KNOWLEDGE, PERCEPTIONS AND PRACTICES OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS TRANSMISSION PREVENTION AMONG NURSES

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ABSTRACT

Objective: *To assess the level of knowledge, perceptions and practices of Methicillin resistant Staphylococcus aureus (MRSA) transmission prevention among nurses.*

Material and Method: *This was a cross sectional study carried out in four months (February to June 2014) to gain an overview on the knowledge and perceptions on MRSA transmission prevention and its practices among nurses in critical care and non-critical care units. Self-administered questionnaire was used to collect the data from 255 nurses.*

Results: *Out of 255 respondents, 222 respondents were female, while 33 respondents were male with different education levels, age groups and years of service. The respondents were working in different units, which were non-critical care (78.4%) and critical care units (21.6%). Nearly 67.1% of respondents had a high level of knowledge and only 2.4% of respondents had a low level of knowledge on MRSA transmission. About 80% of respondents had a high level of perception and 19.2% had moderate perception about MRSA transmission prevention. Most of the respondents (94.5%) said that they carried out a good practice for MRSA transmission prevention and only 5.5% had moderate level of practice of MRSA transmission prevention among nurses in this study.*

Conclusion: *A continuous and effective education should be provided for all nurses to enhance their knowledge and positive perception on the severity of and susceptibility to MRSA, and to improve their adherence to the practices of MRSA transmission prevention.*

Keywords*: Critical care, nurses, methicillin-resistant staphylococcus aureus.* **Nobel Med 2017; 13(3): 57-65**

HEMŞİRELERDE METİSİLİNE DİRENÇLİ STAPHYLOCOCCUS AUREUS BULAŞMASININ ÖNLENMESİ HAKKINDAKİ BİLGİ, ALGI VE UYGULAMALAR

ÖZET

Amaç: Bu çalışmanın amacı hemşirelerde metisiline dirençli Staphylococcus aureus bulaşmasının önlenmesi hakkındaki bilgi, algı ve uygulamaların seviyesini değerlendirmektir.

Materyal ve Metot: Bu çalışma yoğun bakım ve yoğun bakım harici birimlerdeki hemşirelerde Metisiline Dirençli Staphylococcus aureus (MDSA) bulaşmasının önlenmesi hakkındaki bilgi, algı ve uygulamalar hakkında genel görüş elde etmek için 4 aylık (Şubat-Haziran 2014) yapılmış kesitsel bir çalışmadır. Araştırmaya 255 hemşire katılmıştır. Araştırmaya katılan farklı eğitim düzeylerinde, farklı yaş ve tecrübeye sahip 255 hemşirenin 222'si kadın, 33'ü erkektir. Katılımcıların %78,4'ü yoğun bakım harici, %21,6'sı yoğun bakım birimlerinde çalışıyordu. Katılımcıların yaklaşık % 67,1'i MDSA bulaşma hakkında yüksek seviyede bilgiye sahipken, %2,4'ü düşük seviyede bilgiye sahipti. Katılımcıların yaklaşık % 80'i MDSA bulaşmasının önlenmesi hakkında yüksek seviyede algıya sahipken, %19,2'si düşük seviyede algıya sahipti. Katılımcıların çoğu % 94,5'i MDSA bulaşmasının önlenmesinde iyi seviyede uygulamalar yaptıklarını, %5,5'i ise orta seviyede uygulama yaptıklarını söyledi.

Sonuç: Tüm hemşirelerde, MDSA'nın ciddiyeti ve hassasiyeti konusunda pozitif algıyı ve MDSA bulaşmasının önlenmesindeki uygulamalara bağlılığı ve bilgilerini artırmak için sürekli ve etkili eğitim sağlanmalıdır.

Anahtar kelimeler: Yoğun bakım, hemşireler, metisiline dirençli Staphylococcus aureus. **Nobel Med 2017; 13(3): 57-65**

INTRODUCTION

Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi.[1] The earliest organism that showed a resistance against penicillin was Staphylococcus aureus, and this highly resistant bacterium contributes to high percentage of hospital-acquired infections.[1,2] High replication rate, coupled with their powerful ability to perform horizontal gene transfer (especially through conjugation) allows these bacteria to develop penicillin resistance and to spread quickly. In healthcare organizations, Methicillin resistant staphylococcus (MRSA) has been reported to be easily transmitted and is risky for those with compromised immune systems and chronic illnesses.

