UNIVERSITI PUTRA MALAYSIA

COLONIZATION OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) ON NECKTIES, HEADSCARVES AND IDENTIFICATION BADGE AMONG MEDICAL STUDENTS IN UPM 2013

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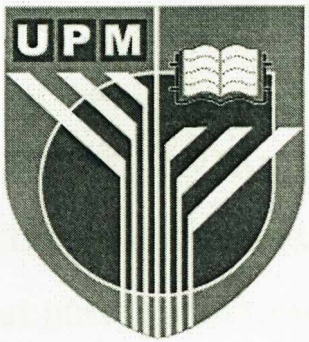

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BERILMU BERBAKTI

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ABSTRACT

COLONIZATION OF MRSA ON NECKTIES, HEADSCARVES AND IDENTIFICATION BADGES AMONG MEDICAL STUDENTS IN UNIVERSITI PUTRA MALAYSIA 2013

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Background: Methicilin-resistant *Staphylococcus Aureus* or MRSA is a staphylococcus bacteria strain that can be transmitted through various ways and can cause life-threatening condition if infected to immunocompromised patients in healthcare setting.

Objective: The aim of this study is to detect the prevalence of colonization of MRSA on neckties, headscarves and ID Badges among medical students in UPM.

Methods: A cross-sectional study was conducted. This study involves 256 medical students comprising of 153 and 103 pre-clinical and clinical students respectively. A validated questionnaire was use to collect the data and samples swab were collected by swabbing neckties, headscarves or identification badges.

Results: Out of 433 samples taken, 40 swabs (9.24%) were positive for *S. aureus*. From this 40, five (12.5%) isolates were MRSA. Out of these five, one culture was isolated from headscarf of pre-clinical student; one culture was isolated from necktie of clinical students while the remaining three were isolated from identification badges of clinical students. There was no significant association between age, gender, ethnicity and phase of medical students with colonization of MRSA ($p>0.05$). There was significant association between knowledge score on hand hygiene practice and phase of medical students.

Conclusion: MRSA colonies were presences on neckties, headscarves and identification badges. However there was no significant difference between presence of this and phase of medical students. There was significant association between knowledge score on hand hygiene practice and phase of medical students. However, there was no association between colonization of MRSA and age, gender, ethnicity.

Keywords: *Staphylococcus Aureus, MRSA, colonization, neckties, headscarves, identification badges, medical students*

ABSTRAK

KOLONISASI MRSA PADA TALI LEHER, TUDUNG DAN TAG NAMA DI KALANGAN PELAJAR PERUBATAN UPM 2013

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Latar belakang : Methicilin-resistant *Staphylococcus Aureus* atau MRSA adalah strain bakteria staphylococcus yang boleh berjangkit melalui pelbagai cara dan boleh menyebabkan keadaan yang boleh membahayakan nyawa jika berjangkit pada pesakit di persekitaran kesihatan.

Objektif : Tujuan utama penyelidikan ini adalah untuk mengesan prevalens kolonisasi MRSA pada tali leher, tudung dan tag nama di kalangan pelajar perubatan di UPM.

Kaedah: Kajian keratan rentas telah dijalankan. Penyelidikan ini melibatkan 256 pelajar perubatan yang terdiri daripada 153 pelaja pra-klinikal dan 103 pelajar klinikal. Borang soal selidik telah digunakan untuk mengumpul data dan sampel telah diambil dengan menyapu pada tali leher, tudung dan tag nama.

Keputusan : Daripada 433 sampel yang telah diambil, 40 sampel telah positif untuk S.aureus. Daripada ini, 5 sampel positif untuk MRSA. Satu sampel adalah daripada tali leher pelajar klinikal; satu sampel adalah daripada tudung pelajar pra-klinikal manakala 3 adalah daripada tag nama pelajar klinikal. Tiada perkaitan yang signifikan untuk hubungan antara umur, jantina, kaum dan fasa pelajar perubatan dengan kolonisasi MRSA. Ada perkaitan yang signifikan antara tahap pengetahuan amalan pembersihan tangan dan fasa pelajar perubatan.

Konklusi : Coloni MRSA ada pada tali leher, tudung dan tag nama. Tetapi, tiada perkaitan signifikan antara kehadiran MRSA dan umur, jantina, kaum dan fasa perubatan. Ada perkaitan yang signifikan antara pengetahuan amalan pembersihan tangan dan fasa pelajar perubatan

Kata Kunci : *Staphylococcus Aureus*, MRSA, Kolonisasi, tali leher, tudung, tag nama, pelajar perubatan

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LIST OF ABBREVIATION

MRSA	-	Methicilin Resistant *Staphylococcus aureus*
MSSA	-	Methicilin Sensitive *Staphylococcus aureus*
S. aureus	-	*Staphylococcus aureus*
WHO	-	World Health Organization
CDC	-	Centres for Disease Control and Preventions
HAI	-	Healthcare Associated Infection
ID	-	Identification
UPM	-	Universiti Putra Malaysia
FMHS	-	Faculty of Medicine and Health Sciences

CHAPTER 1

INTRODUCTION

1.1 Background

Methicilin-resistant *S. aureus* or MRSA is a part of Gram-positive staphylococcus strain that is resistant to widely used antibiotics known as beta-lactams such as methicillin, oxacillin and penicillin (Centres for Disease Control and Prevention, 2010). According to its aetiology, MRSA can be divided into two which is healthcare associated and community associated MRSA.

It has been reported that MRSA infection among inpatients has increased over the years (Al-Talib et al., 2010). Infection of MRSA in healthcare setting can cause life-threatening conditions and, since inpatient has a compromised immune system, it is prone to worsen the infection which can be acquired via healthcare instrument or casual contact from a visitor or healthcare worker themselves (Centres for Disease Control and Prevention, 2013). MRSA has also been associated with surgical wound infections, urinary tract infections, bloodstream infections, and pneumonia (Centres for Disease Control and Prevention, 2013).

MRSA can be transmitted through direct hand contact with contaminated body fluid or through contaminated stethoscope (Jones et al., 1995), identification badges (Kotsanas et al., 2008), neckties ("Doctor's Neckties: A Reservoir for Bacteria," 2004), white coats (Wong et al., 1991), all worn by healthcare worker especially doctors and medical students and it can also be transmitted through contaminated surfaces. Previous studies cite that colonization to neckties and objects such as lanyards are

more likely to transmit bacteria to patients (Dixon M, 2000; Kotsanas et al., 2008. It is also reported that wearing an unsecured necktie results in transmission of bacteria from physician to patient (Weber et al., 2012). When patient is infected with MRSA, it causes them to stay in the hospital for a more prolonged time and subsequently, also cause an increase in the cost of healthcare expenditure (Cosgrove et al., 2005; Shorr et al., 2006).

The study of colonization of MRSA on neckties, scarves, and identification badges among medical student is rarely reported in Malaysia. Since some of the medical students will be exposed to the clinical setting, while some of them are already exposed, their neckties, scarves, and identification badges have the potential to be colonized by MRSA. Therefore, our research is conducted to study the colonization of MRSA on neckties, scarves, and identification badges between preclinical and clinical medical students in Universiti Putra Malaysia (UPM).

1.2 Problem statements

There has been persistence of nosocomial MRSA infection spread among patients in hospitals in Malaysia (Al Talib et al., 2010). This can be caused by increase colonization of MRSA among healthcare worker that leads to infection among patient that causes higher morbidity and mortality (Cosgrove et al. 2003).

1.3 Significant of study

Increased nosocomial MRSA infection among patients in Malaysian hospital can be caused by colonization of MRSA among medical student. By knowing the presence of MRSA on the items, proper measures to prevent spread of this pathogen in healthcare setting can be taken.

1.4 Objectives

The objectives of this research are:

1.4.1 General objectives

To detect the prevalence of colonization of Methicillin-resistant *S. aureus* (MRSA) on neckties, headscarves and ID badges among medical students in UPM.

1.4.2 Specific objectives

To determine the prevalence of colonization of MRSA on neckties, headscarves and ID badges among medical students in UPM.

To determine the socio-demographic characteristics (age, gender, ethnicity, and phase of medical students) of among medical students in UPM

To determine the association between socio-demographic characteristics (age, gender, ethnicity, and phase of medical students) and prevalence of colonization of MRSA on neckties, headscarves, and ID badges among medical students in UPM.

To determine the association of knowledge score on hand hygiene practices and phase of medical students.

1.5 Research hypothesis

There is a significant association between socio-demographic characteristics (age, gender, ethnicity, and phase of medical students) with neckties, headscarves, and ID badges among medical students in UPM.

There is a significant association between knowledge on hand hygiene practices and phase of medical students

CHAPTER 2

LITERATURE REVIEW

2.1 Methicilin-resistant *Staphylococcus aureus* (MRSA)

Methicilin-resistant *S. aureus* (MRSA) or staph is actually a mutation of bacterium called Methicilin-sensitive *S. aureus* (MSSA) and is also called superbug, bacteria which are not susceptible to most medicines ("MRSA Information," n.d). It causes infection in different parts of the body and is harder to treat compared to most strains of *S. aureus* due to its resistant (Levine, 2012). MRSA is resistant to beta-lactams antibiotic which includes methicilin, oxacilin, penicillin, and amoxicillin (Centres for Disease Control and Prevention, 2010).

