EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 3
Issue: 5
106-109
Year: 2016

PREVALENCE OF NASAL CARRIAGE OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS SPP.* IN BAGHDAD

Suhad Y. Abed[1], Mohammed F. AL-Marjani*[1], Khalid R. Esa[2], Roaa F. Mansour[1] and Hassan A. AL-Rubaye[1]

[1]Department of Biology – College of Science / Al- Mustansiriyah University. Baghdad – Iraq.
[2]Ibn Baladi Hospital, Baghdad – Iraq.

***Author for Correspondence: Dr. Mohammed F. AL-Marjani**
Department of Biology – College of Science / Al- Mustansiriyah University. Baghdad – Iraq

Article Received on 01/03/2016 **Article Revised on 24/03/2016** **Article Accepted on 14/04/2016**

ABSTRACT
Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a primary cause of soft tissue and skin infections among persons without extensive exposure to healthcare settings. Nasal carriage of *Staphylococcus aureus* is a known risk factor for these infections. In present study, 100 isolates of *staphylococci* (88.5%) were collected from 113 anterior nares swabs from students in Department of Biology, AL-Mustansiriyah University. 13 students (11.5%) have non-carriers *staphylococci*. Among all *staphylococci* isolates, 63 isolates (63 %) were *S. epidermidis*, flowed by 37 (37%) of isolates were identified as *S. aureus*. 95% of isolates were methicillin resistant *S. aureus*; 85% were methicillin resistant *S. epidermidis*. The higher resistance of *S. epidermidis* isolates to antibiotics was to methicillin 85% and 75% for cephalexin, 5% for cefoxitin, while all isolates were sensitive for the Azithromycin and ciprofloxacin. *S. aureus* isolates showed higher rate of resistance to methicillin 95% and 65% of isolates were resistant for cephalexin and 60% for cefoxitin.

KEYWORDS: *Staphylococcus aureus, S. epidermidis, S. epidermidis.*

INTRODUCTION

Approximately 20% of the healthy human population is persistently colonized in the nasal cavity with *Staphylococcus aureus*, which constitutes a main risk for infection (Weidenmaier *et al*., 2002). The risk of infection in some individual nasal recolonization may can progress substantially within 24-48 h of initial topical system, after 72 h, *Staphylococcus aureus* can take hold in human tissues and eventually become resistant to treatment (Lipsky *et al*., 2010).

The first isolate of MRSA was reported in 1961 in England (Rolinson, 1998). Recently, MRSA has become a major public health problem world (Jarvis *et al*., 2007). Hospital and community-acquired *Staphylococcus aureus* infections pose a substantial burden in terms of mortality, morbidity and healthcare costs (Rashid *etal*.,2012). Methicillin Resistant *S.aureus* (MRSA) is a major nosocomial pathogen that causes severe morbidity and mortality worldwide. Initially, MRSA was limited to hospitals, however it is now increasingly recovered from nursing homes and the community (Askarian *etal*. 2009). Conversely, the global problem of increasing trend in antimicrobial resistance is particularly pressing in the developing countries, were the MRSA is often the sever causal agent in (HA-MRSA) infection (Krebes *etal*.,2011). *Staphylococci* can be divided into two main group are distinguished by their ability to coagulated blood: coagulated-positive *Staphylococci* (COPs), with the most important species *S. aureus* and coagulated Negative staphylococci (CONS), which comprise most species inducing *S. epidermidis* (Kloos and Bannerman,1999).

CONs, particularly *S. epidormidis* part of normal flora (Dall *etal* .,2005) inhabitants of the nasal cavity, but they cause of central nervous system infections and bacteremia is usually required because CONs have become increasing resistant to different Antimicrobial agents (Johan Huebner and Donald,1999).CONS have on indirect importance for pathogenesis of *S. aureus* as reservoir of resistance genes that add to their own pathogenic potential (Dinges *et al*., 2000).

Accordingly and because, *Staphylococci* mainly cause opportunistic infections acquired from different source like patients, hospital staff from their normal flora, mainly through their hand and its high ability to transmitted among hospitalized patients so called epidemic MRSA (Lafi,2008). **The aim** of this study was to determine the prevalence of nasal carriage of MRSA among students at college of science, Al-Mustansiryiah University, Baghdad/Iraq, and to determine the susceptibility of the recovered isolates to various antibiotics.