In view of the devastating effect of MRSA infection, controlling MRSA spread or transmission in hospital settings is very crucial. Many efforts have been made by healthcare centres, such as usage of antibiotics policy and, using antiseptic or disinfectant hand solution. However, the introduction of alcohol hand rub for improved hand hygiene proved to be more effective in reducing the spread of MRSA.[3] But sustaining the success of controlling MRSA in health care setting by the cooperation from all health care workers have proven more challenging. To sustain any successful effort in tackling this challenge. This requires a strong understanding as well as knowledge regarding MRSA infection and the importance of hand hygiene among health care workers (HCW).

Health care workers (HCW) are known to be in the topmost position in antimicrobial resistance phenomenon (AMR). They may act as reservoirs as well as the vectors for MRSA transmission.[4] Therefore, with poor infection control practice among HCW, the transmission of MRSA from HCW to patients can easily occur via skin, clothing and equipment contamination, as well as coughing and sneezing.[5] Thus, the awareness on their roles and the consequence for non-adherence to MRSA transmission prevention practices such as hand washing or hand hygiene, wearing glove and gown when handling patients are very important to ensure the prevention of MRSA transmission.[5]

According to Easton *et al*. about 80% or more respondents need information and education within their specialties.[6] Trigg *et al*. observed that if the staff do not recognize or are not aware of existing MRSA policy, health care associated infection including MRSA would increase due to insufficient knowledge.[7] To improve the attitude of HCW toward hand hygiene in managing MRSA infection in hospitals, the must understands and have enough knowledge about MRSA infection and its control measures.

Silva *et al*. stated that when the nurses' understanding and perception of MRSA is limited, the measures to enhance the knowledge and precautions are required.8 In addition to knowledge, perceptions and practices, it is also important to explore socio-demographic data. It gives a total overview of the

differences in socio-demographic characteristics such as age, gender, education, discipline and working experience in relation to MRSA knowledge, perceptions and practices. Fadeyi *et al*. stated that those with less experience in critical care unit and less working years are not heard about MRSA.[9]

The prevention of MRSA transmission in a hospital setting requires HCW knowledge on MRSA and its transmission is important, as this will provide motivation to implement MRSA transmission program prevention. In addition, HCW should understand the risk on their own and their patients for acquiring MRSA.

To the best of our knowledge, this is the first study which focuses on MRSA' knowledge, perceptions and practice in a hospital setting in our country. In this study, we aimed to assess the level of knowledge, perceptions and practices of MRSA transmission prevention among nurses.

MATERIAL AND METHOD

Setting

A cross-sectional study was conducted at one university hospital from February to June 2014. The hospital provides a 747-bed service through 2,672 staff members who work in administrative and clinical areas. The data were collected from critical care units such as; Intensive Care Unit (ICU), Coronary Care Unit (CCU), Neonatal Intensive Care Unit (NICU), burn unit and non-critical areas such as medical, surgical, orthopaedic, and oncology.

Sampling and Sampling Criteria

The target population was the registered nurses from various departments, including ICU, CCU, NICU and non-critical care units (medical, surgical, orthopaedic, and oncology). Random sampling was used among nurses.

Sample Size Calculation

Raosoft application software was used to estimate the sample size. Calculations were carried out depending on the following assumptions: acceptable margin error was 5%, confidence interval was 95%, population size obtained was 800 and the response distribution was 50%. 260 nurses were chosen randomly from the list of the registered nurses. Nurses working in the outpatient department, and emergency unit were excluded from the study because both units mostly do not involve direct contact with MRSA cases.

Table 1. Summary of respondents profiles

Respondents Profile	n	%
Gender		
Male	33	12.9
Female	222	87.1
Education Level		
Masters	1	0.4
Bachelors	17	6.6
Diploma	230	90.2
Certificate	3	1.2
Other	4	1.6
Department		
Critical care unit	55	21.6
Non Critical care unit	200	78.4
Age*		
Minimum	20	
Maximum	58	
Mean ± Standard Deviation	31.76 ± 8.37	
Service Years*		
Minimum	1	
Maximum	35	
Mean ± Standard Deviation	8.72 ± 7.40	

*: This is a continuous variable measurement

Survey Instrument

A self-administered questionnaire was used to assess the knowledge, perception and practices on MRSA transmission prevention among nurses. The questionnaire was adapted from a document used in the study by Seibert *et al*.[10] An English language version was used in the study and permission from the main author was obtained.