2.1.1 History of MRSA

In the 1940s, discovery and introduction of antibiotic such as penicillin make treatment of *S. aureus* infection, which caused painful skin and soft tissue condition, successful and were, performed routinely which eventually lead to its misuse and overuse thus helping the microbes to become resistant to the antibiotics (NIH, 2008). Methicilin was then developed to treat staph infection at the beginning of 1959. However, a strain of staph that developed resistance towards methicilin was reported by a hospital in the United Kingdom in 1961 thus leading to the so-called birth of MRSA (NIH, 2008). In the United States, the first case of MRSA infection was detected in a Boston man in 1968 ("History of MRSA," n.d). All these cases however, seems to remain isolated to those with immunodeficiency issues and those who are recently hospitalized but are not yet at outbreak level ("History of MRSA," n.d). In 1970s, the first major outbreak of MRSA was reported in Eastern Australia and by this

point; the bacteria had spread to most of Europe by infecting health care centres and hospitals, especially in Eastern Europe ("History of MRSA," n.d). Throughout 1998 to 2008, rates of community-associated MRSA infection continue to increase with scattered reports of the infection among children in the United States while rates of healthcare—associated MRSA infection remained stable ("MRSA History Timeline: 1959-2012," 2010).

The first reported isolation of MRSA in Malaysia is in 1978 (Jamal et al., 1983). In hospital settings, the number of isolations has increased over the years. In 2007, the prevalence rates of MRSA infection in humans in major state hospitals in Malaysia varied from 6.8% to 44.1%, %, with the present overall rate of 28% compared to 31.5% in 2006 and it was also reported that CA-MRSA has emerged in the country with 20 cases identified since July 2006 to July 2008 (Norazah, 2008). Other study revealed that among 100 university students, 3% is positive for MRSA and the isolated MRSA had been identified as putative CA-MRSA (Nor-Shamsudin et al., 2008).

2.1.2 Epidemiology of MRSA

Over the past few decades, MRSA rates are increasing rapidly and in most regions, it is endemic. Conservatives estimates by Dutchan and US prevalence predicts that MRSA is carried by 2-53 million people worldwide (Grundmann et al., 2010). In the United States, S. Aureus infections are seen in more than 290,000 hospitalized patients, with an approximation of 126,000 being related to MRSA infection (Swierzewski, 2008). Males and those with age of 65 and older has the highest rate of MRSA infections while young people from the age of five years to 17 years had the lowest rates. It is estimated that in the US, approximately 94,000 invasive MRSA

infections occurred in the 2005 with about 18,500 deaths and the mortality rates are said to be higher in black people and those aging 65 years and older (Hirschmann, 2007).

In East Asia, especially in Sri Lanka (86.5%), South Korea (77.6%), Vietnam (74.1%), Thailand (57.0%) and Hong Kong (56.8%), reports very high rates of MRSA infections while in contrast; India and Philippines have low infection rates of 22.6% and 38.1 % respectively (Song et al., 2011). For healthcare associated MRSA infection, North America, South America, Asia and Malta have the highest rates which are more than 50%, intermediate rates of 25 to 50% reported in China, Australia, Africa and European countries such as Portugal, Greece, Italy and Romania, while lowest prevalence rates are reported in other European countries (Netherlands and Scandinavia) (Grundmann et al., 2010; Song et al., 2011; Centres for Disease Control and Prevention, 2011; Mejía et al., 2010).

For community-associated infection, its cases rise rapidly in early 2000s in the United States (Stefani et al., 2012). San Francisco, California conducted a prospective, population-based study in the year 2004-2005 and demonstrates a ten-fold higher incidence of Community associated MRSA than healthcare associated MRSA (316 vs 31 per 100000 population) (Liu C et al., 2008).

In Malaysia, MRSA is considered as a major nosocomial pathogen in hospitals because of its increased patterns of frequency in eight major hospitals, which is from 20% in 1990 to 32% in 1998 (Norazah et al., 2003). A cross-sectional study was conducted in Klang Valley which consists of three institutes: Hospital Kuala Lumpur

(HKL), Hospital Tengku Ampuan Rahimah (HTAR), and the Bacteriology Division, Institute for Medical Research (IMR) and it is revealed that overall rate of MRSA has increased from 25.7% to 28.7%, 27.9% and 33.0% in 1996, 1998 and 2000 respectively (Al Talib et al., 2010). According to Ministry of Health, in 2009, the overall prevalence of MRSA in Malaysia was 22% while MRSA rates in 16 major hospitals ranged from 3.5% to 28.5% (MOH, 2009).

2.1.3 Differences between CA-MRSA and HA-MRSA

MRSA can be divided according to its aetiology, HA-MRSA and CA-MRSA. CA-MRSA is defined as MRSA infection by those who are not hospitalized or had medical procedure (e.g.: dialysis, surgery) recently (within a year) (Evans, 2008). The outbreaks of this infection have been reported in sports team, child care attendees, prison inmates, and diverse populations where habitation is relatively concentrated. However, individual who acquired MRSA infections without being hospitalized recently, undergone medical procedure or are immunocompromised are said to have contract HA-MRSA (Evans, 2008).

Table I: Comparison of clinical, epidemiological of community-associated (CA-) and healthcare-associated (HA)-MRSA (Otter J.A., 2012).

Characteristics	HA-MRSA	CA-MRSA
Population affected	Hospital/healthcare/nursing Home patients/residents. Elderly. Preterm neonate. Immunocompromised.	Young healthy individuals Individuals in prisons, military personnel, athletic population, male homosexual
Site of infection	Bacteraemia and wound infections. Infections of respiratory and urinary tracts.	Skin (abscesses and cellulitis, furunculosis, severe skin and soft tissue infections. Septic shock and bacteraemia Necrotising pneumonia
Risk factors	Indwelling devices, catheters, lines, haemodialysis, prolonged	Close physical contact, abrasion injuries, activities

	hospitalisation, long-term antibiotic use.	associated with poor communal hygiene (e.g. sharing towels)
Transmission	(i) Person-to-person spread: healthcare staff (e.g. nurses, doctors, surgeons, physiotherapists),visitors, patients. (ii) Environment-to-patient spread, e.g .hospital equipment	(i) Person-to-person spread. Shared facilities (e.g. sports equipment, towels, pools, etc.). (ii) Environment-to-person spread, e.g. shared sports equipment

2.1.4 Testing for MRSA

MRSA screening test is used to recognize the presence of MRSA colony in a person and also to verify if MRSA is still present at site on infection after treatment. Usually, screening is done before you come into the hospital or at an outpatient clinic (NHS, 2009). Culture is the most widely used test to identify MRSA colonization as it confirms the presence of the MRSA and also further characterization of the bacteria. A swab can be collected from nostrils, wound site or skin lesion and are cultured (usually for one to two days) onto a special nutrient medium and are incubated (Koh et al., 2009). The purpose of this screening is to reduce the transmission of MRSA, including prevention of outbreaks in places such as day-care centres, schools and military facilities, to prevent a carrier from developing an infection and lastly, to prevent further transmission of this bacteria (Skov et al., 2012).

2.1.5 Prevention of MRSA and its infection

In clinical settings, inappropriate or excessive antibiotic therapy and prophylaxis should be avoided. Antibiotics should be given using the correct dosage and duration, and also usage of broad-spectrum antibiotics (particularly third generation cephalosporins and fluorouines) should be reduced to what is clinically appropriate (Coia et al., 2006). Implementation of MRSA prevention bundle in surgery has also

been known to reduce MRSA transmission and nosocomial infections as there is a significant decrease in MRSA transmissions from 5.8 per 1,000 bed-days in 2007 to 3.0 per 1,000 bed-days in 2005 and an overall decrease in MRSA nosocomial infection from 2.0 to 1.0 per 1,000 bed-days (Awad et al., 2009).

MRSA infection can be prevented if we know the signs of its infection and if we get early treatment. It is also important to keep open wound and scrapes clean and covered as there are risk of infection of MRSA. Practicing good hygiene such as cleaning hands regularly and washing personal belongings can also help. Sharing of personal items such as towels and razors should be avoided as there is risk of transmission.

2.2 Neckties, Headscarves and Identification Badge

Neckties, headscarves and name tags have long been parts of medical student's attire, be it clinical or pre-clinical students. It is described as a symbol of professionalism and exhibit discipline and also as a form of identification details. Headscarves, however, are part of every Muslim women attire's throughout their days.

2.2.1 Colonization of MRSA

It is suggested that items such as ends of neckties are a potential source of MRSA infections because of their position at the waist, their tendency to swing freely and also because it is not machine-washable (Hirschmann, 2007). Compared to white coats, unrestrained neckties have potential to make contacts with patients more easily and are also not cleaned as often as white coat (Marcham et al., 2009).

