Bacterial contamination of health care workers

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Abstract
Methicillin resistant *Staphylococcus aureus* (MRSA) is an important cause of nosocomial infection and health workers including doctors can be a carrier of this microorganism; also it can be present on the sleeve of white coat and auxiliaries and so transmitted between patients. Aim of this study performed to assess the MRSA carrier in health personnel in Al-Jumhori teaching hospital and to assess the benefit of dress code policy. This study was conducted on 500 swabs were taken from nose, sleeve, elbow and auxiliaries of 100 health workers and cultured to assess the presence of MRSA. The results of this study showed 65% of health workers are carrier of MRSA ; also MRSA present in 30% and 34% on the sleeve of white coat and elbow respectively while it was found in 24% of health workers auxiliaries.

INTRODUCTION

Methicillin resistant *Staphylococcus aureus* (MRSA) is a vital etiological cause of community and hospital attained infections (Aghazadeh et al. 2009, Bratu et al. 2005). Moreover, the primary MRSA case was testified in 1961 of 19th century (Aghazadeh et al. 2009). Thus, the significance of MRSA as a nosocomial and community developed pathogen is finely documented (Rahbar et al. 2006, Brown et al. 2005). Rise of MRSA globally has caused the over usage of the glycol peptides antibiotics and *S.aureus* vancomycin-resistant strain' occurrence (Mimica et al. 2007). Its heterogeneous nature is a distinguishing factor of the resistance of methicillin (Roman et al. 1997, de Lencastre et al. 1998) however, with fluctuating resistance level agreeing to the used antibiotic of β – lactam and cultural conditions. Thus, the resistance of methicillin in *S. aureus* is centered upon the extra penicillin binding proteins such as PBP2a and PBP2 that are mecA gene mediated (Brown et al. 2001). Strains of MRSA are recurrently resistant to numerous dissimilar antibiotics 'classes (Tiemersma et al. 2004). Since the escalating rate of infections that are MRSA instigated, performance of consistent, precise and quick analysis for discovery of MRSA is crucial for both measures of infection control and antibiotic therapy (Kaier et al. 2009; Muchun, et al, 2018).

Methicillin-resistant *Staphylococcus aureus* (MRSA) remains an up surging issue in the facilities of health care (Fridkin et al. 2005, Salgado et al. 2003). MRSA disease continues to increase the rate of all documented strains of *Staphylococcus aureus* in the past and present decades are the substantial clinical samples of various hospitals (Nimmo et al. 2006, Lakhundi and Zhang 2018). The growing rates of colonization lead to the augmented rates of infection in hospitals and community.

When an individual is considered to be a MRSA carrier, it basically means that that respective person contains the *S. aureus* or MRSA bacteria on his/ her skin or even more frequently their nasal cavity while sustaining the no presence of the infections' indications (Creech et al. 2006).

Initially, the white coat was presented in the 19th century to avoid the cross-contamination. Thus, for more than a century, the white coat with long sleeves have become a mark of medical profession, whereas, the death toll of white coat has been expressed in UK. Hence, the white coat is now convicted as an indication of infection. Several trusts of NHS have now forbidden the garment for government and wards while presuming that all other follow suit by January 2007 (Pratt et al. 2007, Dalal 2012).

In USA the doctors still wear white coat till June 2009 when the subject of the "Endangered White Coat "arise so the American Medical Association (AMA) House of

Delegates passed a resolution to encourage the "adoption of hospital guidelines for dress codes that minimize transmission of nosocomial infections (NI)" (American Medical Association 2009), thus, the editorials' publication were initiated and questioning of novel stories as well that either white coats damage the patients or not (Slife 2009). Such debate is not novel now, for instance, alterations in the dress code of the hospital employees have been executed in UK (Murphy 2008, Kerr 2007, Gray 2008), however, the improved concern has also carried this problem to the front (American Medical Association 2009, Magos et al. 2007) . In United Kingdom, the hospital employees now accept the policy of "bare below the elbows" in the care areas of patients, hoping that it would reduce the NI incidences. Though these alterations have been implemented by United Kingdom, but no researches have considered the impact on the rates of NI by white coats of physicians or bare below elbow policy (Henderson et al. 2008). Aim of Study:

1. Assess the presence of MRSA carrier in Al-Jumhori Teaching Hospital as an indication of the carrier in health personnel and use this as a screening policy in Iraqi MOH.
2. Evaluate the difference of the presence of microorganism between wearing white coat and bare below elbow policy which was applied in U.K., Canada and Mayo clinic in U.S.A.
3. Assess the presence of microorganism in different health staff auxiliaries (stethoscope, stamp, pen, and wristwatch) and this may be used by the infection controlled committee as a dress code policy for hospitals.

MATERIALS AND METHODS

A total of 500 swab were taken from 100 heath workers in Al-Jamhori Teaching Hospital (working in the I.C.U., operative theatre, surgical wards) during a period between June 2017 and February 2018the swabs were taken from:

1. Nose 100 samples (anterior and medial part of septum).
2. Sleeve of white coat and forearm below elbow (200 samples).
3. Auxiliaries (200) samples.

The samples were collected every Sunday (after the weekend) and culture performed using brain heart infusion as a transport media; culturing performed on MacConkey and blood agar.

Culturing time was 24-48 hours (only for aerobic) and the microorganism diagnosed depending on colony appearance followed by gram stain and API.

