OPEN ACCESS

African Journal of
Pharmacy and Pharmacology

22 December, 2018
ISSN 1996-0816
DOI: 10.5897/AJPP
www.academicjournals.org

ACADEMIC JOURNALS
expand your knowledge

ABOUT AJPP

The **African Journal of Pharmacy and Pharmacology (AJPP)** is published weekly (one volume per year) by Academic Journals.

African Journal of Pharmacy and Pharmacology (AJPP) is an open access journal that provides rapid publication (weekly) of articles in all areas of Pharmaceutical Science such as Pharmaceutical Microbiology, Pharmaceutical Raw Material Science, Formulations, Molecular modeling, Health sector Reforms, Drug Delivery, Pharmacokinetics and Pharmacodynamics, Pharmacognosy, Social and Administrative Pharmacy, Pharmaceutics and Pharmaceutical Microbiology, Herbal Medicines research, Pharmaceutical Raw Materials development/utilization, Novel drug delivery systems, Polymer/Cosmetic Science, Food/Drug Interaction, Herbal drugs evaluation, Physical Pharmaceutics, Medication management, Cosmetic Science, pharmaceuticals, pharmacology, pharmaceutical research etc. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in AJPP are peer-reviewed.

Contact Us

Editorial Office: ajpp@academicjournals.org

Help Desk: helpdesk@academicjournals.org

Website: http://www.academicjournals.org/journal/AJPP

Submit manuscript online http://ms.academicjournals.me/

Editorial Board

African Journal of Pharmacy and Pharmacology

Table of Contents: Volume 12 Number 31 22 December 2018

ARTICLE

Vol. 12(31), pp. 455-463, 22 December, 2018
DOI: 10.5897/AJPP2017.4727
Article Number: C13F0EC59625
ISSN: 1996-0816

http://www.academicjournals.org/AJPP

African Journal of Pharmacy and Pharmacology

Full Length Research Paper

Evaluation of surgical antimicrobial prophylaxis use in Ethiopia: Prospective study

Tamrat Legesse[1], Desta Hiko[2], Eneb Khelifa Ismael[3] and Sadikalmahdi Hussen Abdella[4*]

[1]Hawassa College of Health Sciences, Hawassa, Ethiopia.
[2]Department of Epidemiology, College of Health Sciences, Jimma University, Jimma, Ethiopia.
[3]Department of Pharmacy, College of Health Sciences, Madda Walabu University, Ethiopia.
[4]Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, Addis Ababa University, Addis Ababa, Ethiopia.

Received 4 January, 2017; Accepted 20 July, 2017

Appropriate use of surgical antimicrobial prophylaxis can prevent approximately 40 to 60% of surgical site infections. Inappropriate use is associated with emergency of antimicrobial resistance, occurrence of side effects and increased health care cost. We aimed to evaluate surgical antimicrobial prophylaxis use of Hawassa University Referral Hospital against standard guideline Prospective observational study was done on 105 patients who undergone major surgical procedure between March 2 and May 2, 2015. Data was collected from patient medication charts, operational and anesthesia notes, by direct observation and patients' interview using pre-tested questionnaire. All patients were followed daily before, during and after operation till discharge. We coded and cleaned the data using Epi-Data version 3.1 and exported to SPSS for window version 20.0 software for analysis. Overall adherence to American society of health-system pharmacists (ASHP) for surgical antimicrobial prophylaxis use guideline was not observed for all parameters evaluated. Surgical antimicrobial prophylaxis was indicated only in 85(80.9%) patients but administered in 103 (98.1%) patients. Choice of antimicrobial was discordant for all patients for whom antimicrobial prophylaxis was indicated and administered. Ceftriaxone was the most frequently administered 73(70.9%) antibiotics followed by combination of Ceftriaxone and Metronidazole 25(24.3%). Among 98.1% of patients who took antimicrobial prophylaxis , time of first dose administration and duration of administration were concordant in 38(36.9%) and 19(19.1%), respectively. Overall adherence to ASHP guideline was far from optimal for all parameters evaluated.

Key words: Antimicrobial prophylaxis, American health system pharmacists, Ethiopia.

INTRODUCTION

Surgical Site Infection (SSI) is an infection that occurs at or near surgical incision within 30 days of operation or after one year if implant is placed (Larson et al., 1999; Tietjen et al., 2003; WHO, 2009). It is the 3rd commonly reported nosocomial infection accounting or 10 to 40% of all nosocomial infections in most studies done worldwide

*Corresponding author. E-mail: sadhussen@yahoo.com.

(Mangram et al.,1999). It reduces patient quality of life and account for 3.7 million excess hospital days and more than $1.6 billion excess cost annually (Mangram et al., 1999; Kirkland et al., 1999; Suchitra and Lakshmidevi, 2009; Lissovoy et al., 2009). The importance of preventing and controlling SSIs has been well recognized and the effectiveness of intervention has been extensively studied and many of them have been recognized as effective. The interventions include periodic surveillance system, preparation of the patient before operation, appropriate administration of surgical antimicrobial prophylaxis (AMP), careful and skilled surgical technique and postoperative surgical site wound care (Larson et al., 1999; WHO., 2009; Bratzler and Hunt, 2006).