The questionnaire included demographic data such as age, gender, education, disciplines/department and years of experience. Knowledge was assessed through four multiple-choice questions and two True/False questions with scores ranging from 0 to 6 (one point for each correct answer). The perception on MRSA infection was evaluated using the Likert scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree". Since 12 items were used, the summative value of this number of items ranged from 12 to 60. The highest value of perception ranged from 44 to 60, moderate perception from 28 to 43 and low perception from 12 to 27.

Prevention practice was measured through Yes/No questions. Since the practice of MRSA transmission prevention was measured using six items, the

Table 2. Summary of the descriptive analysis results*

Item	n	%
Which of the following precautions should be taken before contact with MRSA patients/items in their room?		
Hand Cleaning	253	99.6
Gloving	219	86.2
Gowning	207	81.5
All of the above	206	81.1
People who have (or carry) MRSA but do not have symptoms can spread MRSA?		
True	208	81.6
False	19	7.5
Do not know	28	11.0
How is MRSA most often spread to patients?		
Overuse of antibiotics	6	2.4
Through the air	18	7.1
Bedside equipment	21	8.2
Health care worker hands	185	72.5
Do not know	25	9.8
How long can MRSA live outside the body on surfaces?		
Seconds	6	2.4
Minutes	10	3.9
Hours	19	7.5
Days	86	33.7
Do not know	134	52.5
Which hand hygiene method is most effective in killing MRSA?		
Alcohol-based hand rub	89	34.9
Plain soap and water	6	2.4
Antimicrobial soap and water	141	55.3
None of the above	19	7.5
These infections are common in the community now and called Community-acquired MRSA (CA-MRSA)?		
True	147	57.6
False	16	6.3
Do not know	92	36.1

*: These are multiple response questions. The percentage is based on the number of respondents.

summated value of this number of items will be ranged from 0 to 6. The highest value in this variable ranged between 4 to 6, moderate ranging between 2 to 3 and low practice ranging from 0 to 1.

Ethics

Ethical approval was obtained from the Faculty of Health Sciences (Universiti Teknologi Mara (UiTM), 600-FSK[PT.5/2]). Participants were given subject information and consent form including subject name, subject identification card, signature of subject, name of individual (conducting consent discussion), signature of individual (conducting consent discussion), and name and signature of witness.

Data Collection

Questionnaires were given to all participating nurses. Consent was obtained from all participants or the nurses before distributing the questionnaire. Completed survey questionnaires were collected from all participating nurses on the same day.

Data Analysis

Data were analyzed using SPSS version 20. The data were described using frequency and descriptive analysis. Person's correlation was used to evaluate the relationship between socio-demographic variables with the level of knowledge, perception and practice of MRSA transmission prevention among nurses. The knowledge, perception and practices of MRSA transmission prevention among nurses from different department was compared and assessed using independent samples t-test. The Relative Importance Index technique was used to determine the ranking of each item as perceived by the nurses for perception and practice. A p-value of <0.05 was considered as statistically significant.

RESULTS

Respondents Profile

Table 1 shows the detail of the respondents' profile for this study. Most the respondents were female with 222 (87.1%) and 90.2% have diploma degree, followed by Bachelors (6.6%), and four respondents mentioned other education level.

In addition, in terms of the distribution of the departments that they worked in, most the respondents worked in non-critical care unit (78.4%) such as oncology, orthopaedic and so on. The others worked in the critical care unit.

The nurses' ages ranged from 20 to 58 years. The mean age was 31.76 (SD =8.37) years old. Their experience ranged from one year to 35 years, the mean was 8.72 (SD=7.40) years.