Resistance was identified conferring to the WHO's NCCLS (National Committee for Clinical Laboratory Standards). Thus, the ≤ 10 mm zone diameter was deliberated as the Methicillin resistant and 11-15

Table 1. Microorganism in the nose of health personnel

Micro organism	Number	% of ersonnel
No growth	6	6
Mixed M.O. ncluding S.aureus	17	17
S. aureus	77	77
MRSA / S.aureus	65/94	65

Table 2. Microorganism in the sleeve versus skin

Micro organism	White coat sleeve	Skin below elbow
No growth	55	43
Mixed M.O.including S.aureus	2	8
Staph aureus	43	49
MRSA / S.aureus	30/45	34/57

Table 3. Microorganism in doctor's auxiliaries

Micro organism	Number	%
No growth	64	64
Other micro organism	2	2
Staph. aureus	34	34
MRSA /S.aureus	24 /34	24

regarded as moderately sensitive ,16 and more regarded as sensitive for Methicillin.

RESULTS

1-Nose: *Staphylococcus aureus* is not present in 6 samples out of 100 while mixed microorganism present (*S.aureus* and others) in 17 personnel and the remaining were all positive for *S.aureus* and it was proved to be MRSA in 65% of health personnel as shown in **Table 1**.

2- Sleeve of white coat and forearm below elbow:
MRSA present in 30% and 34% on the sleeve of white coat and the skin below elbow of health personnel respectively as shown in **Table 2**.

3- Auxiliaries: (stamp, pen, jewelry, stethoscope, wristwatch and cell phone):
24% of samples of health personnel were found to be positive for MRSA which was detected in one or more of their auxiliariesas shown in **Table 3**.

DISCUSSION

MRSA Carrier
Hence, the test results for the detection of MRSA by taking nasal swabs were identical to the MRSA detection taken with swabs from other sites (axilla, groins) (van Hall et al. 2007).

The MRSA presents in 65% of health personnel in Al-Jumhori Teaching Hospital which is not accepted in any hospital and this incidence is greater than other places like USA In Louisiana which approximate that about 30% of overall population are termed as carriers of *Staphylococci*, while 1% of population is low risk MRSA carriers, whereas, higher risk population of 5-20% are acknowledged as MRSA carriers (Louisiana Office of Public Health Infectious Disease Epidemiology Section) ,but the prevalence of MRSA has grown steadily throughout the world to reach 50%(2002) in some hospitals in Japan and Spain where screening

program initiated to decrease this high prevalence (Enright et al. 2002).

This large number of MRSA carrier in Al-Jumhori Teaching Hospital reflects the need for screening program of all health personnel as it may cause serious infection to the in patients as well as spreading of MRSA (Enright et al. 2002).

The problem is bigger than expected as those strain are resistant to many other antibiotic like amoxicillin / clavulanic, cloxacillin, ceftriaxone were the percent of resistance are 84%, 66%, 94%, respectively, also it is important to mention that those microorganism are moderately susceptible to vancomycin 54% and susceptible in 46% these figures are alarming signs to the emergence of vancomycin resistant *Staphylococcus aureus*.

White Coat Versus Bare Below Elbow

This study showed that the sleeve of white coat were contaminated with MRSA in 30% while skin below elbo harbor MRSA in 34 %. guidelines to help prevent NI (Jacob 2008). They cited Wilson et al (Wilson et al. 2007) and Loveday et al (Loveday et al. 2007) as the base proofs for their suggestions. They recognized that the research work of Wilson and his colleagues proposes "no final evidence that uniforms (or other work clothes) pose a significant hazard in terms of spreading infection" (Wilson *et al*, 2007) .Though, they still suggest a policy of bare below elbow (Jacob , 2008).thus colleagues and love day tried to estimate the perception of public for the uniform of healthcare workers relative to the infections and results indicated that "the general public's perception is that uniforms pose an infection risk when worn inside and outside clinical settings" (Loveday *et al*, 2007). Additionally, EPIC2: the guidelines based on national evidence for the prevention of Healthcare linked infections in the England's NHS Hospitals also determined that "none of these studies established an association between contaminated uniforms and HCAI (healthcare associated infections)" (Pratt, 2007).

In this study it is clear that both white coat and skin below elbow harbor MRSA and other pathological microorganism, but surprisingly the contamination was still less than the percent of carrier of MRSA and we have to mention that our health personnel don't practice the wash of hands or the use of germicidal policy between patients examination which is a crucial factor to minimize spread of infection ,the role of suitable hand hygiene must be re-stressed with staff that exert an effort with inmates that have been diagnosed with the infections of MRSA. Thus, appropriate supplies of hand washing are dangerous for MRSA detected inmates and also for the staff that are in contact with those patients (Dancer and Duerden 2014).

This study shows that bare below elbow policy per se is not enough as both (sleeve of white coat and skin)were contaminated ;this emphasize the important of hand hygiene which may reduce this large number of contamination, but we have to mention that there is religious resistance against exposure of skin below elbow for female Muslims doctors and this was overcome in UK dress code by special rubber disposable sleeve.

Auxiliaries

MRSA presents in 24% of different auxiliaries (stamp, pen, jewelry, stethoscope, wristwatch and cell phones); this can be eliminated easily by following a dress code policy that prevent carrying these auxiliaries when dealing with patients similar to guidelines of NHS in U.K. (Grosios et al. 2010).

CONCLUSIONS AND RECOMMENDATIONS

1- There are a large number of health personnel who are unrecognized carrier of MRSA and require treatment with screening of all health personnel.

2- There was no difference between the presence of MRSA on the sleeve of white coat and the skin below elbow, but bear below elbow policy and adequate hand hygiene may reduce the incidence of nosocomial infection.

3- Doctor's auxiliaries harbor MRSA and this can be eliminated by special dress code policy applied when dealing with patients.

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