

Asthma and its related socioeconomic factors

The Shiraz Adult Respiratory Disease Study 2015

Seyed Masoom Masoompour ^{*}, Hamideh Mahdaviazad ^{**}, Seiyed Mohammad Ali Ghayumi ^{***}

* Seyed Masoom Masoompour: MD, Associate Professor of Internal Medicine, Pulmonologist, Non Communicable Diseases Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

** Hamideh Mahdaviazad: MD, Assistant Professor of Community and Preventive Medicine, Poostchi Ophthalmology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

*** Seiyed Mohammad Ali Ghayumi: MD, Professor of Internal Medicine, Pulmonologist, Department of Internal Medicine, Shiraz University of Medical Sciences, Shiraz, IR Iran

Corresponding author: Hamideh Mahdaviazad, Assistant Professor of Community and Preventive Medicine, Poostchi Ophthalmology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. P.O. Box: 7193634154, Shiraz, Iran, Fax: +98-711-32302830, Tel: +98-711-32302830. Email: mahdavih@sums.ac.ir

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Abstract

Objective: This study aimed to explore the association between the prevalence of asthma and socio-economic factors using data from the Shiraz Adult Respiratory Disease Study, 2015(SARDS).

Methods: The SARDS was conducted from June to October 2015 among adult subjects of the general population of Shiraz, Iran. Current asthma was defined as the presence of at least one of the following factors in the preceding 12 months: 1) being awakened by an attack of shortness of breath, coughing, or chest tightness without any identifiable cause; 2) having an asthma attack; 3) currently using medication for asthma; or 4) having wheezing or whistling in the chest not associated with a cold or the flu. Information on individual SES was derived from self-reported education level, occupation, income, and residence location. A value of $p < 0.05$ was considered statistically significant.

Results: A total of 4,582 respondents aged 20-60 years were included in the analysis. The overall prevalence of adult asthma was 7.8%. The prevalence of asthma was higher significantly among female and subjects with higher body mass index, allergic rhinitis, smokers, jobless, and individuals who live in suburban areas. In the adjusted logistic regression model, being jobless (OR, 2.256; 95% CI;1.123- 4.535) and living in a suburban area (OR, 1.735; 95% CI; 1.058- 2.845) were the most significant socioeconomic predictive factors for adult current asthma.

Conclusion: It can be concluded that lower socioeconomic status is associated with higher adult current asthma prevalence. Target interventions are necessary to reduce disparities in healthcare systems.

Keywords: adult; asthma; related factors; respiratory disease; socioeconomic; Shiraz; Iran

Introduction

Asthma is a chronic inflammatory airway disease that contributes majorly to morbidity and mortality worldwide. The prevalence of asthma ranges from 4.7% to 10% in different countries and affects approximately 300 million people around the world, imposing a great social and economic burden on health-related systems⁽¹⁻⁵⁾.

Many studies have investigated the prevalence and risk factors of childhood and adolescent asthma in developed and developing countries⁽⁶⁻⁹⁾. However, in developing countries, only a few epidemiological studies have addressed the impacts of socioeconomic variables on adult asthma. The European Community Respiratory Health Survey (ECRHS) was initiated in 1990 for adult respiratory disease to establish an international research network⁽¹⁰⁾. Subsequently, some studies have reported a relationship between socioeconomic status (SES) and the prevalence of adult asthma in European countries⁽¹¹⁻¹⁴⁾.

In Iran, the prevalence of adult asthma and its related factors have been reported in a few studies^(15, 16); however, no study was found that evaluated the rates of adult asthma and its major determinants, including socioeconomic variables. The current study investigated the prevalence of adult asthma in Shiraz, Iran and explored the association between the prevalence of asthma and socio-economic factors using data from the Shiraz Adult Respiratory Disease Study, 2015 (SARDS)⁽¹⁷⁾.