Surgical antimicrobial prophylaxis (AMP) refers to use of antimicrobials before, during and after diagnostic and therapeutic surgical procedures for brief course to prevent SSI (Larson et al., 1999; SIGN, 2014). They are indicated for clean surgical procedures if the patient has an underlying medical condition associated with a high risk of SSIs like in immune-compromised patients (e.g., malnourished, neutropenic, receiving immunosuppressive agents or HIV/AIDS) or operations in patients for whom postoperative infection wound be catastrophic as is often the case in cardiac, neurologic, or ophthalmologic surgery. They are also indicated for surgical procedures associated with a high rate of infections i.e. clean-contaminated surgical procedure. However, they are not indicated for contaminated and dirty types of surgical procedures. In contaminated and dirty surgical procedures, patients frequently receives therapeutic antimicrobial agents preoperatively for treatment of established infections (Larson et al., 1999; Mangram et al., 1999; Dale, 2013). Antimicrobial agents used for surgical prophylaxis should be active against pathogens most likely to contaminate the surgical site, which can be determined based on the surgical procedure done, anatomical location and local antimicrobial resistant pattern (Larson et al., 1999; Tietjen et al., 2003; Mangram et al., 1999; Daniel, 2013). In addition, they should be safe, cost effective, have acceptable pharmacokinetics, have bactericidal effect with in vitro spectrum and should have narrow spectrum to prevent adverse consequence on the microbial flora of the patient or the hospital (Larson et al., 1999; WHO, 2009; Dale, 2013; Daniel, 2013). Cephalosporins are the most thoroughly studied AMP agents and considered as drug of choice for many surgical procedures. These drugs are effective against many gram-positive and gram-negative microorganisms. They also demonstrated features of safety, acceptable pharmacokinetics, and a reasonable cost per dose. In particular, Cefazoline is widely used and generally viewed as the antimicrobial agent of first choice (Mangram et al., 1999; Burke, 2001; The Medical Letter, 2006).

Evidences indicated that appropriate use of surgical antimicrobial prophylaxis which can be expressed by appropriate selection, time of first dose administration, dose, dosing interval and duration administration can prevent up to 40 to 60% of SSI (The Medical Letter, 2006; Gray and Hawn, 2009; CDC, 2002; Levy et al., 2000).

Despite this evidence, country wide surveys demonstrated that recommendation of surgical antimicrobial prophylaxis use guidelines are not routinely followed (Mangram et al., 1999; Burke, 2001; Gül et al., 2013). Studies also shows that 30 to 50% antimicrobials in hospitals are used for surgical prophylaxis but 30 to 90% of them are used inappropriately (Bratzler and Hunt, 2006; Apisarnthanarak et al., 2006; Cusini et al., 2010). In developing countries appropriate use of AMP is not more than 10% (Schmitt et al., 2012; Yesuf et al., 2014).

Antimicrobial use by itself is one of important factors for development of antimicrobial resistance but the problem is more aggravated in case of inappropriate use (WHO, 2000; CDC, 2013; Ribas et al., 2009). Inappropriate use of surgical antimicrobial prophylaxis can be partly expressed as administration for prolonged duration, administration without indication and administration of broad spectrum antimicrobials. This inappropriate use of antimicrobial increases risk emergence of antimicrobial resistance including MRSA, increases Clostridium difficile infection, increases treatment cost and increase incidence rate of SSIs (Levy et al., 2000; Dancer, 2001; Tacconelli et al., 2008; Manian et al., 2003; Xue et al., 2005; Kasteren, 2005). The annual societal-cost of illness for antimicrobial resistance is considered to be roughly $55 billion for the USA alone (WHO, 2000; Deverick et al., 2009; Angela et al., 2013). Inappropriate use of AMP wastes a precious resource in health care, not only by potential promotion of antimicrobial resistance, but also by incurring unnecessary extra costs. The cost of inappropriate use of AMP is ten times higher compared with appropriate use (Schmitt et al., 2012; Ru Shing et al., 2012; Hatam et al., 2011).

Antimicrobial resistance is a serious issue in developing countries, and resources that can be used to prevent the rise of antimicrobial resistance and limit the extent of this problem are in short supply. Although resistance by pathogens has increased, unfortunately no new antimicrobials that can overcome this resistance have been introduced and are not expected to be introduced in the near future (Gül et al., 2013; Apisarnthanarak et al., 2006). One of important methods to increase appropriate use of surgical antimicrobial prophylaxis and to prevent adverse outcome associated with inappropriate is periodic evaluation of appropriateness using local, national or international guidelines and taking corrective measures based on the result (CDC, 2014; Kourosh et al., 2014). Moreover, surgical care improvement project (SCIP) demonstrated measures for reducing SSI and overall surgical outcomes of which, three of them are related to surgical

antimicrobial use like number of patients with appropriate selection, appropriate time of first dose administration and duration (Bratzler and Hunt, 2006; Gray and Hawn, 2009). Various studies have been conducted in different countries on this area using local, national as well as international guideline for surgical antimicrobial use. However, studies are limited in developing countries including Ethiopia and particularly there is no study done in Hawassa Referal Hospital. As a result, information on appropriateness of current practice is poorly understood by health professional including surgeons working in the hospital as well as in the country. Therefore, this study aimed to evaluate appropriateness of surgical antimicrobial prophylaxis use at surgical ward of Hawassa University Referral Hospital, Southern Ethiopia, against American Society of Health-system Pharmacists (ASHP) guideline for surgical antimicrobial prophylaxis use. The Hospital as well as the country does not have guideline on Surgical Antimicrobial prophylaxis. Hence, we used ASHP guideline to evaluate AMP. ASHP guideline is easy to use and was developed together with CDC considering developing country. The result will provide important baseline information for surgeons, other health professionals involved on prescribing surgical antimicrobial prophylaxis in the hospital, governmental and non-governmental organizations involved in health care systems and policy makers responsible for designing strategies to increase appropriate use of surgical antimicrobial prophylaxis.