MATERIAL AND METHODS

Nasal swab and culture

Anterior nares swab were taken from 113 students (18-23 years) taking in Department of Biology, AL-Mustansiriyah University, the students not have clinical symptoms and no current antibiotic use.

Sterile cotton swab was most end with sterile normal slain and was rotated at last 5 times in one nares (Jain *et al*., 2008), then swabs were inoculated directly on the Manitol Salt agar (MSA) (oxoid), sampling plates were incubate at 37 c for 24 to 48 h. Pure colonies were streaked on to blood and incubated at 37 c overnight. The isolates were identified by convential biochemical reaction according to the criteria established by Forbes *et al*.(2007).

Antimicrobial susceptibility test

The Antimicrobial susceptibility of *Staphylococci* (*S.aureus* and *S.epidermidis*) isolates was done by using Kirby-Bauer disc diffusion technique on Mueller Hinton agar (Oxoid, England) using overnight culture at a 0.5 McFarland standard followed by incubation at 35 oC for 16 to 18 h. following Clinical and Laboratory Standards Institute (CLSI) guidelines (2011) with commercially available antimicrobial discs (Bioanalyse/Turkey): Ciprofloxacin, Cephalexin, Cefoxitin, Methicillin and Azithromycin.

Biofilm formation Assay

The quantification assay was performed as previously described (Mireles *et al*., 2001). Typically, 10 µl of an overnight culture was used to inoculate PVC microtiter wells containing 90 µl of LB without NaCl but with 2% glucose. The covered microtiter dish was sealed with Parafilm during incubation at 30°C. Cultures were removed to determine the optical density at 630 nm (OD_{630}) and the wells were rinsed with distilled water. After drying at room temperature for 15 min, 200 µl of crystal violet (1%) was added to the wells for 20 min. The stained biofilms were rinsed several times with distilled water, allowed to dry at room temperature for 15 min, and extracted twice with 200ul of 95% ethanol.

RESULTS AND DISCUSSION

The nasal cavity are primary ecological reservoir of *Staphylococci* species in human, may promote the development of allergic diseases and is major or reservoir for endogenous infections (Werithem *et al*., 2005), Such as chronic infection due to their capacity to biofilm formation, highly resistant to multidrug treatment (Vanden Akker *et al*., 2006).

In present study, 100 isolates of *staphylococci* (88.5%) were collected from 113 anterior nares swabs from students in Department of Biology, AL-Mustansiriyah University. 13 students (11.5%) have non-carriers *staphylococci*. Among all *Staphylococci* isolates, 63 isolates (63 %) were *S .epidermidis*, flowed by 37 (37%) of isolates were identified as *S.aureus* (Table 1).

Table 1: No. of Staphylococci isolates from anterior nares swabs.

isolates	NO. of isolate	Percentage %
S. epidermidis	63	63
S. aureus	37	37

Several studies worldwide have reported the rate of nasal carriage of *S. aureus* strains varying from 16.8% to 90% (Bolyard *et al*., 1998). Of the all *staphylococci* isolates, 95% were methicillin resistant *S. aureus*; 85% were methicillin resistant *S. epidermidis* (Table 2).

It was appeared that the higher resistance of *S.epidermidis* isolates to antibiotics was to methicillin 85% and 75% for cephalexin, 5% for cefoxitin, while all isolates were sensitive for the Azithromycin and ciprofloxacin.

S. aureus isolates showed higher rate of resistance to methicillin 95% and 65% of isolates were resistant for cephalexin and 60% for cefoxitin.

S.aureus was the major gram positive isolate and which showed higher rate of resistance to methicillin 95% and 65% for cephalexin and in case of cefoxitin antibiotics the resistant of the isolates were 60%. In locally study by AL Hasani (2011) reported 38.7% of MRSA in nasal cavity of adult .While, severally reported in healthy population found 43% of *S.aureus* in anterior nares of adult in Iraq, Similar to that of 36% in nasal carriage of japans adult and 32% in nasal cavity of adults in USA, So, this results agreement with study the medical students in Brazilin and observed a percentage of nasal *S.aureus* isolation of 40.8% (Prates *el al*., 2010).