Method

SARDS, a cross sectional population-based study, was conducted from June to October 2015 among adult subjects from the general population of Shiraz, Iran. Shiraz city is a capital of Fars province, Iran. The 2011 census recorded Fars region's population as 4.59 million that 1.7 million of them are living in the Shiraz city and marginal zones⁽¹⁸⁾. The sampling frame was

individuals of the urban and suburban zones of the Shiraz. Accordingly, the study included more than 6000 non-institutionalized inhabitants 20 and older than 20 years from the nine municipal districts of Shiraz, Iran. We selected the participants proportional to the total number of the sample size in each municipal districts of Shiraz city. The sample consisted of 0.5% of the 1,219,237 total inhabitants aged ≥ 20 years in the survey area. The SARDS' methodology has been described elsewhere⁽¹⁷⁾. In current study we analyzed data of persons aged 20 to 60 years from the urban and suburban zones of the Shiraz, based on the stratified random sampling method.

This study was approved by the Ethical Committee of Shiraz University of Medical Sciences, and verbal informed consent was obtained from all participants.

Information on respiratory symptoms was collected using the Persian version of the ECRHS Questionnaire administered by a trained interviewer. Current asthma was defined as the presence of at least one of the following factors in the preceding 12 months: 1) being awakened by an attack of shortness of breath, coughing, or chest tightness without any identifiable cause; 2) having an asthma attack; 3) currently using medication for asthma; or 4) having wheezing or whistling in the chest not associated with a cold or the flu⁽¹⁹⁾. Subjects reporting chronic cough and phlegm were not considered as current asthma.

Information on individual SES was derived from the participants' self-reported level of education, occupation, income, and residence (urban or suburban). Educational levels were rated as Bachelor's degree or higher, high school graduate, middle school graduate, or less. The self-reported educational level of the research subjects was combined into a single variable. This composite variable contained the four categories of illiterate, primary, secondary/high school, and academic. Current occupations were collected with an open-ended question and then

categorized into the four groups of non-manual, manual, jobless, and unspecified. Subjects who were unable to work, students, retired persons, and unknown were classified as having an unspecified occupation. Earned income was the total income received by households during one year. The classification was based on the average income of all households in Iran⁽¹⁸⁾. Income was divided into four categories ranging from less than \$3500 to more than \$7000 per year. Individual and lifestyle variables which had been previously identified as risk factors for asthma were recorded for controlling the confounding variables in the regression models^(4, 13, 14, 16). These variables were age, gender, self-reported weight and height, marital status, history of allergic rhinitis, and smoking habits (current smoker, passive, ex-smoker, non-smoker).

Statistical analysis

Data was entered into the Statistical Package for the Social Sciences software version 15.0 (SPSS Inc., Chicago, IL, USA) by a trained operator and double-checked by an investigator. In addition to descriptive statistics, the chi-square and student T tests were used to find associations between asthma and socioeconomic factors and group differences. To derive predictive socioeconomic factors, all variables of interest with p-value less than 0.1 in univariate analysis were entered into the multiple logistic regression model to estimate adjusted odds ratios and 95% confidence intervals (CI). A p-value of less than 0.05 was considered to be statistically significant.

Results

This large population-based study surveyed 4,582 adult respondents aged 20-60 years. From total sample of 4771, 189 (3.96%) potential participants refused to complete interview process and considered as a non-respondents in this survey. Frequency analysis of their demographic characteristics did not show substantially difference from respondents.

The mean age of participants was 45.3 ± 26.2 years. Of the total respondents, 57.3% were female, 85.6% were married, and 14.2% were current smokers. Of the total participants, 41.1% had a primary school education, 54.8% had a manual job, 74.4% had a yearly income level $\leq$ \$3500, and 95.9% lived in an urban area (Table 1).

