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Staphylococcus Aureus Bacteria Identification and Sensitivity Test to Amoxicillin Antibiotics On Nurses' Hands in Mangusada Hospital

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ABSTRACT

Background*: HAIs (Healthcare-Associated Infections), also called nosocomial infections, occur in connection with health services in hospitals. Nosocomial infections can be transmitted or acquired through health workers, sick people, visitors with career status, or because of hospital conditions. One of the treatments for nosocomial infections is the administration of antibiotics. Treatment for uncomplicated nosocomial infections is penicillin; antibiotics belonging to the penicillin group are Amoxicillin. This research aims to identify and determine the sensitivity of Staphylococcus aureus bacteria to amoxicillin antibiotics isolated from a nurse's hand swab sample in the janger room of Mangusada Badung Hospital.* ***Methods****:This study used a descriptive method and used 20 samples with a purposive sampling technique. Hand swabs were isolated on MSA media and then identified by gram staining, catalase, and coagulase tests.* ***Results****: The identification results showed that 10 (55.56%) of 20 samples were Staphylococcus aureus bacteria with the characteristics of coccus, gram-positive, catalase test, and coagulation test positive. This study concluded that the sensitivity test showed that all isolates of Staphylococcus aureus isolates were resistant to Amoxicillin. Results based on this study show that Amoxicillin is not practical in inhibiting the growth of Staphylococcus aureus and is not an appropriate choice for treating nosocomial infections.*

Keywords *: Staphylococcus aureus, Sensitivity, Amoxicillin*

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INTRODUCTION

Infections in hospitals are also called nosocomial infections (Hospital Acquired Infections). Currently, the term has been changed to Healthcare-Associated Infections (HAIs) with a broader understanding, namely, the incidence of infection does not only originate from hospitals but is also found in other healthcare facilities (Kemenkes RI, 2017). Nurses have a vital role in nosocomial infection control because nurses are the officers who have the most prolonged contact with patients, even up to 24 hours. Nurses can also play a significant role in reducing the incidence of nosocomial infections(Nursalam, 2011). The percentage of nosocomial infections in the world's hospitals reached 9% (variation of 3-21%), or more than

1.4 million hospitalized patients worldwide found nosocomial infections. A study by the World Health Organization Click or tap here to enter text. explained that about 8.7% of 55 hospitals from 14 countries in Europe, the Middle East, Southeast Asia, and the Pacific described nosocomial infections, and for Southeast Asia, as much as 10.0% (Organisation,

2017). The types of microorganisms that often have the potential for nosocomial infections when direct or indirect contact occurs are Staphylococcus aureus, E. coli, and Bacillus sp3. In research (Hayati et al., 2012), the cause of nosocomial infections in the RSUDZA Banda Aceh surgical ward was Staphylococcus aureus, as much as 70% (Hayati et al., 2012). The most common transmission source that can cause nosocomial infections is room mobiles, then continue with patients and health workers. One of the treatments for nosocomial infections is antibiotic therapy. Antibiotics are natural antimicrobial agents produced by microorganisms (Leboffe & Pierce, 2013). Antibiotic sensitivity testing will help doctors to choose the right antibiotic for treating infections (Soleha, 2015). The Kirby-Bauer method can test bacterial sensitivity to antibiotics by using disc diffusion, and bacterial results are read based on the Clinical Laboratory Standard Institute (CLSI). Based on the background description above and considering the increasing incidence of nosocomial infections, it is necessary to identify and test the sensitivity of Staphylococcus aureus bacteria to amoxicillin antibiotics. This study was conducted on nurses in the Janger room of Mangusada Badung Hospital who were at high risk of being infected with Staphylococcus aureus bacteria and transmitting it to others.

METHOD

This quantitative study uses a descriptive design using purposive sampling technique (Adiputra et al., 2021) with 41 populations. This study was used to determine the identification and sensitivity test of Staphylococcus aureus bacteria to amoxicillin antibiotics on nurse hand swabs based on the characteristics of age, education level, length of work, and patients handled per day in the janger room of Mangusada Badung Hospital. The inclusion criteria in this study were nurses before or after performing nursing care. The data that has been collected is processed with descriptive processing techniques, namely describing each research variable in the form of frequency distribution and percentage.

RESULTS

1. Inoculation results on Mannitol Salt Agar (MSA) media

Based on the research that has been done, the results of inoculation on the media are presented in Table 1.

Tabel 1
Inoculation Results of Hand Wipe Samples of Nurses In Room Janger Mangusada Hospital on MSA Media

No	Growth	Total	Percentage (%)
1	There is growth	18	90%
2	No growth	2	10%
	Total	20	100%

Based on Table 1, 18 (90%) colonies grew on Mannitol Salt Agar (MSA) selective media. Colonies that grow on this media are then continued with identification using gram painting, catalase test, and coagulase test.

