Editorial

Methicillin-resistant *Staphylococcus aureus* carriage screening in intensive care

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Methicillin-resistant *Staphylococcus aureus* (MRSA) has been associated with considerable morbidity and mortality and is a major public health issue world-wide. It has established itself as a common nosocomial pathogen and is being increasingly implicated in both health-care and community associated infections in developing nations including India.[1] Recent studies indicate that MRSA is endemic in our country, with an isolation rate of nearly 27%, 49% and 47% amongst clinical isolates of *S. aureus* from out-patients, ward-in-patients and intensive care unit (ICU) patients respectively.[2]

In the present issue, the study by Datta *et al.* compares different anatomical sites, either alone or in combination, for screening MRSA carriage in the ICU. The surveillance, carried out on 400 adult patients in a multi-disciplinary tertiary care ICU, reveals an overall MRSA carriage rate of 22.5%. Amongst the six sites tested for detection of MRSA carriage, sampling from throat alone exhibited a sensitivity of 84.4%, followed by that from nose (77.7%), groin (55.5%), perineum (40%), axilla (33.3%) and the site of catheterization (17%). Multiple sampling further improved the detection sensitivity, with a combination of the nose and throat swabs detecting the maximum MRSA carriers (95.5%). Likewise, combining throat and groin swabs or nasal and groin swabs also yielded higher detection sensitivity (93.3% and 91.1% respectively) compared with single-site sampling. Based on these data, the authors report that throat is the most common site of MRSA colonization and nose or groin should be sampled simultaneously for superior detection sensitivity. Classically, anterior nares have been considered the major anatomical site for *S. aureus* screening. Many newer studies indeed suggest that including swabs from colonization sites other than the anterior nares increases the MRSA screening sensitivity,[1] though the detection sensitivity of throat versus anterior nares still remains debatable. The present work directs toward a resource-friendly, sensitive screening tool for MRSA carriage, based on phenotypic detection and multiple sampling. This is particularly important in developing countries including India, wherein routine use of molecular-typing methods for such purposes can be prohibitively expensive in many health-care settings.[3]

The transmission of drug-resistant pathogens in high-risk wards such as ICUs poses a serious health threat. However, in developing nations such as ours, the data relating to MRSA's transmission dynamics still remain scarce. A recent study from Christian Medical College, Vellore explored the nosocomial transmission of MRSA in ICUs by mechanistic statistical models, based on a 50 month MRSA infection data collected retrospectively.[3] A total of 72 MRSA infections were observed during this study period, corresponding to an average of 1.44 cases/month and nearly 78% of these infections were nosocomial. Only 4.2% of the patients were MRSA-positive when admitted. The transmission rate, infection rate and ward-level reproduction number were 0.094/day and 0.39/month and 0.42 respectively and the average anti-MRSA treatment cost per patient was estimated to be US dollar 124, which is nearly 3 times greater than the monthly income of more

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than 40% of the Indian population. This data reflects the transmission parameters for MRSA infections in ICUs *per se*; asymptomatic MRSA carriage was not screened in this study. Asymptomatic carriers, both patients and health-care workers, constitute important MRSA reservoirs in the hospitals.[1,4] Limited studies available from India suggest that MRSA carriage rates are nearly 15.6% in in-patients, 3.8% in out-patients and range from 1.8 to 25% amongst health-care workers in various hospital settings.[1] In a study from J. N. Medical College, Aligarh, the clinical isolates from patients with post-operative wound infections in orthopedic surgical wards were found to be indistinguishable or related to the strains colonizing anterior nares and/or skin, indicating endogenous infection.[4] Further, most of the colonized patients appeared to have acquired MRSA in the hospital settings as the carriage strains in such patients were of the same molecular types as those from health-care workers. These findings delineate the potential of MRSA carriage isolates in causing self-infections in the carrier hosts and cross-infections to other patients, through health-care workers, in our settings. Transient carriage on the hands of health-care workers is considered to be the principal mechanism of MRSA transmission between patients.[4] Persistent colonization of health-care workers can further aggravate the situation, as hand hygiene, the key intervention to minimize infection transmission, will not clear persistent carriage.[5]