MATERIALS AND METHODS

Study design and participants

We conducted Prospective observational study at HURH which is found in Hawassa town. The hospital serves as a main referral center for patients in Southern part of Ethiopia. The hospital serves roughly 10 million peoples in the region and surrounding areas per year. We included all patients who undergone major surgical procedure at surgical ward of HURH, Southern Ethiopia from March 2 to May 2, 2015. All patients with age ≥ one year and admitted for elective or emergency clean and clean-contaminated surgery were included. Patients not willing to participate in the study, receiving antimicrobial during admission or stopped receiving within 48 hours before operation and patients with initial diagnosis suggestive of infection at surgical site were excluded.

Data was collected by two trained Nurses not working at surgical ward using pretested data collection tool which was prepared by research team. Socio-demographic and other patient's related factors were obtained directly from patients and from patient's medical chart. Data on time of first dose, surgical AMP administered and intra-operative dose were collected by direct observation and data about postoperative prescribed antimicrobial and duration of administration were extracted from patient medication chart and by direct observation. The variables included were age in years, gender, admission date, co-morbidity, body mass index, systemic steroid use, malnutrition, immunity status, ASA score, date of surgery, type of surgery (elective or emergency), surgical wound Class (clean or clean- contaminated), time of skin incision, duration of operation and amount of blood lost during operation. Regarding surgical antimicrobial prophylaxis use, place of antimicrobial administration (ward or operation room), generic name of antimicrobial, dose, time of first dose , route, time of intra-operative dose, time of postoperative dose and duration of administration were recorded. Wound classification was done using Center for Disease Prevention and Control (CDC) criteria for surgical site infection surveillance (Larson et al., 1999).

Appropriateness of surgical antimicrobial prophylaxis used was evaluated against ASHP guideline (Dale et al., 2013). This guideline was best compared with other international guidelines for surgical antimicrobial prophylaxis use, with regard to level of evidence and strength of recommendation. There is no local or national Surgical AMP guideline in Ethiopia but antimicrobial listed in national medicines formulary to be used for surgical antimicrobial prophylaxis were the same as ASHP guideline.

Surgical AMP use was assessed against six parameters listed below. If more than one antimicrobial were used for single operation, all parameter for each antimicrobial was evaluated separately. If the choice was not as per the guideline, dose and dosing interval not evaluated but the other parameters were evaluated regardless of choice. Each prescription was considered as 'concordant' if it satisfies all parameters for every antimicrobial used and then based on the result overall adherence to ASHP guideline was calculated. If there was any divergence from the parameter for any of antimicrobial then the prescription was considered as 'discordant'. For individual parameters 'concordant' was described by percentage

Ethics statement

Ethical clearance was obtained from Jimma University, College of Health Sciences Ethical review board. We obtained permission from Hospital management before starting data collection. Written informed consent was obtained from each study participant before data collection. For Patients less than 18 years written consent was obtained from the guardians (assent). The Consent for both adults and children's were documented on prepared format. Before starting the study, the protocol including the written consent was approved by Institutional review board of Jimma University. We kept the information confidential. Patients who developed SSIs were treated according to the protocol of the hospital.

Statistical methods

Data were coded and cleaned using Epi-Data version 3.1 and exported to SPSS for window version 20.0 for analysis. Descriptive statistics were used to present socio-demographic and other patient related factors, surgery related factors and surgical antimicrobial prophylaxis received.

RESULTS

One –hundred twenty seven patients fulfilled the inclusion criteria of these, 22 patients were excluded based on exclusion criteria (Figure 1). A total of 105 patients were included in the study. Out of 105 patients, 64(61%) were males and more than half of the patients were from rural 60(57.1%) area. The mean age of the patients was 30.85 ± 17.72 years. Three (2.9%) patients received systemic steroids but none of them took for more than three weeks. Twenty eight (26.7%) patients were cigarettes smokers. More than half of the patients were under ASA score of II 67(63.8%) (Table 1). Twelve patients (11.4%)

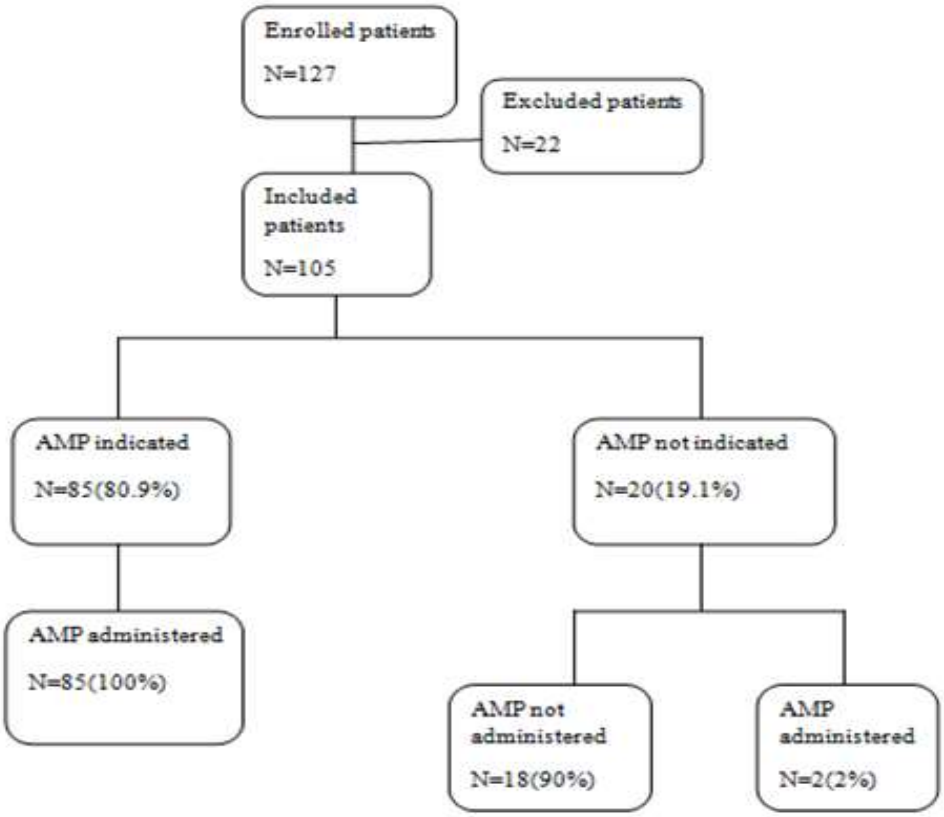


Figure 1. AMP indication and administration of study population in surgical ward of HURH from March 2 to May 2, 2015 (N=105).

