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ORIGINAL PAPER

Self-Reported Asthma in Chaldeans, Arabs, and African Americans: Factors Associated with Asthma

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Abstract Although the prevalence of asthma is increasing worldwide, there are striking, and largely unexplained differences across various racial and ethnic groups. The current study looks at the prevalence of asthma and risk factors between Chaldeans, Arabs, and African Americans. We used Health Assessment Survey data representing 3,136 respondents. Prevalence across the three ethnic groups were compared using unadjusted and adjusted odds ratios, accounting for multiple risk factors. There were significant socio-demographic differences across all ethnic groups. Asthma prevalence was significantly lower in Arabs (9.4%) and Chaldeans (5.4%) than in Non-Middle Eastern Whites (14.4%). African American prevalence was 14.4%. The significantly lower prevalence of asthma among Chaldean and Arabs, as compared to African Americans, were not explained by traditional risk factors included in our models. We therefore, suggest that future studies should explore the possible role of ethnic-specific differences in gene × environmental interactions in the precipitation and/or exacerbation of asthma.

Keywords Chaldean · Arab · Asthma · Health behavior

Introduction

Asthma is increasing worldwide. The World Health Organization (WHO) reports [1] that approximately 300 million people suffer from asthma and that death rates are likely to climb by 20% if actions are not taken to control current asthma trends. However, asthma prevalence differs considerably between countries, as well as between different populations within the same country [2–4]. In the United States the Centers for Disease Control and Prevention (CDC) has drawn attention to the increase in asthma prevalence. The CDC estimates that there are 20 million Americans have asthma, with approximately 12 million annually experiencing an asthma attack [2]**.** The prevalence of asthma in North America has increased by approximately 50% during the last several decades [5]. Healthy People 2010 has eight objectives specifically focused on asthma [6]. Asthma is particularly relevant to the overarching goal of reduction in health disparities, since it has been cited as a major source of health disparities among minority and low socioeconomic groups [7]. LeNoir [5] reported that Hispanics and African Americans were two to six times more likely to die of asthma compared with White asthmatics. Also, asthma mortality has been cited as 500% more common in African Americans than in Whites [8]. Lifetime asthma diagnosis among the 11 Asian American Pacific Islander subgroups ranged from 10.9% among Korean American students to 23.8% among Filipino American students [9], supporting the notion of a large variation in asthma prevalence by race and ethnicity.

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Finally, there is some evidence that immigrant status may be related to asthma [10, 11].

While asthma can be well managed by those with the disease, for many others the condition impacts activities of daily living, reducing quality of life, and can ultimately lead to premature mortality. The exact causal factors related to the development of asthma remain unclear [12], but a significant body of research has identified key factors contributing to the etiology and progression of asthma. Having a genetic predisposition for IgE-mediated response to common aeroallergens is considered one of the strongest predisposing risk factor mechanisms [12]. A history of viral respiratory infections, particularly in infancy, has also been linked to asthma induction and exacerbation [12]. Additionally, of special relevance with regard to health disparities, metabolic and cardiovascular health problems have been linked to asthma [13, 14].

The National Heart Lung and Blood Institute [12] reports that males have a higher asthma prevalence under the age of 18, while females 18 years and over have a higher prevalence than males. A number of home environmental allergens are also suggested to contribute, including: house-dust mites, alternaria, cockroaches, and animal dander (primarily cat and dog) [15]. Interestingly, regarding pet dander, there is some evidence of a protective effect when exposure occurs at a very young age [12]. Additional sensitizing conditions that have been suggested as contributing to asthma development and exacerbations include tobacco smoke (including in utero), air pollution (particularly particulate matter $\leq$10 μm, SO_2, and NO_2), ozone exposures tied to heavy outdoor exercise, some occupations (e.g., bakers' asthma), low dietary intake of antioxidants and omega-3 fatty acids, and obesity [12].