Prevalence

The overall prevalence of adult asthma was 7.8% (358/4582). The mean $\pm$ SD of age was slightly lower in asthmatic participants than in non-asthmatic (44.3 ± 10.5 vs. 45.4 ± 9.9). The mean $\pm$ SD of BMI was significantly higher in asthmatic participants than in non-asthmatic subjects (26.8 ± 4.9 versus 26.1 ± 4.7 ; $p=0.01$). Asthma was more prevalent among women (8.6%) than men (6.7%) significantly ($p=0.02$). The prevalence of asthma in subjects with allergic rhinitis was higher than in subjects without it (15.5% vs. 4.9%; $p<0.001$). The rates of asthma were 8.8%, 10.8%, 10.4%, and 6.8% among current, ex-, passive, and non-smokers, respectively, and these associations were statistically significant ($p=0.003$). Although it was statistically not significant, the prevalence of asthma was higher among illiterate participants than literate subjects. More than two third of asthmatic patients were in primary and secondary/ high school education. In the category of occupation, the prevalence of asthma was highest among individuals who had no job (14.1%, $p=0.005$). Prevalence of asthma was higher in the lowest income category ($< \$3500$) than other categories, but this difference was not statistically significant. In comparison to subjects living in urban areas, asthma was more prevalent among those living in suburban areas (11.8% vs. 7.7%). Table 2 illustrates the prevalence of asthma by sociodemographic and socioeconomic variables.

Predictive factors

An adjusted logistic regression model was used to identify predictive factors for adult asthma (Table 3). Having a high BMI (OR, 1.026; 95% CI; 1.004-1.048), a history of allergic rhinitis (OR,3.473; 95% CI; 2.769- 4.355), being a current smoker (OR,1.848; 95% CI; 1.268-2.694), a passive smoker (OR,1.328; 95% CI; 1.001- 1.763), jobless (OR,2.256; 95% CI; 1.123-4.535), and living in a suburban area (OR, 1.735; 95% CI; 1.058- 2.845) were significant predictive factors for adult asthma.

Discussion

Identifying the epidemiological burden of adult asthma and the related sociodemographic and socio-economic factors is crucial for the prevention and control of disease⁽²⁰⁾. The current study examined the prevalence of adult asthma and predictive ability of selected socio-economic and sociodemographic factors based on the 2015 SARDS.

The prevalence of adult asthma was 7.8 % in urban and suburban non- institutionalize inhabitants of Shiraz, Iran. The prevalence of asthma was higher significantly among female, subjects with higher body mass index, allergic rhinitis, smokers, jobless, and individuals who live in suburban Epidemiologic data about current asthma in adult were scarce in Iran. Rahimi Rad et al. reported prevalence rate of current asthma 1.4% in 20- 44 years old adults in Urmia, Iran. Patients with asthma attack or receiving medication during past 12 months were considered as a current asthma in this study⁽¹⁵⁾. In the most up-to-date meta-analysis from Iran, pooled prevalence of current asthma was reported as 8.8% (95% CI; 6.48%- 11.12%) in all ages, current asthma was defined as a one or more attack of dyspnea and wheezing during past 12 months⁽⁵⁾. So, the differences in asthma definition and age range of subjects could be source of these variations. Joung Song et al. reviewed the epidemiology of adult asthma in Asia (2014) and demonstrated increasing trend in the burden of adult asthma in Asia⁽²¹⁾. The prevalence of adult

asthma in our setting was higher than China⁽²²⁾, Singapore⁽²³⁾, Korea⁽²⁴⁾, India⁽²⁵⁾ and Japan⁽²⁶⁾. In addition to heterogeneity in definition of asthma, this higher prevalence could be related to some difference in environmental and lifestyle factors. Shiraz city (the current study region) is one of the most polluted industrial cities in Iran⁽²⁷⁾; there is a higher prevalence of hookah and cigarette smoking in the south of Iran as reported in some studies⁽²⁸⁾; and finally, there is a recent rising trend of obesity in Iran⁽²⁹⁾. Prevalence of adult asthma was 3.8% in South African⁽³⁰⁾, 4.4% in Brazil⁽³¹⁾, 9% in Finland⁽³²⁾, and 8.4% and 10.4% in ECRHS I & II^(13, 33).

In a multivariate logistic regression model, from demographic and life style factors, BMI allergic rhinitis and current/ passive smoker had statistically significant associations with asthma prevalence.