had one or more co-morbidities namely diabetic mellitus 4(3.8%), hypertension 4 (3.8%), HIV/AIDS 3(2.9%) and followed by gastrointestinal surgery 30(28.6%) (Table 3). Sixty one (58.1%) surgical procedures were clean-contaminated and 69(65.7%) surgery types were elective. Fourteen patients (13.3%) had history surgery hours. The mean duration of operation was 1.08 ± 0.49 (range 0.33 to 2.83 hours).

Assessment of antimicrobial prophylaxis use at surgical ward of HURH

Overall adherence to ASHP guideline was not observed for all parameters evaluated.

Indication

Out of 105 patients, surgical AMPs was indicated in 85(80.9%) and not indicated in 20(19.1%) as per ASHP guideline. Out of 85 patients, for whom surgical AMP was indicated all 85 (100 %) received AMP before surgery. Out of 20 patients, for whom surgical AMP was not indicated, 18(90%) patients received surgical AMP before operation0 (Figure 1).

TB 1(0.9%) (Table 2). Different surgical procedures were done, head and neck surgery 31 (29.5%) was the leading

Choice of AMPs used

The choice was discordant as per ASHP guideline in all patients in which surgical AMP indicated and administered. Out of 103 patients in whom AMP administered, Ceftriaxone 73(70.9%) was most frequently administered followed by combination of Ceftriaxone and Metronidazole 25 (24.3%). The mean number of antimicrobials per patient was 1.3 ± 0.45.

Dose and dosing interval

The dose and dosing interval were not evaluated because the choice was not as per ASHP guideline for all patients in whom surgical AMP was indicated and administered.

Time of first dose of AMP administered and duration

Out of 103 patients, in whom surgical AMP administered,

Table 1. Patient related factors in surgical ward of HURH, from March 2 to May 2, 2015 (N=105).

Variables	Frequency	Percent
Patients factors		
Sex		
Female	41	39.0
Male	64	61.0
Age categories in years		
1-18 years	28	26.7
19-40 years	43	41
>40 years	34	32.3
Obesity		
BMI < 30KG/M^2	102	97.1
BMI >=30kg/M^2	3	2.9
Place of residence		
Urban	45	42.9
Rural	60	57.1
Preoperative blood transfusion		
No	100	95.2
Yes	5	4.8
Cigarettes smoking or tobacco use		
No	77	73.3
Yes	28	26.7
ASA score		
I	29	27.6
II	67	63.8
III	9	8.6
Preoperative hospital stay in days		
<=7 days	78	74.3
>7 days	27	25.7

time of first dose administered was concordant in 38(36.9%) patients and duration was concordant in 19(18.4%) patients. The mean duration of AMP administration was 2.78 ± 1.7 days (range 1day to 11 days).

DISCUSSION

SSIs are the most common cause of nosocomial infections, that result in considerable morbidity and mortality, increased hospitalization, extra drug use and treatment cost (Larson et al., 1999; WHO, 2009).

Appropriate use of surgical AMP decreases the incidence of SSI (The Medical Letter, 2006; Gray and Hawn, 2007; Kasteren et al., 2005) while inappropriate use increases development of antimicrobial resistance, adverse effects, unnecessary cost and development of SSI (Dale, 2013; The Medical Letter, 2006; Gray and Hawn, 2009; Manian et al., 2003; Elbur et al., 2012). The effectiveness of surgical AMP is well established in many studies. However, countrywide surveys done in different countries show that many hospitals were not compliant with optimal use of surgical AMP (Mangram et al., 1999; Kourosh et al., 2014).

The present study indicated that, the overall adherence

Table 2. Co-morbidities and rate of SSIs in surgical ward of HURH from March 2 to May, 2 2015 (N=105).

Variables	Frequency	Percent
Co-morbidity		
Absent	93	88.6
Present	12	11.4
Diabetics mellitus		
No	101	96.2
Yes	4	3.8
HIV/AIDS		
No	102	97.1
Yes	3	2.9
Hypertension		
No	101	96.2
Yes	4	3.8
Surgical site infection		
No	85	80.9
Yes	20	19.1

Table 3. Surgical procedures done in surgical ward of HURH from March 2 to May 2, 2015 (N=105).

Surgical procedures	Frequency	Percent
Head and neck surgery	31	29.5
Breast surgery	7	6.7
Gastrointestinal surgery	30	28.6
Urological surgery	19	18.1
Hepato-biliary surgery	6	5.7
Vascular procedure	4	3.8
Lipoma excision	1	1.0
Hernia Repair	7	6.7
Total	105	100.0

to ASHP guideline was not observed for all parameters evaluated. The finding was similar to studies done in Jordan 0% (Al-Momany et al., 2009); Islamic republic of Iran 0.9% (Vessal et al., 2011); JUSH, Ethiopia (Yesuf, 2014), Sudan 2.7% (Elbur et al., 2012), and Palestine 2% (Musmar et al., 2009). However, lower than studies done in Japan 53% (Imai-kamata et al., 2011); Nicaragua 7% (Disseldorp et al., 2006), Greece 36.3% (Kasteren et al., 2003); France 19.4% (Astagneau et al., 2009); Netherlands 28% (Tourmousoglou et al., 2003) and Italy 18.1% (Napolitano et al., 2013). The difference might be due to periodic surveillance and correction measures taken in developed countries.

