Health Disparities in Pediatric Asthma: Comprehensive Tertiary Care Center Experience

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Background: Although the treatment and management of asthma has improved over time, incidence and prevalence among children continues to rise in the United States. Asthma prevalence, health services utilization, and mortality rate demonstrate remarkable disparities. The underlying causes of these disparities are not fully understood. We aimed to examine racial/ethnic variances in pediatric asthma prevalence/admission.

Patients and Methods: We retrospectively reviewed data on 1070 patients and applied a cross-sectional design to assess asthma admission between 2010 and 2011. Information was available on race/ethnicity, sex, insurance status, severity of illness (SOI), and length of stay/hospitalization (LOS). Chi-square statistic was used for the association between race and other variables in an attempt to explain the racial/ethnic variance.

Results: The proportionate morbidity of asthma was highest among Caucasians (40.92%) and African Americans (40.54%), intermediate among others (16.57%), and lowest among Asian (0.56%), American Indian/Alaska Native (0.28%), and Hawaiian Native/Pacific Islander (0.28%). Overall there were disparities by sex, with more boys (61.80%) diagnosed with asthma than girls (38.20%), $\chi 2(\mathbf{7})=20.1$, $p=0.005$. Insurance status, and SOI varied by race/ethnicity, but not LOS. Caucasian children were more likely to have private insurance, while African Americans and Hispanics were more likely to have public insurance ($p<0.005$). Asthma was more severe among non-Hispanic children, $\chi 2(14)=154.6$, $p<0.001$. While the overall readmission proportion was 2.8%, readmission significantly varied by race/ethnicity.

Conclusion: Racial/ethnic disparities in asthma admission exist among children in the Delaware Valley. There were racial/ethnic disparities in insurance status, asthma severity, and sex differed by race/ethnicity, but not in length of hospitalization.

Keywords: Pediatric asthma ■ Health disparities ■ Asthma admission ■ Racial/Ethnic minorities ■ Delaware Valley.

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INTRODUCTION

Asthma is the most common chronic disease affecting children. In 2010, it was estimated that 7 million children in the United States had been diagnosed with asthma.[1,2] Studies have shown that asthma disproportionately affects children of racial/ethnic minorities, possibly due to the effects of health care access, utilization, health insurance coverage, socioeconomic status, and education level.[2,3] The trends in asthma prevalence tend to vary by gender and geography.[4] Similarly, racial/ethnic variability has been observed in asthma mortality among children.

Observations in health care utilization have revealed a significant racial/ethnic difference among populations in the U.S. There have been remarkable variances in asthma care access and utilization, such as hospitalization, readmission, and use of non-ambulatory and emergency care.[5] A study indicated that among ethnic/racial groups, minority children have a higher rate of asthma hospitalization and readmission.[2] Furthermore, previous studies have shown that African Americans and Hispanic children were more likely to use the emergency department as source of primary care for asthma.[6] Asthma management, including discharge instructions and action plans, is important in preventing emergency room visits and re-hospitalization[7]. Studies comparing Puerto Ricans, African Americans, and Caucasians clearly showed that Puerto Ricans were less likely to receive asthma discharge instructions.[3]

Racial/ethnic disparities also exist in asthma morbidity, treatment, and mortality. Racial/ethnic minority children are at a higher risk for asthma-related complications, such as permanent narrowing of the bronchial tubes, sleep interference, decreased ability to exercise, persistent cough, and even death.[4,8,9] Various complications can lead to more severe comorbidities in asthmatic patients. Common comorbidities of asthma are gastro-esophageal reflux disease, obesity, sleep apnea, sinusitis, stress, and depression.[10,11] A study has demonstrated that children that suffer from asthma have higher rates of attention deficit hyperactivity disorder, learning disabilities, and other behavioral disorders.[12] Trends in mortality have been decreasing due to better education, asthma treatment plans, and newly developed medications;[13] however, there is a major disparity in mortality in racial/ethnic groups. African Americans are twice as likely to die from asthma-related complications as any other race.[13] The disparities that exist in asthma morbidity, treatment, care, and mortality could be explained in part by racial/ethnic

specific variation in genetic, environmental, social, and psychological risk/predisposing factors.

