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Research Article

Surgical Antibiotic Prophylaxis Practices and Occurrence of Surgical Site Infections Among Operated Patients at Dodoma Regional Referral Hospital, Tanzania

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Abstract

This study was conducted to determine association between perioperative antibiotic prophylaxis practices and occurrence of surgical site infections at Dodoma Regional Referral Hospital in Tanzania. Surgical site infections (SSIs) are preventable complications following surgery, but still cause significant burden in terms of patient morbidity, mortality and increased cost of treatment. A prospective cohort study was conducted among 162 operated patients. Patients with different trends of antibiotic prophylaxis were followed up for occurrence SSIs. Analysis of data was done by SPSS version 20 program using frequency tables, chi square test, Kaplan-meier and Cox regression methods. Significance level of < 0.05 was taken to establish associations between variables. It was found that, 60.5% of patients received preoperative antibiotic prophylaxis, the overall surgical site infections rate was 14.8%. There was no significant difference in occurrence of surgical site infections between patients who received and those who did not receive preoperative antibiotic prophylaxis (p=0.88). The study concluded that SSIs are significant complications. Perioperative antibiotic prophylaxis is commonly practiced. Establishment of local protocol on antibiotic prophylaxis and adherence to infection prevention can improve the prevailing situation.

Keywords

Antibiotics, Perioperative, Prophylaxis, Surgical Site Infections

1. Introduction

Surgical site infections (SSIs) are infections occurring at the incision site, organ or space within 30 days after surgery or within 1 year if the implant is left in situ [1]. SSIs cause increasing cost; morbidity and mortality related to surgical operations and continue to be a major problem worldwide [2]. Globally, surgical site infections rates have been found to range from 2.5% to 41.9% [3-11]. In Tanzania, Surgical site infections are also major cause of nosocomial infections, with a wide variations in rates of SSIs reported from different hospitals, ranging from 7 to 36% [12-15].

Proper antibiotic prophylaxis has been proven to protect patients from SSIs by reducing the bacterial load present within the surgical site at the time of operation. This necessitates administering an antimicrobial agent before exposure

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to contamination during surgery. Appropriate antibiotic prophylaxis requires delivery of antibiotic to the operative site at effective concentration intravenously and at appropriate time [8] Antimicrobial agents for surgical prophylaxis should be able to prevent surgical site infections (SSIs), prevent SSI-related morbidity and mortality, reduce the duration and cost of health care, produce no harmful effects, and have no adverse consequences for the normal flora of the patient or the hospital [16, 17]. To attain aforementioned goals, an antimicrobial agent should be active against the pathogens most likely to contaminate the surgical site, administered in an appropriate dosage and at a time that guarantees satisfactory serum and tissue concentrations during the period of potential contamination, safe, and administered for the minimum effective period to minimize adverse effects, the development of resistance, and costs [18, 19]. The World Health Organization (WHO) recommends timing of antibiotic prophylaxis to be within 120 min before making incision while taking into considerations the half-life of a given antibiotic. Higher SSI rate was found when prophylaxis was given earlier than 120min compared to when given within 120min [8, 20, 21]. The administration of antibiotic combinations to prevent SSIs, have shown variable results in SSI rates in different settings [22]. Different settings have documented variations in dosing, timing, duration and combinations based on the risk of infection and the type of surgical procedure for preventing SSIs [23] The WHO recommends against prolongation of SAP after the completion of operation. No benefit has been found when prophylaxis is extended beyond operating time compared to single dosing or re-dosing when operating time exceeds half-life of a particular antibiotic or there is excessive blood loss. However prolongation of SAP in cardiac and orthognathic procedures has been found beneficial [24-29]. Several studies have proven that, single pre-operative of antibiotic prophylaxis could dramatically decrease the risk of SSIs [29, 30]. Other studies have shown that, preoperative antibiotic use within 24hours is as effective as 5 days antibiotic coverage in prevention of infections. Besides no significant difference in terms SSI rate between SAP administration within 24 hours and 72hours perioperative [31, 32].