Level of Knowledge

Table 2 shows the responses for precautionary measures taken before being in contact with MRSA patients. Most of the respondents (99.6%) agreed that hand cleaning is essential before interacting

with MRSA patients. In addition, hand gloving is the second precautionary practice before contacting with MRSA patients (86.2%), followed by gowning (81.5%). Despite this fact, 81.1% of the participants were performs all precautionary practices (hand cleaning, hand gloving, gowning dresses) before interacting with MRSA patients.

Most the participants (81.6%) agreed with the statement "People who carry MRSA, but do not have symptoms, can spread MRSA?", whereby 7.5% of the respondents disagreed with the statement.

In terms of the ways of how MRSA can spread to patients, the majority indicated that these bacteria most often spread to patients through HCW hand (72.5%), while 21 respondents or 8.2% of respondents stated that these bacteria spread through bedside equipment. However, 9.8% of nurses do not know how MRSA bacteria spread to patients.

On other hand, 86 respondents (33.7%) stated that MRSA bacteria can live for few days on the surface of the body. However, 19 respondents stated that, these bacteria can live for hours on the surface of the body. However, the majority (52.5%) or 134 respondents did not know how long these bacteria can survive outside of the body.

Antimicrobial soap and water were the most effective hand hygiene methods in killing MRSA, and had the highest vote among nurses in this study, which as 55.3% followed by using alcohol-based hand rub had the second highest vote (34.9%). Despite this fact and 7.5% stated that, none of the three-hand hygiene methods mentioned in this study was the most effective hand hygiene method in killing MRSA.

When asked about the spread of these infections to the community, which is called as community-acquired MRSA, the majority (57.6%) knew these phenomena. Despite these cases, 36.1% of them did not know whether this problem have spread to the community.

In terms of distribution level, the table 2 shows the distribution of knowledge levels on MRSA transmission prevention among the nurses in this study. It was found that, six respondents were in the low-level category, whereas 67.1% had high level of MRSA transmission prevention knowledge (Table 5).

Level of Perception

Table below shows the high perception of MRSA transmission prevention among nurses in this study.

Table 3. Distribution of knowledge levels on MRSA transmission prevention among nurses in this study

Knowledge Level	n	%
Low level	6	2.4
Moderate level	78	30.6
High level	171	67.1

The data were analysed using the Relative Importance Index (RII) technique per factor. To rank it, this index was computed using the following equation:

$$RII(\%) = \frac{1 \times (n1) + 2 \times (n2) + 3 \times (n3) + 4 \times (n4) + 5 \times (n5)}{5 \times (n1+n2+n3+n4+n5)} \times 100$$

The n1, n2, n3, n4, and n5 are the number of respondents in each group who selected "1" (strongly disagree), "2" (disagree), "3" (unsure), "4" (agree) and "5" (strongly agree).

The results above indicate that, "If I clean my hands and wear gowns and gloves as recommended, I will decrease my risk of getting MRSA." and "If I clean my hands and wear gowns and gloves as recommended, I will decrease my patients' risk of getting MRSA." Are the most perception of MRSA transmission prevention among the respondents, RII index (RII=85.2%). These were followed by "I am concerned that I will transmit MRSA to my family and/or friends at home." which ranked second in perception of MRSA transmission prevention (RII=82.4%).

In addition, the perceptions of "I am comfortable with educating patients and their families about MRSA." and "MRSA is a problem in this hospital." were ranked third for the most perception of the MRSA transmission prevention among nurses due these two perceptions having an equal RII index value (RII=81.8%).

The perceptions of "When we are short staffed on my unit, MRSA is spread more than when we are fully staffed.", "The news media influenced my attitude toward MRSA.", and "I have received meaningful education regarding MRSA." were ranked at the bottom four based on the nurse's opinion (RII=70.6%, RII=72.7%, and RII=77.1% respectively) (Table 4).

In terms of their level of distribution, it was found that 49 respondents (19.2%) were in the moderate category, whereas 80.8% of the respondents had a good level of MRSA transmission prevention perception.

