

E. ENVIRONMENTAL DISEASE BURDEN IN ARAB-AMERICAN COMMUNITIES IN THE DETROIT AREA: PREVALENCE AND SEVERITY

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INTRODUCTION

Asthma management is a serious concern in high-risk urban minority communities. Asthma is positively correlated with numerous chronic and debilitating health problems such as allergies, chronic sinus and ear infections, pneumonia, anxiety, depression, gastroesophageal reflux disease (GERD), ulcers, and cancer.¹⁻⁸ Understanding the patterns of comorbidity in high-risk communities is crucial to efforts improving asthma management. The current study is part of a larger community program to assess environmental morbidity in the Arab-American community in southeast Michigan and to develop effective outreach and intervention programs based on those findings.

METHODS

Arab-American households from four regions in Metro Detroit were selected for the study as described by Johnson.⁹ Six hundred completed surveys were used in the analysis. The prevalence of doctor-diagnosed and self-reported (based on history of wheezing) asthma was determined in the study; total asthma represents the sum of the two definitions of asthma. Demographic characteristics of the study population and determination of asthma status were described in detail by Johnson.⁹

The survey assessed prevalence of chronic doctor-diagnosed health problems, including asthma, allergies, emphysema/chronic bronchitis/persistent cough, pneumonia, reactive airway disease, eczema, high blood pressure, high cholesterol, circulatory problems, heart

disease, diabetes, frequent bladder infections, bowel (intestinal) disease, frequent ear infections, frequent sinus infections, cancer, and chronic fatigue. Doctor-diagnosed disease burden corresponded with the total number of doctor-diagnosed health problems reported by the respondent. Respondents were also asked a series of questions to assess symptoms affecting the eye, ear, nose, mouth, throat, muscles and joints, nervous system, stomach and bowels, and skin. Self-reported symptoms were assessed for prevalence, frequency, and intensity. Symptom burden reflected the total number of symptoms reported by the respondent. Individual symptom severity was determined by multiplying symptom frequency by symptom intensity.⁹ Symptom severity score was calculated by summing individual symptom severity for the 66 symptoms assessed by the survey.

We developed an instrument, the Environmental Risk Index (ERI), to quantify critical risk and protective factors that can cause or trigger asthma. The ERI ranking scheme design and distribution in this study population have been described in depth by Johnson.⁹

Data management and analysis for this project have been described in depth elsewhere.⁹ Associations between independent and dependent prevalence variables were evaluated by using logistic regression. Relationships among independent variables and dependent aggregate morbidity and severity outcomes were assessed by using general linear regression. Student *t* tests were used to determine statistical differences in means. Cluster tree analysis using *proc varclus* in SAS (SAS, Inc., Cary, N.C.) was per-

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formed to determine degree of relatedness in self-reported symptoms and doctor-diagnosed health problems.

RESULTS AND DISCUSSION

The study shows the prevalence of a wide range of health problems in the Arab-American population of Detroit. The most common medical conditions in the study population were high cholesterol (27%), allergies (23%), high blood pressure (18%), diabetes (13%), frequent sinus infections (13%), and frequent bladder infections (12%). Doctor-diagnosed asthma was significantly associated with several chronic health problems including allergies, reactive airway disease, frequent sinus and bladder infections, pneumonia, and high blood pressure ($P < .05$). Doctor-diagnosed asthma was also positively correlated with self-reported non-respiratory symptoms affecting the eyes, ears, nose, mouth, throat, muscles and joints, stomach and bowels, skin, and the nervous system.

Asthma patients had significantly more chronic health problems and self-reported symptoms compared to persons without asthma (Table 1). For instance, asthma patients reported an average of 20 symptoms, compared to 9 for those without asthma, while the average severity score for asthma patients (93) was much higher than that for those without asthma (38). In other words, asthma patients reported more comorbid conditions with higher overall severity compared to patients without asthma. This finding was true for both doctor-diagnosed and self-reported asthma (Table 1).

The ERI score was positively associated with total asthma, self-reported asthma, and asthma risk (OR 1.1 to 1.2, $P < .05$). The ERI was positively associated with asthma symptoms among non-doctor-diagnosed asthma patients, including breathing difficulty or coughing with moderate or strenuous exercise;

Table 1. Mean aggregate comorbidity scores

	Symptom Severity Score*	Self-Reported Symptom Burden†	Chronic Health Problem Burden‡
Minimum score	0	0	1.0
Maximum score	314	50	10
Mean score	47	11	4.9
Total asthma			
Mean for asthma patients	93	20	6.1
Mean for patients without asthma	38	9.4	4.7
<i>P</i> value for <i>t</i> test	<.0001	<.0001	<.0001
Doctor-diagnosed asthma			
Mean for doctor-diagnosed asthma patients	82	18	6.4
Mean for non-doctor-diagnosed asthma	44	10	4.8
<i>P</i> value for <i>t</i> test	<.0001	<.0001	<.0001
Self-reported asthma			
Mean for self-reported asthma patients	110	23	5.8
Mean for non-self-reported asthma patients	41	9.9	4.8
<i>P</i> value for <i>t</i> test	<.0001	<.0001	<.0001

* Association between asthma and overall symptom severity in a linear regression model was significant after adjusting for age, English fluency, education, employment, previous and current employment type, household size, total number of children in household, native country, daytime indoor temperature, water leaks, cockroaches, pesticide use, central air conditioning, weather-stripped windows, weather-stripped doors, double-paned windows, storm windows, satisfaction with quality of home, and ERI score.

† Association between asthma and overall symptom burden in a linear regression model was significant after adjusting for age, English fluency, employment, total number of children in household, daytime indoor temperature, water leaks, cockroaches, storm windows, and satisfaction with quality of home.

