

6-2008

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Recommended Citation

Nasr, Payman; Delorme, Thierry; Rose, Stacy; Senita, Julie; and Callahan, Cynthia (2008). Methicillin-Resistant Staphylococcus Aureus Among Younger Population in Northeastern Ohio. *The Ohio Journal of Science* 108(3), 50-52. doi: <http://hdl.handle.net/1811/48404> Retrieved from <https://digitalcommons.kent.edu/nurspubs/123>

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2008-06

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The Ohio Journal of Science, v108, n3 (June, 2008), 50-52.
<http://hdl.handle.net/1811/48404>

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BRIEF NOTE

Methicillin-Resistant *Staphylococcus aureus* Among Younger Population in Northeastern Ohio

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ABSTRACT. The Ashtabula County Medical Center (ACMC), a 241-bed medical center in Ashtabula County, Ohio, has been providing inpatient and outpatient services for a portion of Northeastern Ohio for over a century. In the current report, we have investigated the rate of *Methicillin-resistant Staphylococcus aureus* (MRSA) occurrence among the younger population (less than 25 years of age) who sought medical attention at ACMC emergency room or one of its outpatient-affiliates (e.g. physician's office or clinics) from January 2006 to December 2007. Here, we report a significant increase in incidence of MRSA among patients six to 25 years of age during this time period. Considering the age population and the origin of specimens, the present findings suggest a rapid increase in incidence of MRSA among the general population in Northeastern Ohio. These findings demonstrate the need for the development of new protocols aimed at identifying preventive measures in order to immobilize the spread of such pathogens among the younger population in the region.

OHIO J SCI 108 (3): 50-52, 2008

INTRODUCTION

Staphylococcus aureus is a bacterium commonly found on the skin and in the nasal cavity of healthy individuals. In fact, according to the Center for Disease Control and Prevention (CDC) (http://www.cdc.gov/ncidod/dhqp/ar_mrsa_ca_public.html) about 25-30% of the population carries *S. aureus* as normal flora in their nasal cavity. These people are referred to as *S. aureus* carriers. Among the healthy carriers, this bacterium is usually harmless and causes no disease; however, upon entrance into a sterile body environment, *S. aureus* may cause minor subcutaneous infections such as folliculitis, pustules and boils. These conditions can typically be treated with incision and drainage of the wound followed by antibiotic treatment. According to the CDC, *Staphylococcus* species are the most common cause of skin infections in the United States. When left untreated, these *Staphylococcal* infections may result in serious illnesses by causing septicemia and pneumonia, which ultimately may be fatal. Even though most *Staphylococcal* infections have historically been treated with antibiotics, in recent years, an increasing number of *S. aureus* strains have become resistant to a wide array of antibiotics, including Methicillin. While Methicillin-resistant *Staphylococcus aureus* (MRSA) infection is not any more infectious than other strains of *S. aureus* infections, the MRSA infection are much more difficult to treat due to their inherent resistance to many antibiotics. In 1980's and 1990's, MRSA infections were commonly associated with hospitals and long-term healthcare facilities (Hospital Acquired (HA)-MRSA), but more recently the worldwide emergence and spread of MRSA strains that are independent of healthcare facilities has been widely reported and is commonly referred to as Community Acquired MRSA (CA-MRSA). Molecular epidemiology studies have shown that CA-MRSA differ both phenotypically and genotypically from HA-MRSA (Fang et al., 2008). Moreover, in recent years, the epidemiology of MRSA has been increasingly shifted toward the younger population (McKenna 2008; Larcombe, Waruk et al.

2007). Before the mid-1990s, infections with MRSA in children and adults who had no contact with the healthcare facilities were quite uncommon; however, today, CA-MRSA infections are one of the important public health concerns which is reaching worldwide epidemic proportions (Dailey, Coombs et al. 2005; Jensen, Jensen et al. 2006; Zlomek and August 2007; Niniou, Vourli et al. 2008). The objective of the current study was to evaluate the frequency of MRSA cases among the younger population, from newborn to 25 years old, in Northeastern Ohio. New insights into the distribution and pattern of occurrence of MRSA among this population allow the development of targeted interventions. Researchers at Kent State University Ashtabula and the Infection Control Practitioners at ACMC have established a collaborative project to investigate and characterize the epidemical changes in MRSA incidence among the younger population in Ashtabula County. This brief report indicates a rapid distribution of MRSA across Northeastern Ohio younger population, stressing the need for better education in infection control and prevention directed at the community, family and schools levels.

METHODS

A retrospective survey was performed on all identified cases of *staphylococcal* infection among individuals less than 25 years of age that were diagnosed through the ACMC clinical laboratory from January 2006 to December 2007. One of the requirements for CA-MRSA categorization, according to the CDC, is the absence of hospitalization or a medical procedure within a year of MRSA diagnosis. Since we had no access to the participants' previous hospitalization and medical records, we only targeted the emergency room and outpatient facilities to better reflect the cases of CA-MRSA rather than HA-MRSA in the community. Two hundred and eighteen patients were included in the study after laboratory file reviews. The diagnosis of MRSA versus antibiotic sensitive *Staphylococcus* infection was determined based on clinical laboratory culture findings (antibiotic resistance screening) performed by microbiology laboratory personnel at ACMC. Antibiotic resistances were interpreted in accordance with Clinical

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and Laboratory Standards Institute (2006). Means of the different treatments were separated using the Waller-Duncan k-ratio t-test after it was determined that there was a significant treatment effect using the general linear model procedure. The probability level of $P < 0.05$ indicates significant differences between 2006 and 2007 monthly incidences in each age group. The cases of MRSA infection were classified on the basis of age in five-year increments (except <1 year) ranging from newborn to 25 years of age. Statistical analyses were performed using the statistical program: SAS 9.13 (SAS Institute Inc. Cary, NC).

