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ISOLATION AND ANTIBIOTIC SUSCEPTIBILITY OF BACTERIA FROM POTENTIAL NOSOCOMIAL SURFACE IN STIKES MITRA KELUARGA, INDONESIA

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Abstract

Introduction: Nosocomial is a common infection in hospitals, health care facilities or environments where pathogens grow. Transmission of nosocomial infections occurs due to the presence of pathogenic bacteria that attack the officers, visitors or someone with susceptible immunity. The causes of nosocomial infections are bacteria, viruses, fungi and parasites. Transmission that occurs by microorganisms has the potential to contaminate food that enters the human body. Generally, this transmission can be through contact with organisms either directly or indirectly. Antibiotic sensitivity test aims to test the sensitivity of a bacterium to antibiotics. Bacteria that are sensitive to antibiotics will show an inhibition zone with a large diameter, the larger the inhibition zone formed, the more inhibited bacterial growth will be.

Method: This study aims to isolate bacteria that have the potential to be a source of pathogens in STIKes and hospitals. This research is a qualitative descriptive research. The samples used in this study were security guards' phones, parking attendants' cellphones, women's closets, motorcycle handlebars, hospital canteen sauce bottles, hospital cafeteria windows, hospital parking attendants' keyboards, hospital parking attendants' mice and the cross button. In addition, researchers also used 2 media, namely general media or Mueller-Hillon (Oxoid, UK) and *Blood Agar* (BA).

Results: The results of this study are that from all samples found pathogenic bacteria that can hemolyze blood and from the 14 samples of which 1 sample came from Ladies Toilet1 that had the most resistance to antibiotics, as many as 4 antibiotics were gentamicin, rifampicin, tetracycline, chloramphenicol, and cefixim.

Conclusion: This study concluded that the potential for pathogenic bacteria from STIKes and hospitals could hemolyze BA media and 1 of 14 samples was resistant to 4 antibiotics.

Key words : Antibiotic, *Blood Agar*, Nosocomial, Resisten, *Staphylococcus aureus*.

INTRODUCTION

In everyday life, there are many bacteria that cause contaminations. Most people believe the high potential for bacterial contaminants only occurs in hospital and dirty environments. Infections that occur in hospitals, health care facilities or the surrounding environment where pathogenic bacteria grow are called nosocomial infections. Transmission of nosocomial infections occurs due to the presence of pathogenic bacteria that attack officers, visitors or someone with susceptible immunity. According to (Al-Ghamdi, et al., 2011), sources of pathogenic bacteria can be found in the air, water, soil, food and surrounding objects (such as mobile phones, computer equipment, motorcycle handlebars).

Nosocomial infections can be caused by Gram-positive cocci (*Staphylococcus* spp., *Micrococcus* spp.), but also spore-forming rods (*Bacillus* spp.) or Gram-negative bacteria, which can be transmitted through devices such as mobile phones or computer devices. Mobile phones, computer equipment, and motorcycle handlebars have a high potential for nosocomial infections, this is because these objects can act as cellular reservoirs for pathogenic microbes. Mobile phones, computer equipment, and motorcycle handlebars that are often used and are rarely disinfected routinely are the triggers for microbial transmission ((J, 2012); (Koroglou, et al., 2015); (Siegmond, et al., 2010)). Transmission that occurs by

microorganisms has the potential to contaminate food that enters the human body. Generally, this transmission can be through contact with organisms either directly or indirectly. In addition, droplet transmission can occur through the respiratory tract by large droplets (Ferioli, et al., 2020)

Antibiotic sensitivity test aims to test the sensitivity of a bacterium to antibiotics. Bacteria that are sensitive to antibiotics will show an inhibition zone with a large diameter, the larger the inhibition zone formed, the more inhibited bacterial growth will be. If an inhibition zone with a small diameter is found, it can be interpreted as bacteria experiencing resistance or intermediate to antibiotics (Khusuma, Safitri, Yuniarni, & Rizki, 2019)

The purpose of this study was to determine the presence or absence of pathogenic bacteria on surrounding objects, namely mobile phones, computer equipment, motorcycle handlebars, toilets, canteen sauce boxes, canteen windows and parking bars located at the hospital and STIKes Mitra Keluarga.

METHOD

This study was conducted with descriptive qualitative. This study was conducted on June 2022 at Microbiology Lab STIKES Mitra Keluarga. The sample that used in this research was 14 samples including the security and parking attendants' cellphones, toilets, motorcycle handlebars, bottle's sauce in the canteen, storefronts in the canteen, parking attendant's keyboard in school and in hospitals, mouse parking attendants on school, parking doorstop buttons. Media that used are Blood agar and Mueller-Hillon (Oxoid, UK).

*/-For isolation bacteria, it's necessary to do a swab on the surface of the object using a cotton bud that has been moistened with 0.8% NaCl and streak on the blood agar media. After that, incubation (Memmert, Germany) media at 37°C for 24 hour.

