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Evaluation of surgical antimicrobial prophylaxis use in Ethiopia: Prospective study
Tamrat Legesse, Desta Hiko, Eneb Khelifa Ismael and Sadikalmahdi Hussen Abdella
Full Length Research Paper

Evaluation of surgical antimicrobial prophylaxis use in Ethiopia: Prospective study

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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 emergence 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 underwent 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.
Surgical antimicrobial prophylaxis (AMP) refers to the 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 would be catastrophic as is often the case in cardiac, neurologic, or ophthalmologic surgery. They are also indicated for surgical procedures 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 Referral 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 in 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 cigarette smokers. More than half of the patients were under ASA score of II 67(63.8%) (Table 1). Twelve patients (11.4%)
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).

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).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>41</td>
<td>39.0</td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>61.0</td>
</tr>
<tr>
<td>Age categories in years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-18 years</td>
<td>28</td>
<td>26.7</td>
</tr>
<tr>
<td>19-40 years</td>
<td>43</td>
<td>41</td>
</tr>
<tr>
<td>&gt;40 years</td>
<td>34</td>
<td>32.3</td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI &lt; 30KG/M²</td>
<td>102</td>
<td>97.1</td>
</tr>
<tr>
<td>BMI &gt;=30kg/M²</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>Place of residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>45</td>
<td>42.9</td>
</tr>
<tr>
<td>Rural</td>
<td>60</td>
<td>57.1</td>
</tr>
<tr>
<td>Preoperative blood transfusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>95.2</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>4.8</td>
</tr>
<tr>
<td>Cigarettes smoking or tobacco use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>77</td>
<td>73.3</td>
</tr>
<tr>
<td>Yes</td>
<td>28</td>
<td>26.7</td>
</tr>
<tr>
<td>ASA score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>29</td>
<td>27.6</td>
</tr>
<tr>
<td>II</td>
<td>67</td>
<td>63.8</td>
</tr>
<tr>
<td>III</td>
<td>9</td>
<td>8.6</td>
</tr>
<tr>
<td>Preoperative hospital stay in days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;=7 days</td>
<td>78</td>
<td>74.3</td>
</tr>
<tr>
<td>&gt;7 days</td>
<td>27</td>
<td>25.7</td>
</tr>
</tbody>
</table>

The 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 1 day 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).

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

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

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

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% (Elburl 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 recommended 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 administrated, 37(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 administrated 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 (Mesarret 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 Fluroquinolones (Bratzler et al., 2013; Kourosh et al., 2014). In present study, out of 103 patients for whom AMP administrated, time of first dose was concordant in 38(36.3%) patients. The finding was higher than study done in Sudan 9.3% (Elburl 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 administrated. 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% (Elburl 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

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