2. Results of gram painting

Based on the results of the research that has been done, the results of gram painting are presented in Table 2.

Tabel 2
Gram Staining Results of Hand Wipe Samples of Nurses In Room Janger Mangusada Hospital

Charakteristics				
Gram	Shape	∑	%	Interpretation
Positif (+)	*coccus*	18	100%	Suspected *Staphylococcus aureus*

Based on Table 2, the results obtained, gram painting performed on gram-positive as many as 18 samples (100%) were identified as gram-positive bacteria in the form of coccus. Colonies of suspected isolates will continue with the catalase test and coagulase test.

3. Catalase test results

Based on the results of the research that has been done, the results of the catalase test are presented in table 3.

Tabel 3
Catalase Test Results of Hand Wipe Samples of Nurses In Room Janger Mangusada Hospital

No	Catalase Test	Total	Persentage (%)
1	Katalase positif (+)	14	77,78%
2	Katalase negatif (-)	4	22,22%
	Total	18	100%

4. Coagulase test results

Based on the results of the research that has been done, the results of the coagulase test are presented in Table 4.

Tabel 4
Coagulase Test Results of Hand Wipe Samples of Nurses In Room Janger Mangusada Hospital

No	Coagulase Test	Total	Persentage (%)
1	Coagulase positif (+)	10	71,43%
2	Coagulase negatif (-)	4	28,57%
	Total	14	100%

Table 4 shows that the coagulase-negative test was four samples (28.57%), and the coagulase-positive test was ten samples (71.43%). Based on this data, most nurses in the Janger room of Mangusada Badung Hospital tested positive for coagulase.

5. Sensitivity Test Results

The results of measuring the inhibition zone of 10 isolates identified as Staphylococcus aureus bacteria against amoxicillin antibiotics are presented in Table 5.

Tabel 5
Sensitivity Test Results of Staphylococcus

aureus Bacterial Isolates Against Amoxicillin Antibiotics

No	Classification	Total	Persentage (%)
	Sensitive	0	0
	Resistant	10	100%
	Total	10	100%

Based on Table 5, from 10 isolates of Staphylococcus aureus bacteria tested for sensitivity to amoxicillin antibiotics, all isolates experienced increased resistance characterized by a smaller inhibition zone size than the Clinical Laboratory Standard Institute standard of ≤ 19 mm.

6. Isolation and Identification Results of Staphylococcus aureus Bacteria Based on Characteristics of Research Subjects

The characteristics presented in Table 6 were obtained based on the interview results.

Tabel 3
Characteristics of Nurses in the Janger Room of Mangusada Hospital

No	Characteristics	Positif	Negatif	Total (%)
		Total (%)	Total (%)	
1	Age			
	17 - 25	1 (10%)	1 (10%)	2 (10%)
	26 - 35	2 (20%)	3 (30%)	5 (25%)
	36 - 45	5 (50%)	5 (50%)	10 (50%)
	46 - 55	2 (20%)	1 (10%)	3 (15%)
	Total	10 (100%)	10 (100%)	20 (100%)
2	Educatian level			
	DIII Nursing	5 (50%)	7 (40%)	12 (60%)
	Ners	5 (50%)	3 (30%)	8 (40%)
	Total	10 (100%)	10 (100%)	20 (100%)
3	Length of service			
	1 - 5	0	2 (20%)	2 (10%)
	6 - 11	9 (90%)	6 (60%)	15 (75%)
	>12	1 (10%)	2 (20%)	3 (15%)
	Total	10 (100%)	10 (100%)	20 (100%)
4	Patients treated per day			
	2 - 4	1 (10%)	2 (20%)	3 (15%)
	5 - 15	4 (40%)	7 (70%)	11 (55%)
	16 - 25	1 (10%)	1 (10%)	2 (10%)
	> 25	4 (40%)	0	4 (20%)
	Total	10 (100%)	10 (100%)	20 (100%)

Based on Table 6, the results show that the age group with positive results of Staphylococcus aureus bacteria is 36-45 years (50%), the group with the last education level is DIII Nursing 5 people (50%), the group with length of work is 6-11 years (90%), and patients handled per day are 5-15 people (40%).

DISCUSSION

1. Isolation and Identification of Staphylococcus aureus Bacteria

Colony growth of isolates on Mannitol Salt Agar (MSA) media was obtained in 18 (90%) of 20 hand swab samples that experienced colony growth on MSA media. Washing hands with soap, according to the WHO method will reduce the number of microbes on the skin of the hands(Organisation, 2017). The difference in the number of colonies in each respondent's hand swab sample after washing hands can be due to the duration of hand washing. The longer someone washes their hands, the fewer colonies there are on their hands (Rsud et al., 2020).