We found surgical AMPs were indicated in 85 patients out of 105 patients as per the ASHP guideline. All patients 85(100%) with surgical AMP indication received surgical AMP. This suggests that surgeons in the hospital are aware of value of AMP in preventing SSI. The result was in line with studies done in Iran 100% (Vessal et al., 2011), Jordan 100% (Al-Momany et al., 2009) and India 100% (Gandage et al., 2013). Out of 20 patients, for whom surgical AMP was not indicated as per the ASHP

guideline 18(90%) patients received surgical AMP before operation. The finding was similar with studies done in Islamic Republic of Iran 93.3% (Vessal et al., 2011), India 100% (Gandage et al., 2013), Shiraz University Medical Sciences (SUMS), Iran 98% (Hatam et al., 2011). In contrast, lower use of AMP for patient without indication was observed in studies conducted in Nicaragua 71.2% (Disseldorp et al., 2006), Greece 19% (Kasteren et al., 2003). The discrepancy might be due to better understanding and implementation of surgical AMP guidelines (CDC, 2002; WHO, 2000; Ribas et al., 2009; Angela et al., 2013).

The antimicrobial selected for surgical prophylaxis should cover the most likely pathogens that are expected to cause SSI which can be determined based on operation type, anatomical location and local antimicrobial resistance pattern (Larson et al., 1999; Bratzler et al., 2013; Gray and Hawn, 2007). In addition, they should be less expensive, have acceptable pharmacokinetics and have narrow spectrum of activity (Larson et al., 1999; Thirion. 2013). In current study, concordance for choice was 0% as per ASHP guideline for all patients with AMP indicated and administered. The finding was consistent with similar studies done in Jordan 1.7% (Al-Momany et al., 2009), JUSH, Ethiopia 0% (Yesuf, 2014). In contrast, lower than studies done in Islamic republic of Iran 7.5% (Vessal et al., 2011), Palestine 18.5% (Musmar et al., 2009), Sudan 29.1% (ElburI et al., 2012), Iran 62% Rafati et al., 2014), Netherland 92% (Tourmousoglou et al., 2003), Greece 70% (Kasteren et al., 2003) and France 83.3% (Astagneau et al., 2009). The difference might be due to in availability of first line medication and poor implementation of guidelines.

The ASHP and other guidelines for surgical AMP use reco mmend use of antimicrobials with narrow spectrum and less expensive like Cefazoline for most surgical procedures because such agents are as effective as with antimicrobials with broader spectrum in preventing SSI (WHO, 2009; Mangram et al., 1999; Bratzler et al., 2013). However, in current study, out of 103 patients for whom AMP administered, 73(70.6%) patients took Ceftriaxone alone or in combination with Metronidazole 25(24.3%). The result was in agreement with previous studies (Gandage et al., 2013; Rana et al., 2013; Afzal Khan et al., 2013). In contrast to this, Cefazoline was most frequently administered medication in similar studies (Vessal et al., 2011; Rafati et al., 2014; Parviz et al., 2013). Studies confirmed that over use of third generation Cephalosporin for surgical prophylaxis is alarming and has led to MRSA outbreaks, emergence of extended spectrum beta-lactamases (ESBL), vancomycin-resistant enterococci (VRE), and Clostridium difficile (Levy et al., 2000; Ru Shing et al., 2006; Ling et al., 2014; Graffunder and Venezia, 2002). In our study, out of 44 clean surgical procedures, Ceftriaxone was administered in 36(81.8%). In study done at surgical ward of HURH, most frequently isolated pathogen from SSI was *S. aureus* 45(25.4%) but 16(35.6%) developed resistance for Ceftriaxone (Meseret et al., 2014). These all suggests that over use of Ceftriaxone for surgical prophylaxis is alarming but not associated with additional benefits. We strongly recommend broad spectrum antimicrobial like third generation Cephalosporin should reserved for therapeutic purpose in case of serious infection and/or for management of resistance infections.

The first dose of AMP should be administered within optimal time before skin incision to have effective serum and tissue concentration. As many studies confirmed, these can be achieved if the first dose of AMP is administered within one hour before skin incision for most antimicrobials and two hours for Vancomycine and Flouroqinolones (Bratzler et al., 2013; Kourosh et al., 2014). In present study, out of 103 patients for whom AMP administered, time of first dose was concordant in 38(36.3%) patients. The finding was higher than study done in Sudan 9.3% (Elbur et al., 2012) and Nicaragua 22% (Disseldorp et al., 2006). In contrast, lower compared to study done in Palestine 59.8% (Musmar et al., 2009), Netherlands 50% (Tourmousoglou et al., 2003), Greece 100% (Kasteren et al., 2005), Jordan 99.1% (Al-Momany et al., 2009), Iran 76.5% (Vessal et al., 2011) and France 76.6% (Astagneau et al., 2009). The difference might be due to administration of first dose of AMP in ward for most of the patients in our case. Administration of first dose in operation room rather than ward improves concordance of time of first dose administration as indicated in many studies (Xue et al., 2005; Musmar et al., 2009). Many studies confirmed that administration of first dose one hour before skin incision is associated with development of SSI (Garey et al., 2006; Mary et al., 2013).

