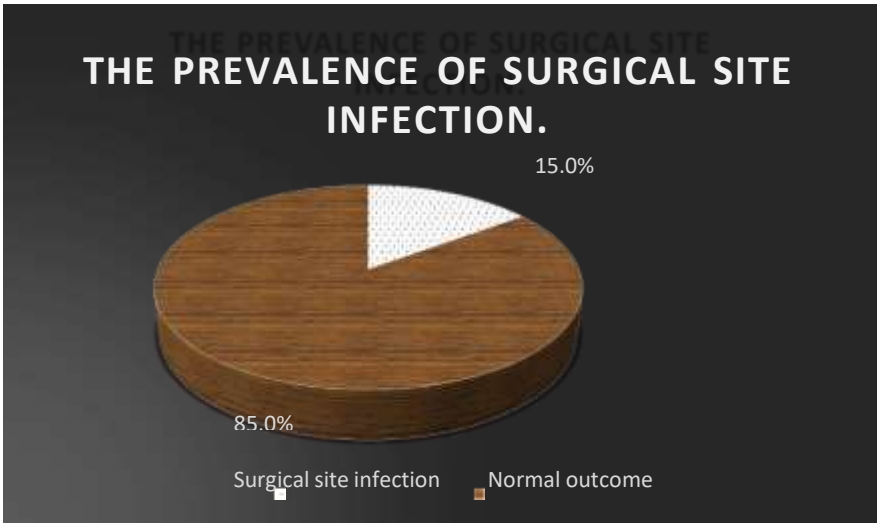

Figure 1: Prevalence of Surgical Site Infection

In this study, majority of the participant were aged between 20-30 years of age 34 (34.0%), 57 (57.0%)were male ,39 (39.0) at least attended primary school, 71 (71.0%) had a height of 1.5- 2.0 meters, 47 (47.0%) weighted between 75-100 kilogram, 49 (49.0%) were overweight, 63 (63.0%) had normal blood sugar, 51 (51.0%) had over nutrition status, 78 (78.0%) had increased erythrocyte sedimentation rate and 47 (47.0%) had fever as shown below.

Table 1: Factors Associated with Surgical Site Infection

Host Factors

Variable	Category	Frequency	Percentage (%)
	Less than 20	07	7.0%
Age in years	20-30	34	34.0%
	30-40	31	31.0%
	40-50	24	24.0%
	60 and above	04	4.0%
Sex	Male	57	57.0%
	Female	43	43.0%
Education	Not Educated	12	12.0%
	Pre- Primary	14	14.0%
	Primary	39	39.0%
	Post Primary	29	29.0%
	Institution	6	6.0%
	0.5 or Less	0	0.0%
Height in Meters	0.5-1.0	1	1.0%
	1.0-1.5	28	28.0%
	1.5-2.0	71	71.0%
	2.0 and Above	0	0.0%
Weight In Kilograms	0-25	0	0.0%
	25-50	12	12.0%
	50-75	39	39.0%
	75-100	47	47.0%
	100 and above	2	2.0%
BMI	Underweight	6	6.0%

	Normal	26	26.0%
	Over Weight	49	49.0%
	Obese	19	19.0%
	Increased		
Blood Sugar		17	17.0%
	Normal	63	63.0%
	Decreased	20	20.0%
Nutritional Status	Over Nutrition	51	51.0%
	Normal	22	22.0%
	Under Nutrition	27	27.0%
Erythrocyte Sedimentation Rate	Increased	78	78.0%
	Normal	12	12.0%
	Decreased	10	10.0%
Temperature	Elevated	47	47.0%
	Normal	23	23.0%
	Decreased	30	30.0%

According to this study,54 (54.0%) of the patients had stayed in the hospital for more than 10 days, 31 (32.0%) had a pfannestiel incision, 37 (37.0%) of them were operated by junior house officers, 49 (49.0%) of them had operation that lasted between 1-2 hours, 45 (45.0%) were operated through caesarean section, 70 (70.0%) had used ceftriaxone and metronidazole as antibiotic for pre-operatively, intra-operatively and post operatively, 58 (58.0%) used multiple filament suture, 87 (87.0%) had aseptic foci and 51 (51.0%) had dirty wound as shown below.