A study shows that neckties of eight out of 40 doctors (20%) show the presence of *S.Aureus* and seven of it were methicilin sensitive while one of it was methicilin-resistant *S.Aureus* (MRSA) (Awad et al., 2009). In another study, it is determined that neckties worn by doctors are more likely to be contaminated with *S.Aureus* compared to neckties worn by pre-clinical medical students as they were not involved in patients care (Coia et al., 2006).

The *S.aureus* isolated is also identified mostly to be coagulase positive (Coia et al., 2006). MRSA were isolated from 16 out of 26 (62%) of the neckties worn by doctors while non-MRSA *S.aureus* were isolated from four neckties worn by pre-clinical medical students (Coia et al., 2006). Similarly, identity badges attached to lanyards hang in front of the body may also act as a source of infection as it can come into contact with patients due to their pendulous nature (Hirschmann, 2007). A study done previously shows that seven of the identity badges had methicilin sensitive *S. aureus* (MSSA), one was detected with MRSA, one with Enterococcus spp, and one had Gram-Negative bacteria (GNB) (Hirschmann, 2007).

2.2.2 Relevance of Necktie in Healthcare settings

Even though confidence and aura of professionalism are displayed by the usage of ties among doctors; it still proves to be quite harmful in healthcare settings and also functionless. In order to stop the spread of infections such as MRSA, British Medical Association (BMA) has advised doctors to remove their ties (BBC News, 2006). Malaysian Medical Association (MMA) has also pleaded against Health Ministry to release them from the regulations that requires them to wear neckties while on ward rounds by claiming that it is an item that is not frequently washed and also have high

dry-cleaning cost which is about RM 15 per tie and also had been proven to carry contaminants that could cause infection (Andrews, 2004).

2.3 Medical Students Exposure to Infection

True to the nature of the course, medical students have high potential of being exposed to infections. A previous study done by Birenbaum et al. shows that there were 60 out of 644 reports of exposures to blood or body fluids thus making them susceptible to infection (Birenbaum et al., 2002). Surveys done on fourth-year medical student states that nearly one half of them are exposed at least once with only 40% of the exposures reported to staff or faculty (Koenig et al., 1995). Obstetrics-gynaecology, surgery and emergency medicine have clerkships with the highest exposure rates (Koenig et al., 1995).

2.4 Hand Hygiene Practice

Nosocomial infection can be prevented by hand washing as often as possible, use alcoholic hand spray and removing jewellery before washing. Others ways include sterilizing stethoscope, wearing gloves, mask and gown, changing administration sets of IV catheters every 72 hours and enforced uses of whitecoats (H Salooje, 2000).

Hand hygiene is a term used to describe measures such as routine hand washing; antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis which is considered as a primary measure for reducing risk of organism's transmission to patients and health care personnel and can also reduces potential pathogens on hands (Centres for Disease Control and Prevention, 2013). Considered as an important healthcare issue globally, hand hygiene is single most cost-effective practical measure

that reduces incidence of healthcare associated infection and the spread of antimicrobial resistance across all-settings-from advanced health care systems to primary healthcare centres (Mathur, 2011; Kelcíkova, 2012). As hands are more prone to contamination, it bears the risk of spreading infectious disease from one person to another. Thus it is important to acknowledge the importance of hand hygiene.

2.4.1 Types of Hand Hygiene

Table II: Different type of hand hygiene (Centres for Disease Control and Prevention, 2013)

Methods	Agent	Purpose	Area	Duration (minimum)
Routine Handwash	Water and non-antimicrobial soap (i.e., plain soap)	Remove soil and transient microorganisms	All surfaces of the hands and fingers	15 seconds
Antiseptic handwash	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora (persistent activity)	All surfaces of the hands and fingers	15 seconds
Antiseptic handrub	Alcohol-based handrub	Remove or destroy transient microorganisms and reduce resident flora (persistent activity)	All surfaces of the hands and fingers	Until the hands are dry
Surgical Antisepsis	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora (persistent activity)	Hands and forearms	2–6 minutes
	Water and non-antimicrobial soap (i.e., plain soap) followed by an alcohol-based surgical hand scrub product with persistent activity			Follow manufacturer instructions for surgical hand scrub product with persistent activity

2.4.2 Healthcare Associated Infection

Hands of healthcare worker have been shown in numerous studies to play an important role in the propagation of microorganisms within healthcare environment and subsequently to patients which ultimately can lead to healthcare associated infection or HAI (WHO, 2006).

Healthcare worker who fail to practice proper hand washing procedures or to change gloves between contacts with patients, causes HAIs to be transmitted to hospitalized patients who are at risk for HAI endemic infections in hospitals caused by multi-resistant tuberculosis, ancomycin-resistant Enterococcus in some specialised units, and cross-infection with methicillin-resistant *Staphylococcus Aureus* (MRSA) that affect the urinary tract, upper and lower respiratory tracts, gastrointestinal tract, conjunctiva, and skin (Adam et al., 2009).

A study conducted in Europe reports that hospital-wide prevalence rates of patients affected by healthcare associated infection ranges from 4.6 % to 9.3% (Klevens et al., 2007). Also, healthcare associated infections are said to affects 9-37% of patients admitted to intensive care units in developed countries (Lopez et al., 2006). Generally, attributable mortality caused by HAIs in Europe is estimated to be 1 %(50 000 deaths per year), but HCAI contributes to death in at least 2.7% of cases (135 000 deaths per year) (Klevens et al., 2007).

2.4.3 Role of Hand Hygiene in Healthcare Setting

In 1847, Semmelwiess demonstrated the efficacy of hand disinfection in reducing nosocomial infection (Pittet et al.,2001). To prevent the transmission of microorganisms in health care, adherence to hand hygiene practice is most important as it can directly contributes to patient safety (Pittet et al.,2006). A number of studies have demonstrated the effect of hand hygiene practice and reduction in cross-transmission of anti-microbial resistant pathogen. A study done in China shows that daily bathing with Chlorhexine Gluconate (CHG), which is an antimicrobial agent used widely in hand hygiene and skin disinfection, significantly decrease the rate of acquired infection of MRSA and vancomycin-resistant Enterococcus (VRE) (Chen et al., 2013). Another study shows that out of 7727 patients in six hospitals, only 127 cases of MRSA and VRE were detected during the periods of chloerhexidine bathing which is 23% lower compared to when nonantimicrobial bathing were used where there was 165 new cases detected (Climo et al.,2013).

Vernon et al. performed a prospective sequential group single-arm clinical trial in medical intensive care unit of teaching hospitals where 1787 patients were bathed or cleansed with specific procedure for three different periods and culture specimens from environmental surfaces and health care worker's hand were obtained. The result shows that when cleaned with chlorhexidine, there were 2.5 log10 less colonies of VRE on patients' skin and less VRE contamination on health care workers' hands and environmental surfaces and also, incidence of there was decreased incidence of VRE acquisition from 26 colonizations per 1000 patient-days to 9 per 1000 patients-days (Vernon et al., 2006).

2.4.4 Practice of Hand Hygiene among Medical Students

Soon to be a part of healthcare worker, it is essential for medical students to understand the importance of hand hygiene practice. Multiple studies have been conducted to study the hand hygiene practices of medical students. Such studies are important as medical students throng the healthcare facilities and have the potential to transmit infections besides being the healthcare providers of future when their pattern of training will reflect on their infection control practices (Azzam et al., 2012.). One study in Saudi Arabia finds that out of 67 medical students, only 29% were able to identified the correct indications of hand hygiene and among the same group of students, the compliance of hand hygiene among the students was only 17% which is alarmingly low (Azzam et al., 2012).

Another study done by Feather et al. to 187 candidates of final MBBS OSCE (Objective Structured Clinical Examination) at The Royal London Hospital School of Medicine and Dentistry in UK found that after contact with patients, only 8.5% of candidates washed their hands, although the figure rose to 18.3% when hand hygiene signs were displayed (Feather et al., 2000). Another study done by Snow et al, also states that medical students have a low overall rate of hand hygiene (Snow et al., 2006). Melenhorst et al. also states in their study that there was a low level of correlation between self-assessment of knowledge and observed adherence to hygiene recommendations (Melenhorst et al., 2009).

In Malaysia, a study done by IMU observed that despite having satisfactory knowledge and level of awareness about hand washing, majority of the medical

students did not practice hand washing during their actual clinical work (Sulaiha et al., 2010).

Another study also shows that out of 196 medical students, when assessed for hand hygiene practice, only 5.53% had good hygiene practice, while 29.6% had moderate practice and the majority (67%) had poor hygiene practice whereas nursing students were observed to have better hygiene practice compared to medical students (Ariyaratne et al., 2013).

