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Do Methicillin Resistant *Staphylococcus* (MRSA) Carrier Patients Influence MRSA Infection more than MRSA-carrier Medical Officers and MRSA-carrier Family?

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ABSTRAK

Tujuan: untuk mengetahui tingkat carrier infeksi MRSA di antara pasien, anggota keluarga dan petugas kesehatan, serta hubungan antara infeksi MRSA pada pasien carrier dengan petugas kesehatan carrier dan anggota keluarga carrier pada pasien infeksi MRSA setelah operasi ortopedi. **Metode:** studi potong lintang dilaksanakan pada bulan Desember 2010 hingga Desember 2011. Pengambilan sampel secara konsekutif dilakukan pada semua pasien pascaoperasi yang mengalami infeksi MRSA, serta pada keluarga dan pelayan kesehatan yang memiliki riwayat kontak dengan pasien. Terhadap subjek penelitian dilakukan pemeriksaan kultur kuman dari usap hidung dan ketiak. Data insiden infeksi MRSA, pembawa kuman pada pasien, keluarga, dan pelayan kesehatan dipaparkan secara deskriptif sedangkan asosiasinya dengan infeksi MRSA pascaoperasi diuji dengan uji Fischer. **Hasil:** selama penelitian, terdapat 759 operasi orthopedic dengan 4 (0,5%) kasus infeksi MRSA pascaoperasi. Dari empat kasus tersebut diperoleh 48 subjek penelitian. Angka pembawa pada pasien ditemukan sebesar 50%, pada keluarga sebesar 25% dan pada pelayan kesehatan sebesar 0%. Tidak terdapat hubungan bermakna antara angka pembawa pada keluarga dan pelayan kesehatan dengan angka infeksi MRSA pascaoperasi. **Kesimpulan:** insiden infeksi MRSA, pembawa pada pasien, keluarga dan pelayan kesehatan berturut-turut sebesar 0,5%, 50%, 25%, dan 0%. Tidak terdapat hubungan yang bermakna antara status pembawa pada keluarga dan pada pelayan kesehatan dengan infeksi MRSA pascaoperasi dan tidak ditemukan infeksi MRSA pada pelayan kesehatan.

Kata kunci: methicillin-resistant *Staphylococcus aureus*, pembawa pada pasien, pembawa pada keluarga, pembawa pada pelayan kesehatan.

ABSTRACT

Aim: to determine the rate of MRSA-carrier among patients, family members and health care providers, and the association between MRSA-carrier family members and health care providers on MRSA infection patient after orthopaedic surgery. **Methods:** this is a cross-sectional analytical study. Samples were taken consecutively during December 2010 to December 2011, consisting of postoperative patients infected with MRSA, attending family members, and the medical officers with history of contact with the patient. Swab culture were taken from nasal and axilla of all subjects. The incidence of MRSA infection, and MRSA-carrier on the patient, family members and medical officers were presented descriptively, while their association with MRSA infection was statistically tested using Fischer exact test. **Results:** during the study period, there were 759 surgeries, with 4 (0.5%) patients were identified to have MRSA infection. Of these four cases, 48 subjects were enrolled. The rate of MRSA-carrier among patients, family and health care providers were 50%, 25% and 0% respectively. There

were no significant association between MRSA and the rates of MRSA-carrier on the family member or health care providers. **Conclusion:** the incidence of MRSA infection, MRSA-carrier patient, MRSA-carrier health care providers, and family member carrier were 0.5%, 50%, 0%, and 25% respectively. No significant association found between MRSA-carrier on the family member or health care providers and MRSA infection patient. There were no MRSA infection found on the health care provider.

Key words: methicillin-resistant *Staphylococcus aureus* infection, MRSA-carrier patient, MRSA-carrier family member, MRSA-carrier medical officer.

INTRODUCTION

Along with the increasing frequency of surgery, perioperative infection has been one of the most important problems needed to be resolved.¹ Post-operative infection will increase morbidity and mortality rates, hospitalization stay and medical cost. Hence, the use of prophylactic antibiotic is a must before surgery, was carried out especially in orthopaedic surgery.¹

Not all infection can be easily prevented by using common antibiotics. Methicillin-resistant *Staphylococcus aureus* (MRSA) infection is one of the major threats in orthopaedic and traumatology practice due to its high resistance and rare types of antibiotic that could eradicate the bacteria. The transmission of MRSA may occur by direct contact with MRSA-carrier: either of the patient themselves, family members, contaminated equipment or health care providers.² One study revealed that the occurrence of MRSA infection was significantly higher in MRSA-carrier patients.³ Adding to the complexity, one meta-analysis reported that 11 of 191 MRSA outbreak occurred due to MRSA-carrier state in the health care providers.⁴ This finding gives us some challenges, since it is the health care providers who will have a routine contact with the patients. Other study found that MRSA-carrier family members also play a role in increasing risk of MRSA infection of the patient.⁵

In Orthopaedic and Traumatology Department of Cipto Mangunkusumo Hospital, the incidence of MRSA infection during 2009 was as high as 61 cases and is increasing every year. However, the incidence of MRSA-carrier among patients, family members, and health care providers in the Orthopaedic and Traumatology Department has not yet been established. The risk of the patients from developing MRSA infection

is also unknown.