Table 1

Total incidence of MRSA cases per year by patients' age. There was 2.5-fold increase in the total number of confirmed MRSA cases from 2006 to 2007.

Age	Year	
	2006	2007
<1	1	3
1-5	19	26
6-10	7	15*
11-15	5	30*
16-20	15	47*
21-25	15	35*
Total	62	156*

* Indicates significant differences between 2006 and 2007 monthly incidences in each age group ($P < 0.05$).

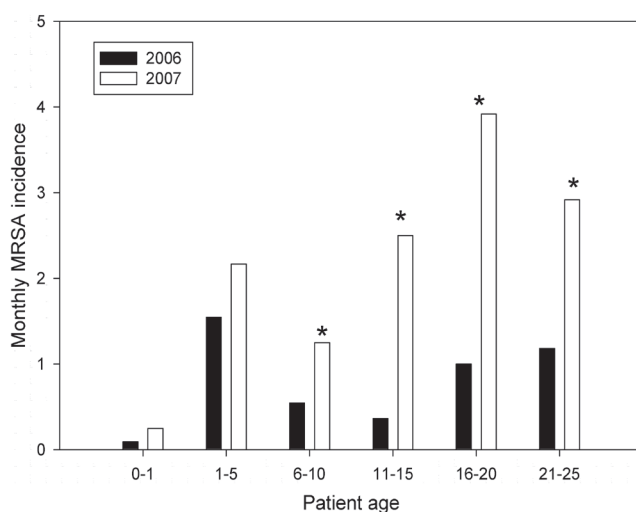


FIGURE 1. Average monthly incidence of MRSA cases by patients' age among those seeking medical attention at ACMC or one of its outpatient affiliates from January 2006 to December 2007. * Indicates significant differences between 2006 and 2007 monthly incidences among each age group ($P < 0.05$).

RESULTS

From January 2006 to December 2007, there were 218 confirmed cases of MRSA infections among individuals less than 25 years of age at ACMC. In this population, the total yearly incidence of MRSA was significantly increased from 62 cases in 2006 to 153 cases in 2007, a 2.5-fold increase (Table 1). This increase was statistically significant for six to 25 year old age groups, with the highest increase of 600% for 11 to 15 year olds. The average monthly incidence of MRSA cases in each age group for 2006 and 2007 are shown in Figure 1. When comparing data from 2006 to 2007, the average monthly incidence of MRSA significantly increased in all age groups except <1 and one to five year olds. There were no significant differences in the monthly incidence of MRSA among males and females (data not shown).

DISCUSSION

Recent reports have revealed a worldwide rise in MRSA incidence among the general population. According to the CDC web site, more than 90,000 thousand Americans become infected with MRSA each year. In our opinion, this figure is an underestimate. MRSA is no longer considered a nosocomial infection primarily contracted by individuals in hospitals and nursing homes. In fact, MRSA is now frequently found in schools and daycares (Beam and Buckley 2006; Jensen, Jensen et al. 2006; Lo, Lin et al. 2007; Larcome, Waruk et. al. 2007). This recent epidemiological change in distribution of MRSA is alarming and must be addressed.

Despite MRSA being endemic in many US health care facilities, there is no specific data on the prevalence of MRSA among the younger populations in Northeastern Ohio. Here, we report a significant increase in MRSA incidence among the six to 25 year olds. This alarming trend demonstrates the urgent need for the development and implementation of new preventive measures to directly address each unique age population. Although the general public and school officials may be aware of publicized cases of MRSA especially among young male athletes, they usually lack the basic understanding of MRSA epidemiology in general population. This is of utmost concern since the increase of MRSA cases among the school age children suggests that the current preventative measures in place are not successful in slowing MRSA spread and must be revisited.

Although previous reports have indicated seasonality affect on the frequency of MRSA cases (Larcome, Waruk et. al. 2007), perhaps due to increased outdoor activities during the summer months, the current report demonstrates that the increased rate of MRSA among the younger population is independent of seasonality affect. Considering the age range of susceptible population, our future goal is to develop comprehensive educational programs at elementary, middle and high school levels to implement preventative measures and control the spread of such pathogens among the susceptible population.

In conclusion, the current data identifies a significant increase in the rate of MRSA occurrence among the younger population from January 2006 to December 2007 that is independent of seasonality. The data raises concern over the increased rate of MRSA infections among younger individuals and demands our attention in developing new strategies to maintain and control the spread of such resistant pathogens in our community. It is our goal to further evaluate the epidemiology of MRSA over a longer period of time and establish appropriate preventative measures directed towards school-aged children in our region.

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