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Evaluate Utilization Pattern of Antibiotics among Surgical Patients at District Head Quarter Hospital Badin, Sindh, Pakistan

Natasha Hanif [1,] Rameez Raja [2,] Abdul Manan [3,] Rehan Hussain [4], Mashal Zehra [5,] Aslam Shah [6,] Danish Aslam [7,] Mohammad Musadaq [8]
[1,3,4,]Department of Pharmacy, Indus Hospital & Health Network, Badin, Sindh, Pakistan.
[2] Master of Pharmacology, Zia u Din university Karachi, Sindh, Pakistan
[5,6]Department of Pharmacy, Indus Hospital & Health Network, Karachi, Sindh, Pakistan
[7,8]Department of General Surgery, Indus Hospital & Health Network, Badin, Sindh, Pakistan

Abstract:-
BACKGROUND: Guidelines for surgical antibiotic are highly successful in promoting appropriate antibiotic and lowering antibiotic resistance. This investigation was done to determine how frequently surgical patients at DHQ Badin run by Indus Hospital & Health network used antibiotics.

METHOD: A cross-sectional observational study was conducted by involving 1643 patients. The choice, timing and duration of antibiotics were examined in the medical record of patients who underwent surgical procedures. SPSS software was used to analyze the data that was gathered.

RESULTS: All surgery patients received preventative antibiotic. Cephalosporins (83%) were generally utilized regularly for all surgical wounds. First generation cephalosporin use was prevalent (68%) Compared to third generation use (15%) among cephalosporins. The administration's timing compiled.

CONCLUSION: The primary issues inappropriate antibiotic selection and prolonged duration. Guideline for the use of surgical antibiotics were therefore key treatment that were recommended.

Keywords:- *Antibiotics, Surgical prophylaxis.*

I. INTRODUCTION

Hospital acquired infections (HAI) has chance to raise in morbidity and mortality rates in hospital setting surgical site infections (SSI) are more prevalent in low-and middle income countries(LMC) than they are in high income countries (HIC), where device associated infections are major prevalent [1,2]SSIs are caused by infectious microorganisms that develop at the site of incision (superficial or deep) or that invade an organ or space within 30days of surgery [3,4] one of the major issues in surgical procedures is SSI, which accounts for 40% nosocomial infections[5,6] and places a significant burden on patient morbidty,mortalityand increased expenses[7,8].According to hospital setting and surgical method, the prevalence rate of SSI varies [1,2,9] with the united kingdom and the united states of America having prevalence rates of 16% and 31% respectively [10,11] .According to a study ,SSIs were prevalent for Pakistani patients who underwent elective surgery at rate of 6.5-13% [12,13].surgery is broken down into four categories (clean wound, clean-contaminated wound, contaminated wound & Dirty wound), with post-operative infections and bacterial impurities occurring more frequently in each category [14].The administration of antibiotics prior to surgical procedure is known as surgical antimicrobial prophylaxis (SAP) [15,16]. The Proper use of surgical antibiotic is among the useful means for reducing SSI [17]. According to study that antimicrobials should be administered 30 minutes before incision [18]. However, pharmacokinetics and pharmacodynamics of antimicrobials, selection of antibiotics by considering bactericidal concentrations against pathogens, duration, dose of therapy and route of administration should be considered for appropriate prophylaxis [17, 19-21]. According to World Health Organization (WHO), postoperative SAP should be done within 24 hours of incision [22]. Previous studies have shown that surgical antimicrobials usage was not according to the guidelines [19, 23-25]. Antimicrobial timing, selection and duration of utilization was highly inappropriate [25-27]. The variation in practice could be due to difference in published guidelines, lack of awareness and lack of acceptance of the guidelines among surgeons [25, 28]. Inappropriate choice of SAP could lead to antimicrobial resistance (AMR), increased healthcare cost and adverse drug reaction that is probable to become a bigger challenge to practitioners in both community and hospital settings [17, 29].

Irrational use of antimicrobials is common practice in surgical procedures especially in LMICs [19, 23, 30, 31]. We know that there is excessive inappropriate use of broad-spectrum antibiotic in Pakistan as surgical prophylaxis [32].

However, limited research available on the usage of SAP in Pakistani hospitals according to surgical procedure is still the main problem. Hence, this study was designed to observe the utilization pattern of antibiotics in surgical procedures, with regards to the choice of the antibiotics, timing and duration of treatment.

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II. METHOD

A. Study, location and lay out

This retrospective study was conducted in surgical wards of DHQ Hospital Badin to review the usage of antibiotics in surgical treatment of clean wounds, clean-contaminated wounds, contaminated wounds and dirty wounds. The ethical approval for the study was granted by Institutional Review Board of IHHN.

B. Study population

Patients from gynecological, general surgical and orthopedic wards were considered for the study population and those that fulfill the inclusion criteria were included.

Inclusion and Exclusion Criteria Patients admitted in gynecologic, general surgical and orthopedic wards with clean wound, clean-contaminated wound, contaminated wound and dirty procedures as defined [33] by ACS-NSQIP (Table 1). Seriously ill patients need admission in Intensive Care Unit (ICU) and patients unable to communicate were excluded from study.