The actual means to determine prevalence of asthma varies. The Epidemiology of Asthma in Michigan: 2004 Surveillance report defines lifetime asthma as an affirmative answer to having been informed by a health professional that one has asthma [16]. Using this definition, the report notes that adult asthma prevalence in the US for 2001 was 11%, while the state of Michigan lifetime asthma prevalence was 12.4% [16]. As part of the Asthma Initiative of Michigan, the Detroit Alliance for Asthma Awareness [17] reported that the city of Detroit's asthma prevalence is even higher −13.9%.

Arabs make up a substantial part of the greater Detroit population. However, little systematic research has been done concerning prevalence of and risk factors for asthma in this population. Arabs in America number almost 5 million [18]. They descended from a Semitic people that inhabited most of the Middle East and northern Africa and they speak Arabic. They share a very long and complex history. The majority are Muslim [19]. In the United States, Arab Americans live in all 50 states. Almost 500,000 live in the southeastern Michigan Metropolitan Detroit area [18, 20]. Southeast Michigan has become home to the largest concentration of Chaldeans [21] and Arab Americans in the United States [18]. There is very little information available on these two rapidly growing immigrant groups. The Chaldean community in Michigan (the largest outside of Iraq) consists of more than 75,000 people. Historically, they originated in southern Iraq, are Christians, and speak a modern version of Aramaic. As Chaldeans and Arabs have migrated around the world, they carry with them their traditions of cigarette and/or water pipe (Hookah) smoking [22]. As the Arab American population grows, we need to better understand the epidemiology of common and costly medical conditions affecting immigrants, such as asthma, so that culturally appropriate interventions can be designed and implemented.

There has been some previous limited work done examining the pulmonary health of this population. Johnson et al. [22] reported asthma prevalence among Arab Americans in southeast Michigan similar to that for the state and nation, yet higher than compared to the prevalence of Arabs in the Middle East. One factor suggested as contributing to the increased prevalence for Arabs in the US as compared to the Middle East is acculturation to Western risk factors. Acculturation toward a Western lifestyle has also been cited by the WHO as a risk factor [23]. Johnson et al. [15] additionally investigated the influence of environmental risk factors, and found a significant association between increased environmental risk factor exposure and increased asthma prevalence. However, comparison of asthma among Arabs in the US as compared to the Middle East is hampered by the fact that only limited data is available regarding asthma prevalence in the Middle East. The Global Initiative for Asthma [24], offers some data for this part of the world [25]. Table 1 presents asthma prevalence percentage for selected countries [25]. These data highlight the varied prevalence of asthma in some of Arab countries, noting a range of 8.5% for Kuwait to 3.6% for the Palestine region. This paper investigates asthma prevalence and risk factors, with a focus on Arab and Chaldean populations in southeast Michigan metropolitan Detroit area. We specifically wanted to test the hypothesis that asthma prevalence is lower among Chaldean and Arab Americans as compared to African Americans, and such differences would largely be accounted for by traditional and socio-economic risk factors.

Methods

Data Collection

This paper is part of a series of papers reporting on the 2005 Health Assessment Survey (HAS) within this

Table 1 Rank ordered selected asthma prevalence data from GINA

Country	population proportion (%)
United States of America	10.9
Arab Countries	
Kuwait	8.5
Lebanon	7.2
United Arab Emirates	6.2
Saudi Arabia	5.6
Oman	4.5
Occupied Territory of Palestine	3.6
Neighboring countries	
Turkey	7.4
Iran	5.5

World Health Organization global initiative for asthma [24]

population, prior reports examined: diabetes [26], tobacco use [27], heart disease [28], and depression [29]. While briefly reviewed below, additional methodological detail has been previously reported [26–29]. The primary objective of the HAS was to determine the prevalence of and risk factors for chronic health conditions. The information would ultimately be used for the development of intervention strategies to prevent morbidity and mortality. Those invited to participate were all individuals attending the Arab American and Chaldean Council (ACC). The ACC provides a number of community support services (e.g., primary health care clinics, computer training, job search assistance, etc.) across multiple community locations. The ACC services are open to all members of the community, and thus not restricted to certain ethnic or racial subgroups. The HAS collected data from 3,543 participants (representing about 5% of ACC visits per year), all 18 years of age and older. The HAS instrument was developed as a standard self-report health status questionnaire. The questionnaire included basic demographics, socioeconomic status, health status, health care utilization, and health behavior questions. It was available in English and Arabic. The translated instrument was pilot tested and approved by a team of medical, education, research, and public health professionals.