Table 4. Summary of RII analysis result

Rank	Item	Frequency					RII (%)
		SDA	DA	UN	AG	SAG	
1	If I clean my hands and wear gowns and gloves as recommended, I will decrease my risk of getting MRSA.	0	10	10	139	96	85.2
1	If I clean my hands and wear gowns and gloves as recommended, I will decrease my patients' risk of getting MRSA	1	1	15	152	86	85.2
2	I am concerned that I will transmit MRSA to my family and/or friends at home.	1	8	30	137	79	82.4
3	I am comfortable with educating patients and their families about MRSA	3	2	33	148	69	81.8
3	MRSA is a problem in this hospital.	1	14	15	156	69	81.8
4	When staff on this unit(s) do not clean their hands, I feel comfortable reminding them.	6	5	22	162	60	80.8
5	MRSA is a national problem.	1	12	40	150	52	78.8
6	When staff on this unit(s) do not gown and glove before touching a patient with MRSA, I feel comfortable reminding them.	7	19	18	154	57	78.4
7	I have received meaningful education regarding MRSA.	2	13	35	175	30	77.1
8	The news media influenced my attitude toward MRSA.	6	20	51	162	16	72.7
9	When we are short staffed on my unit, MRSA is spread more than when we are fully staffed.	7	48	45	113	42	70.6
10	Someone I know had MRSA and the experience influenced my attitude towards MRSA	0	16	154	71	14	66.5

SDA: Strongly disagree, **DA:** disagree, **UN:** unsure, **AG:** agree, **SAG:** strongly agree

Level of Practice

Relative Importance Index technique per factor (RII) analysis was performed to investigate the most common practice of MRSA transmission prevention practices among respondents in this study. Since the practices were measured by six items, in which three items were self-practices and three items were staff-members' practices, RII analysis was performed separately. The formula was modified to achieve the objective. This index was computed by using the equation below:

$$RII(\%)=\frac{1 \times (n1)+ 2 \times (n2)}{2 \times (n1+n2)} \times 100$$

Where RII(%) is the percentage of Relative Importance Index of each factor for each group of respondents, and n1 and n2 are the number of respondents in each group who selected "1" (no) and "2" (yes).

Table 6 shows the results of the RII analysis for MRSA transmission prevention practices among nurses in this study. It can be concluded that, the practice "Perform hand hygiene before and after touching patients." was the most frequent practice which nurses perform to prevent MRSA transmission for both self-practices and staff-members' practices. This is because the RII value of both self and staff members' practices were the highest (RII=99.8% and RII=99.6%, respectively). However, the practice "Wear gloves when entering an MRSA isolation room." was the second most practice to prevent MRSA transmission for both categories (RII=96.5% and RII=96.1% respectively). Despite this case, the practice "Wear gowns when entering a MRSA isolation room." was the lowest practice complied by nurses in this study for self-practices (RII=91.0%) and staff-members' practices (RII=89.6%) (Table 6).

In terms of their level of distribution, Table 7 shows the distribution of MRSA transmission prevention practices among the nurses in this study. It was found that, 14 respondents (5.5%) were in the moderate category, whereas 241 respondents (94.5%) had high levels of MRSA transmission prevention practices.

Comparison of the level of knowledge, perceptions and practices on MRSA transmission prevention between nurses in critical care and non-critical care units

The independent t-test found that, a significant difference exists between nurses in the critical care and non-critical care departments t (253)=-2.175, $p<.05$) with a small effect size (effect size=.018), regarding the capacity of MRSA transmission prevention perception. It is also indicated that, nurses in non-critical care department (M=47.36, SD=4.12) have a better perception on MRSA transmission prevention level compared to nurses in the critical care department (M=46.00, SD=4.00).

On other hand, knowledge on MRSA transmission prevention between critical care and non-critical care departments shows that there was no significant difference between the two departments (t(253)=-0.834, p=0.405) with a small effect size (effect size =0.003). This indicates that nurses in the critical care department (M=12.29, SD=3.90) the same level of knowledge on MRSA transmission prevention with nurses in non-critical care department (M=12.72, SD=3.22).

In addition, the same scenario happened for the practices to prevent MRSA transmissions. The independent t-test indicated that there was no significant difference between nurses in the critical care department and non-critical care departments at the level of MRSA transmission prevention practices (t(253)=0.749, p=0.455) with a small effect size (effect size=0.002). The nurses in critical care department (M=5.55, SD=0.79) the same level of practices on MRSA transmission prevention with nurses in non-critical care department (M=5.43, SD=1.12).