C. Data collection process

A standardized data collection form was used to assort data from 1643 patients who underwent wound surgery at hospital. At the start of the study, all the participants were informed about the nature of the study, and were assured that the data will remain confidential. The data collection form was divided into various sections as (1) Patient demographic and medical data, (2) surgical data (type of surgery), (3) SAP utilization data (antimicrobial class, name, frequency and duration of administration) and (4) Surgical wound classification (clean wound, clean-contaminated wound, contaminated wound and dirty wound).

D. Statistical analysis

Data was analyzed by using latest versions of Microsoft Excel and Statistical Package for Social Sciences, (SPSS), Statistical details were used to compile clinical data and demographics of patients.

III. RESULTS

A. Clinical characteristics and Sociodemographic of study participants

Patients medical profiles of 1643 were assessed which were administered a prophylactic antimicrobial. The average age of the study surgical patients was 28.6 years , 75% of the assessed patients were female. Majority of the patients were from Gynae & Obs (65.9%) and Orthopedics (21.7%). As to concerned the types of wounds, a large number of subjects had clean procedure (36%), followed by clean contaminated (50.4%). About the types of surgical procedure performed, C-Section was leading procedure accounting approximately 60.6% of all procedures. The details are given in Table 2, Table 3 and Table 4.

B. Antimicrobial utilization pattern for wound surgery

The antimicrobial classes utilized for different types of wound surgery were penicillin's, cephalosporin's, tetracycline's, aminoglycosides, fluoroquinolone's, beta-lactamase inhibitors and nitroimidazoles. More than half of antimicrobials (50.4%) were used for clean contaminated procedures followed by clean procedures (36%). Among the antimicrobials given to surgical patients, cephalosporin's (83%) were most commonly used from which 68% were 1st generation cephalosporin. Penicillin were utilized for 6.9% recommended for dirty procedures while cephalosporin's for clean contaminated (47.6%) and clean (27%). As to the timing of antimicrobials administration, antimicrobial administered to all the patients with in 30 to 60 minutes' prior surgery. Duration of antimicrobial prophylaxis was 1-3 days 1156 Patients, in which duration of 1 day was for 45.5%, 2 days for 19.6% & 3 days for 5.2%.

Table 1: Surgical Wound Classifications by ACS-NSQIP*.

Wound Type	Definition
Clean	Surgical wound that is not infected but don't have inflammation or involved the respiratory, alimentary, genital, or urinary tracts.
Clean-Contaminated	Clean-Contaminated surgical wound in which the respiratory, alimentary, genital, or urinary tract is penetrated under controlled circumstances without anomalous contamination.
Contaminated	Contaminated Open, new, unintentional wound, surgeries involving significant lapses in sterile technique or gastrointestinal tract spill, as well as incisions exhibiting acute, non-purulent inflammation.
Dirty	Dirty, chronic traumatic injuries that still have devitalized tissue and involved an active clinical signs of infection or visceral perforation.

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Table 2: Sociodemographic characteristics and medical condition.

Variables	**Frequency (N=1643)**	**%age**
Sex		
Male	397	24.2%
Female	1246	75.8%
Age (Mean)	28.2	
Comorbidities		
Diabetes Mellitus	22	1.3%
Hepatitis	15	0.9%
Hypertension	33	2.0%
Miscellaneous	123	7.5%
Ward		
General Surgery	205	12.5%
Gyne & Obs	1082	65.9%
Orthopedic	356	21.7%
Procedure Type		
Major	1133	69.0%
Moderate	175	10.7%
Minor	335	20.4%
Anaesthesia Type		
General	218	13.3%
Local	242	14.7%
Spinal	1183	72.0%

Complains		
Fever	33	2.0%
Nausea/Vomiting	6	0.4%
Pain	945	57.5%
Pain/Pus Discharge	23	1.4%
Pain/Swelling	28	1.7%
Swelling	145	8.8%
Diagnosis		
Full Term, Miscarriage, Abortions	1046	63.7%
Injury, Fractures	255	15.5%
Hernia	23	1.4%
Cholelithiasis	9	0.5%
Abscess	13	0.8%
Appendicitis	23	1.4%
Hemorrhoids	20	1.2%
Cellulitis	5	0.3%
Gangrene	11	0.7%
Hydrocele	16	1.0%

Table 3: Surgical class of wounds in study patients

Wound Type	**Frequency**	**%**
Clean	591	36.0%
Clean/Contaminated	828	50.4%
Contaminated	210	12.8%
Dirty	14	0.9%

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Table 4: Surgical procedure performed

Surgical Procedures Performed	Frequency	%
Amputation	10	0.6%
Appendectomy	25	1.5%
Arthrotomy	11	0.7%
Austin Moore Hemi arthroplasty	3	0.2%
Biopsy	6	0.4%
C-Section	996	60.6%
Fixation	176	10.7%
Cholecystectomy	9	0.5%
Dilatation and Curettage of Uterus (D&C)	59	3.6%
Excision	36	2.2%
Fissurectomy	9	0.5%
Hernia Repair	61	3.7%
Hydrocelectomy	12	0.7%
Hysterectomy	20	1.2%
Laparotomy	6	0.4%
Debridement	73	4.4%
Tenotomy	16	1.0%
Pyelolithotomy	6	0.4%
Hemorrihdectomy	17	1.0%
Miscellaneous	92	5.6%