The local community was made aware of the study through media announcements (radio, television, and newspapers). ACC staff identified eligible participants, described the study, and asked if the participants would be willing to volunteer. The self-administered questionnaire was distributed at local small businesses, mosques and churches. Participants were offered the option of completing it immediately, or returning it by pre-stamped and addressed mail. Surveys were coded to allow for random content checks for completed surveys, and to avoid redundant surveys from individuals who may have been solicited multiple times. The study was approved by the Wayne State University Institutional Review Board (#0507002615). Data were collected over an approximately two-month period during the fall season of 2005.

Participants

Participants self-identified as African American, Arab, Chaldean, Hispanic, White, or Other. There were 28 Hispanics who participated; due to the small number they were excluded from the subsequent data analyses. Also excluded from the current analyses were respondents who reported an ethnicity of 'other' or did not respond to the ethnicity item ($n = 149$), and all those who did not respond to the asthma item ($n = 232$). This left a remaining sample of 3,136 (797 African American, 1,319 Arab, 832 Chaldean, and 188 Whites).

Data Analyses

Using logistic regression, the outcome for this study was self-reported asthma, where the measure was solicited as either a "yes" or "no" response (no as referent) to "Have you been diagnosed by your doctor with asthma?" This was examined across the noted ethnicity categories (White as referent). Covariates included the demographic variables of age, gender, marital status, language spoken/written, educational level, employment status, income, health insurance, time since last physician visit, self-rated health, presence of other chronic health conditions (hypertension, diabetes, high cholesterol, heart disease, depression), body mass index, exercise, own a car for transportation, smoking status, and diet (fruit servings, vegetable servings). Missing data for all covariates, except age, were included as a separate category. For individuals with missing information for age, the total sample mean was imputed.

Data analysis was conducted using SPSS 17.0 for Windows. Descriptive statistics for the total sample and ethnic subgroups are reported. Chi-square (for categorical variables) and *t*-test (for continuous variables) were used to test for associations and differences for selected variables between ethnic groups. The strength of association between asthma and ethnicity was examined using logistic regression, including the calculation of point estimates within 95% confidence intervals. Toward investigation of factors significantly related to asthma, six sets of analyses were performed. First, crude odds ratios (ORs) were calculated between ethnicity and asthma, using Non-Middle Eastern Whites as the referent group. Second, the ORs were adjusted for demographic characteristics (i.e., adjusted for age, gender, marital status and language). Third, the ORs were adjusted for demographic and socioeconomic status (i.e., additionally adjusted for education, employment

status, and income). The fourth set of ORs were adjusted for demographic, socioeconomic status, and health care characteristics (i.e., additionally adjusted for health insurance, physician visits, and self-rated health). The fifth set of ORs were adjusted for demographic, socioeconomic status, health care characteristics, and chronic conditions (i.e., additionally adjusted for diagnosis of hypertension, high cholesterol, heart disease, diabetes, depression, and high calculated body mass index). The sixth set of ORs were adjusted for demographic, socioeconomic status, health care characteristics, chronic conditions, and health behaviors (i.e., additionally adjusted for smoking status, physical activity, transportation, fruit servings, and vegetable servings).

Results

Descriptive statistics for all the predictor variables modeled are listed in Table 2 by ethnicity and for the total sample. The Arab group (42.1%) was the largest ethnic group in the sample, followed by the Chaldean (26.5%), African American (25.4%), and White (6.0%) groups. The mean years of age for the full sample was 38.0 years (± 1.36, 95% CI). Over half were married (57.1%), and the majority were unemployed (56.2%), female (72.2%), had minimally attended some high school (65.4%), had health insurance (72.4%), had seen a doctor within the last year (79.1%), and rated themselves to be in good health (63.7%).

