BACTERIA SENSITIVITY PATTERN OF CAESAREAN SECTION WOUND ON SELECTED ANTIBIOTICS IN ULIN GENERAL HOSPITAL BANJARMASIN

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Abstract: A cesarean delivery increases the risk of wound infection it should be prevented by using antibiotics. *This study was to determine the pattern of bacterial sensitivity in surgical wounds of cesarean section patients for selected antibiotics, i.e ceftriaxone, cefixime, sulbactam ampicillin, ciprofloxacin, clindamycin and gentamicin.This observational study was conducted at the Ulin Public Hospital in Banjarmasin from July to September 2019. Using a cross sectional approach Samples of bacteria were identidied from 36 that were pusposively sampled, i.e., Staphylococcus aureus, Staphylococcus epidermidis and Escherichia coli. Antibiotic sensitivity test showed that Staphylococcus aureus was sensitive against gentamicin (100%),whereas Staphylococcus epidermidis and Escherichia coli. Were intermediately sensitive towards gentamicin (62.5%) and ceftriaxone (80%)*

Keywords: *Antibiotic susceptibility, caesarean section, surgical wound*

INTRODUCTION

In obstetric and ginecology practice for worldwide, cesarean section is one of the most frequently performed procedures. Caesarean section is a technique of removing the fetus by incising the abdominal wall and uterus.[1] The indication of caesarean section from the mother side are caused by cephalopelvic disproportion, placenta previa, maternal pelvic deformity, and premature rupture of membranes; while from the fetus sides are fetal location abnormalities, fetal distress and umbilical cord prolapse.[2]

The increase of caesarean section delivery also allows the complication in the surgery wound. As WHO standard, the average of caesarean section in a country is around 5 – 15% for 1000 deliveris in the world.[3] Dased on Indonesian Demography and Helath Survey data, the increase of caesarean section in Indonesia happened in 1991 for 1,3% and in 2007 for 6,8%.[4]

The administration of antibiotics is purposed to decrease the probability of infection. The antibiotic that is given before and after caesarean section can prevent surgical site infection. Antibiotic administration rationally should be based on the result of sensitivity test and the causes. The results of the sensitivity test to several antibiotics in various places showed different patterns. The results of the study on cesarean section patients at Prof. Dr. R. D. Kandou Manado Hospital showed that the most widely used antibiotics were the third-generation cephalosporin class ceftriaxone with metronidazole combination (55.8%), while the antibiotic was cefadroxil with metronidazole combination (53.59%).[5] The research of Muthmainah et al at two hospitals in Surakarta in cesarean section patients showed that the prophylactic antibiotics used were ampicillin sulbactam (23%), ceftriaxone (19.5%), ampicillin (24%), cefotaxime (16%). The antibiotics that are often used are ceftriaxone, cefixime, ampicillin sulbactam, ciprofloxacin, clindamycin and gentamicin.

RESEARCH METHOD

This research is a descriptive observational research using cross sectional method. Samples in this study were bacterial isolates from surgical wound swabs in cesarean section patients who were treated 3 x 24 hours at the Gynecology and Obstetrics Section of the Ulin Hospital, Banjarmasin. The sampling technique used was purposive sampling according to inclusion criteria, namely cesarean section patients who were treated 3x24 hours, and obtained 36 samples in total.

The material of this research was bacterial isolates from swabs of surgical wounds of cesarean section patients whose types of bacteria had been identified. Other ingredients are bouillon agar, Brain Heart Infusion (BHI), sterile distilled water, sterile Mueller Hinton cotton sticks, 30µg ceftriaxone antibiotic discs, 5µg cefixime, 10µg ampicillin-sulbactam, 5µg ciprofloxacin, 2µg clindamycin and 10µg gentamicin, McFarland 1 standard solution. The tools used were test tubes, pipettes, mister calipers, hot plates, bunsen laminary flow lamps, autoclaves, incubators, petri dishes, erlenmayer flasks and sterile ose.

The main variables of this research were the selected antibiotics (ceftriaxone, cefixime, ampicillin sulbactam, ciprofloxacin, clindamycin and gentamicin) and the pattern of bacterial sensitivity measured from the diameter of a certain radical inhibition zone. The confounding variables in this research were contamination from research tools and materials covering the research tools and samples or materials, temperature and humidity from the storage environment, fungal contamination, and sample inspection time that exceeded the limit.