In our local setting we do not have a protocol on SAP, the choice, dose, timing and duration of SAP varies among different Surgeons. The increasing antimicrobial resistance and the cost of using antibiotics, creates a need for local evidence to optimize outcomes. This study was designed with the aim of determining the association between Surgical Antibiotic Prophylaxis (SAP) practices and occurrence of surgical site infections (SSIs) among operated surgical patients at DRRH, The aim was to generate evidence for rational SAP at our Hospital and a basis for developing a protocol for Hospital SAP.

2. Methodology

2.1. Design and Setting

Hospital based Prospective Cohort study design was conducted in Dodoma Regional Hospital in central Tanzania from November 2017 to April 2018. Cases were patients given preoperative Antibiotic Prophylaxis (AP), while controls were patients who were not given preoperative AP. All patients who were fit for operations and underwent surgeries in the general surgical department were included in the study provided they gave an informed consent to participate in the study. Patients who underwent procedures outside the operating theatre and those with repeat surgeries were excluded from the study.

2.2. Data Acquisition and Variables

Participants from surgical department were enrolled using convenient sampling technique before undergoing operations. Closed ended structured questionnaires were used for data. Study participants demographic data including their mobile phone and their clinical history were collected by a trained doctor or a nurse. Trends of antibiotic prophylaxis were assessed before, during and after operations. Patients were categorized into those who received preoperative antibiotics within an hour of skin incision or more than an hour before skin incision, those who did not receive preoperative antibiotics, those who received intra operative antibiotics and those who received postoperative antibiotics. While in the theatre trained theatre nurses did counter check measures that can influence the risk of SSIs and also assessed antibiotic prophylaxis administration trends including timing of AP. Operating doctors/surgeons were asked about specific intraoperative parameters that were not documented in the patient's operative notes. Post operatively patients were followed by trained doctors for minimum of one day and discharged after examination of their wounds. Patients wound were assessed before discharge for any signs of SSIs. While at home patients were phoned on third and fifth day on the wound progress and if necessary they were told to come back before appointment days. Patient were followed up at the clinic on day seven, day fourteen, day twenty one and day thirty to assess for any clinical feature for SSIs. Patients who developed SSIs were classified and empirical treatments were initiated.

2.3. Sampling and Analysis

A convenient sampling method was employed and all patients for elective and emergency procedures were included during the study period. The sample size was calculated using Fleiss formula in a Standard Epi info software program available in the Centre for Disease Control website (http://www.cdc.gov/epiinfo). A minimum sample size of 134 was obtained.

Data recorded were manually processed using data master sheet. Data cleaning was done using consistent checks. Analysis was done using SPSS version 20 program.

Frequency distribution and two way tables were used to summarize the data, Chi-square test was used to establish association between categorical variables and Kaplan meir procedure and Cox regression analysis were used to determine strength of association between independent and dependent variables, probability values of < 0.05 was considered significant Data recorded were manually processed using data master sheet. Data cleaning was done using consistent checks. Analysis was done using SPSS version 20 program.

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3. Results

3.1. Sociodemographic and Clinical Characteristics of the Cohort

A total of 170 patients who underwent surgeries were enrolled in the study but only 162 patients completed the whole course of follow up. Table 1 shows socio demographic. 66.7% of the patients were females, 47.5% were between 18 and less than 60 years while the least number of patients were below 5 years of age with 4.3%. 45.7% of the respondents had primary education with higher education being the least (4.9%). Prevalence of HIV was 9.2%. Surgical site infections occurred in 14.8% of those who were operated.

Table 1. *Socio Demographic characteristics of surgical patients who underwent surgeries.*

Variables	Variable categories	n	%
Age	Less than 5 years	7	4.3
	5years to less than18 years	21	13.0
	18years to less than 60 years	77	47.5
	More or equal to 60 years	57	35.2
	Total	162	100.0
Sex	Male	54	33.3
	Female	108	66.7
	Total	162	100.0
Education level	Formal education	47	29.0
	Primary education	74	45.7
	Secondary education	33	20.4
	Higher education	8	4.9
	Total	162	100.0
Current smoking	Yes	25	15.4
	No	137	84.6
	Total	162	100.0
Previous smoking	Yes	32	23.5
	No	104	76.5
	Total	136	100.0
HIV status	Reactive	11	9.2
	Non-reactive	108	90.8
	Total	119	100.0
SSI occurrence	Yes	24	14.8
	No	138	85.2
	Total	162	100.0