For the full sample, all of the predictor variables were significantly related to ethnicity. The margin of error for these statistics for the total sample size ($n = 3{,}136$) was ± 1.61 (95% CI). The Chaldean sample's mean age (44.4 years) was older than the other groups, followed by the Arab (39.0 years) and White (35.3 years) groups; the African American group (30.1 years) was the youngest [F (3, 3135) = 170.22, $P < .001$]. The Bonferroni post-hoc test found significant age differences for all contrasting pairs of ethnic groups ($P < .001$). The other variables used in the regression models were nominal or ordinal. The Chi-square analysis found a significant relationship between ethnicity and each of the model variables. Within the full sample, the margin of error for the ethnic group-specific percentages ranged from 7.1% for white participants to 2.6% for Arab participants. The following discussion highlights the largest differences for the predictor variables across ethnic groups. Full variable distribution detail is presented in Table 2. Percent of members that had not attended any high school was highest for the Arab group (46.6%) followed by the Chaldean (44.0%), White (20.8%), and African American (8.1%) groups. Whites were less likely to report having seen a physician in the last year (69.7%), and the African American group was most likely (85.6%). The percentages for physician visits among Chaldeans and Arabs during the last year were similar (77.6 and 77.5%, respectively), with the largest difference found between African Americans (85.6%) and Whites (69.7%). Self-rated health assessments of excellent and good were less frequently noted in the Chaldean (53.5%) and Arab (60.5%) groups, and highest in the African American group (77.4%). Reports of a history of hypertension, high cholesterol, heart disease were most frequent among the Arab and Chaldean groups. African Americans were least likely to report having diabetes (5.0%), followed by Whites (8.2%), Arabs (8.3%), and Chaldeans (10.6%). Depression was most frequently cited in the White (30.2%) and Arab (21.8%) groups. Arabs had the highest proportion of a healthy Body Mass Index (i.e., BMI <25 kg/m^2) at 22.1%, followed by Whites and Chaldeans (16.7 and 15.0%, respectively). Only 5.6% of the African American participants had a healthy BMI.

Table 3 presents all of the model predictor variables for those who reported having a diagnosis of asthma. The asthma prevalence for the full sample was 9.9% (= 311/3,136), and within each ethnic sample; 14.4% for both African Americans ($n = 115$) and Whites ($n = 27$), 9.4% for Arabs ($n = 124$), and 5.4% for Chaldeans ($n = 45$). The margin of error for the ethnic group-specific percentages ranged from 18.8% for White participants to 8.8% for Arab participants. Variable distribution measures were similar to the larger sample, as were results examining their differences and relationships between the ethnic groups. There were some exceptions. Unlike the results for the total sample, the following predictor variables did not identify statistically significant relationships with ethnicity: Income, Insurance, Physician Visit History, Diabetes, History of Smoking, and the two dietary items for number of Fruit and Vegetable servings per day. Similar to the results from the full sample, age differed significantly by ethnicity [F (3, 310) = 36.32, $P < .001$]. The Bonferroni post-hoc test again found pairwise significant differences between all groups ($P < .001$). For the remainder of the predictor variables the Chi-square test identified significant relationships by ethnicity.

Logistic Regression Modeling

The results of the stepwise logistic regression are presented in Table 4. The table shows the unadjusted Model 1 and adjusted Model 6 odds ratios with 95% confidence intervals for reported asthma prevalence by ethnicity. The White group served as the reference category. The unadjusted OR of .62 for the Arab participants means that the Arab participants were about two-thirds as likely to report having asthma as the White participants. The Chaldean participants were even less likely to report having asthma, with an