Caesarean section patients who had been treated 3 x 24 hours were asked to be the research subjects. If the patient agreed, the patient was asked to sign an informed

consent form; after that, a swab was performed on the cesarean section wound. The swab result is then put into the bouillon agar media and to be put into the ice thermos saved in the laboratory. After that, the bacteria planting process was carried out. The colonies that have grown are then identified for the type of bacteria and tested for their sensitivity to antibiotics. Antibiotic potential was measured using the Kirby Bauer diffusion method. Pure colonies that have been identified are then taken with sterile ose, then planted on BHI media in a test tube to be incubated at 37 ° C for 24 hours. The results of the incubation were added with sterile distilled water to achieve turbidity according to the McFarland 1 standard (equivalent to the number of bacteria 3 x 108 cfu / ml). A sterile cotton swab was dipped in a bacterial suspension, then pressed against the tube wall until the cotton was not too wet, then the cotton was smeared on the surface so that Mueller-Hinton dries, the antibiotic disc to be tested was placed on top of the agar with sterile tweezers, then the media was incubated at 37 ° C for 18-24 hours. The diameter of the radical zone formed was measured in millimeters.

The obtained data were compared with the standard measurement of antibiotic sensitivity according to the Clinical and Laboratory Standard Institute (CLSI) in Performance Standards for Antimicrobial Susceptibility Testing: twenty-first informational supplement in 2019.

RESULTS AND DISCUSSION

The percentage of antibiotic sensitivity in the isolates of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* can be seen in Figure 1.

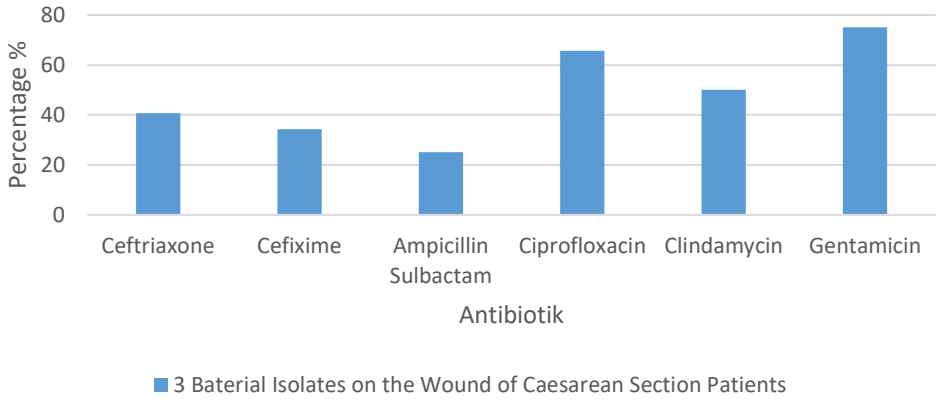

Figure 1 Pattern of Bacterial Sensitivity to Various Selected Antibiotics in the Gynecology and Obstetrics Section of Ulin General Hospital, Banjarmasin, July-September 2019

Figure 1 shows that from the 32 bacterial isolates, the highest sensitivity was to gentamicin as many as 24 isolates (75%) and ampicillin-sulbactam was the lowest with 8 isolates (25%). This study proves that gentamicin, ciprofloxacin and clindamycin are antibiotics that are sensitive to bacteria in surgical wounds in cesarean section patients. High sensitivity to gentamicin because it is active against Gram positive and negative organisms. Cefixime and clindamycin are indicated in patients with wet wounds in cesarean section patients. Continuous use of cefixime and ceftriaxone antibiotics can reduce the sensitivity to bacteria in the surgical wound of cesarean section patients. Ampicillin-sulbactam is an antibiotic that is no longer used in surgery because this antibiotic does not cover both aerobic and anaerobic germs.