3.2. Perioperative Characteristics of Surgical Patients Who Underwent Surgeries

Majority of patients had a preoperative hospital stay of less than or equal to 2days 79.6% while those with more than or equal to seven days were the minority 4.9%. 43.2% of procedures where of clean type and the least had infected wounds 1.2%. 57.4% of patients had an ASA score of II and the least were those with ASA score of IV.6%. Most of patients did not receive blood transfusion 93.2% while few patients had a drainage 38.9%. Most of patients 87.6% had operation duration less or equal to two hours. 50.9% of operated patients underwent abdominal surgeries, followed by 22.8% who underwent urological surgeries and 11.1%.

Table 2. Perioperative characteristics of surgical patients who underwent surgeries (N=162).

Variables	Variable categories	n	%
Preoperative hospital stay	Less or equal 2days	129	79.6
	More than 2days	25	15.4
	More or equal to 7days	8	4.9
Wound class	Clean	70	43.2
	Clean contaminated	59	36.4
	Contaminated	31	19.1
	Infected	2	1.2
	Total	162	100.0
ASA score	I	39	24.1
	II	93	57.4
	III	29	17.9
	IV	1	.6
	Total	162	100.0
Use of drain	Yes	63	38.9
	No	99	61.1
	Total	162	100.0
Blood transfusion	Yes	11	6.8
	No	151	93.2
	Total	162	100.0
	3-4days	5	3.1
	More or equal to 5days	150	92.6
	Total	162	100.0
Operation duration	<one hour	70	43.2
	<two hour	72	44.4
	<4hour	20	12.3
Types of operations			
Abdominal		84	51.9
Urological		37	22.8
Perineal		9	5.6
Biopsy		10	6.2

Variables	Variable categories	n	%
Chest		4	2.5
Neck		4	2.5
Others		14	8.6
Total		162	100.0

3.3. Antibiotic Prophylaxis Pattern Among Surgical Patients Who Underwent Surgeries

Table 3. *Antibiotic prophylaxis pattern among surgical patients who underwent Surgeries.*

Variable	Variable Categories	n	%
Preoperative antibiotics	Yes	98	60.5
	No	64	39.5
	Total	162	100.0
Mode of preop-antibiotics	single	97	99
	multiple	1	1
Timing of antibiotics prophylaxis (preop)	within one hour	79	94
	more than one hour	5	6
	Total	88	100.0
Intraoperative antibiotics	Yes	14	8.8
	No	146	91.2
	Total	160	100
Postoperative antibiotics	Yes	160	98.8
	No	2	1.2
	Total	162	100.0
Duration of post	1day	3	1.9
	2days	4	2.5
Operative antibiotics	3-4days	5	3.1
	More or equal to 5 days	150	92.6
	Total	162	100
Antibiotic(s)	Ceft	84	85.7
	Ceft, Gent, Metr	1	1.0
	Ceft, Metr	13	13.3
	Total	98	100.0

NB: Ceft; Ceftriaxone, Metr; Metronidazole, Gent; Gentamycin

60.5% of patients received preoperative antibiotics and almost all received single antibiotic 99% and most of them received it within one hour before skin incision 94%. Only 8.8% received intraoperative antibiotics and almost all patients received postoperative antibiotics 98.8% and most of them received them for more or equal to five days 92.6%. Most of Patients were given Ceftriaxone 85.7% followed by combination of ceftriaxone and metronidazole 13.3% and last combination of ceftriaxone, gentamycin and metronidazole 1.0%.

3.4. Means for Survival Time Between Patients Given Preoperative Antibiotic Prophylaxis and Patients Not Given Preoperative Antibiotic Prophylaxis

The means for survival time between patient given preoperative antibiotic prophylaxis and those not given were 26.9 and 27.1 respectively. The difference in the survival time was not statistically significant (p value=0.88).