These studies results incompatible with study in Palestine during 2011, observed the nasal carriage of MRSA among the students was 2.5%, also, in 2010, a total of 322 university students in Taiwan were screened and 2.2% of them harbor MRSA(Jann- Tay., *et al*., 2009). These result less than other study .for example, in a study conducted in India in2009, the nasal cavity colonization of MRSA was15.4% (Gregory *et al*., 1997),.

This result higher than study result by Ary *et al*. (2014) in Duhok of Iraq showed 18.4% of student were found to be colonization by *S.aureus* only 10 (2.04%) of the student were MRSA carriers. In a study of Yassin and Hassan (2013) about MRSA nasal cavity carriers rates among 56 nursing student, 48 pharmaceutical students,135 medical school and 45 dental students in Iraq, the rates of MRSA nasal carriage were 14.3% , 2.1%, 2.2% and 2.2% in nursing, pharmaceutical, medical and dental students respectively. In study of AL-Gebory *et al*.(2011) showed the resistance rate to methicillin was 94.3%.

Aghazadan *et al* .(2009) in Iran showed the resistance of MRSA isolates to vancomycin ,ciprofloxacin, tetracyclin

and clarithromycin were 71%, 47%,52% and 57% respectively.

Table 2: Antibiotic susceptibility Profile of nasal *S.aureus* and *S.epidermidis* isolates.

Antibiotics	Resistance %	
	S. aurseus	*S. epidermidis*
Methicillin	95%	85%
Cephalexin	65%	75%
Cefoxitin	60%	5%
Azithromycin	35%	0%
Ciprofloxacin	15%	0 %

Surprising, in study of comparison of population with MRSA carriage and without MRSA colonization, showed that smoking was protective factor against MRSA colonization of *S.aureus* (Jann – Tay *et al*., 2009).

While, in study was showed, the MRSA prevalence was higher among the inpatients 62.6% than of out patients 10.7%, this may be attributed to the presence of hospital related strains, this similar whit studies showed that 10% to 35% of population harbor MRSA in the nose transiently or persistently and up to 30% of healthy people have *S. aureus* in their nose or other body areas (Hassan *et al*.,2008), in other study, carrier's nasal MRSA are particular problematic nasal MRSA was detected in 46% of patients with liver cirrhosis (Ucuncu *et al*., 2009). Ruimy *etal*, 2010 showed host genetic factors appeared to be the predominant determinant for MRSA persistent nasal carriage in human.

Also, some studies indicated that no epidemiological factors or antibiotic exposure were significantly associated with persistent carriage, As well as, in studies suggested that low vitamin D status may be associated with higher rates of MRSA carriage because vitamin D play an role in innate immunity (Olsen *et al*., 2012; Matheson *et al*., 2010).

Biofilm forming ability of *S. aureus* and *S. epidermidis* were study, the results showed that 11(29.7%) out of 37 *S. aureus* isolates were strong biofilm, 2(5.4%) isolates were intermediate and 7(18.9%) isolates were week biofilm formation. AL- Hassani (2011) observed that 60% of MRSA isolates produced biofilm and Jahn *et al*. (2008) from Pakistan found that 54.8% of isolates were biofilm producers. Akiyama *et al*.(1997) showed that 50% of *S.aureus* isolates produced strong biofilm and 10% found negative result.