2.5 Conceptual Framework

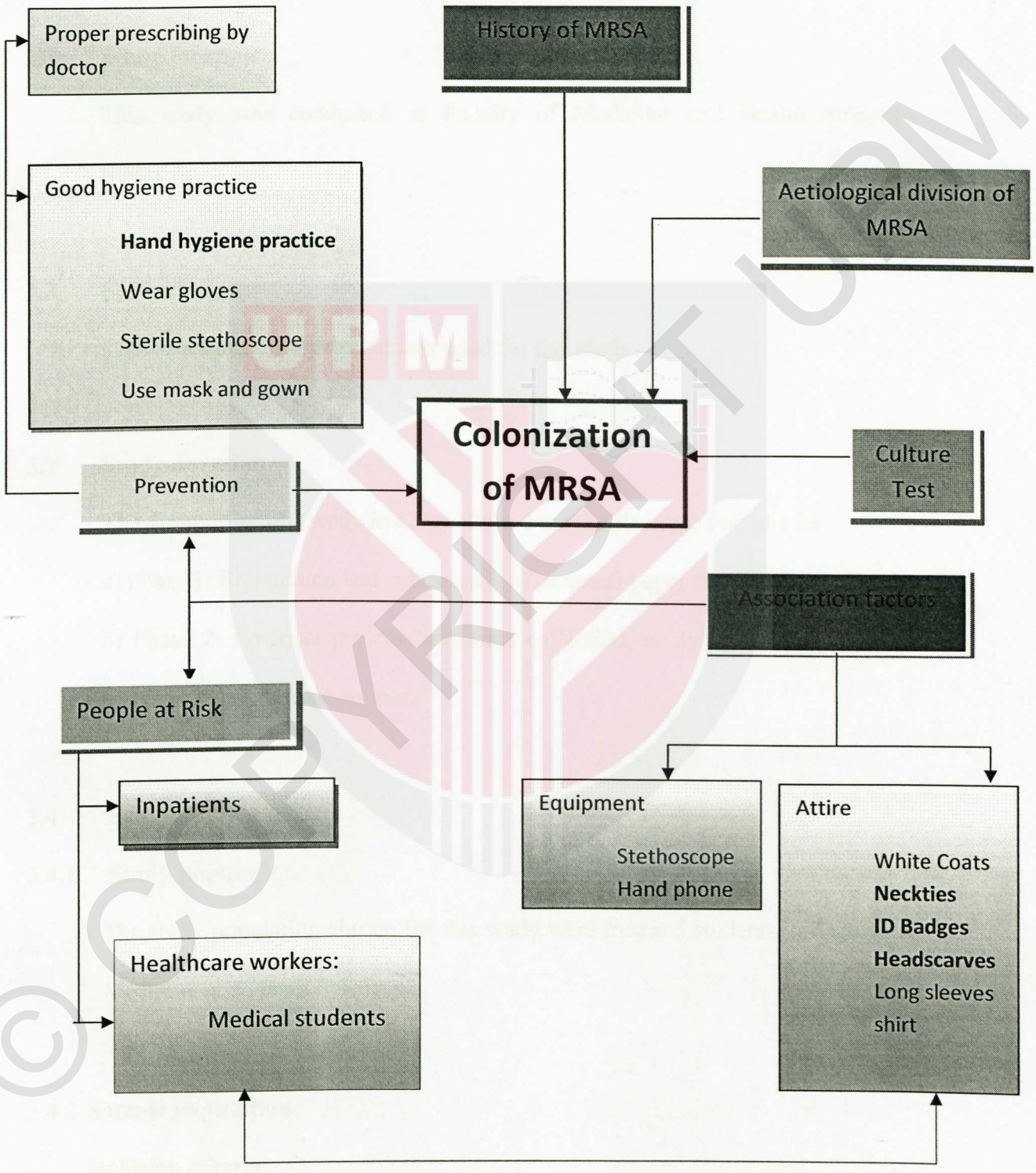

Figure 1: Conceptual Framework for the Colonization of MRSA

CHAPTER 3

MATERIALS AND METHODOLOGY

3.1 Study location

This study was conducted at Faculty of Medicine and Health Sciences (FMHS).

3.2 Study design

Cross-sectional study design was used for this study.

3.3 Study duration

The duration of this study is 12 weeks and are divided into two phases:

a) Phase 1: Preparation and submission of proposal paper (week 1-week 2)

b) Phase 2: Proposal presentation, data collection, analysis and presentation, and final presentation/seminar.

3.4 Sampling

3.4.1 Study population

The study population chosen for this study were medical students in Faculty of Medicine and Heath Sciences.

3.4.2 Sample population

Inclusion criteria

a) Medical students at FMHS regardless of which year they are currently attending from 15 July 2013 to 1 August 2013.

Exclusion criteria

a) Medical students who have posting outside of faculty.

3.4.3 Sampling Frame

List of medical students attending FMHS from 15 July to 1 August 2013.

3.4.4 Sampling Unit

Medical students in FMHS

3.4.5 Sampling Method

Convenience sampling method was used for this study where respondents that happen to be available at the time of data collection were selected as the sample thus making it convenience.

3.4.6 Sample Size

Simple/ single proportion sampling formula is used in estimation of sample size (Naing et al., 2006).

$$n = \frac{Z^2 P(1-P)}{d^2}$$

n – Required sample size

P – Expected prevalence or proportion = 0.62 (Koh et al., 2009)

Z – Statistic for a level of confidence = 1.96

d – Margin of error = 0.06

$$n = \frac{(1.96)^2 x 0.62(1-0.62)}{(0.05)^2}$$

n = **251**

After considering a 20% dropout rate, the final sample estimated was 300.

3.5 Variables

3.5.1 Dependent variable

a) Presence of colonization of MRSA

b) Knowledge on hand hygiene practices among medical students

3.5.2 Independent variable

a) Status of belonging's of neckties, headscarves, and ID-badges

b) Age

c) Gender

d) Ethnicity

e) Phase of medical students

3.6 DEFINITION OF TERMS

Colonization	:	The invasion of new habitat by new species. The presence and multiplication of microorganisms without causing tissue invasion or damage. The colonies develop when a bacteria cell begins to reproduce.
Headscarf	:	A kerchief worn over the head and tied under the chin of Muslim female students. Also known as hijab, conceals the hair and neck.
Necktie	:	Neckwear consisting of a long narrow piece of material worn by male medical students under a collar and tied in knot at the front.
ID badge	:	A card giving identifying data about a person, as name, age, hair colour, etc., and often bearing a photograph and are worn by most of the students
Positive MRSA	:	Indicate presence of MRSA colony on agar for studied items.
Agar	:	A media which contains all the essential nutrient needed for growth of bacteria. In this case, Mannitol Salt Agar was used which is selective towards *S. aureus*.
Good knowledge	:	Students which scored more than 56 marks on the questionnaire score was considered to have good knowledge score

Poor knowledge : Students which scored less than 56 marks on the questionnaire score was considered to have poor knowledge score

3.7 INSTRUMENTS/QUESTIONNAIRE

3.7.1 Instruments/questionnaire

a) Questionnaire

The data was collected by using validated questionnaire. The questionnaire consists of three sections which are Section A: Socio-demographic characteristics of medical students in UPM, section B: related information that might be associated with MRSA colonization among medical students, and section C : knowledge of hand hygiene practices among medical students.

Section A

This section collects information regarding the socio-demographic profile of medical students including age, gender, ethnicity and current year of studying.

Section B

This section collects related information that was related with MRSA colonization among medical students. It covers aspects such as hygiene practice of neckties, headscarves and ID badge, laboratory visit, and current posting.

Section C

In this section, there were 11 questions to test medical students' knowledge regarding hand hygiene practices taken from WHO Hand Hygiene Knowledge Questionnaire for Health-Care Workers. The mark was calculated based on WHO marking scheme. The distribution of the scores was grouped into 2 categories by using median as cut off point.

b) Laboratory research

433 samples were collected by swabbing the lower end of neckties, headscarves or identification badges of medical students attending Faculty of Medicine and Health Sciences, UPM. The swabs were then streaked onto Mannitol Salt Agar (MSA) which is a selective media for *S. aureus* and were incubated overnight at 37°C. The MSA were then examined for any indication of distinctive golden yellow halo which signifies *S. aureus*. Lastly, DNA was extracted from the colonies and was amplified using a specific primer. Agarose gel was then used to detect band that indicates the presence of MRSA.

3.7.2 Quality control

In order to obtain accurate data, we acquired the help of microbiologist from FMHS to aid us in the laboratory work. Furthermore, pre-test/pilot testing was conducted in to test the reliability of the questionnaire. It was done on 30 respondents from Faculty of Medicine and Health Sciences (Cronbach's Alpha=1.00)

3.8 DATA ANALYSIS

All data were analysed using Social Package for social Science Version 21.0 (SPSS). For decriptive analysis, frequency and percentage were used to describe the categorical data.

In order to determine the association between variables of categorical data, Chi-Square Test and Fischer's Exact Tesr were used. Confidence interval is set as 95% and Standard p value of $p<0.05$ is set for all significant levels.

3.9 STUDY ETHICS

Ethical approval was obtained from:

a) The Ethical Committee of Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

b) Head of Department of Medical Microbiology and Parasitology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

c) Dean, Faculty of Medicine and Health Sciences

d) Informed consent was also obtained from the respondents prior to data collection.

CHAPTER 4

RESULTS

4.1 DATA ANALYSIS

The data analysis for this study are divided into descriptive part and analytic part.

