

## **RISK FACTORS FOR INVASIVE GROUP A STREPTOCOCCAL DISEASE IN LOS ANGELES COUNTY, 2004-2006**

### **BACKGROUND**

Infection with group A streptococci (*Streptococcus pyogenes*) may result in several clinical presentations, ranging from non-invasive disease, such as strep throat, to invasive disease, where the bacteria invade a normally sterile site. Although readily treatable with antibiotics, severe invasive infections require prompt treatment to prevent devastating sequelae. Severe sequelae include necrotizing fasciitis (NF), otherwise known as “flesh eating disease,” and streptococcal toxic shock syndrome (STSS), which is characterized by a rapid onset of hypotension and multi-system involvement. Other clinical symptoms, often overlapping, include bacteremia, cellulitis, and pneumonia.

Invasive group A streptococcal (IGAS) infections cause substantial burden and mortality. In 2005, an estimated 10,400 cases and 1,350 deaths occurred in the United States [1]. The case fatality rate of IGAS infections is 12 to 13%, increasing to 30 to 80% in persons with severe infections [2]. Known risk factors include age, diabetes, Human Immunodeficiency Virus (HIV) infection, injection drug use (IDU), cardiovascular disease, and other chronic conditions [3].

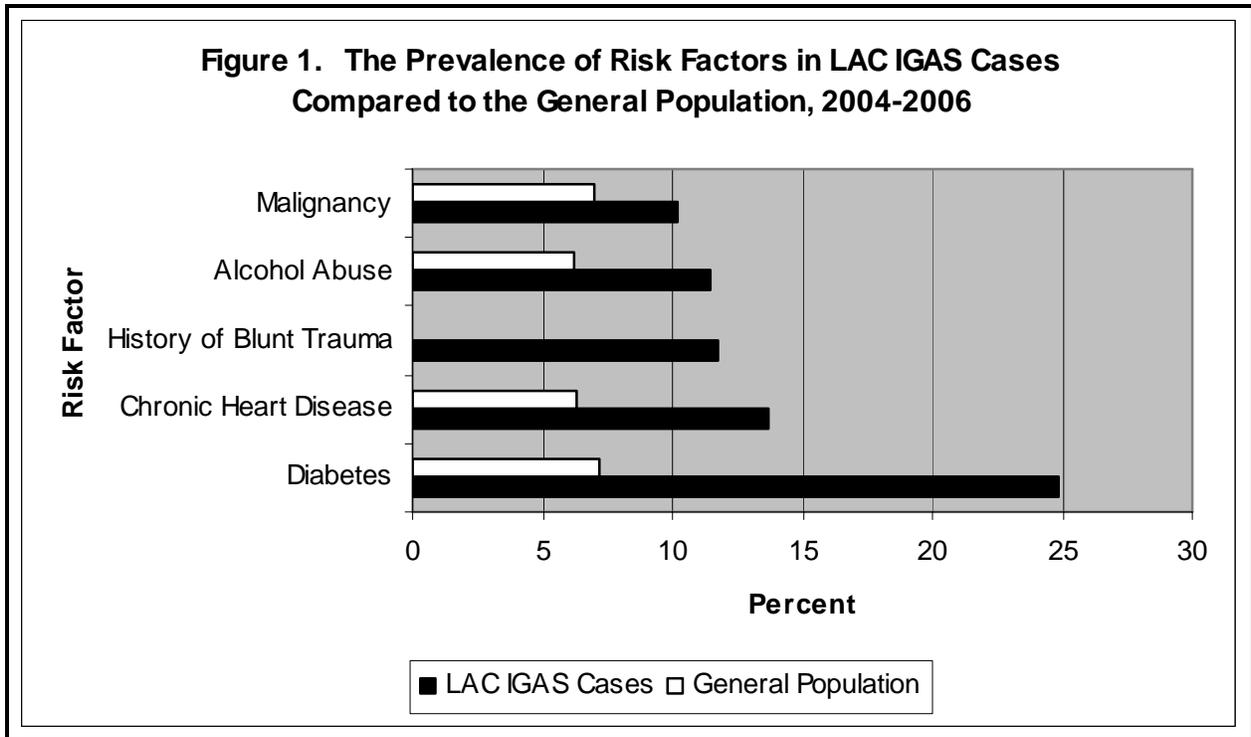
The risk factors of Los Angeles County (LAC) IGAS cases were reviewed and compared to the prevalence of these risk factors in the general population to determine specific populations at greatest risk for IGAS infection. Based on this study in LAC, diabetes was the most prevalent risk factor observed in IGAS cases. Risk factors in older adults included chronic diseases, while risk factors in younger adults included alcoholism and blunt trauma. The prevalence of nosocomial IGAS infection, IDU, and HIV was lower in LAC IGAS cases when compared to national data.