Another aspect, which needs to be considered, is the potential role of carriage screening and decolonization in preventing MRSA infections amongst hospitalized patients in our settings. Currently, such studies are lacking in India. MRSA screening is routinely employed in many countries world-wide and is thought to be helpful in limiting MRSA spread.[1,5,6] However, in developing nations including India, universal active surveillance is expected to be resource and labor intensive and its benefits need to be appropriately weighed with respect to the outcomes obtained and its cost-effectiveness. Targeted surveillance may also be tested as a viable alternative in our settings, wherein the screening can be focused on patients who are more likely to convert to an MRSA colonized pattern, such as those in long-term care, greater than 70 years of age, having diabetes or antibiotic exposure.[6]

The effectiveness of decolonization strategies in preventing MRSA transmission has remained inconclusive so far. Many studies reveal that decolonization of specific patient subgroups, like those on continuous ambulatory peritoneal dialysis and hemodialysis or those undergoing surgery, significantly decreases *S. aureus* infection rate. Eradication of *S. aureus* carriage in non-surgical patients may delay the infection onset, but the infection rate remains nearly unaffected. In settings where MRSA is endemic such as in India, elimination of carriage is not considered cost-effective, except under outbreak situations.[7] Another study further indicates that regular screening of health-care workers followed by decolonization of MRSA carriers is unlikely to reduce nosocomial spread in high-endemicity settings; in contrast, decolonization of patients can be very effective.[5]

In developed countries with a low incidence of MRSA infections, policies of active case and carrier detection surveillance and eradication leads to effective containment. However, in India, with an MRSA prevalence of 30-50% of all *S. aureus* clinical isolates, where multiple clones circulate at any point of time, there is an urgent need for well controlled multicenter studies for MRSA carriage in patients and health-care providers and molecular clonal identity with clinical isolates to give an insight into the dynamics of MRSA reservoir and transmission in hospital. The results will guide us to formulate appropriate strategy for prevention and containment of such infections.

References

1. Ray P, Gautam V, Singh R. Methicillin-resistant *Staphylococcus aureus* in developed and developing countries: Implications and solutions. World Health Organization (WHO), Special issue on Antimicrobial Resistance in South-East Asia. Regional Health Forum (WHO South-East Asia region) 2011;15:74-82.
2. Indian Network for Surveillance of Antimicrobial Resistance (INSAR) Group, India. Methicillin resistant *Staphylococcus aureus* (MRSA) in India: Prevalence and susceptibility pattern. Indian J Med Res 2013;137:363-9.
3. Christopher S, Verghis RM, Antonisamy B, Sowmyanarayanan TV, Brahmadathan KN, Kang G, *et al*. Transmission dynamics of methicillin-resistant *Staphylococcus aureus* in a medical intensive care unit in India. PLoS One 2011;6:e20604.
4. Dar JA, Thoker MA, Khan JA, Ali A, Khan MA, Rizwan M, *et al*. Molecular epidemiology of clinical and carrier strains of methicillin resistant *Staphylococcus aureus* (MRSA) in the hospital settings of North India. Ann Clin Microbiol Antimicrob 2006;5:22.
5. Gurieva TV, Bootsma MC, Bonten MJ. Decolonization of patients and health care workers to control nosocomial spread of methicillin-resistant *Staphylococcus aureus*: A simulation study. BMC Infect Dis 2012;12:302.
6. Gupta K, Martinello RA, Young M, Strymish J, Cho K, Lawler E. MRSA nasal carriage patterns and the subsequent risk of conversion between patterns, infection, and death. PLoS One 2013;8:e53674.
7. Kluytmans J, van Belkum A, Verbrugh H. Nasal carriage of *Staphylococcus aureus*: Epidemiology, underlying mechanisms, and associated risks. Clin Microbiol Rev 1997;10:505-20.

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