4.2 RESPONSE RATE

The total number of respondents who fulfilled the inclusion was 312. From that, 256 students were recruited as respondents. Data of all 256 respondents were recorded. Therefore, the response rate was 82%.

4.3 DESCRIPTIVE DATA ANALYSIS

In this study, the presence of Methicilin Resistant *S. aureus* (MRSA) colonies on medical student's neckties, headscarves and identification badges were detected through lab experiments.

In Table III, the distributions of socio-demographic characteristics of the respondents were described. The total number of respondents recruited for this study was 256. They were classified into different age, gender, ethnicity, and current year of studying. In our study, most of the respondents were between the age of 19-21 (54.7%) and the remaining were between the age 22-24 (45.3%). For gender, the number of female respondents were greater (55.9%) as compared to male (44.1%).In our study, Malay respondents contributed the most (60.9%) followed by Chinese (29.3%), Indian (7.0%) and lastly others (2.7%).For educational level, 1st and 2nd year medical students contributed the most with 34.0% and 25.8% respectively while 4th year and 5th year students that participated in this study were 24.2% and 16.0% respectively.

Preliminary results for *S. aureus* in table IV show that among 433 samples, 40 cultures were positive for *S. aureus*. From 112 samples collected for neckties, one pre-clinical and nine clinical students were positives with *S. aureus*. Out of that, only 1 clinical student was positive for MRSA. From 100 samples collected for headscarves, nine pre-clinical and three clinical students were positive with *S. aureus*. Out of that, only one pre-clinical student was positive for MRSA. For ID badges, 221 samples were collected and five pre-clinical students were positive together with 13 clinical students. From that, three clinical students were positive with MRSA.

4.4 ANALYTICAL DATA ANALYSIS

Table V, VII, IX, shows the association between socio-demographic characteristics of medical students with colonization of *S. aureus* on neckties, headscarves and identification badges respectively. Based on the tables, there was significant association between age and and colonization of *S. aureus* on neckties (X^2=6.135, df=1, p=0.013) For identification badges, ethnicity (X^2=4.698, df=1, p=0.030) and phase of medical students (X^2=6.171, df=1, p=0.013) have significant association with colonizatioin of *S. aureus*. There was no significant association, however, between any of the socio-demographic characteristics with colonization of *S. aureus* on headscarves.

Table VI, table VIII and table X show the association of socio-demographic characteristics of medical students with colonization of MRSA on the three respective items. Results showed there is no significant association between socio-demographic characteristics of medical students with colonization of MRSA on neckties, headscarves and identification badges ($p > 0.05$).

The normality test for knowledge score on hand hygiene practice shows the significant value of Kolmogorov-Smirnov is <0.001, since it not >0.05 the data is not normally distributed. The skewness value is 0.053 and kurtosis value is -0.0206. The median score is 56.00 which are used as cut off point for this score. In table XI, the result shows that there is significant association between knowledge score on hand hygiene practice and phase of medical students (X^2=6.975,df=1,P=0.008). Majority of clinical students (67.0%) have good knowledge on hand hygiene practice while the remaining 33.0% have poor knowledge on the topic. Likewise, pre-clinical students have higher percentage of good knowledge compared to poor knowledge. However, the percentage of pre-clinical students having good knowledge on hand hygiene practice is less compared to clinical students.

TABLE III: Distribution of respondents by socio-demographic characteristics

Factors (%)	n	Percentage
Age		
19-21	140	54.7
22-24	116	45.3
Total	**256**	**100**
Gender		
Male	113	44.1
Female	143	55.9
Total	**256**	**100**
Race		
Malay	156	60.9
Chinese	75	29.3
Indian	18	7.0
Others	7	2.7
Total	**256**	**100**
Year		
1st	66	25.8
2nd	87	34.0
4th	62	24.2
5th	41	16.0
Total	**256**	**100**

TABLE IV: Prevalence of Colonization of *S. aureus* and MRSA on neckties, headscarves and ID badges between preclinical and clinical students

	Neckties		Headscarves		ID badges	
	Pre-clinical n(%)	**Clinical n(%)**	**Pre-clinical n(%)**	**Clinical n(%)**	**Pre-clinical n(%)**	**Clinical n(%)**
S. aureus	1 (1.6)	9 (17.6)	9 (14.3)	3 (8.1)	5 (4.1)	13 (13.3)
MRSA	0	1 (2.0)	1 (1.6)	0	0	3 (3.1)
Total sample	**61**	**51**	**63**	**37**	**123**	**98**

TABLE V: Association of socio-demographic characteristic of medical students with colonization of *S. aureus* on neckties

	Colonisation of *S. aureus* on neckties			Chi- square Test value		
	Positive, n(%)	**Negative, n(%)**	**Total**	**X^2**	**df**	**p-value**
Overall	10 (8.9)	102 (91.1)	112			
Age				6.135	1	0.013*
19-21	1 (1.9)	52 (98.1)	53			
22-24	9 (15.3)	50 (84.7)	59			
Ethnicity				0.439	1	0.508
Malay	4 (7.1)	52 (92.9)	56			
Non-Malay	6 (10.7)	50 (89.3)	56			
Medic phase				1.207	1	0.455[a]
Preclinical	1 (1.6)	60 (98.4)	61			
Clinical	9 (17.6)	42 (82.4)	51			

* x^2 significant at $p<0.05$
[a] Fisher exact test

Table VI: Association of socio-demographic characteristic of medical students with colonization of MRSA on neckties

	Colonisation of Methicillin Resistant *S. aureus* (MRSA) on neckties			Continuity correction		
	Positive, n(%)	Negative, n(%)	Total	X^2	df	p-value
Overall	1 (0.9)	111 (99.1)	112			
Age				0.000	1	1.000
19-21	0	53 (100.0)	31			
22-24	1 (1.2)	58 (98.8)	81			
Ethnicity				0.000	1	1.000
Malay	0	56 (100.0)	56			
Non Malay	1 (1.8)	55 (98.2)	56			
Medic phase				0.008	1	0.928
Preclinical	0	61 (100.0)	61			
Clinical	1 (2.0)	50 (98.0)	51			

Table VII: Association of socio-demographic characteristic of medical students with colonization of *S. aureus* on headscarves

	Colonisation of *S. aureus* on headscarves			Chi- square Test value		
	Positive, n(%)	**Negative, n(%)**	**Total**	**X^2**	**df**	**p-value**
Overall	12 (12.0)	88 (88.0)	100			
Age				1.278	1	0.258
19-21	9 (15.0)	51 (85.0)	60			
22-24	3 (7.5)	37 (92.5)	40			
Ethnicity				1.333	1	0.321[a]
Malay	11 (11.3)	86 (88.7)	97			
Non-Malay	1 (33.3)	2 (66.7)	3			
Medic phase				0.842	1	0.527 [a]
Preclinical	9 (14.3)	54 (85.7)	63			
Clinical	3 (8.1)	34 (91.9)	37			

[a] Fisher's Exact Test

Table VIII: Association of socio-demographic characteristic of medical students with colonization of MRSA on headscarves

	Colonisation of Methicillin Resistant *S. aureus* (MRSA) on headscarves			Continuity correction		
	Positive, n(%)	**Negative, n(%)**	**Total**	**X^2**	**df**	**p-value**
Overall	1 (1.0)	99 (99.0)	100			
Age				0.000	1	1.000
19-21	1 (1.7)	59 (98.3)	60			
21-24	0	40 (100.0)	40			
Ethnicity				0.000	1	1.000
Malay	1 (1.0)	96 (99.0)	97			
Non Malay	0	3 (100.0)	3			
Medic phase				0.000	1	1.000
Preclinical	1 (1.6)	62 (98.4)	63			
Clinical	0 (0.0)	37 (100.0)	37			

Table IX: Association of socio-demographic characteristic of medical students with colonization of *S. aureus* on ID badges

	Colonisation of *S. aureus* on ID badges			Chi- square Test value		
	Positive, n(%)	Negative, n(%)	Total	X^2	df	p-value
Overall	18 (100.0)	203 (100.0)	221			
Age				3.175	1	0.075
19-21	5 (27.8)	107 (52.7)	112			
22-24	13 (72.2)	96 (47.3)	109			
Gender				0.555	1	0.456
Male	6 (6.5)	86 (93.5)	92			
Female	12 (9.3)	117 (90.7)	129			
Ethnicity				4.698	1	0.030*
Malay	15 (11.5)	116 (88.5)	131			
Non Malay	3 (3.3)	87 (96.7)	90			
Medic phase				6.171	1	0.013*
Preclinical	5 (4.1)	118 (95.9)	123			
Clinical	13 (13.3)	85 (86.7)	98			

*x^2 significant at $p<0.05$

Table X: Association of socio-demographic characteristic of medical students with colonization of MRSA on ID badges