REFERENCE

1. Aghazadan, M.; Rahbar, M.; Monnavar, M.K.; and Moghadam, f.s. 2009. Sensitivity Pattern of Methicillin Resistant and Methicillin sensitive *Staphylococcus* including Tigecyline in Iran: A. hospital study. Pak. J. Med. Sci 25(3): 443-446.
2. Akiyama, H.M.; uedo, H.; Kan Zaki, J.; Tada and J. Arata. 1997. Biofilm formation of *Staphylococcus aureus* strains isolated from impetigo and furuncle: role of fibrinogen and fibrin. J. Derm. Sci., 16: 2-10.
3. AL-Geobory, H.A.H. 2011. Comparative study between methicillin resistant *Staphylococcus aureus* (MRSA) and methicilin sensitive Staphylococcus aureus (MSSA) and detect the antimicrobial effects of some plant extracts on them. Msc. Thesis. College of Science /Baghdad University Iraq.
4. AL-Hassani, H.M.H. 2011.Comparative study between Methicillin-Resistant Coagulase Positive and Negative Staphylococci. Msc. Thesis. College of Science/ Baghdad University. Iraq.
5. Ary, H.; Nawfal, R.H.; Mahde, S.A.; Samim, A. AL Dabbagh. 2014. Methicillin resistant *Staphylococcus aureuse* colonization among secondary school students at Duhok city-Iraq. J. Microbiology and Infections Diseases., 4(2): 59-63.
6. Askarian, M.; Zeinalzadeh, A. and Japoni, A. (2009). Prevalence of nasal carriage of methicillin-resistant *Staphylococcus aureus* and its antibiotic susceptibility pattern in healthcare workers at Namazi Hospital, Shiraz, Iran. International Journal of Infectious Diseases, 13: e241—e247.
7. Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchmann SD. Guideline for infection control in healthcare personnel, 1998. Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol, 1998; 19(6): 407- 463.
8. CLSI, (Clinical and Laboratory Standars Institute), (2011). performance standard for antimicrobial susceptibility testing ,Twenty- First informational supplement., 31(1): M100-S21.
9. Dall; Antonia, M.; Coen, PG.; Wiks, M. *et al*. 2005. Competition between methicillin-sensitive and resistant *Staphylococcus auureus* in the anterior nares. J ltosp Infect., 61: 62-7.
10. Dinges, MM.; Orwin, PM. and schlievert, PM.2000. Exotoxins of *Staphylococcus aureus*. Clin Microbiol Rev. 13:16-34.
11. Edited by P.R. Murry, E.J. Baron, M. Pfaller, A.F.C. Tenover and R.K. Yoljen. Washington, DC: American Society for Microbiology.
12. Forbes, B. A; Sahm, D. F and weissfeld, A.S. (2007). Baily and Scotts Diagnostic Microbiology. 12th – ed. mosby, lnc. Blatimore, USA. P: 266 – 277.
13. Gregory, PD.; Lewis, RA.; Curnock, SP. and Dyke, KG.1997.Sudies of the repressor (Blal) of beta-lactamase synthesis in *Staphylococcus aureus*. Mol. Microbiol., 24: 1025-1037.
14. Hassan, AN.; Hashim, EA.; Musa, OH.; and Elsayed, DE. 2008. *Staphylococcus aureus* nasal carriage among surgical personel in National Ribat university Techingiya Hospital –Khartoum-Sudan. Journal of Medical Science., 3: 281-284.
15. Jahn, J.F.; Lindsay, J.A,; and Feng-yeechang, M.D.; 2008. Clones and Drones: Dovariants of Panton–