Table 2: Health Service-Related Factors

Variable	Category	Frequency	Percentage (%)
Duration of Hospital Stay	Less Than 10 Days	46	46.0
	More Than 10 Days	54	54.0
Type of Incision	Pffannestrial	31	31.0
	SUMI	28	28.0
	Midline	32	32.0
	Others	9	9.0
Qualification of Surgeon	Junior House Officer	37	37.0
	Medical Officer	34	34.0

	Senior House Officer	22	22.0
	Consultant	7	7.0
Duration of Operation in Hours	Less Than 1	11	11.0
	1-2	49	49.0
	2-3	30	30.0
	3 and above	10	10.0
Name of Operation	Explorative Laparotomy	36	36.0
	Caesarean Section	45	45.0
	Hernioraphy	1	1.0
	Thyroidectomy	0	0.0
	Incisions and Excisions	1	1.0
	Others	7	7.0
Type of Antibiotic Used Pre-operatively	Ceftriaxone	35	35.0
	Metronidazole	35	35.0
	Gentamycin	20	20.0
	Others	10	10.0
Type of Sutures Used	Monofilament	42	42.0
	Multifilament	58	58.0
Septic Focus	Surgical Site	87	87.0
	Other Site	13	13.0
Cleanliness of the Wound	Clean	02	2.0
	Contaminated	47	47.0
	Dirty	51	51.0

According to the study, Host factors associated with Surgical Site Infection among participants were Age, Sex, Level of education, weight, BMI, Level of blood sugar, erythrocyte sedimentation rate and temperature as shown in the table below.

Table 3: Relationship between the host factor and surgical site infection

Variable	Category	Frequency	SSI		P-Value
			Frequency	Percentage (%)	
	Less than 20	07	01	14.3	
Age(years)	20-30	34	03	8.8	
	30-40	31	04	12.9	0.001
	40-50	24	05	20.8	
	60 and Above	04	02	50.0	
Sex	Male	57	09	15.8	0.032
	Female	43	06	14.0	
Education	Not Educated	12	05	41.7	
	Pre- Primary	14	03	21.4	
	Primary	39	04	10.3	0.002
	Post Primary	29	03	10.3	
	Institution	6	00	00	
	0.5 Or Less	0	00	0.0	
Height(m)	0.5-1.0	01	00	0.0	0.071
	1.0-1.5	28	06	21.4	
	1.5-2.0	71	09	12.7	
	2.0 and Above	0	00	0.0	
Weight (Kg)	0-25	0	00	0.0	
	25-50	12	02	16.7	
	50-75	39	04	10.3	0.027
	75-100	47	08	17.0	
	100 and Above	2	01	50.0	
BMI	Underweight	06	02	33.3	
	Normal	26	01	3.8	0.006
	Over Weight	49	05	10.2	
	Obese	19	07	36.8	
	Increased	17	09	52.9	
Blood Sugar	Normal	63	02	3.2	0.001
	Decreased	20	04	20.0	
		12			
Erythrocyt	Increased		06	50.0	

e SedimentationRate	Normal	78	07	9.0	0.041
	Decreased	10	02	20.0	
Temperature	Elevated	23	06	26.1	
	Normal	47	05	10.6	0.005
	Decreased	30	04	13.3	

Note: P-Value<0.05 was considered significant

According to the current study, surgical site infection was associated with duration of hospital stay, Cadre of the operating surgeon, Duration of the surgery, type of antibiotic used pre-operatively, type of sutures used and cleanliness of wounds as shown in the table below.