Table 2 Model variable response percentages (*n*) by ethnicity for total sample

	White ($n = 188$)	African American ($n = 797$)	Chaldean ($n = 832$)	Arab ($n = 1,319$)	Total ($n = 3,136$)
Demographics					
Age (Mean years, SD)*	35.3 (12.9)	30.1 (8.2)	44.4 (16.3)	39.0 (13.1)	38.0 (14.0)
Sex (Male)*	25.5 (48)	6.4 (51)	34.5 (285)	37.0 (481)	27.8 (865)
Married*	42.4 (78)	12.4 (98)	72.1 (595)	76.6 (1,000)	57.1 (1,771)
Language spoken*					
English	70.9 (127)	98.9 (788)	13.2 (109)	15.6 (195)	39.9 (1,219)
Arabic	14.0 (25)	0.3 (2)	38.3 (316)	63.4 (794)	37.2 (1,137)
Arabic & English	14.5 (26)	0.0 (0)	45.9 (378)	20.5 (257)	21.7 (661)
Another language	0.6 (1)	0.9 (7)	2.5 (21)	0.6 (7)	1.2 (36)
Socioeconomic status					
Education (No high school)*	20.8 (38)	8.1 (63)	44.0 (360)	46.6 (601)	34.6 (1,062)
Employment status*					
Employed	47.0 (86)	39.3 (312)	33.8 (279)	26.2 (341)	32.8 (1,018)
Unemployed	49.2 (90)	55.2 (438)	51.7 (427)	60.8 (790)	56.2 (1,745)
Disabled	2.7 (5)	4.9 (39)	8.8 (73)	10.7 (139)	8.3 (256)
Retired	1.1 (2)	0.6 (5)	5.7 (47)	2.3 (30)	2.7 (84)
Income (< $10 K)*	32.4 (46)	54.6 (323)	30.9 (188)	47.0 (489)	44.1 (1,046)
Health care					
Have health insurance*	70.0 (126)	83.0 (641)	70.2 (569)	67.7 (852)	72.4 (2,188)
Physician visits*					
In the last year	69.7 (131)	85.6 (682)	77.6 (646)	77.5 (1,022)	79.1 (2,481)
In last 2–5 years	16.0 (30)	8.8 (70)	8.4 (70)	8.6 (114)	9.1 (284)
Don't know	14.4 (27)	5.6 (45)	13.9 (116)	13.9 (183)	11.8 (371)
Self-rated health*					
Excellent/very good/good	72.9 (137)	77.4 (617)	53.5 (445)	60.5 (799)	63.7 (1,998)
Fair/poor	25.0 (47)	18.0 (151)	44.0 (366)	34.8 (459)	32.6 (1,023)
Don't know	2.1 (4)	3.6 (29)	2.5 (21)	4.6 (61)	3.7 (115)
Chronic illness					
Hypertension*	9.9 (18)	13.1 (102)	24.7 (199)	20.6 (263)	19.1 (582)
High cholesterol*	7.1 (13)	8.0 (62)	27.0 (217)	22.2 (279)	19.0 (571)
Heart disease*	1.6 (3)	1.8 (14)	7.1 (58)	8.4 (108)	6.0 (183)
Depression*	30.2 (52)	14.7 (113)	12.2 (97)	21.8 (274)	17.9 (536)
Diabetes*	8.2 (15)	5.0 (39)	10.6 (86)	8.3 (106)	8.0 (246)
Healthy body mass index (<25 kg/m^2)*	15.8 (25)	9.7 (68)	24.0 (180)	19.5 (218)	18.0 (491)
Health behaviors					
Ever smoked*	59.4 (98)	40.8 (321)	40.1 (218)	42.1 (445)	42.4 (1,082)
Not physically active (<3 days per week)*	93.1 (175)	93.8 (748)	89.8 (747)	95.2 (1,256)	93.3 (2,926)
Transportation (yes)*	70.4 (131)	62.5 (496)	64.1 (523)	58.1 (749)	61.6 (1,899)
Fruit servings/day (none)*	18.6 (24)	12.1 (75)	14.5 (33)	12.5 (54)	13.2 (186)
Vegetable servings/day (none)*	9.2 (12)	5.9 (37)	6.6 (15)	10.2 (44)	7.6 (108)

Margin of error with 95% confidence interval: White 7.1%, African American 3.4%, Chaldean 3.3%, Arab 2.6%

* $P < .05$

OR of .34 compared to the White participants. The predictor variables were entered in five progressive stepwise blocks (i.e., demographic characteristics, socioeconomic status variables, health care characteristics, chronic conditions, and health behaviors). Each model stage resulted in small adjustments to the odds ratios. Therefore, only the fully adjusted Model 6 is reported. The Chaldean asthma prevalence was significantly lower than the White

Table 3 Model variable response percentages (*n*) by ethnicity for those with asthma