The results of gram painting obtained various types of bacterial morphology, namely 18 bacteria (100%). The result is in line with research conducted by (Hayati et al., 2012). that gram-positive bacteria are the dominant bacteria as contamination in health workers; this is shown in several studies that have found that gram-positive bacteria are more dominant as contaminants (Hayati et al., 2012).

The catalase test showed that as many as 14 samples (77.78%) showed positive catalase results. If there is catalase, it will form bubbles of free oxygen gas (O2↑). The bubbles indicate a positive catalase test. The catalase test results are negative if there is no visible gas bubble formation because Staphylococcus aureus can produce catalase enzyme10. Based on the negative catalase test results this is in line with research conducted by (Gifari et al., 2022) that the isolates obtained have non-catalase characteristics or give negative results in catalase testing (Gifari et al., 2022).

The coagulase test results obtained as many as ten samples (71.43%) of 14 isolates that produced a positive coagulase reaction and were suspected of being Staphylococcus aureus bacteria, which is a protein that resembles an enzyme which, when added with oxalate or citrate can coagulate plasma. While Staphylococcus epidermidis, Staphylococcus albus, Staphylococcus intermedius, and other Staphylococcus species give negative coagulase test results, this is under research from (Fajardo et al., 2016).

Based on the results of this study, the Staphylococcus aureus bacteria in the hands of nurses is very high, namely 55.56%. This aligns with research (Malau & Simanjuntak, 2019), that contaminants come from the environment, visitors, nurses, and equipment, which are less sterile(Rsud et al., 2020). Supported by research (Murdiana, 2021), they can take preventive measures for pathogenic bacterial contaminants on the hands of nurses, such as maintaining hand hygiene by washing hands before or after performing nursing care and after contact with tools used on patients (Juliana et al., 2023).

2. Sensitivity of Staphylococcus aureus Bacteria to Amoxicillin Antibiotics

The sensitivity test results in Table 5 show that as many as 10 (100%) positive isolates of Staphylococcus aureus bacteria are resistant to amoxicillin antibiotics. The result is in line with research conducted by (Rambiko, Fatmawali, 2016) that the antibiotic with the highest sensitivity to Staphylococcus aureus bacteria is amoxicillin, which has the highest resistance rate of 100% (Rambiko, Fatmawali, 2016). This is under the literature, which states that amoxicillin antibiotics in vitro are active against most gram-positive strains that produce

penicillinase, including Staphylococcus aureus (Murdiana, 2021).

This study can identify and determine the sensitivity of Staphylococcus aureus bacteria to amoxicillin with the result of 100% resistance, namely the ability of bacteria to resist, fight, and be immune to amoxicillin antibiotics, which were initially effective for the treatment of infections caused by Staphylococcus aureus bacteria (Rista et al., 2022). Based on this study's results, amoxicillin is ineffective in inhibiting bacterial growth, and it may not be an appropriate choice for treating pathogenic bacterial infections.

3. Identification of Staphylococcus aureus bacteria results based on nurse characteristics in the Janger Room, Mangusada Hospital.

The age group is 36-45 years (50%). In old age, people are more likely to get infections because, in old age, people are more susceptible to all types of diseases due to decreased endurance and reduced function of some five senses (Fridalni & Rahmayanti, 2020).

The group with the last level of education DIII Nursing, as much as 50%. Based on research conducted by (Rsud et al., 2020), the application of occupational safety and health to reduce the risk of nosocomial infections can be seen based on the level of education and experience possessed by nurses.

The group's length of work is 6-11 years (90%). The result is in line with research conducted by (Azwar, 2008) that the longer the person works, the longer and greater their risk of exposure to various diseases caused by their work (Hayati et al., 2012).

The group of patients handled per day by nurses is 5-15 people (40%). The length of time patients are treated has the opportunity to cause nosocomial surgical wound infections. The longer the treatment, the greater the chance of nosocomial surgical wound infection. Some literature states that too long in the hospital forces patients to be associated with hospital personnel with a risk of nosocomial infections (Fridalni & Rahmayanti, 2020).

CONCLUSIONS

The identification test on nurse hand swab samples in the Janger room of Mangusada Hospital, there were ten samples (55.56%) identified as Staphylococcus aureus bacteria. The sensitivity test results of Staphylococcus aureus bacteria isolated from hand swab samples of nurses in the janger room of Mangusada Hospital against amoxicillin antibiotics showed 100% resistant results. Based on the characteristics of nurses in the janger room of Mangusada Hospital, it was found that the age group of 36-45 years (50%), DIII Nursing education level (50%), length of work as a nurse 6-11 years (90%), patients handled per day 5-15 patients (40%) were groups at high risk of infection with Staphylococcus aureus bacteria.

Conflict of Interest

During the research, there is no conflict of interest related to this research and publication.

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