Table 4: Relationship between health services related factors and surgical site infection

Variable	Category	Frequency	Surgical Site Infection			P-Value
			Frequency		Percenta Ge	
Duration of	Less than 10 Days	46	Yes	05	10.9	0.004
Hospital Stay	More than 10 Day	54	Yes	10	18.5	
Qualification ofSurgeon	Junior House Officer	37	Yes	07	18.9	
	Medical Officer	34	Yes	05	14.7	0.000
	Senior House Officer	22	Yes	03	13.6	
	Consultant	07	Yes	00	00	
Duration of Operation	Less than 1 Hour	11	Yes	01	9.1	
	1-2 Hour	49	Yes	03	6.1	0.036
	2-3 Hour	30	Yes	07	23.3	
	3hours and above	10	Yes	04	40.0	
Name of Operation	Explorative Laparotomy	36	Yes	08	22.2	0.003
	Caesarean Section	45	Yes	05	11.1	
	Hernioraphy	01	Yes	00	00	
	Thyroidectomy	00	Yes	00	00	
	Incisions And Excisions	01	Yes	00	00	
	Others	07	Yes	02	28.6	

		35	Yes			
Type of Antibiotic Used Pre-operatively	Ceftriaxone			06	17.1	
	Metronidazole	35	Yes	04	11.4	0.041
	Gentamycin	10	Yes	03	30.0	
	Others	10	Yes	02	20.0	
Type of Sutures Used	Monofilament	42	Yes	04	9.5	0.023
	Multifilament	58	Yes	11	19.0	
Cleanliness of The Wound	Clean	02	Yes	00	00	
	Contaminated	47	Yes	12	25.5	0.007
	Dirty	51	Yes	03	5.9	

Note: P-Value<0.05 was considered significant

DISCUSSION

The study found out that of the 100 patients who underwent major surgical procedure at Kiryandongo General Hospital, 15(15.0%) had surgical site infection. This was lower as compared to the study done in South Western region which showed an overall incidence of surgical wound infection of 16.4% [30]. However, its slightly higher compared to the findings of a study in Nigeria which showed that the prevalence of surgical site infection was 14.5% [32]. Azeze & Bizuneh [33] in their cross-sectional study done in Ethiopia revealed a lower prevalence of surgical wound infection of 7.8%. Accordingly, another study conducted in Ethiopia found a prevalence of 9.4% [34]. The high prevalence of surgical site infection in this study could be attributed to the fact that the study setting is at a low level of the health pyramid with inadequate resources for patient care.

The current study revealed that Host factors associated with Surgical Site Infection among participants were Age, Sex, Level of education, weight, BMI, Level of blood sugar, erythrocyte sedimentation rate and temperature however there was no association between height and occurrence of surgical site infections.

According to the study, the prevalence of Surgical Site Infection was highest among participants Aged 60years and above(50.0%), males(15.8%),no formal education(41.7%),weight 100kg and above(50.0%),Obese(36.8%),Increased blood sugar(52.9%),raised erythrocyte sedimentation rate(50.0%) and Elevated temperature(26.1%).This results corroborates with the results of a study which showed a high prevalence of SSI among patients aged more than 60years,however the same study reported no association between gender and SSI [35].The findings of the study are also in line with another study with reported high rate of occurrence of SSI among male patients and those with elevated fasting blood sugar [36]. Additionally [37] in their study reported temperature as a risk factor for SSI.

In this study, surgical site infection was associated with duration of hospital stay, Cadre of the operating surgeon, Duration of the surgery, type of antibiotic used pre-operatively, type of sutures used and cleanliness of wounds.

According to the current study, the prevalence of Surgical site infection was highest among those who stayed in the hospital for more than

10days(18.5%),operated by Junior House officer(18.9%),whose operation lasted for 3hours and above(40.0%), used gentamycin pre-operatively(30.0%), multifilament sutures were used(19.0%) and those with contaminated wounds(25.5%).This result is in accordance with literature which reported the prevalence of SSI to be high among those with a prolonged hospital stay, long operation, those without ongoing antibiotic treatment, wound contamination and increase in blood loss [35]. Increased hospital stay and duration of surgery increase the risk of wound contamination predisposing to SSI. The findings are also concordant with the results of a study in Serra Leone which revealed that long preoperative hospital stay and duration of surgery were associated with SSI [36]. Type of antibiotic used was identified as a risk factor for surgical site infection.

CONCLUSION

Surgical site infections continue to be a major public health problem. The risk factors associated with Surgical wound infection were age, male gender, level of education, height, weight, BMI, blood sugar, nutrition, erythrocyte sedimentation rate, fever, duration of hospital stay, type of incision, cadre of surgeon, duration of the procedure, type of the operation, antibiotics, type of the sutures used and type of wound.

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