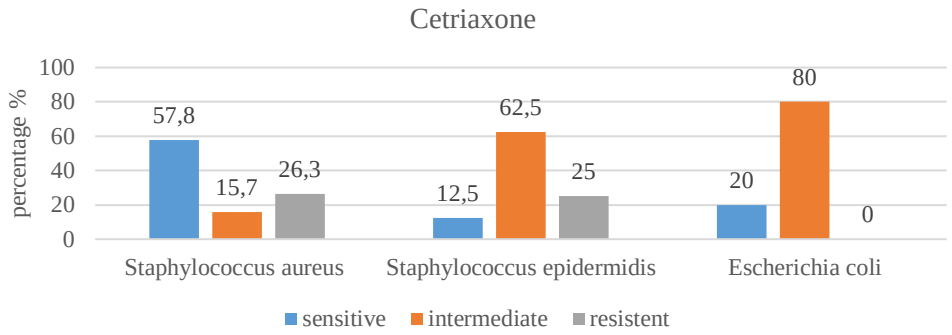

Figure 2 Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to ceftriaxone.

From Figure 2 it can be seen that two bacterial isolates, *S. epidermidis* and *E. coli*, are intermediate bacteria. This means that there has been a shift in sensitivity from sensitive to resistant but not completely resistant to ceftriaxone antibiotics. One of the causes of the resistance mechanism to beta-lactam antibiotics such as ceftriaxone is because these bacteria produce beta-lactamase enzymes such as in Gram-negative bacteria *E. coli* which synthesize the enzyme beta-lactamase AmpC. This enzyme can hydrolyze the betalactam ring of the ceftriaxone antibiotic so that the antibiotic cannot work.[7]

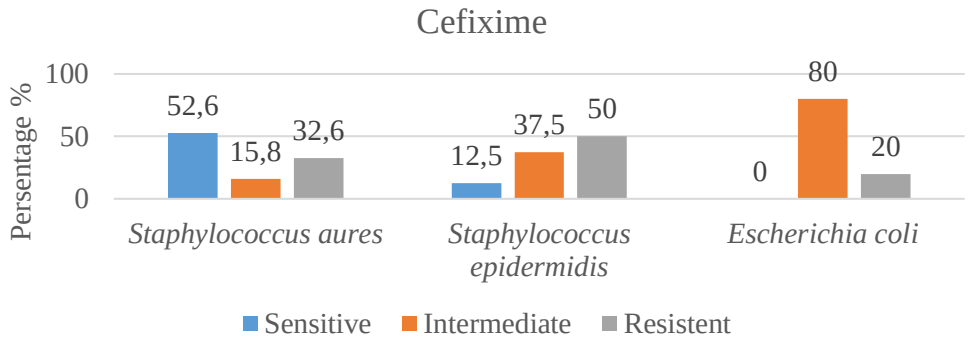

Figure 3. Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to cefixime

Seen from Figure 3, it can be interpreted that the *E. coli* bacterial isolates given cefixime antibiotic discs did not reach the sensitivity of the sensitive zone. Cefixime works by inhibiting bacterial cell wall synthesis, binds to one or more penicillin-binding proteins (PBPs) which in turn inhibits the transpeptidation stage of bacterial cell wall peptidoglycan synthesis thereby inhibiting cell wall biosynthesis.[8] *E. Coli* and *S. sp.* resistance to cefixime antibiotics can occur because bacteria are able to produce a destructive enzyme, namely beta-lactamase which will open the beta-lactam ring so that the beta-lactam class of antibiotics loses their antibiotic activity.

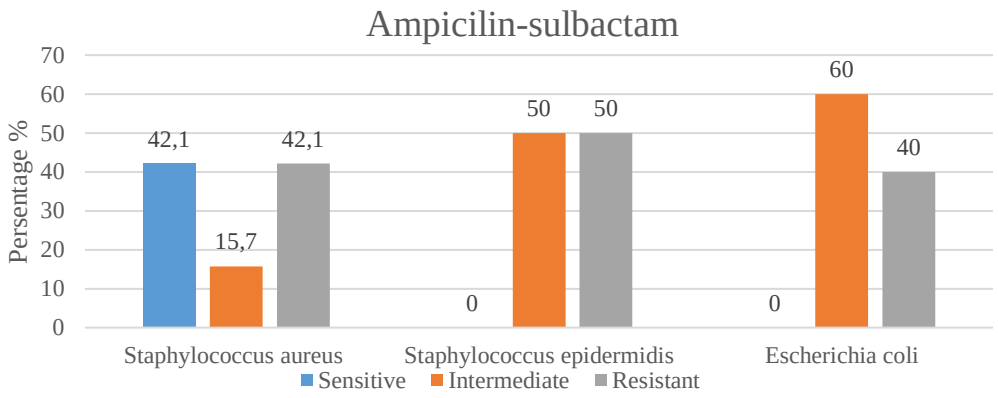

Figure 4. Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to Ampicillin-sulbctam