Lee et al., reported that obesity is a risk factor for asthma and allergic rhinitis in Korean adolescents⁽³⁴⁾. In national adult survey in a developing country, obesity was one of independent sociodemographic predictors of recent wheeze⁽³⁰⁾. After adjusting for possible confounders, nasal allergy was a significant risk factor of asthma, in ECRHS and Swedish study^(10, 33). Significant positive association between cigarette smoking and asthma prevalence reported in many studies previously^(30, 34, 35). In Tazesh et al. study, the prevalence of asthma symptoms and current asthma was significantly higher in current/ passive smokers than non- smokers⁽¹⁶⁾.

Even after adjusting for other factors, socioeconomic factors such as being jobless and living in suburban areas were significantly predicted the prevalence of adult asthma. The ECRHS I& II considered levels of education and occupations to measure socioeconomic status. In the ECRHS I (1991–1993), the prevalence of asthma was higher in people with a lower educational level (OR: 1.28; 95%CI: 1.00, 1.64) or social class (OR: 1.51; 95%CI: 1.20, 1.90), regardless of

atopic status¹². In ECRHS II (1999-2001), asthma was significantly associated with low educational level (RR=1.40; 95%CI; 1.03-1.89)⁽³³⁾. Considering occupation as a proxy of socioeconomic status, Ekerljung et al. found that manual workers in services had the highest prevalence and incidence of asthma⁽³⁶⁾. Low subjective academic achievement and household income level <\$15000 were significant risk factors for adult asthma in Korean and US populations, respectively^(4, 34). Because of differences in definition, way of measuring of socioeconomic variables and its cultural dependency, achieving a unique socioeconomic index across the world is difficult. The prevalence of current asthma is the result of both the burden of the disease and its control; nevertheless it is clear that poor people have less access to and/or utilization of health care systems and poor adherence to medication regimens, and they are more susceptible to poorer asthma control.

Living in suburban areas has been a predictor of higher asthma prevalence in our study as Menezes had previously shown in southern Brazil⁽³¹⁾. This correlation may be explained by the fact that subjects who live in suburban areas are more exposed to industrial pollutants and allergens.

Strengths and Limitations

To the best of the authors' knowledge, this is the first population-based study to evaluate the association between adult asthma prevalence and socioeconomic factors in Iran. To increase response rate, the questionnaires were completed by a team of trained interviewers. A validated ECRHS questionnaire was used to facilitate international comparisons. This study has at least two limitations. First, the study is limited by the lack of national studies and the methodological heterogeneity in international studies. This shortage made achieving the desirable comparison difficult, especially in socioeconomic areas. Another limitation is that

using self-reported income as an indicator of socioeconomic status does not essentially imply the real income; it is associated with underreporting because of social undesirability of this variable in our cultural setting(37).

Conclusion

According to this study, lower socioeconomic status is associated with higher adult current asthma prevalence. This association was consistent after adjusting for known risk factors. Epidemiological studies on asthma and its main determinants provide information helpful to developing targeted interventions and subsequently reducing the disparities and inequality in a healthcare system. Therefore, considering the limitations, a key policy priority could be to plan for the national research network to develop standard protocols, a standardized questionnaire, and a gold standard definition of asthma based on an academic consensus. Further clinical studies are needed to establish such knowledge and associations.

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Table1. Sociodemographic characteristics of participants - Shiraz Adult Respiratory Disease Study, 2015

Variables	Number (%) or mean± SD
Age (y)	45.3± 26.2
Gender	
Male	1,957(42.7%)
Female	2,625(57.3%)
BMI (kg/m ²)	26.2± 4.7
Marital status	