The two curves overlap in most points suggesting that survival of patients at particular times for the two groups had no significant difference.

Table 4. Means for Survival Time between patients given preoperative antibiotic prophylaxis and patients not given preoperative antibiotic prophylaxis.

Means for Survival Time					p-value
preoperative antibiotics	Estimate	Std. Error	95% Confidence Interval		
			Lower Bound	Upper Bound	0.88
yes	26.863	.787	25.320	28.407	
no	27.072	.885	25.336	28.808	
Overall	26.953	.590	25.796	28.109	

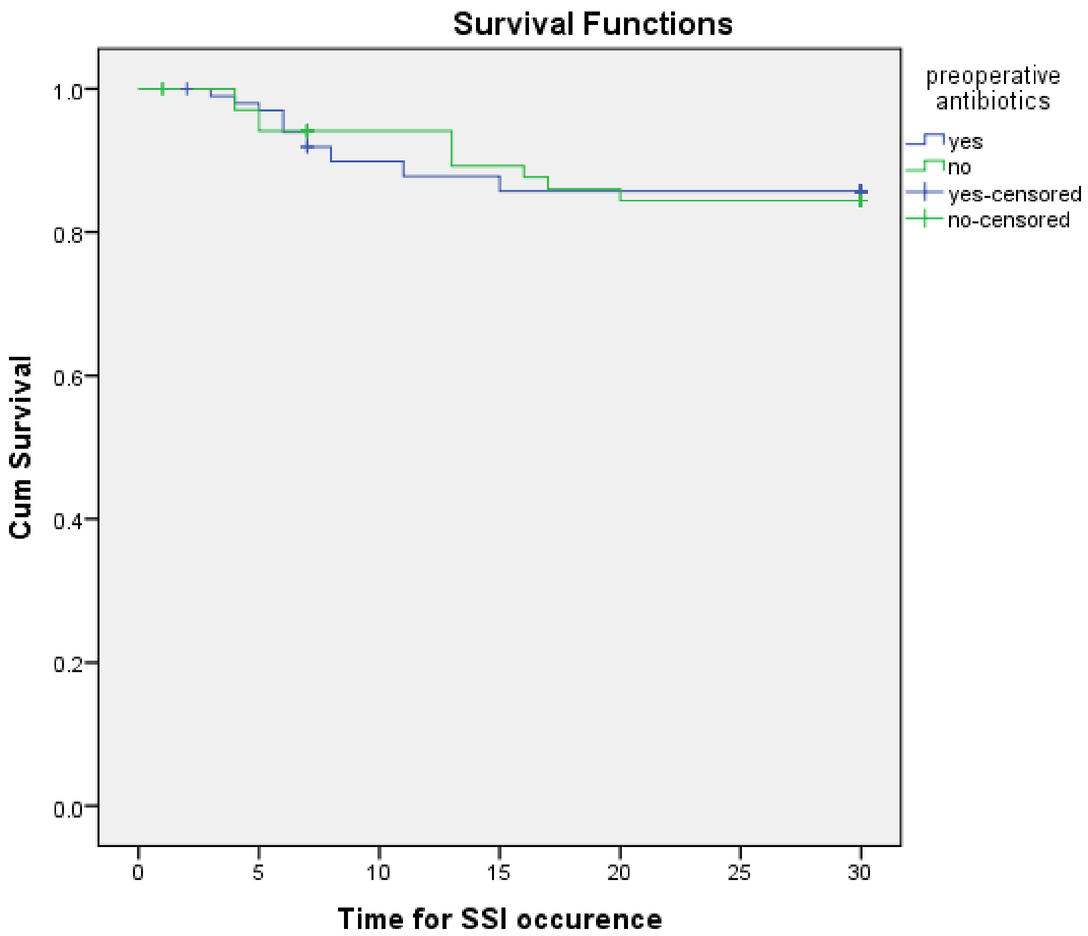

Figure 1. Kaplan-meier curves.

3.5. Relationship Between Wound Class and Preoperative Antibiotics Among Surgical Patients Who Underwent Surgeries

Two patients with infected wounds received preoperative antibiotics and other patients received antibiotic in the order 67.7%, 66.1% and 61.4% for contaminated, clean contaminated and clean wound respectively. The difference was statistically significant (p value=0.021).