The aim of this research is to determine the rate of MRSA-carrier among patients, family members and health care providers, and the association between MRSA-carrier family members and health care providers with MRSA infection on the patient after orthopaedic surgery. The goal criteria of this study are the availability of data regarding the rate of MRSA-carrier among patients, family members, and health care providers, and the data regarding the association between MRSA-carrier patient status with health care providers' MRSA-carrier status and family member MRSA-carrier status with MRSA infection on the patient after an orthopaedic surgery. We hypothesized that there is an association between the status of MRSA-carrier on the patient, health care providers and/or family members with MRSA infection on the patient after an orthopaedic surgery.

METHODS

The design of this study is a cross-sectional analytical study. Forty-eight samples were taken consecutively from all admitted patients, health care providers, and attending family members in the Orthopaedic and Traumatology Department Cipto Mangunkusumo Hospital during December 2010 to December 2011. All admitted patients who had undergone orthopaedic surgery will be screened for MRSA in the wound culture. After the surgery, wound culture was also performed on patients with signs of infection. Nasal and axilla swab were performed on all MRSA patients, family members, and health care providers who fulfilled the research criteria. Those who were positive for MRSA infection were included in the study.

We also include those who have a close

contact with these patients, which includes their family member who physically contacted the patient during the last week before the patient's hospital admission, and also all health care providers (doctor and nurse) who had direct contact with the patients. The exclusion criteria for health care providers and family members were active or history of MRSA infection and/or in ongoing treatment of MRSA infection. Patients, health care providers, or family member who refused to participate in the study were also excluded. Written informed consent was obtained at the beginning of the study. This study was approved by Ethics Committee of Faculty of Medicine, Universitas Indonesia.

RESULTS

During the study period, there were 759 surgeries in our department. As much as 393 (51.8%) surgeries were elective surgeries while the remaining 366 (48.2%) were emergent surgeries. Of the 759 surgeries, 4 (0.5%) patients were identified to have MRSA infection.

From the 4 patients, we also enrolled 48 subjects consisted of 34 doctors (70.8%), 6 nurses (12.5%), and 4 family member (8.3%). Most of the subjects were male (79.2%) and women (20.8%).

The incidence of the MRSA carriers among patients, medical officers, and family members were shown in **Table 1**.

Association of MRSA Carrier on medical officers and MRSA Patients. Nasal swab and axillary swab examination from health care providers showed no positive result. Negative result of healthcare providers was obtained from patients with either a positive or negative carrier of MRSA. Fisher test produces $p > 0.99$.

Association of MRSA-Carrier on Family members and MRSA Patients. The examination for MRSA-carrier status of family members

revealed 1 sample, who were the family member of a patient with positive MRSA-carrier. No association was found between family member carriers and MRSA-carrier patient (Fisher test, $p=0.25$).

DISCUSSION

We evaluated the incidence of MRSA infection in Orthopaedic and Traumatology Department, Cipto Mangunkusumo Hospital and it found to be as high as 0.5%. The incidence of MRSA in other center ranged from 0.6.

Rohr⁶ states that the proportion of positive *Staphylococcus aureus* was higher in nasal swabs of 54% and the proportion of axillary was 28%, with sensitivity of 76% when only the nasal swab alone and sensitivity of 96% when combined. We also found high incidence of MRSA-carrier in our study (50%). It is in accordance to the finding of Hassan⁷ and Bert⁸ who reported that MRSA-carrier patient incidence to be as high as 25 to 50% and 57.2% respectively. The high incidence of MRSA-carrier suggests that MRSA-carrier status on the patients contribute to the increased risk of MRSA infection. This is also in accordance with the finding of Bert et al⁸ who found only 10% of patients with non-carrier acquired MRSA infection.

The highest incidence of MRSA-carrier in medical officers was reported in the research of Vinodhkumaraditya⁹ and Johnston¹⁰ (2%) while lowest was reported by Suffoletto¹¹ (0.7%). Negative result of MRSA-carrier on health care providers in our study perhaps caused by the use of self-protection equipment such as masks, protective clothing, head gear and gloves. Medical officers in our center also regularly wash their hands before and after contact with patients to reduce the risk of infection transmission.

Family members can often serve as the source of infection. Chamber⁵ said the family's carrier numbers ranged from 25% to 50%. We found similar result to the result of Chamber.

Swarkopf¹² listed MRSA-carrier status on medical officers as the risk of MRSA infection in the patient, however we could not confirm the finding since none of medical officers in our study was a carrier.

We also did not found any association between

Table 1. Incidence of MRSA carrier

Subjects	Number of subjects evaluated	Number of MRSA carriers
Patients	4	2 (50%)
Medical officers		
- Doctors	34	0 (0%)
- Nurses	6	0 (0%)
- Family member	4	1 (25%)

MRSA-carrier status on family members and MRSA infection on the patient. However, it should be noticed that the proportion positive family carrier numbers was greater in patients with MRSA carrier. Schoendstat¹³ stated that family carrier increased the risk of MRSA infection.

Despite the results, our study involved only small number of subjects. We also did not evaluate environmental factors as the source of infection and assumed that the asepsis and antisepsis procedure were done properly. Moreover, patients with non-MRSA postoperative infection was not evaluated. Therefore, the correlation of carrier numbers with the number of infections could not be determined.

CONCLUSION

We found that the incidence of MRSA infection, MRSA-carrier in patients, health care providers, and attending family members were 0.5%, 50%, 0%, and 25% respectively. There was no significant association between MRSA-carrier status on health care providers and attending family member of patients with MRSA infection. Although only 4 cases found with positive MRSA infection, there were no carrier found on the health care provider. We recommended the application of Mupirocin 2% ointment for the carrier to prevent the occurrence of MRSA infection. Further study should involve a larger number of MRSA cases and directed to evaluate association of environmental factors as a risk of MRSA infection.

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