	Colonisation of Methicillin Resistant *S. aureus* (MRSA) on ID badges			Continuity correction		
	Positive, n(%)	Negative, n(%)	Total	X^2	df	p-value
Overall	3 (100.0)	218 (100.0)	221			
Age				1.408	1	0.235
16-20	0	112 (100.0)	112			
21-25	3 (2.8)	106 (97.2)	109			
Gender				0.780	1	0.377
Male	0	92 (100.0)	92			
Female	3 (2.3)	126 (97.7)	129			
Ethnicity				0.069	1	1.000[b]
Malay	2 (0.8)	129 (99.2)	131			
Non Malay	1 (1.1)	89 (98.9)	90			
Medic phase				1.873	1	0.171
Preclinical	0	123 (100.0)	123			
Clinical	3 (3.1)	95 (96.9)	98			

[b] chi-square

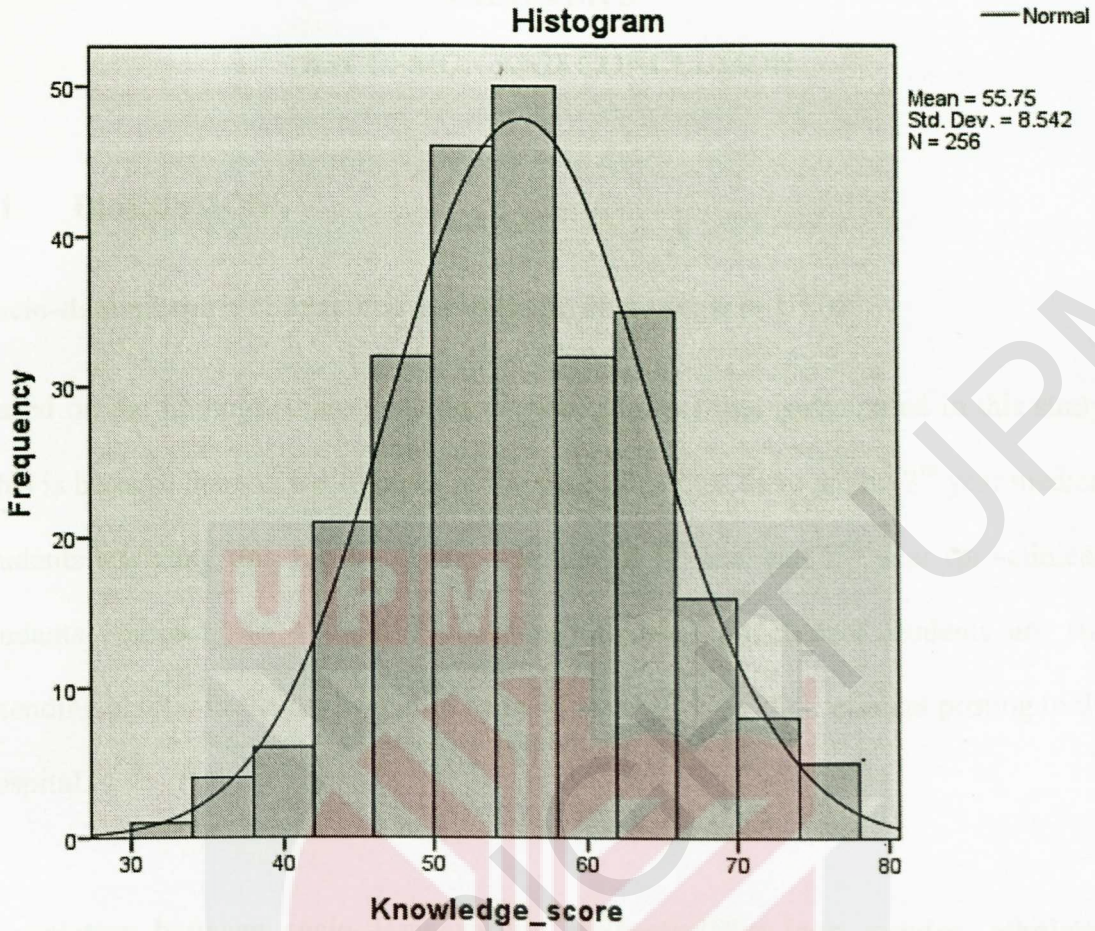

Figure 2: The frequency of knowledge score on hand hygiene practices among medical students

Table XI: Association of knowledge on hand hygiene practices and phase of medical students

Knowledge score	**Phase of medical students**		**Chi square**		
	Pre-clinical (n = 153) n (%)	**Clinical (n = 103) n (%)**	**X^2**	**df**	**P value**
Poor Knowledge	76 (49.7)	34 (33.0)	6.975	1	0.008*
Good Knowledge	77 (50.3)	69 (67.0)			

*x^2 significant at $p<0.05$

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 DISCUSSIONS

Socio-demographic characteristics of medical students in UPM

Based on the findings, there were no 3rd year students that participated in this study. This is because there is a difference in the time table thus there are no 3rd year medical students attending this faculty. There were more 1st year and 2nd year (pre-clinical) students compared to 4th and 5th (clinical) because pre-clinical students are still attending classes in faculty while the clinical students have their clinical posting in the hospital.

Association between socio-demographic characteristics (age, gender, ethnicity, and phase of medical students) and prevalence of colonization of MRSA on neckties, headscarves, and ID badges among medical students

a) Age

There is no significant association between age and colonization *of MRSA* on the three items, where all p value is more than 0.05. There were no recent studies found for comparison purpose.

b) Ethnic

Based on our findings, we did not find any significant association between ethnicity and colonization of MRSA on the three items. For *S.aureus* only ID badge has significant association (p=0.030). There were no recent studies done for comparison purpose.

c) Gender

The finding for this study was inconsistent with previous study done where male gender is a significant risk factor for MRSA colonization (Kupfer M., et al, 2010). This might be because we have more female respondents compared to male respondents in this study.

d) Phase of medical students

Result show that clinical students' neckties and ID badges are more likely to be contaminated with MRSA compared to those worn by pre-clinical medical students who are not yet exposed to the hospital setting. Even so, there is no significant association between phase of medical students and colonization of MRSA on the three items. Presence of MRSA colonies on clinical student's neckties and ID badges might be because of exposure to hospital setting as opposed to pre-clinical students who are not yet exposed to the hospital.

The finding from this study was inconsistent with previous study where there was significant association between doctor's and pre-clinical students' neckties and colonization of *S. aureus* and MRSA. Out of the 9 neckties worn by clinical students which are positive for *S. aureus* , one of this isolates was MRSA. This might be because 80% of those who were positive for *S. aureus* admit that they did not button up their white coats during lab practical or while examining patients. The colonization of MRSA on clinical student's neckties might be because of their exposure to hospital setting as opposed to pre-clinical students who are not yet exposed to the hospital. Neckties of clinical students have higher prevalence of being colonized with MRSA because unrestrained neckties have the potential to make contacts with patients easily

because of their tendency to swing freely as the wearer leans forward and it is not machine-washable (Kotsanas et al., 2008). In one study, when doctors were asked how many times they clean their neckties, 70% admit that they had never cleaned their neckties while the remainder said that it had been 20 weeks on average since the neckties had been cleaned (Ditchburn , 2006). Meanwhile in our study, 48% admits to never washing to never washing their neckties while the remaining admits to washing their neckties at least once a month.

In this study, there was no significant association between phase of medical students and colonization of S.aureus and MRSA on headscarves. For headscarves, this study is the premier study in detecting the colonization of MRSA among headscarves. In this study, a pre-clinical student was positive for MRSA. This is probably because, in this study, more pre-clinical students admit to washing their headscarves at least once every fortnightly as opposed to clinical students. The reason might be because pre-clinical students think that they are not yet exposed to any infectious or harmful materials as compared to clinical students who are already exposed to hospital setting thus are more lenient in the practice of washing their headscarves frequently.

The finding for this study is consistent with previous study done where it shows that a total of 7 lanyards and ID badges had MRSA, and there were no significant differences between nurses and doctors in total median bacterial counts on items carried (Kotsanas et al., 2008). For identification badges, more clinical students were positive for MRSA compared to pre-clinical students. The colonization of MRSA on clinical student's ID badges might be because of their exposure to hospital setting as opposed to pre-clinical students who are not yet exposed to the hospital. Clinical

students' ID badges which are attached to lanyards hang around the front of the body, and, because of their pendulous nature, can come into contact with patients and thus have higher chances of being colonized with MRSA (Kotsanas et al., 2008). Also in our study, when asked if they ever cleaned or sanitized their ID badges, about 87% of the clinical students admit to never doing it thus increasing the chances of ID badges being colonized with nosocomial pathogen. Another study also states that bacteria tend to survive for a longer periods on hospital fabrics and plastic surfaces (Neely et al., 2000; Neely A, 2000).

Physician in formal attire (i.e. white coat, necktie) has been said to portray a professional image to patients and may favourably influence trust and confidence-building (Shakaib et al., 2005). However another study done in Australia proved otherwise by finding that even without wearing necktie, patient's confidence or satisfaction in doctors did not diminish as long as they are neatly attired (Dobson, 2003). As contaminated neckties and identification badges have the potential to serve as vector for nosocomial pathogen, perhaps it's time for us to give further thoughts on whether or not these items are relevant as a part of physician formal attire.