Many guidelines recommend single dose surgical prophylaxis and the duration should not be more than 24 hours (SIGN, 2014; Bratzler et al., 2013; Kourosh et al., 2014). In our study, the duration of surgical AMP administration was concordant in 19(18.4%) out of 103 patients in whom AMP was administered. The result was similar with study done in Turkey 20% (Saleh et al., 2013), but higher than studies done in JUSH, Ethiopia 5.8% (Yesuf, 2014), Sudan 3% (Elbur et al., 2012) and India 13.98% (Gandage et al., 2013). The finding was lower compared to studies done in France 35% (Miliani et al., 2009), Palestine 31.8% (Musmar et al., 2014), Islamic Republic of Iran 45% (Vessal et al., 2011), Mazandaran University of Medical Sciences, Sari, Iran 59.8% (Rafati et al., 2014), Malaysia 77% (Ling et al., 2014) and Netherland 82% (Kasteren et al.,2003). The difference might be due to lack of awareness and poor implementation of guidelines. As indicated in many countries wide survey most surgeons believe that prolonged administration of surgical AMP prevents SSIs and hence they prescribe AMP for longer duration than recommended (Ng and Chong, 2012; Ling et al., 2014)

which might be the other reason for unnecessary prolonged administration. Studies confirmed that administration of surgical AMP for more than 24 hours was not observed as beneficial to reduce the incidence of SSI rather associated with development of antimicrobial resistance (Miliani et al., 2009; Harbarth et al., 2000; Ali et al., 2012).

Limitations

Our study period was short which resulted in small sample size and factors that affect appropriate use of surgical AMP were not studied due to resource shortage. Moreover, international guideline (ASHP) was used for evaluation due to absence of evidence based local and nationally guideline which might increase discordance rate. Despite the limitations, our study provides vital baseline information on appropriateness of surgical AMP use.

Conclusions

The overall adherence to ASHP guideline for AMP use was not observed for all parameters evaluated. The most frequently observed inappropriate use were administration of AMP without indication, use of broad spectrum antimicrobial (Ceftriaxone), prolonged administration and administration of first dose AMP in ward.

RECOMMENDATIONS

Federal ministry of health should prepare national or adopt international guideline on surgical AMP use based on availability of antimicrobials, cost and local antimicrobial resistance pattern. Up on preparation or adoption of guideline Surgeons, Microbiologists, Clinical Pharmacists, and other health professionals involved in administering the drugs should be involved. Periodic evaluation of appropriateness and determination of factors associated with inappropriate use of AMP and preparing strategies for them further increase appropriate use of surgical AMP.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The study was supported by a research grant from Jimma University (Jimma, Ethiopia). The authors would like to express due appreciation for study participants and Hawassa University referral hospital. We are also grateful to Jimma University for providing us with different reference materials and financial support.

Abbreviations

SSI, Surgical site infection; **HURH,** Hawassa University Referral Hospital; **JUSH,** Jimma University Specialized Hospital; **AMP,** antimicrobial prophylaxis; **AHSP,** American Health System Pharmacists; **SPSS,** statistical package for social sciences

REFERENCES

Afzal Khan AK, MirshAd PV, Mohammed RR, Gausia B (2013). A study on the usage pattern of antimicrobial agents for the prevention of surgical site infections (SSIs) in a tertiary care teaching hospital. Journal of Clinical and Diagnostic Research 7(4):671-674.

Ali M, Nadeem M, Shah SZA, Khan MM, Ahmad M, Ullah MA (2012). Prolonged versus short course of antibiotic prophylaxis in clean general surgery. Journal Of Medical Sciences 20(3):128-132.

Al-Momany NH, Al-Bakri AG, Makahleh ZM, Wazaify MM (2009). Adherence to international antimicrobial prophylaxis guidelines in cardiac surgery: A Jordanian study demonstrates need for quality improvement. Journal of managed care pharmacy 15(3):262-71.

Apisarnthanarak A, Danchaivijitr S, Bailey TC, Fraser VJ (2006). Inappropriate antibiotic use in a tertiary care center in Thailand: an incidence study and review of experience in Thailand. Infection Control and Hospital Epidemiology 27(4):416-20.

Bratzler DW, Dellinger EP, Olsen KM, Perl TM, Auwaerter PG, Bolon MK, Fish DN, Napolitano LM, Sawyer RG, Slain D, Steinberg JP (2013). Clinical practice guidelines for antimicrobial prophylaxis in surgery. American Journal of Health-System Pharmacy 70:195-283.

Bratzler DW, Hunt DR (2006). The surgical infection prevention and surgical care improvement projects: national initiatives to improve outcomes for patients having surgery. Clinical Infectious Diseases 43(3):322-330.

Burke JP (2001). Maximizing appropriate antibiotic prophylaxis for surgical patients: an update from LDS Hospital, Salt Lake City. Clinical Infectious Diseases 33(2):78-83.

Center for Disease control and Prevention (CDC) (2013). Antibiotics resistance threats in the united states pp. 25-65. Available at: https://www.cdc.gov/drugresistance/threat-report-2013/index.html

Center for Disease control and Prevention (CDC) (2014). National strategy for combacting antimicrobial resistant bacteria. pp. 1-10.

Center for Disease control and Prevention (CDC) (2002). Surgical Infection Prevention (SIP) Collaborative Problem Statement pp. 1-16.

Cusini A, Rampini SK, Bansal V, Ledergerber B, Kuster SP, Ruef C, Weber R (2010). Different patterns of inappropriate antimicrobial use in surgical and medical units at a tertiary care hospital in Switzerland: a prevalence survey. PLoS One 5(11):e14011.

Dancer SJ (2001). The problem with cephalosporins. Journal of Antimicrobial Chemotherapy 48(4):463-478.