In conclusion, the level of knowledge and practice on MRSA transmission prevention was equal for nurses in both critical care and non-critical care departments. However, the level of MRSA transmission prevention perception for nurses in non-critical department was higher compared to nurses in the critical care department.

The relationship between socio-demographic variables (age and service years) and the level of knowledge, perceptions and practices on MRSA transmission prevention

Table 8 shows the results of bivariate correlation between variables of interest in this study. Results show that, the knowledge level of MRSA transmission prevention have significant correlation with the perception on MRSA transmission (r(255)=0.240, p<0.05), practice of MRSA transmission (r(255)=0.252, p<0.05), age of nurses (r(255)=0.229, p<0.05), and services years as nurses (r(255)=0.256, p<0.05).

The direction of the correlation for each significant bivariate correlation was positive with fair strength (Correlation range from 0.229 to 0.256). Therefore, if the level of MRSA transmission prevention knowledge were high, then the perception on MRSA transmission, the practice of MRSA transmission, age of nurses, and service years as nurses in terms of bivariate correlation would be high.

Although, the perception on MRSA transmission level had significant correlation towards the practice of MRSA transmission (r(255)=0.277, p<0.05), age of nurses (r(255)=0.213, p<0.05), and services years as nurses (r(255)=0.260, p<0.05). The direction of the correlation for each significant bivariate correlation was positive with fair strength (Correlation range from 0.213 to 0.277).

Table 5. Distribution of perception levels on MRSA transmission prevention among nurses in this study

Perception Level	n	%
Moderate perception	49	19.2
High perception	206	80.8

Table 6. Summary of RII analysis result

Rank	Item	Frequency No	Frequency Yes	RII (%)
	Self-practices			
1	Perform hand hygiene before and after touching patients.	1	254	99.8
2	Wear gloves when entering a MRSA isolation room.	18	237	96.5
3	Wear gowns when entering a MRSA isolation room.	46	209	91.0
	Staff-members' practices			
1	Perform hand hygiene before and after touching patients.	2	253	99.6
2	Wear gloves when entering a MRSA isolation room.	20	235	96.1
3	Wear gowns when entering a MRSA isolation room.	53	202	89.6

Table 7. Distribution of practice levels of MRSA transmission prevention among nurses in this study

Practice Level	n	%
Moderate practices	14	5.5
High practices	241	94.5

Table 8. Summary of t-test Results

Variable	Group	Mean (SD)	Independent Samples t-test	Effect Size
Knowledge	CC	12.29 (3.90)	-0.834	0.003
	NCC	12.72 (3.22)		
Perception	CC	46.00 (4.00)	-2.175*	0.018
	NCC	47.36 (4.12)		
Practice	CC	5.55 (0.79)	0.749	0.002
	NCC	5.43 (1.12)		

CC: Critical care unit, **NCC:** non-critical care unit, ***:** p <05.

Table 9. Summary of Pearson's correlation results

Variable	Knowledge	Perception	Practice	Age	Years of Service
Knowledge	1.00				
Perception	0.240*	1.00			
Practice	0.252*	0.277*	1.00		
Age	0.229*	0.213*	0.244*	1.00	
Years of Service	0.256*	0.215*	0.260*	0.964**	1.00

:** p<.05, *:** p<.001, **n:** 255.

The results indicate that, if the level of MRSA transmission prevention perception was high, then the practice of MRSA transmission, age of nurses, and service years as nurses in terms of bivariate correlation would likely be high.

The table shows that the practice of MRSA transmission had significant correlation with age of nurses (r(255)=0.244, $p<0.05$) and service years as nurses (r(255)=0.260, $p<0.05$). The direction of the correlation for each significant bivariate correlation was positive with fair strength (Correlation range from 0.244 to 0.260). The results indicate that if the level of MRSA transmission prevention practice were high, the age of nurses and service years as nurses in terms of bivariate correlation would be high (Table 9).