The sensitivity test results of 3 bacterial isolates in the surgical wounds of cesarean section patients showed that they had low sensitivity to ampicillin-sulbactam. Resistance to ampicillin-sulbactam is due to the hyperproduction of the beta-lactamase enzyme, which can cause interference with genes that regulate the production of the beta-lactamase enzyme. According to a research by Tomaylo et al. Gly-124, which turned into Asp, caused changes in the function of BHA RI as a signal carrier in genes involved in regulating the production of the beta-lactamase enzyme in *S. aureus*.

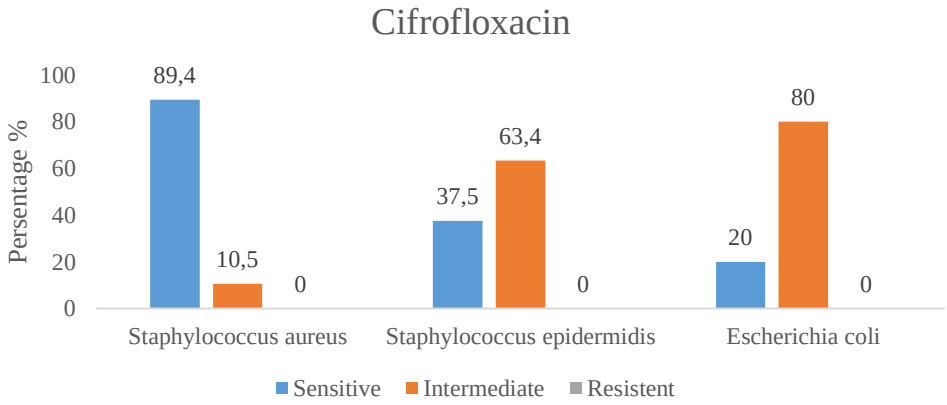

Figure 5. Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to Ciprofloxacin

The sensitivity test results of *S. aures* isolates showed a high sensitivity to ciprofloxacin. This is different from 2 bacterial isolates, *S. epidermidis* and *E. coli*, which have low sensitivity to Ciprofloxacin and the sensitivity test results of *E. coli* isolates to ciprofloxacin show 20% sensitivity and 80% intermediates. Resistance that occurs to ciprofloxacin occurs through mutations in the bacterial chromosome gene encoding DNA gyrase or topoisomerase IV or through active transport of drugs out of bacteria.[11]

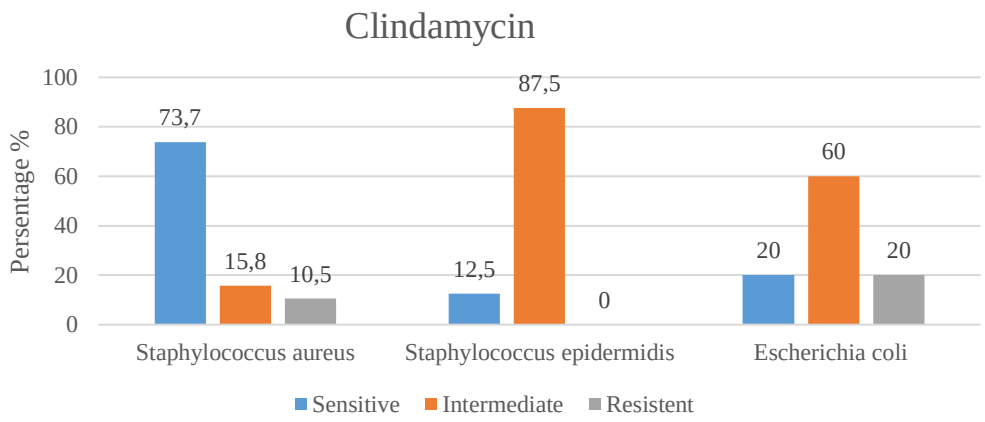

Figure 6. Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to Clindamycin

The resistance mechanism to clindamycin occurs through a plasmid-mediated mechanism by reducing membrane permeability and then causing changes in the receptors on the ribosomes and hydrolysis by esterase which ultimately causes the clindamycin antibiotic to not work on these bacteria.[12]