Table 5. Relationship between Wound class and Preoperative antibiotics among surgical patients who underwent surgeries.

		preoperative antibiotics		Total	P-value
		Yes	No		
wound class	clean	43	27	70	0.021
		61.4%	38.6%	100.0%	
	clean contaminated	39	20	59	
		66.1%	33.9%	100.0%	
	contaminated	21	10	31	
		67.7%	32.3%	100.0%	
	infected	2	0	2	
		100.0%	0.0%	100.0%	
Total		105	57	162	
		64.8%	35.2%	100.0%	

3.6. Surgical Site Infections by Type of Operations

Surgical site infections occurred at a rate of 16.7% for appendicectomy, 7.1% for hernia repair, 26.0% for laparotomy and 44.0% for Prostatectomy. (Figure 2).

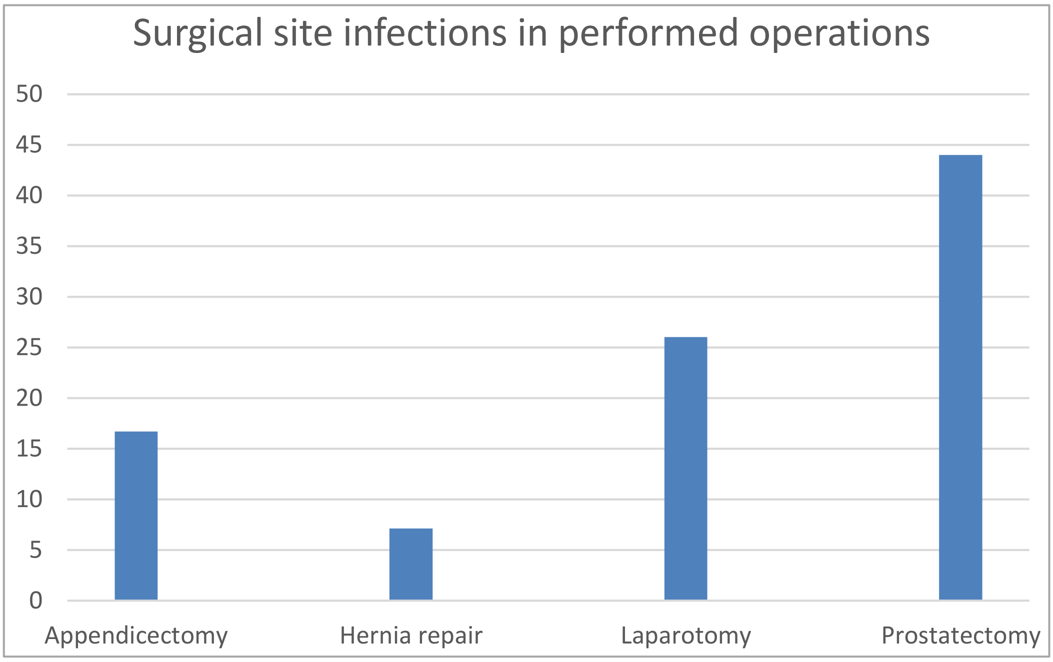

Figure 2. Surgical site infections by type of operations.

3.7. Perioperative Antibiotics Administration

Among all the operated patients (162), 32.7% of them were given a combination of Ceftriaxone, Metronidazole and Ampiclox followed by patients given a combination of Ceftriaxone and Metronidazole, 13%. Patients who were given Ampiclox, Ceftriaxone and Ciprofloxacin were 6.2%, 5.6% and 4.3% respectively.

4. Discussion

4.1. Surgical Site Infections Occurrence

This study has revealed the Surgical Site Infection cumulative incidence of 14.8% among patients who underwent various operations in the general surgery department. Half of these infections occurred to patients while still in the ward.