Deverick JA, Kaye KS, Chen LF, Schmader KE, Choi Y, Sloane R, Sexton DJ (2009). Clinical and financial outcomes due to methicillin resistant Staphylococcus aureus surgical site infection: a multi-center matched outcomes study. PloS One 4(12):1-8.

Disseldorp J, Slingenberg EJMH, Matute A, Delgado E, Hak E, Hoepelman IM (2014). Application of guidelines on preoperative antibiotic prophylaxis in león, Nicaragua. Netherlands Journal of Medicine 64(11):411-6.

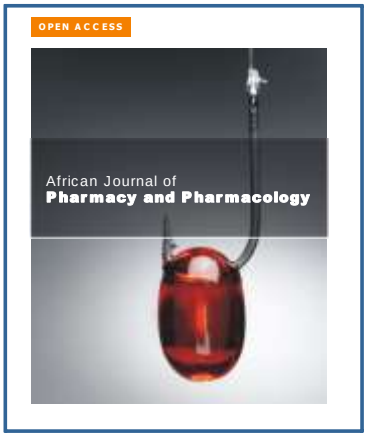
Elbur AI, Yousif MAER, ElSayed ASA, Abdel-Rahman ME (2013). An audit of prophylactic surgical antibiotic use in a Sudanese Teaching Hospital. International Journal of Clinical Pharmacy 35(1):149-153.

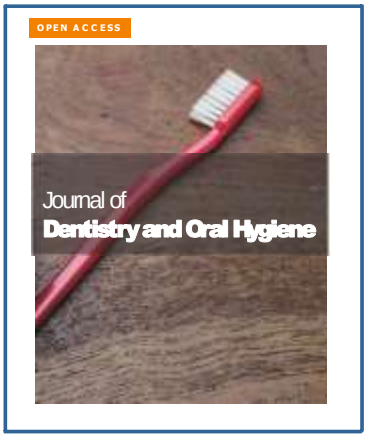
Gandage MG, Reddy PN, Shirsand SB, Ali SH, Kalyani B, Jeevangi VM (2013). Assessment of antibiotics prescription in surgical prophylaxis in a teaching hospital. RGUHS Journal of Pharmaceutical Sciences 3(1):67-72.

