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A Pilot Study to Determine the Degree of Colonization of Pediatric Emergency Staff with Methicillin-Resistant *Staphylococcus aureus* (MRSA)

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Methicillin-Resistant *Staphylococcus aureus* (MRSA) can be transmitted during pediatric emergency treatment and, occasionally, could result in contamination and infection of both patients and staff. Nasal swabs were taken from a sample of 14 physicians and 22 registered nurses working in a pediatric emergency unit at a tertiary care hospital in Riyadh, KSA. All participants filled in a short survey related to the study. All swabs were spread onto *Staphylococcus aureus*, CHROMagarat and incubated at 37° C for 48 hours. In order to isolate this bacterium form the air plates containing the same medium was also exposed to different areas of the clinical environment in the same pediatric emergency unit (for 72 hours). Thirty six health care professionals participated in the study comprising 14 physicians and 22 registered nurses. Methicillin-resistant *Staphylococcus aureus* colonies were isolated from 71% of physicians and 68% of registered nurses, while no isolates were obtained from the opened plates exposed to the air of the clinical environment. The colonization rate in both physicians and nurses group was not related to hand washing before and after patients encounter, the number of working years in pediatric emergency, or the number of monthly shifts. The colonization rate for MRSA is high among pediatric emergency staff included in this pilot. Further studies are required to study factors leading to this high rate and the effect of this high rate on patient's safety.

Key words: MRSA, *Staphylococcus aureus,* pediatric emergency, cross-contamination.

Staphylococcus aureus can be isolated on the skin and from the nasal passage of 32% (approximately 89.4 million people) of the United States population[1]. *Staphylococcus aureus* is an opportunistic pathogen which can ciase a variety of clinical problems, such as minor skin infections (furuncles, folliculitis,and cellulitis) to life-threatening pneumonia, septicemia, which can lead to death[2] some strains of *S aureus* have developed resistance to many commonly used beta lactam antibiotics, including penicillin, amoxicillin, cephalosporin, and carbapenem and the monobactam antibiotic group. Those strains of *Staphylococcus* exhibiting such resistance are reffered to as methicillin-resistant *Staphylococcus aureus* (MRSA). These strains originated and were

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mainly isolated from hospitals and in 1974, only 2% of hospital *S.aureus* infections were caused by MRSA while currently, 64% of all *S. aureus* infections in hospitals are due to MRSA[3,4] and infections by this bacterium are now one of the leading causes of nosocomial infections of patients in long-term care facilities, prisons and amongst homeless people[5.] It is estimated that annually, some 26,000 hospitalizations are due to MRSA with 94,000 being invasive, leading to approximately 19,000 deaths[2,6]. A significant increase in MRSA infections has occurred since the late 1990s and it has been estimated that 14% (19,000) of all deaths in the United States yearly are due to MRSA[2].This includes people with no recent exposure to hospitals and patients in long-term care facilities.

Although the incidence of CA-MRSA infections in children has increased dramatically over the past decade, little is known about MRSA colonization rates in health workers who are attending patients with potential or actual MRSA infection.

Emergency medical responders (EMRS) have a high potential for MRSA exposure, not only through patient and hospital contacts but also in, for example, the fire station environment, and MRSA was isolated with the highest frequency on the couches and the class desks[6,7] from such environments. Although the true health significance of these exposures is unknown, improved infection control practices, such as routine hand washing and surface disinfection are warranted to reduce MRSA exposures.

METHODS

Samples were taken from health care professionals working in a pediatric emergency unit at a tertiary care hospital in Riyadh, KSA. All participants were trained how to take a nasal swab by one of the investigators, then each participant took nasal swab for him or herself using a sterile cotton tip moistened with sterile normal saline, the swab was taken from both nostrils using a single swab. Each participant then filled in a short survey to determine details of basic demographic data, years of experience spent in pediatric emergency, number of shifts per month, and hand washing habits before and after attending patients. All swabs were incubated in SMA plates at 37^{o} C for 48 hours. The colonies which developed were then identified for *Staphylococcus aureus*, using CHROMagar which incubated for 48 hours before the colonies were counted. Samples of the same culture medium were also exposed (fro 72h) to the air of a range of different clinical environments in the same pediatric emergency unit; any colonies which were isolated were then counted and identified.

RESULTS

A total of 36 health care professionals participated in the study, i.e. 14 physicians, and 22 registered nurses, details of which are given in Table 1. Methicillin-Resistant *Staphylococcus aureus* (MRSA) were isolated from 10 out of 14 in the physicians group while 15 out of 22 in the registered nurses group with a statistical significance (P- Value 0.013175). No statistical relationship was found between years of experience, age, number of shifts worked, hand washing habit, and the colonization rate in both group (Tables 2 and 3), and all isolates from the clinical environment were negative for MRSA.

Table 1. Characteristics of the health professionals involved

Variable		Physicians(14)	Nurses (22)	P- Value
Age		32-57	33	Not significant
Gender	Male	12	0	
	Female	2	22	
Years of practice		8	6	Not significant
Shift per month		17	18	Not significant
MRSA		10	15	0.013175

Table 2. Washing hands before patient encounter

MRSA	+	-	Total
Occasionally	1	1	2
Frequently	15	10	25
Constantly	9		9
Total	25	11	36
	p value	0.27019	

Table 3. Washing hands after patient encounter

MRSA	+	-	Total
occasionally		1	1
Frequently	9	4	13
Constantly	16	6	22
Grand Total	25	11	36
	p value	0.429493341	

DISCUSION

The literature shows that, MRSA associated skin infection is increasing in children presenting to pediatric emergency[8], therefore, it is expected that a high incidence of MRSA colonization would be found in health care workers attending those patients. The results of this study confirm this, as a high colonization rate was found for both groups, i.e. 71% and 68% for physicians and nurses respectively. The study was done in a tertiary care hospital which might explain the high colonization rate. Although hand hygiene is generally accepted as being of prime importance in controlling the spread of MRSA, there was no statistical relation between hand washing before and after patient encounter and MRSA contamination rate in our study population, which could be explained by the small sample size, or related to correct hand washing technique or not which was not looked at in our study, therefore, our results do not negate the need for increased emphasis on proper hand hygiene technique as required by current infection control guidelines for all health care worker. All bacterial isolates from the clinical environment were found to be negative for MRSA; thereby indicating that contact between health care professionals and patients is the main mode of transmission rather than contact with the various clinical environments as such. The results of this study are limited by the small sample size, a fact which likely accounts for the low level of statistical significance; therefore, larger study should be carried out before making any recommendation.

CONCLUSIONS

The colonization rate for MRSA is high among pediatric emergency staff included in this pilot. Further studies are required to study factors leading to this high rate and the effect of this high rate on patients' safety.

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