This rate is higher compared to one of the study done at the same hospital in the department of obstetrics and gynaecology department which reported the rate of 12.0% among caesarean section patients. However it is lower compared to the earlier study in the same department also among caesarean section patients in which high rate of 48% was reported [34, 35]. One of the difference noted was the use of preoperative antibiotics, in the former study 98.7% compared to only 2.0% in the latter study. The differences in the rates between these two studies and the current study can also be due to difference in the proportion of patients given antibiotic prophylaxis in these populations, also most procedures in the two studies were done in the emergency base.

Surgical site infections rates in the country range from 4%-48%. The rate observed in this study is lower compared to some previous studies done in our country at MNH, BMC and SFDDH in which incidence of 35.6%, 26% and 24% respectively were observed although it is higher compared to other studies done in our country at SFDDH, KCMC and BMC which observed the rate of 4%, 7.6% and 10.9% respectively [12-15, 31].

These variations could be due to a number of reasons including different study population characteristics, different study designs, difference in the hospital settings and different infection preventive measures antibiotic prophylaxis being among them. A study done at MNH which reported the rate of 35.6% had large proportion of study population from patients with emergency operations (68.6%) more than two times compared to elective procedures. This could have led to increased SSIs since it is established that emergency operations carry higher risk of SSIs than elective operations as the pointed in the very study in which there was 3 fold increase in the SSIs in the emergency operations.

Another significant difference noted between the previous study and the present study is that majority of patients (79.6%) in the current study were from clean and clean contaminated wounds, 43.2% and 36.4% respectively compared to large proportion (53.4%) of patients with dirty and contaminated wounds with 33.9% and 19.5%respectively in the study at MNH. This could have affected the results since it is known that clean and clean contaminated wounds have less infections compared to dirty and contaminated wounds.

The same variation was seen to a study done at BMC in which majority of patients had undergone emergency operations (77.6). Also in that study laparotomies were more compared to the current study although there were also common. Moreover majority of patients in study done at SFDDH were from the department of Obstetrics and Gynecology (75.0%) and majority of infections occurred in this group (73.6) while SSIs from the general surgical accounted for (19.5%) over the overall SSI rate. Also like the previous two studies large proportion of patients (66.0%) had undergone emergency surgeries.

Contrary to those previous studies large proportion (58%) of patients in the current study were patients who had undergone elective procedures compared to emergency procedures (42%) probably this could have affected the results seen in terms of surgical site infections. The difference in the rate observed in this study can also be attributed partly to significant number of preoperative antibiotic prophylaxis use within one hour before skin incision observed in this study (60.8%) compared to lower rates of preoperative antibiotic use in some of previous studies. In the previous study done at Bugando preoperative antibiotic prophylaxis use was only 16.4% and at SFDDH was12% before intervention and both studies showed higher incidence of SSIs 26% and 21.6% respectively) as compared significant lower SSI rate of 4% at SFDDH during interventional study in which 69.6% of patients had received preoperative antibiotics within an hour before incision [13, 30].

Generally the rate in the present study is higher compared to the ones observed in developed countries. In the United States of America, approximately 2% to 5% of the 16 million patients undergoing surgical procedures each year have postoperative surgical site infections [5, 22]. The same picture is seen in a number of studies done in Western Europe and China. A study done in Switzerland found the incidence of SSI to be 4.6% while the study in Italy showed that SSI occurred in 241 (5.2%) of 4,665 patients, of which 148 (61.4%) occurred during in-hospital, and 93 (38.6%) during post discharge period [28, 36]. A study done in China found a rate of SSIs to be 4.5% (95% CI: 3.1–5.8) from 2001 to 2012 [37]. High patient’s standard care and strict adherence to standard infection preventive measures in these countries account for lower rate of SSIs.

A study done in Ethiopia found SSI incidence of 19.1% among patients undergoing major surgical procedures while another study in the same country observed equal rate of 14.8% as the one observed in the present study [38, 39] Difference in population in former study compared to the present study could have accounted for higher rate in that study. Lower rate

(6.0%) was reported in Eritrea, prophylactic antibiotics were given for those with clean and clean contaminated procedures as opposed to the present study in which preoperative AP was given randomly. Partly this could have resulted in the observed difference, apart from other factors [40].