Table 5: Surgical Prophylaxis Antimicrobials Prescription pattern

Antimicrobials	Wound								Total (n)	%age
	Clean wound		Clean-Contaminated wound		Contaminated wound		Dirty wound			
	Numbers	%age	Numbers	%age	Numbers	%age	Numbers	%age		
Penicillins										
Amoxicillin Clavulanic acid	48	2.9%	15	0.9%	50	3.0%	4	0.2%	113	6.9%
Cephalosporins										
Cefazolin	342	20.8%	682	41.5%	85	5.2%	8	0.5%	1109	67.5%
Ceftriaxone	102	6.2%	100	6.1%	44	2.7%	0	0.0%	246	15.0%
Fluoroquinolone										
Ciprofloxacin	5	0.3%	2	0.1%	0	0.0%	7	0.4%	7	0.4%
Tetracycline										
Clindamycin	0	0.0%	1	0.1%	0	0.0%	0	0.0%	1	0.1%
Aminoglycosides										
Amikacin					1	0.1%			1	0.1%
Gentamycin	5	0.3%	4	0.2%	2	0.1%	0	0.0%	11	0.7%
Sulbactams										
Piperacillin+Tozabactum	4	0.2%	17	1.0%	3	0.2%	0	0.0%	24	1.5%
Glycopeptides										
Vancomycin 1 gm	7	0.4%	0	0.0%	5	0.3%	0	0.0%	12	0.7%
Total Antimicrobials	513	31.2%	821	50.0%	190	11.6%	19	1.2%	1524	92.8%

IV. DISCUSSION

This study was conducted to review the pattern of antibiotic usage for surgical wounds (clean wound, clean-contaminated wound, contaminated wound and dirty wound). Optimal prophylaxis for surgical procedures includes appropriate selection of antimicrobials, appropriate timing and duration of administration and discontinuation when the subjects are not getting any benefit [34]. In this study, almost all the patients received antimicrobials who went through surgery. This indicates over usage of antimicrobials. This finding was observed in other studies as well [35-37]. This might be due to lack of knowledge about updated references, lack in the awareness culture and need guidance on compliance toward guidelines among health care providers. A study was conducted in Pakistan revealed an alarming poor compliance rate [38]. With respect to the choice of antimicrobials, it was found that 1st generation cephalosporins were frequently used in this study. This result is different to other previous studies [32, 39-44]. Different antimicrobials were used for similar procedures. This showed consistence's in antimicrobial selection. Such difference and deviation from guidelines were also observed in other studies [23, 37].

Regarding timing of administration of antimicrobials, approximately all patients received antimicrobial 30 to 60 minutes' prior surgical procedure. This indicated obligingness to the guidelines. Previously available data showed similar findings [23, 44]. Consistent with the findings from previous studies [39, 40, 45, 46], this study found the prolonged duration of antimicrobial prophylaxis. Several patients frequently were treated with these antimicrobials until the day of discharge in order to avoid infection while they were hospitalized. According to published guidelines, antimicrobial prophylaxis should be discontinued within 24-48 hour because prolonged administration can be dangerous for the patients as it encourages antimicrobial resistance and adverse events related to antimicrobial [42]. Numerous factors appeared to effect 11 patterns of antimicrobial prescribing. A lot of physicians did not believe that international antimicrobial prescribing guidelines were directly applicable to their patients due to the differences in infection control practices, patient care services and hospital environment in LMICs. Moreover, there is a trust deficit in the credibility of antimicrobial liable data [47]. Unfortunately, understanding the connection between antimicrobial use, infection control practices and emergence of resistance is not a priority and such issues did not always change physicians prescribing practices. As advance medical technologies, complex surgical procedures and therapeutic interventions have been introduced globally, it has become challenging to develop parallel advancements in infection control practices and improve overall patient outcomes. In Pakistan, there are limited resources to effectively implement infection control programs [48]. Therefore, "National Institute of Health" (NIH) in Pakistan has recognized the impact of HAIs and started working to ensure infection control awareness refresher and assure the necessary facility management [49]. There are few limitations in interpreting our data. The main limitation of the study was regarding data collection as it was taken only from one center. This was the single point data and patients were not followed prospectively. Culture repost were also not checked to identify the resistance pattern. Lastly these observational studies cannot identify true risk factors. Nevertheless, this survey can be helpful in explaining the level of the problem and in highlighting other potential areas for future research.

V. CONCLUSION

In conclusion, the current pattern of antimicrobial utilization was comparable to the standard guidelines. The use of 1st generation cephalosporins, usage and proper duration of treatment were the main concern of study. In the light of this, this study suggested that, the development of local antimicrobial guidelines and antimicrobial prescribing policy would be helpful with effective monitoring.

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