While racial/ethnic disparities have been explored with respect to health services utilization, it is not fully understood why these disparities continue to exist. This current study aimed to assess racial/ethnic disparities in a sample of asthma patients utilizing care from a comprehensive pediatric tertiary hospital. Additionally, we sought to examine factors that may explain the observed disparities.

MATERIALS AND METHODS

After an institutional review board approval, we conducted a cross-sectional analysis to examine racial/ethnic differences in asthma prevalence, and to see whether or not there are factors influencing the admission and readmission.

Data Source

The data for this study were obtained from the Nemours medical records during 2010 and 2011. We utilized admission and readmission data during this period.

Study Population

Between January 1, 2010, and December 31, 2011, we collected data from asthma patients. These data included patients from Nemours Delaware Valley sites. There were 1,070 participants between the ages of 0 and 18 years. However data were not available on ethnicity/race on some of the patients. Major races/ethnicities were included in the study population, namely Caucasians (n=437), African Americans (n=433), Hispanics (n=154), Asians (n=6), American Indian/Alaska Native (n=3), and Hawaiian Native/ Pacific Islander (n=3).

Study Variables

The following variables were studied: asthma prevalence as admission and readmission, race, ethnicity, insurance status, length of hospitalization/stay (LOS), and measured disease severity as SOI.

Diagnosis

All patients had one or more diagnoses of asthma or asthma-related conditions. For example, a patient could be diagnosed with extrinsic asthma exacerbation and esophageal reflux, implying more than one diagnosis.

Severity of Disease

The severity of the disease was based on a scale and was measured from 1 to 4. This scale represented patient symptoms using asthma assessment criteria. The scale increases in severity with 1 being the least severe and 4 being the most severe. Further, this scale reflects the classification of asthma, namely: (1) intermittent, (2) mild-persistent, (3) moderate-persistent, and (4) severe-persistent.

Insurance Status

Insurance information was obtained from the patient during hospitalization. Insurance coverage was classified as commercial or private insurances, Medicaid or public, no insurance coverage, and Nemours subsidized.

Length of Stay/Hospitalization

The LOS was obtained from the admission and discharge dates of each patient.

Demographics

We studied race, ethnicity, and geographic location of our patients. Race was classified as (A) American Indian/Alaska Native, (B) Asian American, (C) Black or African American, (D) Hawaiian Native/Pacific Islander, (E) White or Caucasian, and (F) others. The geographic locations were determined by the patients' ZIP codes. This variable was not included in the analysis, given the focus of this current study.

Statistical Analyses

We performed summary statistics for both continuous and categorical variables. Continuous variables were summarized using mean and standard deviation (normal data), or median/interquartile range (non-normal data), while categorical variables were summarized with frequency and percentage. To examine the association between the study variables and race/ethnicity, we used a chi-square statistic and the Fisher exact test (accounting for small expected cell count). All tests were two-tailed and the significance level was 0.05. The entire analyses were performed using STATA statistical software, version 12.0 (STATA, College Station, TX).

RESULTS

Table 1 illustrates the prevalence of asthma stratified by race/ethnicity. The total sample comprised n=1070 patients. Asthma prevalence was highest among Caucasians (n=437; 40.92%) and African Americans (n=433; 40.54%), intermediate among others (n=177; 16.57%), and lowest among these other racial groups: Asians (n=6; 0.57%), American Indian/Alaska Native (n=3; 0.28%), and Hawaiian Native/Pacific Island (n=3; 0.28%). With respect to ethnicity, the prevalence of asthma was higher among non-Hispanics (n=907; 84.85%) versus Hispanics (n=154; 14.41%). Hospital readmission was equal among African Americans and Caucasians (37%), and 21% of readmitted patients were Hispanic.

Table 2 presents the characteristics of the patients by race. The patients' sex, insurance coverage, and disease severity were compared among racial groups. There were more male children (n=661; 61.8%) than females (n=409; 38.2%) diagnosed with asthma between 2010 and 2011. Caucasian male children (39.70%) were slightly more likely than African Americans (39.09%) to be diagnosed with asthma but were