4.2. Surgical Antibiotic Prophylaxis Pattern

The current study has shown that of all patients, 60.8% received preoperative antibiotic prophylaxis and most of them within one hour (94.0%) before incision which is a good practice and it goes in hand with WHO recommendation on the measures to reduce SSIs [3, 8]. This is contrary to the studies at BMC and SFDDH which showed small percentage of patients who were given preoperative prophylactic antibiotics within one hour [13, 30].

The present study has also shown inappropriateness in the use of antibiotic prophylaxis. First, most of patients received preoperative antibiotic prophylaxis regardless of types of wounds anticipated. Almost all patients 98.8% received antibiotics post-surgery regardless the type of surgery and without reasonable rationale. Moreover some of patients with contaminated and infected wounds also received preoperative antibiotics prophylaxis contrary to the established guidelines. Among the patients who received preoperative AP 67.7% had contaminated wounds, 66.1% had clean contaminated wounds and 61.4% had clean wounds.

Moreover prolongation of antibiotic prophylaxis was noted in which almost all patients who received preoperative antibiotics were extended beyond the duration of five days or more (92.6%). This pattern has been shown also in the developed and developing countries [13, 30, 41].

In one of the study in Kenya, antibiotics were administered before the skin incision in only 20 of the 43 patients who receive antibiotics (46.5%) at an average of 11.3 minutes before incision (range 1-33). In 23 patients (53.5%) the antibiotic was administered after the skin incision had been made at an average of 11.35 minutes after skin incision (range 1-26). In all cases the use of the antibiotic was initiated by the anaesthetists [42].

A study done in Palestine also revealed that only 59.8% of patient who had undergone operations received their first dose in appropriate time, 18.5% had appropriate antibiotic selection, and 31.8% of patients received antibiotic in appropriate duration [44]. In one of the studies done at BMC, all except three patients who underwent excisional biopsy, were treated with antibiotics after the surgical operations [13].

Studies suggest that the misuse of antibiotics could be due to lack of knowledge on when to use antibiotics and lack of established protocols on antibiotic prophylaxis use. One study showed that Timing of preoperative antibiotics was inconsistent, poor and inappropriate drugs were selected and surgeons still gave antibiotics post operatively [44]. Some studies have shown that Low adherence to appropriate antimicrobial prophylaxis is contributed by lack of established guidelines hence resulting in high rate of broad spectrum antibiotics use, long duration and inappropriate timing of first dose [43, 45]. Similarly in the current study despite the fact that antibiotics for prophylaxis were readily available in theatre yet the lack of protocol for AP was seem to be an underlying factor for inappropriate prescriptions.

Despite the notion that antibiotic prophylaxis is not required in most open clean procedures, studies have shown that it is effective in prevention of SSIs [46, 47]. The same observation has been seen in this study with low percentage of infection in patients with clean wounds probably due administration of preoperative prophylactic antibiotics.

Almost all patients in the current study received single antibiotic preoperatively (99%). Similarly other studies have shown that single preoperative of antibiotic prophylaxis could decrease, occasionally dramatically the risk of SSIs [50]. A Study done in our country also showed significant reduction in SSIs when single preoperative prophylactic antibiotic was used. The timing of administration, although clearly important, proved less crucial than expected, as long as the AMP was given before the incision. The administration of antibiotics 10 to 30 minutes preoperatively proved to be realistic and highly efficient in this setting. The incidence of SSIs during the intervention phase was reduced by more than 80% compared with the data from the pre-intervention phase [30].

A number of studies showed that Ceftriaxone is the most prescribed antibiotic for prophylaxis and in other setting the only given antibiotic [14, 42, 45]. The same picture was found in this study in which most patients who were given preoperative prophylactic antibiotics were prescribed Ceftriaxone (85.7%).

4.3. Association Between Surgical Antibiotic Prophylaxis and Surgical Site Infections

The findings in the current study are somehow similar to a study in USA which showed no significant difference between patients given preoperative prophylactic antibiotics and those given post operatively [18]. Moreover other studies done to compare effectiveness between duration of 30 minute before incision prophylactic antibiotic administration compared to 30-60 minutes before incision have been producing varying results. One multicenter study showed that antimicrobial prophylaxis with cephalosporins and other short infusion antibiotics resulted in lower risk of SSIs when given within 30 minutes prior to incision than other times. Contrary to the previous study another study showed that cefuroxime was found to be more effective as prophylaxis when given between 30-59 minutes than when given in the last half an hour [22, 23].