### **METHODS**

IGAS is a reportable condition in LAC. An IGAS case is defined as a LAC resident who has *Streptococcus pyogenes* isolated from a normally sterile body site or from a non-sterile site if associated with STSS or NF. In 2004, a questionnaire was created to collect detailed demographic, clinical, and risk factor information for each reported case. IGAS cases reported and investigated by March 1, 2007 with disease onset from January 1, 2004 to December 31, 2006 were reviewed and analyzed to identify risk factors associated with IGAS infection. By univariate analysis, the prevalence of risk factors in LAC IGAS cases was compared to that of the general population, using data from multiple surveillance systems, including the Behavioral Risk Factor Surveillance System (BRFSS), the National Health Interview Survey (NHIS), the Los Angeles County Health Survey (LACHS), and US census.

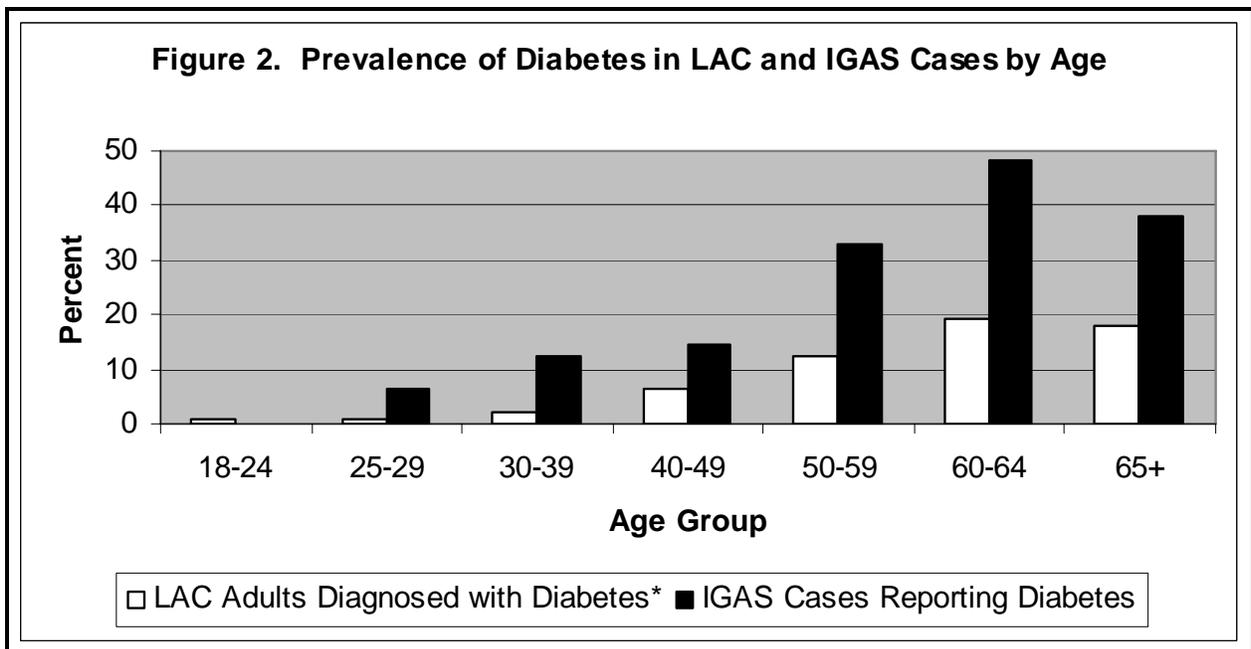
### **RESULTS**

From 2004 to 2006, a total of 516 cases were reported in LAC, with risk factor information available for 80% of the cases (n=410). From 2004 to 2005, the average incidence rate of IGAS infection in LAC was lower than the average rate reported in the United States (1.7 versus 3.5 cases per 100,000) [1]. However, the average case fatality rate from 2004 to 2005 was higher than the national average (18% versus 13%). During the three-year period, IGAS infection occurred more often in males (62%), adults aged 45 years and older (61%), Latinos (40%), and Whites (40%). Risk factors in older adults included chronic diseases, while risk factors in younger adults included alcoholism and blunt trauma. The most common risk factors reported included diabetes (25%), chronic heart disease (14%), blunt trauma (12%), alcohol abuse (12%), and malignancy (10%) (Figure 1). Specific trends and analyses are highlighted below.