	White ($n = 27$)	African American ($n = 115$)	Chaldean ($n = 45$)	Arab ($n = 124$)	Total ($n = 311$)
Demographics					
Age (Mean years, SD)*	34.8 (14.5)	31.8 (8.76)	53.1 (15.4)	42.1 (13.4)	39.2 (14.3)
Sex (Male) *	3.7 (1)	8.0 (9)	40.0 (18)	32.8 (40)	22.1 (68)
Married*	40.7 (11)	13.3 (15)	75.0 (33)	70.2 (85)	47.2 (144)
Language*					
English	85.2 (23)	98.3 (113)	4.4 (2)	13.5 (15)	51.3 (153)
Arabic	7.4 (2)	0.0 (0)	35.6 (16)	75.7 (84)	34.2 (102)
Arabic & English	7.4 (2)	0.0 (0)	51.1 (23)	9.9 (11)	12.1 (36)
Another language	0.0 (0)	1.7 (2)	8.9 (4)	0.9 (1)	2.3 (7)
Socioeconomic status					
Education (No high school) *	30.8 (8)	8.8 (10)	62.8 (27)	63.1 (77)	40.0 (122)
Employment status*					
Employed	30.8 (8)	32.5 (37)	11.4 (5)	13.1 (16)	21.6 (66)
Unemployed	57.7 (15)	57.0 (65)	54.5 (24)	57.4 (70)	56.9 (174)
Disabled	11.5 (3)	10.5 (12)	18.2 (8)	21.3 (26)	16.0 (49)
Retired	0.0 (0)	0.0 (0)	15.9 (7)	8.2 (10)	5.6 (17)
Income (<$10 K)	42.1 (8)	59.3 (54)	47.8 (11)	66.0 (62)	59.5 (135)
Health care					
Have health insurance	88.9 (24)	81.2 (91)	82.2 (37)	78.4 (91)	81.0 (243)
Physician visits					
In the last year	77.7 (21)	81.7 (94)	88.9 (40)	87.1 (108)	84.5 (263)
In last 2–5 years	11.1 (3)	10.5 (12)	8.9 (4)	5.6 (7)	8.4 (26)
Don't know	11.1 (3)	7.8 (9)	2.2 (1)	7.3 (9)	7.1 (22)
Self-rated health*					
Excellent/very good/good	55.5 (15)	63.5 (73)	8.8 (4)	26.6 (33)	40.2 (125)
Fair/poor	44.4 (12)	32.2 (37)	88.9 (40)	67.8 (84)	55.7 (173)
Don't know	0.0 (0)	4.3 (5)	2.2 (1)	5.6 (7)	4.2 (13)
Chronic illness					
Hypertension*	25.0 (6)	24.3 (27)	68.9 (31)	42.2 (49)	38.2 (113)
High cholesterol*	16.7 (4)	12.3 (13)	53.3 (24)	43.2 (48)	31.1 (89)
Heart disease*	0.0 (0)	6.6 (7)	27.5 (11)	21.8 (24)	14.9 (42)
Depression*	52.2 (12)	27.1 (29)	54.8 (23)	52.3 (58)	43.1 (122)
Diabetes	18.5 (5)	10.9 (12)	25.0 (11)	20.8 (22)	17.4 (50)
Healthy body mass index (<25 kg/m^2)*	16.7 (4)	5.8 (6)	15.0 (6)	22.1 (23)	14.3 (39)
Health behaviors					
Ever smoked	54.2 (13)	39.8 (45)	55.6 (15)	41.7 (40)	43.5 (113)
Not physically active (<3 days per week)*	100.0 (27)	92.3 (106)	91.0 (41)	97.5 (121)	94.9 (295)
Transportation (yes)*	73.1 (19)	68.1 (77)	56.8 (25)	43.3 (52)	57.1 (173)
Fruit servings/day (none)	15.0 (3)	13.6 (11)	44.4 (4)	17.1 (6)	16.6 (24)
Vegetable servings/day (none)	5.0 (1)	9.8 (8)	0.0 (0)	13.9 (5)	9.5 (14)

Margin of error with 95% confidence interval: White 18.8%, African American 9.1%, Chaldean 14.6%, Arab 8.8%