Association of knowledge on hand hygiene practices and phase of medical students

The result shows clinical students have higher percentage of having good knowledge on hand hygiene practice compared to preclinical students. This is supported by previous studies done which indicate that 80-90% of clinical students' shows good level of knowledge and awareness regarding hand hygiene practices and its importance as they have practiced it more while working it clinical environment

(Sulaiha et. al., 2010). However it is contraindicated with another study which states that hand hygiene awareness and compliance among medical students were found to be low (D. Alvis WR et al., 2012). Another study also revealed that medical students did not have a culture of good hand hygiene practice (Al Kadi A, 2012).

5.2 LIMITATIONS

This study was done in a single teaching centre; hence results did not generalize on the whole population of medical students in Malaysia. Also, due to time and financial constraint, nasal carriage was not determined in this study, thus correlation of colonisation of neckties, headscarves and ID badges with nasal carriage could not be determined. This study uses cross-sectional study design, and generally, there were no evidence of temporal relationship between exposure and outcome as both factors were assessed simultaneously. Also, there was bias toward including respondents with more favourable result, which in this study, was the colonization of MRSA. Also as this study uses convenience sampling, the selection of respondent was biased to those who were convenience to approach thus did not represent the whole population.

5.3 CONCLUSION

Based on our finding, there was no significant association between age, gender, ethnicity and phase of medical student to present of colonization of MRSA on neckties, headscarves and identification badges but there were still presence of MRSA colonies on neckties, headscarves and identification badges among medical students.

There was significant association between phase of medical students to present of colonization of *S. Aureus* on neckties and identification badges. There was significant association between ethnicity to present of colonisation of *S. aureus* on identification badge only. There is significant association of knowledge score on hand hygiene practice and phase of medical students.

5.4 RECOMMENDATIONS

We recommend increasing the study duration in a bigger population to increase the validity and reliability of results and to provide more conclusive findings.

Further studies including nasal carriage of *S. aureus* should be performed to determine the transmission of *S .aureus* among medical students, patients, environment and clothing. These strains should then be analysed by molecular methods, e.g. Staphylococcal cassette chromosome mec (SCCmectyping), Multi locus sequence typing (MLST) and pulsed field gel electrophoresis (PFGE) which will further contribute in the determination of the transmission model of *S. aureus* among medical students

Health authorities should take precautions on dress code like wearing neckties, headscarves and identification badges among medical students and also health care worker in order to reduce the risk of harbouring life threatening *S. aureus* and MRSA. Malaysian Medical Association already proposed to relegate the wearing of ties to archives of medicine.

Proper hand hygiene and attitude when in contact with patients should be adhered to reduce the risk of transmitting *S. aureus* to others, especially immunocompromised patients.

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APPENDIX

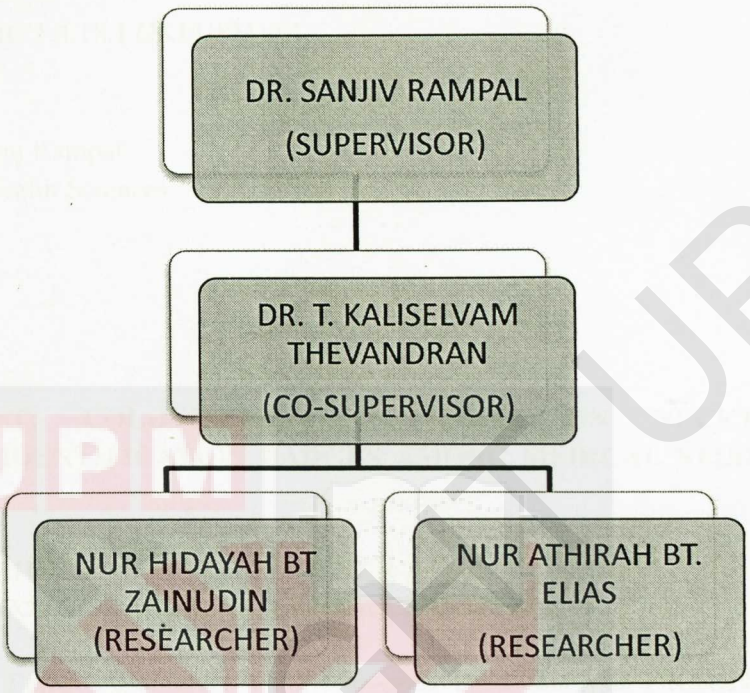

Figure 1 : Flow Chart for Research Team

Attachment 2

JKEUPM Ref No. : FPSK_Mei(13)58

Members of the JKEUPM who reviewed the documents:

Assoc. Prof. Dr. Johnson Stanslas

Date of approval: 4/7/2013

Endorsed at JKEUPM Meeting on **2/8/2013**, attended by:

NAME	DESIGNATION	GENDER	TICK IF PRESENT
Prof. Dr. Norlijah Othman	Paediatrics& Dean, Faculty of Medicine and Health Sciences	Female	√
Prof. Dr Zamberi Sekawi	Medical Microbiologist & Deputy Dean of Research and Internationalization, Faculty of Medicine and Health Sciences	Male	√
Prof. Dato' Dr. Lye Munn Sann	Medical Statistician, Dept of Community Health, Faculty of Medicine and Health Sciences	Male	
Prof. Dr. Tengku AizanAbd Hamid	Gerontologist & Director, Institute of Gerontology	Female	√
Prof. Dr. Lekhraj Rampal	Medical Statistician, Dept of Community Health, Faculty of Medicine and Health Sciences	Male	
Prof. Dr. Elizabeth George	Pathologist, Dept of Pathology, Faculty of Medicine and Health Sciences	Female	√
Prof. Dr. Lim ThiamAun	Anesthesiologist, Dept of Surgery, Faculty of Medicine and Health Sciences	Male	
Prof. Dr. Wan Omar Abdullah	Medical Parasitologist, Dept of Medical Microbiology and Parasitology, Faculty of Medicine and Health Sciences	Male	
Prof. Dr. Patimah Ismail	Professor of Biomedicine, Dept of Biomedical Sciences, Faculty of Medicine and Health Sciences	Female	√
Assoc. Prof. Dr. Johnson Stanslas	Pharmacologist, Dept of Medicine, Faculty of Medicine and Health Sciences	Male	√
Assoc. Prof Dr. Mansor Abu Talib	Assoc. Professor of Guidance and Counselling, Dept of Human Development and Family Studies, Faculty of Human Ecology	Male	
Assoc. Prof. Dr. Noritah Omar (Lay Person)	Assoc. Professor of English Language, Dept of English Language, Faculty of Communication and Modern Languages	Female	√
Dr. RojanahKahar (Lay Person)	Lecturer of Dept of Human Development and Family Studies, Faculty of Human Ecology	Female	√
Tan Sri Dato' Napsiah Omar (Lay Person)	Chairman, National Population and Family Development Board	Female	

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SELANGOR, MALAYSIA

RESPONDENT'S INFORMATION SHEET

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

STUDY TITLE

Colonization Of MRSA On Neckties, Identification Badge And Headscarves Among Medical Students In Upm 2013

INTRODUCTION

Methicilin-resistant *Staphylococcus Aureus* or MRSA is a part of Gram-positive staphylococcus strain that is resistance to widely used antibiotics known as beta-lactams such as methicillin, oxacillin and penicillin. MRSA can be transmitted through direct hand contact with contaminated body fluid or through contaminated stethoscope, identification badges, neckties, white coats, all worn by healthcare workers, for example, doctors and nurses, and also worn by medical students.

WHAT WILL YOU HAVE TO DO?

A swab will be collected from participants neckties's, ID badge's or headscarve's for laboratory research to detect MRSA colonization. Participants are also required to answer questionnaires.

WHO SHOULD NOT ENTER THE STUDY?

Students who are not wearing neckties, ID badges or headscarves.

WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

The laboratory research will detect MRSA colonies on your neckties, ID badges or headscarves. The laboratory result obtained will be useful to provide information for future prevention of MRSA colonization.

b) TO THE INVESTIGATOR?

Your participation will help in the gathering of data for the laboratory research in order to provide the information on the colonization of MRSA.

WHAT ARE THE POSSIBLE RISKS?
NONE

WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?
Yes. All information provided are strictly confidential. Information will only be presented in a collective manner without the mentioning of any individual identity.

WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

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HELAIAN PENERANGAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

TAJUK KAJIAN

Kolonisasi MRSA Pada Tali Leher, Tag Nama Dan Tudung Dalam Kalangan Pelajar Perubatan Di Upm 2013

PENGENALAN

Methicilin-resistant *Staphylococcus Aureus* atau MRSA adalah sebahagian daripada strain gram-postif Staphylococcus yang boleh bertahan daripada antibiotik daripada kumpulan beta-lactams seperti methicilin, oxacilin dan penicilin. MRSA boleh disebarkan melalui sentuhan kepada cecair kotor seperti darah, steteskop yang tercemar, tag nama, tali leher, kot putih yang dipakai oleh pekerja bidang kesihatan contohnya doktor dan jururawat, dan juga yang dipakai oleh pelajar perubatan.