Another study showed that higher SSI rates were observed when the antibiotic was administered more than 60 minutes before the incision. Interestingly, higher SSI rates were not seen if the antibiotic was administered after the incision. One of the other interesting findings from the study was that there were variations in SSIs among different approved antibiotic regimens [48].

A systematic review on intervention studies done in sub Saharan Africa showed that single preoperative antibiotic prophylaxis was more effective than extended post-operative antibiotic regime (Aiken et al., 2012). A study done in Ethiopia showed that nearly 21.8% of study participants received antibiotics before the day of operation and their treatment were continued for up to 5 days. The incidence of nosocomial infections in those patients who were taking antibiotic prophylaxis was 15.6%. This was much higher than those who did not receive any antimicrobials (8.7%). Nevertheless, the observed difference was not statistically significant (OR=1.944, CI=0.860-4.397) [49].

A study done at SFDDH showed significant reduction of SSI from 21.6% to 4% after adopting the AP protocol from western countries [31]. This is in contrast to the present study which showed no significant difference between patients given preoperative antibiotic prophylaxis and those who did not receive preoperative AP (p= 0.82) although the rate of SSIs was lower in preoperative antibiotic group compared to the control group (14.3% vs 15.6%). The observed findings in this study could have been affected by the fact that antibiotic prophylaxis was given randomly without regarding type of expected wounds and high resistance (81.3%) of ceftriaxone which is the one used mostly for prophylaxis.

A study done at BMC reported that patients who were given preoperative antimicrobial prophylaxis were 2 times more likely to develop SSIs compared to those who did not receive preoperative antibiotic prophylaxis, although this difference was not statistically significant (p =0.08). The authors attributed this to lack of antibiotic prophylaxis policy in the setting. Another study done at BMC among women undergoing caesarean sections did not find the effect of antibiotic prophylaxis timing on the occurrence of SSIs, although the study could not specify how many patients received preoperative antibiotic prophylaxis. Of the 77 patients who developed SSI, 67 (87%) received antibiotic prophylaxis [13, 15]. Also a study done at KCMC found out that about 30% of patients who got prophylactic antibiotics (ampicillin) developed SSIs as compared to 15.6% who didn't get prophylactic antibiotics. The author attributed these unexpected results to confounders, after accounting for other factors [50].

5. Conclusions

Surgical site infections are common complication in the surgical department at DRRH. Significant rate of SSIs observed in this study suggest morbidity associated with overwhelming inappropriate use of surgical antibiotic prophylaxis at DRRH. Although this study has not established significant effectiveness of preoperative antibiotics, generally it remains a standard practice as observed by many studies and established by international health institutions including WHO, among other strategies proved in the prevention of SSIs.

Introduction of surgical antibiotic prophylaxis protocol can reduce low antibiotic stewardship observed as seen in many studies. Adoption of standard international guidelines will be appropriate while local guidelines are still in the process of being designed. This can be facilitated by conducting randomized multicenter clinical trial to study the safety of implementation of international guidelines on SAP.

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Informed Consent Statement

Informed written consent were obtained from all participants and parental consent for all patients below 18years. A consent was also obtained for HIV testing, and those who did not consent were not denied to continue with the study or other patient's right. All patients' information were kept confidentially and not accessed by people not concerned in the study.

Institutional Review Board Statement

Ethical clearance for the study was sought from the Research and ethical committee of CoHS-UDOM and Dodoma Region Referral Hospital.

Author Contributions

Conceptualization, PPK; Methodology, PPK and MAJ.; formal analysis, PPK; investigation, PPK and MAJ, data curation, PPK; writing original draft preparation, PPK and NAC; writing—review and editing NAC. and PPK.; visualization, NAC.; supervision, MAJ.; project administration, MAJ.; funding acquisition, PPK.

All authors have read and agreed to the published version of the manuscript.

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Hospital.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

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