\*No prevalence data available for blunt trauma in the general population.

**Diabetes:** From 2002 to 2003, seven percent of LAC adults reported being diagnosed with diabetes [4]. In contrast, the overall percentage of IGAS cases with diabetes was 3.5 times higher, as one in every four cases (25%) was also diabetetic. The greatest number of IGAS cases with diabetes occurred in persons aged 45 years and older. However, in all racial groups (data not shown) and for persons over 25 years, the percentage of IGAS cases with diabetes was greater than the corresponding LAC diabetes prevalence by age (Figure 2) [4]. In particular, the percentage of IGAS infections in persons aged 25 to 39 years with diabetes was much higher than expected based on the underlying prevalence of diabetes in this age group.



\* 2002-03 Los Angeles County Health Survey; Office of Health Assessment and Epidemiology, Los Angeles County Department of Public Health.

**Chronic Heart Disease and Malignancy:** As the majority of IGAS infections occur in older adults, it is not surprising that many of the top reported risk factors include existing chronic diseases. Chronic heart disease was the second most reported risk factor (14%) and one in every three IGAS cases over 65 years reported this condition (33%). In contrast, the prevalence of coronary heart disease in the United States is lower (6%), with 18% of adults aged 65 to 74 years and 26% of persons over 75 years reporting coronary heart disease [5].

Overall, 10% of IGAS cases reported a malignancy compared to the national prevalence of 7% [5]. Interestingly, the percentage of IGAS cases with malignancy in LAC is higher in younger age groups and lower in older age groups when compared to the national cancer prevalence. Malignancy was reported in 7% of IGAS cases aged 20 to 44 years compared to the United States prevalence of 2% in those aged 18 to 44 years and was highest in persons aged 45 to 64 years (14% in LAC IGAS cases versus 8% in the United States). In IGAS cases 65 years and older, malignancy occurred in 13% of cases, which is lower than the national cancer prevalence of 19% in persons 65 to 74 years and 25% in persons 75 years and older. Additionally, the percent of female IGAS cases with malignancy (14%) was higher than both the national prevalence (7%) and the percentage of male IGAS cases with malignancy (8%).

**Alcohol Abuse and Blunt Trauma:** From 2004 to 2006, there has been an increase in the number of IGAS cases reporting a history of blunt trauma or alcohol abuse (data not shown). The majority of IGAS cases younger than 20 years have no risk factors reported (72%). However, a history of blunt trauma was the most reported risk factor in children IGAS cases aged 1 to 19 years, ranging from 32% in children aged 1 to 4 years to 27% in children aged 5 to 19 years.

In IGAS cases aged 20 to 44 years, alcohol abuse was reported more than any other risk factor (20%), more than double the percentage of Californians reporting heavy drinking in 2005 (10% in persons 18 to 24 years, 7% in persons 25 to 34 years, and 4% in persons 35 to 44 years) [6]. Among LAC adults, the percentage of males reporting alcohol abuse was more than 3 times higher than the percentage of females (16% versus 5%). Comparatively, in 2005, 8% of men and 5% of women reported heavy drinking in California [6].

**Other:** In contrast to what other studies have reported [3,7], HIV infection or IDU was infrequently observed in LAC IGAS cases. In one study, 7% of adult IGAS cases reported HIV infection and 24% reported a history of IDU [7]. In contrast, HIV and IDU were reported in 2% and 6% of LAC IGAS cases, respectively. In addition, only 2% of LAC IGAS cases were nosocomial, compared to 5% in the United States and 14% as reported in Canada [2].

## DISCUSSION

By conducting IGAS surveillance in LAC, risk factors of persons presenting with IGAS infection can be identified which may assist in the timely diagnosis and treatment of these infections. With the recent increase in community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA), diagnosing IGAS in persons presenting with skin infections is challenging, especially since one of the most commonly prescribed antibiotics for CA-MRSA is not indicated for treating IGAS infections.

In LAC diabetes was the most prevalent risk factor, especially in adults aged 45 years and older. In older adults, risk factors for IGAS included chronic heart disease and malignancy, while a history of blunt trauma and alcohol abuse are reported more often in younger age groups. Physicians should recognize risk factors for IGAS infection and counsel their diabetic and older patients with chronic disease about their increased risk for IGAS and other infections. In addition, IGAS should be considered in younger patients, especially those with a history of trauma or alcoholism.

## REFERENCES

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