APAKAH YANG PERLU ANDA LAKUKAN?

Swab akan diambil daripada tali leher, tag nama atau tudung responden untuk tujuan penyelidikan makmal. Responden juga perlu menjawab borang soal selidik.

SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Pelajar yang tidak memakai tali leher, tag nama atau tudung.

APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) **KEPADA ANDA SEBAGAI PENYERTA?**

Penyelidikan makmal akan mengesan koloni MRSA pada tali leher, tag nama atau tudung. Keputusan yang diperolehi akan berguna untuk menyediakan maklumat untuk mencegah kolonisasi MRSA pada masa akan datang.

b) **KEPADA PENYELIDIK?**

Penglibatan anda akan membantu kami untuk mengumpul data dalam penyelidikan makmal untuk memperolehi data untuk kolonisasi MRSA.

ADAKAH IA BERISIKO?
TIDAK

ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Ya. Setiap maklumat yang diberikan akan dirahsiakan dan tidak akan didedahkan kepada orang lain.

SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

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SELANGOR, MALAYSIA

CONSENT FORM (RESPONDENT)

RESEARCH TITLE :

COLONIZATION OF MRSA ON NECKTIES, HEADSCARVES AND IDENTIFICATION BADGES AMONG MEDICAL STUDENTS IN UPM 2013

RESEARCHERS :

NUR HIDAYAH BINTI ZAINUDDIN & NUR ATHIRAH BINTI ELIAS (PELAJAR PENYELIDIK)
DR. SANJIV RAMPAL A/L LEKHRAJ RAMPAL (KETUA PENYELIA)
DR. T. KALAISELVAM THEVANDRAN (PENOLONG PENYELIA)

I ..... Identity Card No. .....
address.....
.....hereby voluntarily agree to take part in the comunity research *(questionnaire study/ labaratory research) specified above.

I have been informed about the nature of the clinical research in terms of methodology, possible adverse effects and complications (as written in the Respondent Information Sheet). I understand that I have the right to withdraw from this clinical research at any time without assigning any reason whatsoever. I also understand that this study is confidential and all information provided with regards to my identity will remain private and confidential.

I* wish / do not wish to know the results of the tests performed on any samples taken from me.

* delete where necessary

Signature ..... Signature .....
(*Respondent*) (*Witness*)

Date :..... Name :.....

I/C No.
:.....

I confirm that I have explained to the respondent the nature and purpose of the above –mentioned clinical research.

Date ..... Signature .....
(Researcher)

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SELANGOR, MALAYSIA

BORANG PERSETUJUAN RESPONDEN

TAJUK PENYELIDIKAN :

KOLONI MRSA PADA TALI LEHER, TAG NAMA DAN TUDUNG DALAM KALANGAN PELAJAR PERUBATAN DI UPM 2013

PENYELIDIK :

NUR HIDAYAH BINTI ZAINUDDIN & NUR ATHIRAH BINTI ELIAS (PELAJAR PENYELIDIK)
DR. SANJIV RAMPAL A/L LEKRAJ RAMPAL (KETUA PENYELIA)
DR. T. KALAISELVAM THEVANDRAN (PENOLONG PENYELIA)

Saya..... No Kad Pengenalan. .....
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam menyertai penyelidikan komuniti *(pengajian soal selidik/ kaji makmal) seperti yang disebut di atas.

Saya telah diberi penjelasan secara menyeluruh mengenai dasar penyelidikan komuniti dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang dijalankan ke atas sampel yang diambil dari saya.

*potong yang tidak berkenaan

Tandatangan .....
(*Responden*)

Tandatangan .....
(*Saksi*)

Tarikh :.....

Nama :.....

No. K/P: .....

Saya mengesahkan bahawa saya telah menerangkan kepada responden sifat dan tujuan penyelidikan klinikal tersebut di atas.

Tarikh .....

Tandatangan .....
(*Penyelidik*)

Questionnaire (*Please tick the appropriate response*)

Section A

1. Age
   ☐ 18-21 ☐ 22-24

2. Gender
   ☐ Male ☐ Female

3. Ethnicity
   ☐ Malay ☐ Chinese ☐ Indian ☐ Others

4. Year
   ☐ 1st year ☐ 2nd year ☐ 3rd year ☐ 4th year
   ☐ 5th year

Section B

1. Please choose the following items :

ITEM	WEAR (in a week)				WASH				
	1-2x	3-4x	5-6x	EVERYDAY	DAILY	WEEKLY	FORTNIGHTLY	MONTHLY	NEVER
NECKTIE									
HEADSCARF									
ID BADGES									

2. Do you button up your white coat during lab practical or while examining patients ?
   ☐ Yes ☐ No

For Pre-Clinical Student

3. Did you attend any lab recently ?
   ☐ Yes.
   If yes, which lab ?
   Please state : _____
   ☐ No

For Clinical Students

4. Are you stationed at any department in hospital recently ?
   - ☐ Yes
     If yes, what department ?
     please state : _____
   - ☐ No

5. How many hours are you exposed to the clinical setting in a day?
   - ☐ 1-2 hours ☐ 3-4 hours ☐ 5-6 hours ☐ 7-8 hours
   - ☐ more than 8 hours

6. How many patients do you examine in a day?
   - ☐ 1-2 patients ☐ 3-4 patients ☐ 5-6 patients ☐ 7-8 patients
   - ☐ more than 8 patients

7. Did you perform any of the basic procedure on a patient?
   - ☐ Yes.
     If yes, which procedure ?
     - ☐ Physical examination (e.g ; chest examination, abdominal examination)
     - ☐ Blood taking
     - ☐ Insertion of catheter
     - ☐ Insertion of nasogastric tube
     - ☐ Insertion of IV Branula (Canula)
     - ☐ Others : _____ (please state)
   - ☐ No

8. Did you wash your hands before and after performing medical procedure / physical examination ?
   ☐ Yes ☐ No

Section C

9. How many minutes did you spent to wash your hand?
   - ☐ 1-2 minutes ☐ 3-4 minutes ☐ 5-6 minutes ☐ 7-8 minutes
   - ☐ more than 8 minutes

10. Have you been taught the proper way of hand hygiene?
    ☐ Yes ☐ No

11. Do you routinely use an alcohol-based hand rub for hand hygiene?
    ☐ Yes ☐ No

12. Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? *(tick one answer only)*

- ☐ Health-care workers' hands when not clean
- ☐ Air circulating in the hospital
- ☐ Exposure to colonised surfaces (i.e., beds, chairs, tables, floors)
- ☐ Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

13. What is the most frequent source of germs responsible for health care-associated infections? *(tick one answer only)*

- ☐ The hospital's water system
- ☐ The hospital air
- ☐ Germs already present on or within the patient
- ☐ The hospital environment (surfaces)

14. Which of the following hand hygiene actions prevents transmission of germs *to the patient*?

a.	Before touching a patient	☐ Yes	☐ No
b.	Immediately after a risk of body fluid exposure	☐ Yes	☐ No
c.	After exposure to the immediate surroundings of a patient	☐ Yes	☐ No
d.	Immediately before a clean/aseptic procedure	☐ Yes	☐ No

15. Which of the following hand hygiene actions prevents transmission of germs *to the health-care worker*?

a.	After touching a patient	☐ Yes	☐ No
b.	Immediately after a risk of body fluid exposure	☐ Yes	☐ No
c.	Immediately before a clean/aseptic procedure	☐ Yes	☐ No
d.	After exposure to the immediate surroundings of a patient	☐ Yes	☐ No

16. Which of the following statements on alcohol-based handrub and handwashing with soap and water are true?

a.	Handrubbing is more rapid for hand cleansing than handwashing	☐ True	☐ False
b.	Handrubbing causes skin dryness more than handwashing	☐ True	☐ False
c.	Handrubbing is more effective against germs than handwashing	☐ True	☐ False
d.	Handwashing and handrubbing are recommended to be performed in sequence	☐ True	☐ False

17. What is the minimal time needed for alcohol-based handrub to kill most germs on your hands? *(tick one answer only)*

- ☐ 20 seconds
- ☐ 3 seconds
- ☐ 1 minute
- ☐ 10 seconds

18. Which type of hand hygiene method is required in the following situations?

a.	Before palpation of the abdomen	☐ Rubbing	☐ Washing	☐ None
b.	Before giving an injection	☐ Rubbing	☐ Washing	☐ None
c.	After emptying a bedpan	☐ Rubbing	☐ Washing	☐ None
d.	After removing examination gloves	☐ Rubbing	☐ Washing	☐ None
e.	After making a patient's bed	☐ Rubbing	☐ Washing	☐ None
f.	After visible exposure to blood	☐ Rubbing	☐ Washing	☐ None

19. Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs?

a.	Wearing jewellery	☐ Yes	☐ No
b.	Damaged skin	☐ Yes	☐ No
c.	Artificial fingernails	☐ Yes	☐ No
d.	Regular use of a hand cream	☐ Yes	☐ No

Thank you very much for your time !