Married	3,920 (85.6%)
Unmarried	436 (9.5%)
Others	222 (4.9%)
Smoking habit	
Current smoker	650 (14.2%)
Ex-smoker	139 (3.0%)
Passivesmoker	811(17.7%)
Non-smoker	2,982(65.1%)
Allergic Rhinitis	
Yes	1,263 (27.6%)
No	3,278 (71.5%)
Educational level	
Illiterate	343(7.5%)
Primary	1,883(41.1%)
Secondary/High School	1,465(32.0%)
Academic	866 (18.9%)
Occupation	
Manual	2,509 (54.8%)
Non-manual	1,474 (32.2%)
Jobless	92 (2.0%)
Unspecified	491(1.7%)
Income level (per year)	
< \$3500	3,402(74.4%)
\$3500- \$5250	837(18.3%)
\$5250- \$7000	187(4.1%)
>\$7000	120(2.6%)
Residence location	
Urban	4,392 (95.9%)
Suburban	169 (3.7%)
Total	4,582 (100%)

SD: standard deviation; BMI: body mass index; Numbers may not add up to the total because of missing data.

Table2.Prevalence of asthma by sociodemographic data (univariate analysis) - The Shiraz Adult Respiratory Disease Study, 2015

Variables	Asthma (n=358)	Total (n=4582)	<i>p</i> – value*
Age (y) mean± SD	44.3± 10.5	45.3± 26.2	0.07
BMI (kg/m ²) mean± SD	26.8± 4.9	26.2± 4.7	0.01
Gender n (%)			
Male	132 (6.7%)	1957	0.02
Female	226 (8.6%)	2625	

Marital status n (%)			
Married	304 (7.8%)	3920	0.89
Unmarried	35 (8.0%)	436	
Others	19 (8.6%)	222	
Smoking habit n (%)			
Current smoker	57 (8.8%)	650	0.003
Ex-smoker	15 (10.8%)	298	
Passive-smoker	84 (10.4%)	139	
Non-smoker	202 (6.8%)	811	
Allergic Rhinitis			< 0.001
Yes	196 (15.5%)	1263	
No	160 (4.9%)	3278	
Educational level n (%)			
Illiterate	33 (9.6%)	343	0.31
Primary	136 (7.2%)	1883	
Secondary/High School	123 (8.4%)	1465	
Academic	63 (7.3%)	866	
Occupation n (%)			0.005
Manual	214 (8.5%)	2509	
Non-manual	106 (7.2%)	1474	
Jobless	13 (14.1%)	92	
Unspecified	25 (5.1%)	491	
Yearly income level n (%)			
< \$3500	276 (8.1%)	3402	0.49
\$3500- \$ 5250	55 (6.6%)	837	
\$5250- \$7000	14 (7.5%)	187	
>\$7000	8 (6.7%)	120	
Residence location n (%)			
Urban	337 (7.7%)	4392	0.04
Suburban	20 (11.8%)	169	

*Indicating the level of significant differences between asthmatic and non-asthmatic groups

Table 3. Predictive factors of asthma prevalence based on odds ratios and 95% confidence intervals (95%CI) using multiple logistic regression analysis- the Shiraz Adult Respiratory Disease Study, 2015

Variables	Asthma			
	B	SE	Adjusted OR (95% CI)	P-value
Age (y)	-0.011	0.006	0.989(0.977- 1.001)	0.066
Body Mass Index (kg/m²)	0.026	0.011	1.026(1.004- 1.048)	0.018
Gender n (%)				
Female	Baseline	-	-	-
Male	-0.332	0.211	0.717(0.475- 1.084)	0.115

Allergic rhinitis				
No	Baseline	-	-	-
Yes	1.245	0.116	3.473(2.769- 4.355)	<0.001
Smoking habit				
Non-smoker	Baseline	-	-	-
Current smoker	0.614	0.192	1.848(1.268-2.694)	0.001
Ex-smoker	0.565	0.317	1.759(0.944- 3.277)	0.075
Passive-smoker	0.284	0.145	1.328(1.001- 1.763)	0.049
Occupation				
Manual	Baseline	-	-	-
Non- manual	0.040	0.202	1.041(0.701- 1.548)	0.842
Jobless	0.814	0.356	2.256(1.123- 4.535)	0.022
Unspecified	-0.295	0.260	0.744(0.447- 1.239)	0.256
Residence location				
Urban	Baseline	-	-	-
Suburban	0.551	0.252	1.735(1.058- 2.845)	0.029