Garey KW, Dao T, Chen H, Amrutkar P, Kumar N, Reiter M, Gentry LO

(2006). Timing of vancomycin prophylaxis for cardiac surgery patients and the risk of surgical site infections. Journal of Antimicrobial Chemotherapy 58(3):645-650.
Graffunder EM, Venezia RA (2002). Risk factors associated with nosocomial methicillin-resistant Staphylococcus aureus (MRSA) infection including previous use of antimicrobials. Journal of Antimicrobial Chemotherapy 49(6):999-1005.
Gray SH, Hawn MT (2007). Prevention of surgical site infections.Hospital Physician 43(11):41.
Gül HC, Karakaş A, Artuk C, Özbek G, Kılıç S, Eyigün CP (2013). Antibiotic usage and appropriateness at a university hospital in Turkey: point prevalence results. Nobel Medical 9(3):98-103.
Harbarth S, Samore MH, Lichtenberg D, Carmeli Y (2000). Prolonged antibiotic prophylaxis after cardiovascular surgery and its effect on surgical site infections and antimicrobial resistance. Circulation 101(25):2916-2921.
Hatam N, Askarian M, Moravveji AR, Assadian O (2011). Economic burden of inappropriate antibiotic use for prophylactic purpose in shiraz, iran. Iranian Red Crescent Medical Journal 13(4):234.
Imai-Kamata S, Fushimi K (2011). Factors associated with adherence to prophylactic antibiotic therapy for elective general surgeries in Japan. International Journal for Quality in Health Care 23(2):167-72.
Kasteren ME, Mannien J, Kullberg BJ, De Boer AS, Nagelkerke NJ, Ridderhof M, Wille JC, Gyssens IC (2005). Quality improvement of surgical prophylaxis in Dutch hospitals: evaluation of a multi-site intervention by time series analysis. Journal of Antimicrobial Chemotherapy 56(6):1094-1102.
Kasteren MEE, Kullberg BJ, De Boer AS, Mintjes-de Groot J, Gyssens IC (2003). Adherence to local hospital guidelines for surgical antimicrobial prophylaxis: A multicentre audit in Dutch hospitalsJournal of Antimicrobial Chemotherapy 51(6):1389-1396.
Khan S, Rao P, Rao A, Rodrigues G (2006). Survey and evaluation of antibiotic prophylaxis usage in surgery wards of tertiary level institution before and after the implementation of clinical guidelines. Indian Journal of Surgery 68(3):150.
Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ (1999). Kourosh A, Julie B, Tamara C, Virginia F, Susan FNG (2014). Preventing surgical site infection, Getting started kit. pp. 12-22. Available at: https://bcpsqc.ca/documents/2013/11/SSI-Getting-Started-Kit.pdf
Suchitra J, Lakshmidevi N (2009). Surgical site infections: Assessing risk factors, outcomes and antimicrobial sensitivity patternsAfrican Journal of Microbiology Research 3 (4):175-9.
Larson EL, York N, Pearson ML, Lee JT, Adams AB (1999). Guideline for Prevention of Surgical Site Infection. Infection Control and Hospital Epidemiology 20(4):247-77.
The Medical Letter (2006). Treatment Guidelines - Antimicrobial Prophylaxis for Surgery. Available at: http://www.surgicalcriticalcare.net/Guidelines/antibiotic_prophylaxis.pdf
Levy DG, Stergachis A, McFarland LV, Van Vorst K., Graham DJ, Johnson ES, Elmer GW (2000). Antibiotics and Clostridium difficile diarrhea in the ambulatory care setting. Clinical Therapeutics 22(1):91-102.
Ling AO, Goh LM, Azim NAN, Tee CS, Phung CWS (2014). Antibiotic usage in surgical prophylaxis: a prospective surveillance of surgical wards at a tertiary hospital in Malaysia. Journal of Infection in Developing Countries 8(2):193-201.
Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn BB (2009). Surgical site infection: incidence and impact on hospital utilization and treatment costs. American Journal of Infection Control 37(5):387-397.
Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, Hospital Infection Control Practices Advisory Committee. (1999). Guideline for prevention of surgical site infection, 1999. American Journal of Infection Control 27(2):97-134.
Manian FA, Meyer PL, Setzer J, Senkel D (2003). Surgical site infections associated with methicillin-resistant Staphylococcus aureus: do postoperative factors play a role?. Clinical Infectious Diseases 36(7):863-868.
Mary TH, Richman JS, Vick CC, Deierhoi RJ, Graham LA, Henderson WG, Itani KM (2013). Timing of surgical antibiotic prophylaxis and the risk of surgical site infection. JAMA Surgery 148(7):649-657.
Meseret G. Aragaw K, Merid Y (2014). Bacteria from infected surgical wounds and their antimicrobial resistance in Hawassa University Referral Teaching Hospital, Southern Ethiopia. African Journal of Microbiology Research 8(11):1118-1124.
Miliani K, L'hériteau F, Astagneau P, INCISO Network Study Group. (2009). Non-compliance with recommendations for the practice of antibiotic prophylaxis and risk of surgical site infection: results of a multilevel analysis from the INCISO Surveillance Network Journal of Antimicrobial Chemotherapy 64(6):1307-1315.
Musmar SM, Baba H (2014). Adherence to guidelines of antibiotic prophylactic use in surgery: a prospective cohort study in North West Bank, Palestine. BMC Surgery 14(1):69.
Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF, Collaborative Working Group. (2013). Evaluation of the appropriate perioperative antibiotic prophylaxis in Italy. PloS One 8(11):e79532.
Ng RS, Chong CP (2012). Surgeons' adherence to guidelines for surgical antimicrobial prophylaxis–a review. Australasian Medical Journal 5(10):534-40.
Rafati M, Shiva A, Ahmadi A, Habibi O (2014). Adherence to American society of health-system pharmacists surgical antibiotic prophylaxis guidelines in a teaching hospital. Journal of Research in Pharmacy Practice 3(2):62.
Rana DA, Malhotra SD, Patel VJ (2013). Inappropriate surgical chemoprophylaxis and surgical site infection rate at a tertiary care teaching hospital. Brazilian Journal of Infectious Diseases (1):48-53.
Ribas RM, Freitas C, Gontijo Filho PP (2009). Nosocomial methicillin-resistant Staphylococcus aureus bacteremia in a tertiary care hospital: Risk factors, overall mortality and antimicrobial resistance. International Journal of Medical Sciences 1(10):412-417.
Saleh P, Bastani P, Piri R, Goldust M, Naghavi-Behzad M (2013). Antimicrobial prophylaxis for surgical site infections in surgical wards in Northwest Iran. Life Science Journal 10(2):1977-81.
Schmitt C, Lacerda RA, Padoveze MC, Turrini RNT (2012). Applying validated quality indicators to surgical antibiotic prophylaxis in a Brazilian hospital: learning what should be learned. American Journal of Infection Control 40(10):960-2.
SIGN (2014). A national clinical guideline on antibiotic prophylaxis in surgery. pp. 1-30. Available at: http://www.sign.ac.uk/assets/sign104.pdf
Tacconelli E, De Angelis G, Cataldo MA, Pozzi E, Cauda R (2007). Does antibiotic exposure increase the risk of methicillin-resistant Staphylococcus aureus (MRSA) isolation? A systematic review and meta-analysis. Journal of Antimicrobial Chemotherapy 61(1):26-38.
The impact of surgical-site infections in the 1990s: Attributable mortality, excess length of hospitalization, and extra costs. Infection Control and Hospital Epidemiology 20(11):725-730.
Thirion DJ (2013). Antimicrobial Prophylaxis for Ambulatory Surgery. American Journal of Health-System Pharmacy 70:195-283.
Tietjen L, Bossemeyer D, McIntosh N (2003). Infection prevention: guidelines for healthcare facilities with limited resources. Available at: http://pdf.usaid.gov/pdf_docs/Pnact433.pdf
Tourmousoglou CE, Yiannakopoulou EC, Kalapothaki V, Bramis J, Papadopoulos JS (2007). Adherence to guidelines for antibiotic prophylaxis in general surgery: a critical appraisal. Journal of Antimicrobial Chemotherapy 61(1):214-218.
Vessal G, Namazi S, Davarpanah MA, Foroughinia F (2011). Evaluation of prophylactic antibiotic administration at the surgical ward of a major referral hospital, Islamic Republic of Iran. Eastern Mediter. Health Journal 17(8):663-668.
World Health Organization (WHO) (2000). Antimicrobial resistance a global threat.
World Health Organization (WHO) (2009). Guideline for safe surgery. pp. 69-80.
Xue Y, Joanna T, Sciences H (2011) Predictive Risk Factors forMethicillin-Resistant Staphylococcus aureus (MRSA) Colonisation among Adults in Acute Care Settings : A Systematic Review. A thesis submitted in total fulfilment of the requirements for the degree of Master of Clinical Science.
Yesuf BY (2014). Prospective evaluation of antimicrobial prophylaxis and other risk factors for surgical site infection at surgical ward. Clinical Pharmacology and Biopharmaceutics ISSN: 2167-065X

Related Journals:





www.academicjournals.org