Furthermore, bacteria that grow on agar media are inoculated on Mueller-Hillon agar (Oxoid, UK) using a cottonbud that has been moistened with 0.5% Mac Farland and taking the bacterial isolates with the cotton buds. Then, streak on Mueller-Hillon (Oxoid, UK) media and place the antibiotics on the surface of the media Mueller-Hillon agar media and antibiotics are placed on the surface of the media. Antibiotics that used in this study are Ampicillin, Imipenem, Gentamicin, Chloramphenicol, Rifampicin, Amoxycillin clavulanic acid, Tetracycline, Cefixime (Oxoid, UK). Then incubated (Memmert, Germany) at 37°C for 24 hour. In this study, identification of the results was carried out by measuring the diameter of the clear zone on nutrient agar media. Interpretation result was compared with CLSI 2016 for resistance criteria.

RESULTS

Observations regarding nosocomial examinations carried out in the area of Mitra Keluarga Hospital and STIKes Bekasi in 2022 are shown in the table below:

Tabel 1 Observation Result

Sample	Diameter BA (mm)	Clear Zone (mm)							
		AMP 10	IPM 10	C 30	AMC 30	CN 10	TE 30	RD 30	CFM 5
Security's phone	10	20 (S)	45 (S)	0 (R)	29 (S)	10 (R)	10 (R)	30 (S)	0 (R)
Parking attendant phone	7	30 (S)	30 (S)	44 (S)	42 (S)	44 (S)	30 (S)	30 (S)	40 (S)
Ladies toilet 1	1	0 (R)	17 (R)	16 (I)	16 (I)	12 (R)	8 (R)	15 (-)	20 (S)
Ladies toilet 2	7	16 (I)	32 (S)	26 (S)	12 (R)	27 (S)	33 (S)	35 (S)	0 (R)
Motorcycle handlebar revo 1	6	36 (S)	50 (S)	30 (S)	38 (S)	26 (S)	30 (S)	44 (-)	8 (S)
Motorcycle handlebar revo 2	6	35 (S)	40 (S)	24 (S)	40 (S)	27 (S)	30 (S)	40 (S)	8 (S)
Sauce bottle kantin 1	8	25 (S)	52 (S)	34 (S)	34 (S)	25 (S)	30 (S)	40 (S)	26 (S)
Sauce bottle kantin 2	8	27 (S)	50 (S)	30 (S)	32 (S)	25 (S)	33 (S)	40 (S)	24 (S)
Canteen storefront right	6	23 (S)	56 (S)	23 (S)	36 (S)	26 (S)	31 (S)	58 (-)	26 (S)
Canteen storefront left	6	23 (S)	0 (R)	32 (S)	34 (S)	30 (S)	31 (S)	0 (R)	17 (I)
Hospital parking keyboard 1	11	23 (S)	50 (S)	25 (S)	34 (S)	28 (S)	30 (S)	44 (-)	20 (S)
Hospital parking keyboard 2	11	22 (S)	42 (S)	24 (S)	32 (S)	28 (S)	34 (S)	30 (-)	0 (R)
STIKES parking mouse	7	15 (S)	32 (S)	30 (S)	26 (S)	22 (S)	23 (S)	0 (R)	0 (R)
Parking cross button	5	18 (S)	47 (S)	26 (S)	23 (S)	23 (S)	20 (S)	28 (S)	0 (R)

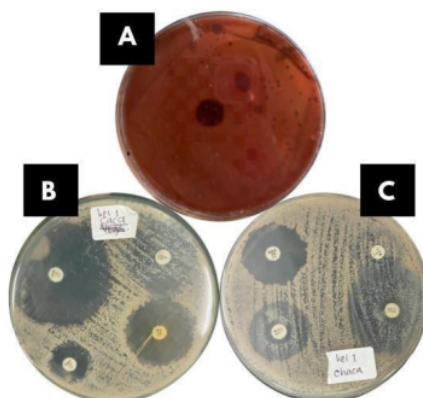


Figure 1 Ladies Toilet 1

The results of the identification of nosocomial bacteria in the Hospital area and the Mitra Keluarga STIKes area, namely Enterobacteriaceae. On BA media, from all samples there were colonies of bacteria capable of hemolyzing blood with the diameters in the table above. In the antibiotic test, of the 14 samples there was 1 sample that was resistant to ampicillin antibiotics, 2 samples were resistant to imipenem, 1 sample was resistant to chloramphenicol, 1 sample was resistant to amoxycillin clavulanic acid, 2 samples were resistant to gentamicin, 2 samples which were resistant to tetracycline, 2 samples were resistant to rifampicin and 5 samples were resistant to cefixime. The female toilet sample 1 can hemolyze BA media with a diameter of 10 mm as shown in Figure 1. In addition, this sample is resistant to 4 antibiotics.