valentine Leukocidin Extend threat of community-associated methicillin –Resistant *Staphylococcus aureus*? J. Infect. Dis., 197: 175-178.
16. Jain, A.; Agarwal, A.; and verma, R.K. 2008. Cefoxitin disc diffusion test for detection of methicillin-resistant *Staphylococci*. J. Microbiol., 57: 957-61.
17. Jann-Tay Wang.; Chun-Hsing Liao.; Chi-Tai Fang; Wie-Chu Chie*; et al*. 2009. Prevalence of Rick Factor for colonization by Methicillin – Resistant *Staphylococcus aureus* among Adults in community setting in Taiwan Journal of Clinical Microbiology., 47(9): 2957-2963.
18. Jarvis W.R.; Schlosser J.; Chinn, R.Y.; Tweeten S.; and Jackson M. 2007. National prevalence of methicillin-resistant *Staphylococcus aureus* in inpatients at US health care facilities. Am. J. Infect. Control., 35: 631-637.
19. Johan Huebner, MD and Donald, A. 1999. Coagulase-negative *Staphylococci*: Role as pathogens Annual Review of Medicine. 50: 223-236
20. Kloos, W.E; and Bannerman, T.L. 1999.*Staphylococcus* and Micrococcus. In Manual of clinical Microbiology, 7thedn, pp. 264-282.
21. Krebes, J.; Al-Ghusein, H.; Feasey, N.; Breathnach, A.; and Lindscey, J.A. 2011. Arenasal carriers of staphylococcus aureus more likely to become colonized or Infected with Methicillin Resistant *shaphylococcus aureus* on Admission to altospital?. J. Clin. Microbiol., 49(1): 430-432.
22. Lafi, M.A. 2008. Incidence of Methicillin-resistance and macrolide-lincosamidest- reptogaminB resistance in clinical sample of *Staphylococca* isolatesl: a pharmacodynamic study. *J Fac Med*. Baghdad., 50(4): 1-4.
23. Lipsky, B.A; T, Y.P.; Johannes, R.S.; Vol Hyed, L. and Weigelt, J.A. 2010. Skin and soft tissue infection hospitalissed patients with diabetes: culture isolates and risk factors assocated .with mortality, length of stay and cost. US National Library of Medicine National Institutes of Health, 53(5): 914-23.
24. Matheson, EM. Mainous, AG. III. Hueston, WJ. Diaz, VA.; Everett, CJ. 2010. Vitamin Dand methicillin- resistant *Staphylococcus aureus* nasal carriage. Scand J Infect Dis., 42: 455-460.
25. Mireles J. R., Adam T. and Rsaika M. H. (2001). *Salmonella enterica Serovar Typhimurium* Swarming Mutants with Altered Biofilm-Forming Abilities: Surfactin Inhibits Biofilm Formation. J. of Bacteriology., 183 (20): 5848–5854.
26. Olsen, K.; Falch, BM.; Danielsen, K.*; et al*. 2012. *Staphylococcus aureus* nasal carriage is associated with serum. 25-hydroxy vitamin Dlevels –gender and smoking status the Tromso Staph and skin study. Eur.J. Clin Microbiolinfect Dis., 31: 465- 475.
27. Prates, K.A.; Torres, A.M.; Garcia, L.B.*; etal*.2010. Nasal Carriage of methicillin resistant *Staphylococcus aureus* in university students. Braz J Infect Dis., 14: 216-8.
28. Rashid Z, Farzana K, Sattar A. and Murtaza G.(2012). Prevalence of nasal *Staphylococcus aureus* and methicillin-resistant *Staphylococcus aureus* in hospital personnel and associated risk factors. Acta Pol Pharm.; 69(5): 985-91.
29. Rasmussen, L.P.; Kirkeby, K.; Poulsen, J. Reinhold and M. Kilian.2008. Resident aerobic microbiota of the adult human nasal cavity, APMIS. US National Library of Midicine National Institutes of Health., 108(10): 663-75.
30. Rolinson, G.N. 1998. Forty years of beta-lactam research. J antimicrob chemother, 41: 589-603.
31. Ruimy, R.; Angebult, C.; Djossou, F.; Epelboin, L.; Jarroud, S. et al. 2010. Are host genetics the prebominant determinant of persistent nasal *Staphylococcus aureus* carriage in humans? J Infect Dis, 202: 924-934. doi:10.1086/655901,htt://www.ncbi.nlm.nih.gov/pubmed/20677941.
32. Ucuncu, H.; Uslu, H.; zbek, AA.; ktan, B.; Sutbeyaz, Y. and Altas, E. 2009. Comparison of the bacterial flora of the nasal vestibule and cavity in haemodialysis patients., 29(5): 251-2,4.
33. Vanden Akker, E.L.; Nouwen, J.L.; Melles, D.C.; Van Roussum, E.F.; Koper, J.w.; uitterlind, A.G.; Hofman, A.; Verbrugh, H.A.2006. *Staphylococcus aureus* nasal carriage is associated with glucocortid receptor gene polymorphism. J.Infect. Dis., 194: 814-818.
34. Weidenmaier ,C.; Goerke,C. and Wolz, C. 2002. *Staphylococcus aureus* determinants for nasal colonization, Trend in Microbiology, 20(5): 243–250.
35. Wertheim, HF.; Mells, DC.; Vos, MC.; *et al*. 2005. The role of nasal carriage in *Staphylococcus aureus* infections. Lancet Infect Dis., 5: 751-62.
36. Yaasin, N. and Hassan,. 2013. Nasal carriage of methicillin –resistant /sensitive *Staphylococcus aureus* among students in faculty of (Midicalscienes), Duhok university. Adv Trop Med Pub Healthy Int, 3: 65-72.