‡ Association between asthma and doctor diagnosed disease burden in a linear regression model was significant after adjusting for age, English fluency, regular family doctor, previous employment type, current employment status, and difficulty getting landlord to make repairs.

difficulty sleeping due to coughing attacks or shortness of breath; difficulty breathing deeply; occasional wheezing or chest tightness; breathing difficulty exacerbated by cold weather or by tobacco smoke, fumes, or strong odors; one or more overnight hospitalizations or visits to the emergency room in the past year because of breathing problems (OR 1.1 to 1.2, $P < .05$).

Other symptoms significantly associated with environmental risk factors assessed by the ERI included neurologic symptoms (eg, difficulty concentrating, difficulty making decisions, dizziness, unsteadiness or loss of balance, difficulty with complex tasks, restlessness, agitation, irritability, panic/anxiety, or fear), gastrointestinal symptoms (eg, nausea, cramps or stomach discomfort, constipation, or diarrhea),

and several non-specific symptoms (eg, hearing loss, impaired sense of smell, stiffness in muscles and joints, trouble staying asleep, fever or chills, or rash on face and neck) (OR 1.1 to 1.2, P value $< .05$). The ERI score was positively associated with several doctor-diagnosed health problems including chronic ear infections and chronic fatigue; while eczema, allergies, chronic bladder infections, chronic sinus infections, and bowel/intestinal disease were also significantly associated with environmental variables in this study population.

Among the doctor-diagnosed health problems, asthma was most tightly clustered with emphysema/chronic bronchitis/persistent cough and pneumonia (Figure 1). The next most clustered comorbid conditions with asthma

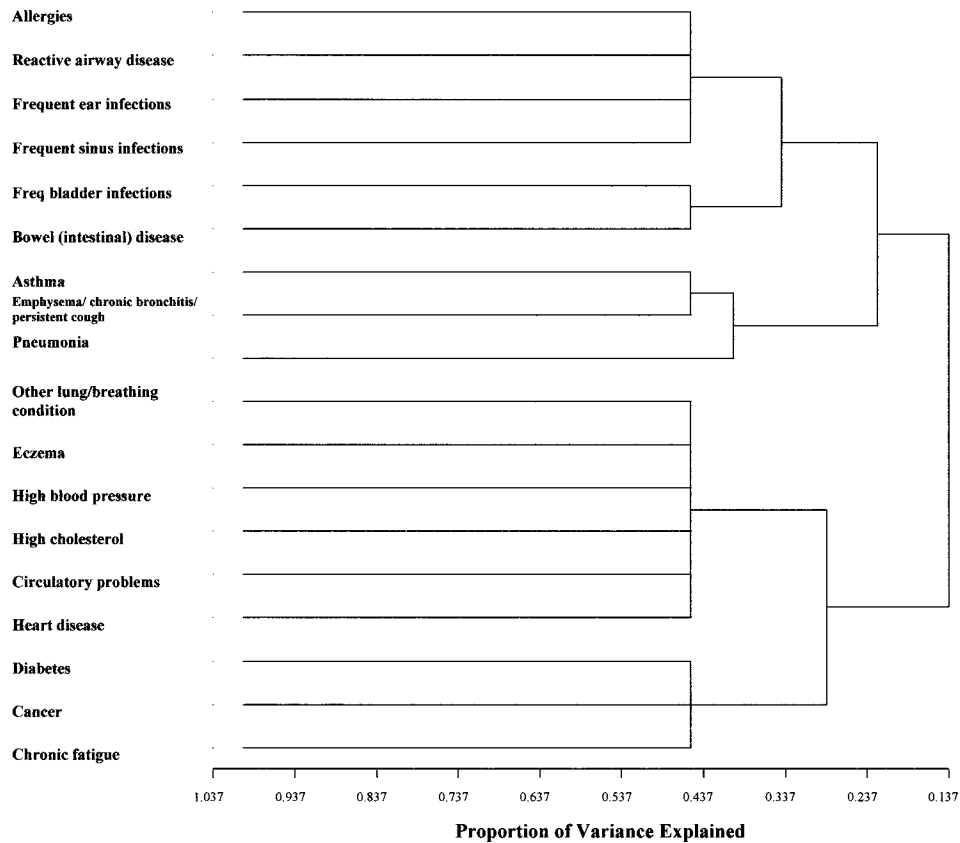


Fig 1. Clustering of chronic health problems

were allergies, reactive airway disease, sinus infections, ear infections, bladder infections, and bowel/intestinal disease (Figure 1). The least closely clustered conditions with asthma were other lung/breathing conditions, eczema, high blood pressure, high cholesterol, circulatory problems, heart disease, diabetes, cancer, and chronic fatigue (Figure 1).

Understanding the patterns of comorbidity in high-risk communities is crucial to efforts aimed at improving asthma management and lessening the environmental disease burden. We found a high burden of chronic disease among Arab Americans in Metro Detroit. Asthma patients reported more chronic health problems and disease symptoms. Both asthma and environmental risk factors assessed by the ERI

were positively associated with many health problems in the community. Many of the apparent asthma comorbidities in this study are consistent with previous findings in the literature.^{1,2,7} Previous studies focused primarily on the relationship between asthma and one or two comorbid conditions. In this study we were able to explore the relationship between asthma and multiple comorbidities. The disproportionate burden of chronic health problems and symptoms among asthma patients in this study population suggests that even within high-risk communities, disease burden may be clustered in a small fraction of the community. In addition, findings suggested that environmental risk factors associated with substandard housing may contribute heavily to these disparities.

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