DISCUSSION

From the results of the study on 14 samples obtained 3 samples that have resistance to antibiotics. In this study, Blood agar media and Nutrient agar media were used for bacterial growth. In the Blood agar media, 3 different samples were used by swab using a *cotton bud* on the surface of the closet, cell phone, and computer mouse. After cultured in the Blood agar media, bacteria was able to hemolyze the Blood agar media so that it was marked by the presence of a clear zone area adjacent to the growth of bacteria. Blood agar media is a differential medium used to determine which bacteria are capable of catabolizing red blood cells or known as the hemolysis process. There are 3 ways for bacteria to hemolyze Blood agar media. If bacteria can destroy red blood cells and there are areas that appear greenish near the area of bacterial growth then it is called α -hemolysis. However, if bacterial enzymes can destroy all red blood cells and there is a clear zone in the adjacent area of bacterial growth it is called β -hemolysis. Whereas γ -hemolysis occurs if there is no bacterial enzyme that can damage red blood cells, then the area adjacent to bacterial growth will remain red. In the Nutrient agar media, 3 different samples were used by swab using a *cotton bud* on the surface of the closet, cell phone, and computer mouse. In this study, cotton bud was dipped into NaCl 0.8% for moistening the cotton bud. After cultured on Blood agar media, the bacteria were tested on Nutrient agar media to test for antibiotic resistance against bacteria. Media Nutrient agar is a standard medium for the growth of various types of bacteria. This media is also a complex medium that has a high nutritional content such as meat extract, yeast extract, and protein. Some bacteria that can grow well on Nutrient agar media such as *Escherichia coli*, *Staphylococcus aureus*, *Staphylococcus epidermidis* (Safitri et al, 2010).

All of samples contained hemolytic bacteria. One representative hemolytic bacteria from all samples were tested for antibiotic susceptibility. In this study used 8 types of antibiotics that can be used to fight bacteria isolated from various places, the results of the 14 isolated samples there were 3 samples that showed resistance to antibiotics. The first resistant sample was obtained from a cell phone at a security officer of STIKes Mitra Keluarga which showed bacteria resistant to the antibiotic *Gentamicin* with a clear zone diameter of 10mm, *Tetracycline* 10mm, and *Cefixime* which did not show any clear zones. This is consistent with previous study which states that cell phones have antibiotic-resistant because cell phones are usually stored in bags or even placed in contaminated places. This study is in line with Debnath's study which states that the batteries from cell phone samples are usually resistant to *Tetracycline* and *Chloramphenicol* antibiotics. are usually resistant to *Tetracycline* There are 5 types of bacteria that *S. aureus*, *S. epidermis*, *Pseudomonas aureginosa*, *E. coli*, and *Salmonella typhi*. Meanwhile, bacteria that are resistant to *Chloramphenicol* are *S. aureus*, *E. coli*, and *Salmonella typhi* (Debnath, Bhowik, Islam, & Chowhury, 2019). The second resistant sample was obtained from the results of the female toilet swab number 1 which is a sanitation facility for defecation and urination. The toilet is also a very risky place for transmitting a disease, such as through faecal-oral and others, because the toilet can be used by many people. Enteropathogens or pathogens that can be found on human skin, such as *Staphylococcus aureus*, can be very easily transmitted between individuals by touching public restrooms (Maryanti & Amir, 2019). The results showed that the swab sample in the female toilet no. 1 was resistant to *Ampicillin* with no clear zone forming, *Imipenem* with a clear zone diameter of 17mm, *Gentamicin* with a clear zone diameter of 12mm, and *Tetracycline* with a clear zone of 8mm. One of the studies conducted in Nigeria by isolating bacteria from the toilet surface found the results of *Staphylococcus*, *E. coli*, *Bacillus*, and *Klebsiella* but in this study no resistance test was carried out (Sampson, Esheyigba, & Baridam, 2019).

The results of the third resistant sample were obtained from a computer device, namely in the form of a security guard mouse. The computer is a tool that is very much needed because of its many uses in helping work and being a tool that is needed in services such as processing and storing data. In caring for the computer, the thing that must be considered is cleanliness. One of them is the cleanliness of the mouse which is very rarely done, the mouse sometimes looks very clean due to the contact between the hands and the surface of the mouse so that it looks clean and does not need periodic cleaning. In the study, bacteria were resistant to *Rifampicin* and *Cefixime* with no clear zone formation. The bacteria that usually contaminate computer devices such as keyboards and mice are *Enterobacter sp.*, *Staphylococcus epidermis*, *Staphylococcus aureus*, *Escheria coli*, and *Pseudomonas sp.* According to study conducted by Olu-Taiwo in 2021 stated that all these bacteria were resistant to antibiotics but *Enterobacter sp.* have a low level of resistance (Olu-Taiwo, Laryea, Kweku Mykels, & Forson, 2021)

CONCLUSION

The results of this study indicate that from the 14 samples used, there are 3 samples that have a level of resistance to antibiotics, including the female toilet sample 1, the security officer's cellphone, and the parking attendant's mouse. The results of the study of resistance to antibiotics were mostly found in the female toilet sample 1 because it was resistant to 4 antibiotics.

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