* $P < .05$

reference group in all six models, with an odds ratio smaller than .25 in the final model. Considering the sixth final fully adjusted model, Chaldeans were about 4 times less likely to report having asthma, while Arabs were about 2 times less likely to report having asthma compared to the White referent group. No significant differences were noted in asthma prevalence between Whites and African Americans across all models. Given the importance of age and

Table 4 Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (CI) for asthma prevalence by ethnicity

Ethnic group	Model 1 unadjusted OR (95% CI)	Model 6[a] OR (95% CI)
White	1.00	1.00
African American	.99 (0.63–1.56)	1.04 (0.61–1.80)
Chaldean	.34* (0.21–0.57)	.23* (0.12–0.44)
Arab	.62* (0.39–0.97)	.47* (0.26–0.84)

* $P \leq .05$

[a] Model 6 adjusted for all predictor variables blocked as demographic, socioeconomic status, health care characteristics, chronic conditions, and health behaviors, as seen in Table 2

gender related to asthma diagnosis and the significant differences within the sample on these variables, age and gender adjusted asthma prevalence were calculated. The overall age and gender adjusted prevalence of self-reported asthma was 10%. These adjusted estimates were lowest for Chaldeans (5%) and Arabs (9%) and highest for African Americans (16%) and Whites (14%).

Discussion

The results of the study showed significant differences between the three ethnic groups studied and within all variable categories (demographics, socioeconomic, health care, chronic illness and health behaviors). When testing possible relationships between ethnic groups and the asthma model predictor variables within the subsample of all asthma cases, we found no significant relationships for the income, health insurance, physician visits, diabetes, smoking history, and servings per day of fruits and vegetables items; while there were significant relationships among ethnicity and the rest of the model variables. The logistic regression equation models subsequently applied, control for the variable differences. It was of interest to note that asthma prevalence for the Arab group was significantly lower in the unadjusted model 1 (i.e., crude OR), and in the fully adjusted final model (i.e., adjusted for demographic, socioeconomic status, health care characteristics, chronic conditions, and health behaviors). Furthermore, the Chaldean group was identified as having significantly lower prevalence of asthma in all regression models, even after controlling for all variable categories entered in the fully adjusted final model.

The fully adjusted Chaldean asthma OR (.25) suggesting a 4:1 reduced prevalence over the white referent group is particularly striking. Further study of contributory factors relative to the clinical importance of this finding is needed. These results confirm the importance of the variable categories studied in the occurrence of asthma among different ethnic groups, keeping in mind that there are several risk factors which the people in any of these groups could have been exposed to (e.g. environmental, occupational, chronic diseases, and genetic vulnerability) [30–36]. The lower prevalence of asthma among the Chaldean group (5.4%) was an unexpected finding, as was the low asthma prevalence among the Arab group (9.4%). Both of these prevalence's were lower than the national prevalence of asthma (10.9%). In contrast, both the African American (14.4%) and White (14.4%) groups reported higher prevalence's than the nationally reported figures [16]. Also our results show that the prevalence of asthma among Arabs in Southeast Michigan was higher than that of several Arab countries while for Chaldeans it was within the range reported for these countries [24, 25].

These results should be considered as a pilot study among Arab and Chaldean people, especially since it is the first time the Chaldean population was recognized as an individual ethnic group in comparative ethnic-racial studies of asthma within the United States. Often inappropriately considered a homogeneous group, Arabs and Chaldeans have distinct histories and cultural practices as highlighted by language and religious distinctions [19, 22]. Compared to the United States as a whole, our study demonstrates significantly lower asthma prevalence for Chaldean and Arab Americans residing in Michigan, as compared to the higher occurrence in African Americans and Whites. This indicates a need to study possible gene × environmental interactions among Chaldean/Arab Americans as opposed to Whites and African Americans, since other traditional risk factors included in our models do not account for the differences. It is possible that genetic differences, and/or genetic-environmental interactions are different between these groups although this study, of course, cannot address such possibilities. There is therefore, a need for more elaborate future studies to inform as to possible genetic, environmental, and individual contributors to the observed ethnic-related differences.

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