DISCUSSION

This study demonstrates that the level of knowledge among nurses was overall good. Although, the level of knowledge is good, it is still inadequate considering that most respondents gave an incorrect answer regarding MRSA bacteria survival in an environment and less than half responded alcohol-based hand rub as the most effective killing method for MRSA organism. The results of this study are similar with a recent study conducted by Seibert 5, in which more than half of HCW did not know that MRSA can live on the body surface for days and did not know that alcohol rub is the most effective hand hygiene method for killing MRSA. Among all, hand hygiene to prevent spreading of MRSA had the highest percentage (99.6%) of respondents checking the correct answer.

When compared to the percentage of knowledge, 100% of nurses correctly answered gloving and gowning precautions should be taken before contacting with MRSA patients. Furthermore, 86.2% voted for gloving and 81.5% voted for gowning.

The knowledge level of the nurses varied from high level in precaution before contact, effect of carrier in MRSA spread, ways of spreading to the low level of knowledge such as the living period of MRSA outside of the body, effective method in killing MRSA, in addition to moderate knowledge about CA-MRSA.

A study by Lugg, Ahmed revealed that an overall low knowledge level among their respondents.[11] In addition, another study by Brady found that nurses have higher level of knowledge compared to doctors.[12] A study by Burkitt revealed that the basic knowledge about MRSA by a nurse was high.[13]

Perceptions are crucial in assisting MRSA transmission preventative practices. Many researchers had evaluated HCW as threats in transmitting MRSA or being vulnerable to MRSA, and the impact on infection control practices.[14] The results of this study showed that the level of perception among nurses regarding MRSA transmission was between moderate (66.5%) to high levels (85.2%). Nurses who participated in this study agreed that MRSA is a hospital problem (81.80%) and a national problem (78.8%).

The results of perceptions on MRSA transmission clarified that 85.18% nurses agreed that if they wash their hand, wear gowns and gloves, they could decrease the risk to get MRSA and transmit it to patients. Similarities with the study performed by reported that 93.8% of respondents felt comfortable using glove, gown and performing good hand hygiene in reducing the risk to get MRSA and spreading MRSA organism to patients.[5]

Education on the perceptions on MRSA transmission to family members and patients is important in the first step to motivate compliance toward recommended practices. Therefore, 81.8% of nurses in this study felt pleasant to educate patient and their family members about MRSA.

However, in this study, the only perceptions encourage adherence to recommended practices were hand hygiene and wear gloves and gowns in addition to advising colleagues when non-compliance to recommendation.

In addition, clues to action including effective information regarding MRSA, media influenced attitudes and attitude toward MRSA patient had the lowest perceptions with 77.1%, 72.7% and 66.5% respectively. Moreover, results from this study showed that around two-third of the nurses believed that being short staffed increased the susceptibility to MRSA.

A study by Wolf[15] revealed that their nurses agreed that MRSA is a risk for patients. Another qualitative study by Seibert[5] found that most the nurses had positive perception toward MRSA and its effects on patients.

On average, the level of MRSA transmission prevention practice among nurses in this study was high (95.5%). In this study, the nurses agreed that following the required practices of hand hygiene, gloving and gowning reduces the nurses' and patient's risk of acquiring MRSA. Further, the other staff was compliant with practical measures with 95.1%.

Several studies have stated that health practitioner compliance is less than optimal to prevent transmission of disease with only 48%– 69%.[16, 17]

In this study, the researcher found positive correlations between knowledge and other variables, indicating that if the level of knowledge is high, the practices of MRSA transmission prevention would also be high. This is supported by findings from a study conducted by Lugg and Ahmed which reported a direct positive correlation between the level of knowledge and practice scores among nurse, when a comparison was done between practices and knowledge scores, whereby higher level of knowledge leads to higher practice score.[11]

According to Pittet adherence to hand hygiene was highly practiced in paediatrics unit than in ICUs.[18]

According to Fadeyi *et al.*, MRSA awareness correlated positively with age, number of years in service, and number of years in the critical care unit.[9]

CONCLUSION

The level of knowledge among nurses regarding MRSA transmission is good; the level of perception was more than moderate. Moreover, their prevention practice was high. Therefore, adequate information regarding MRSA should be consistently provided and infection control prevention need to be emphasized to nurses, especially to nurses who are routinely in contact with MRSA patient. More research should be done to investigate the barriers and the impact of nursing workload on MRSA infection and prevention.

*The authors declare that there are no conflicts of interest.

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