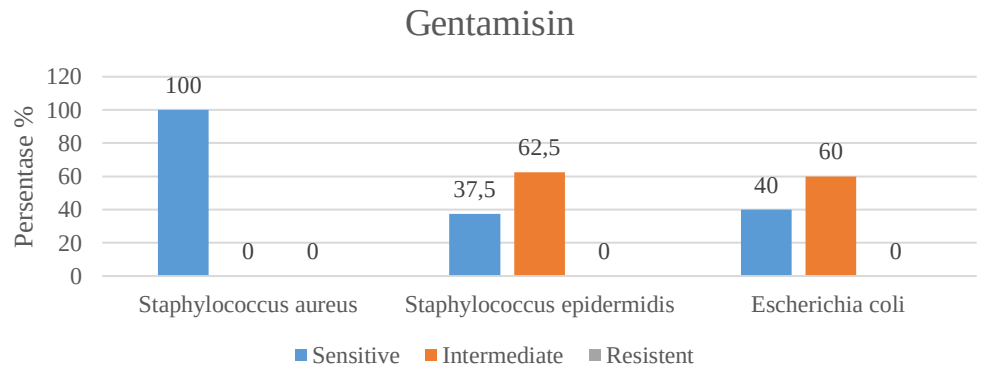

Figure 7 Percentage of *Staphylococcus aureus, Staphylococcus epidermidis* and *Escherichia coli* sensitivity to Gentamicin

The sensitivity test results of *S. aures* isolates showed high sensitivity to gentamicin, while *S. epidermidis* and *E. coli* had low sensitivity to gentamicin. The results of the sensitivity test of *E. coli* isolates to gentamicin were 40% sensitive and 60% intermediates.

Resistance in this group can occur due to failed penetration into germs, low drug affinity for ribosomes or drug inactivation by bacterial enzymes. In addition, it can also occur due to antibiotic modification. Modification of target molecules through the methylation process of 16 sRNA by Arm and methyltransfeerase Rmt Efflux pump in AerD in *E. coli* so that it can remove gentamicin from the germ.[13]

CONCLUSSION

Based on the results of research regarding the sensitivity pattern of bacteria in surgical wounds of cesarean section patients to the antibiotics ceftriaxone, cefixime, ampicillin-sulbactam, clindamycin and gentamicin at the Ulin General Hospital Banjarmasin for the period July-September 2019, it can be concluded that bacteria in the surgical

wounds of caesarean section patients were sensitive to gentamicin (75%), followed by ciprofloxacin (65.6%) and clindamycin (50%). Ceftriaxone, cefixime and ampicillin-sulbaactam had the lowest sensitivity 40.6%, 34.3% and 25% respectively.Saureus was sensitive to gentamicin (100%), ciprofloxacin (89.4%), clindamycin (73.7%).), ceftriaxone (57.8%), cefixime (52.6%) and resistant to ampicillin-sulbactam (42.1%). *S. epidermidis* was intermediate to gentamicin (62.5%), ciprofloxacin (63.5%), clindamycin (87.5%) and ceftriaxone (62.5%) and was 50% resistant to cefixime and ampicillin-sulbactam. *E. coli* intermediates to ceftriaxone and cefixime 80% each and intermediates to gentamicin, ciprofloxacin, ampicillin-sulbactam and clindamycin 60% for each.

From the research that has been done, several things can be suggested as follows: (1) Further research can be carried out with a larger number of samples and research variables regarding the pattern of bacterial sensitivity in surgical wounds of cesarean section patients to selected antibiotics; (2) Further research can be carried out by examining Methicillin Resistant Staphylococus aureus (MRSA) and Extended-Spectrum B-Lactamase Enzyme (ESBL) on bacterial surgical wounds in cesarean section patients against selected antibiotics. The results of this study can be used as a reference for rational antibiotic selection in cesarean section patients, thereby increasing the effectiveness and efficiency of cesarean section patient management, especially in the Gynecology and Obstetrics Section of the Ulin General Hospital, Banjarmasin.

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