Available online at **www.ijmrhs.com**

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2020, 9(5): 10-19

The Determinants and Risk Factors of Bronchial Asthma in Saudi Arabia: Online Community Survey

Abeer Alatawi*

Department of Nursing, Faculty of Applied Medical Sciences, Tabuk University, Tabuk, Saudi Arabia

**Corresponding e-mail: asalatawi@ut.edu.sa*

ABSTRACT

Background: *Bronchial Asthma is most common of the greatest public main chronic illnesses and for many, has a considerable influence on the quality of life. There are a great environmental difference in asthma severity, and mortality. The main goals of this study were included, assess prevalence rate of asthmatic disease, determents of risk factors of asthma and to identify to specific asthma symptoms among the children and adults having bronchial asthma in Tabuk city in Saudi Arabia.* ***Methods:*** *This study was quantitative, questionnaire based on online survey. A total of 400 asthmatic participants (aged 12-50 years) in Tabuk city in Saudi Arabia, completed the survey (have Social Media during two months (period of data collection) and diagnosis with Bronchial Asthma more than 24 months. The researcher used online survey based-questionnaire has a standardized script of close-ended questions. Descriptive statistics were performed for categorical and continuous variables by used SPSS program version 22.* ***Results:*** *Four hundred participants participated in this study. 58.3% from participants were male (294/400). More than half of the participants 55% have prevalence of asthma and 45% don't have asthma. 70.5% from participants cooking with liquefied petroleum gas (LPG) and 14% cooking with solid fuel have asthma but 45.6% no self-cooking and 19.4% cooking with solid fuel from participants don't have asthma. Also, there are significant differences raise in pets in home with asthma, 76.4% from participants have asthma that found pets in home and 46.7% from participants don't have asthma that found pets in home. There are significant differences according to car exhaust smoke cause to breathe, 50% from participants have asthma that show car exhaust smoke cause to breathe.* ***Conclusion:*** *More than half of the participants have of asthma. The main determent of asthma in this study was cooking with liquefied petroleum gas (LPG). Also, smoking was the main risk factor of asthma and found pets in home.*

Keywords: Determinants, Risk factors of bronchial asthma, Saudi Arabia

INTRODUCTION

Bronchial Asthma is most common the greatest public main chronic illnesses and for numerous has a considerable influence on the quality of life. Worldwide, asthma disease is graded sixteenth amongst of the important reasons of years lived with disability and twenty eighth amongst the leading reasons of load of illness. Globally, about 300 million individuals have bronchial asthma disease, and it is possible that by 2025 a furthermore 100 million may be affected [1]. There are a great environmental difference in asthma mortality and severity. Most asthma mortality occurs in low and middle income countries [2]. Despite the development of asthma management in current decades, there are motionless improvements to be complete in relation of successful patient teaching, using original diagnostic methods, and applying modified situation of management.

In Saudi Arabia country, the prevalence rate of asthma disease was 19.5% and 6.9%. The main prevalence degree for a wheeze included 25.3%, 18.5% from this number have wheeze through the previous one year and 19.6% have asthma by physician-diagnosed among students aged within range 17 years in Riyadh city [3]. The Saudi Initiative for Asthma boards supposed this increasing was multi-factorial, portion of it could be connected with rapid innovation of our society, or it might be accredited to environmental features [4]. The National Saudi domestic investigation of chronic medical circumstances including asthma was specified a medical diagnosis of asthma disease to be 4% [5].

The most common risk factors for increasing asthma is consuming a parent with asthma, having a severe breathing

infection as a child, having an allergic condition, or being bare to certain chemical irritation or industrial dusts in the workplace [6]. The present indication recommend that asthma is a compound has many of features and its etiology is progressively accredited to connections between natural vulnerability, and environmental structures. These include (pollens, mold and other aeroallergens, air pollution and weather), host features (sensitive sensitization fatness, nutritious factors, and pollutions,), and hereditary features (asthma vulnerability loci on genes). Though fundamental apparatuses of asthma are not yet fully unstated, they may comprise airway irritation, regulator of airway quality and reactivity [7].

It is also currently documented that asthma disease might not be a particular illness but a collection of varied phenotypes with diverse prospects [8]. This study aimed to assess the prevalence rate, determents of risk factors of bronchial asthma disease and to identify to specific asthma symptoms among the children and adults of asthma patients in Tabuk city in Saudi Arabia.

METHODS

Study Design and Setting

The present study was quantitative, questionnaire-based online survey. The study was conducted among 400 patients have asthma disease (aged 12-50 years, more than two prescriptions in the preceding two years, by used of social media such as: Whats up, Facebook and Imo) from Tabuk city in Saudi Arabia between November (2019) and January (2020).

Sample and Sampling

No sampling method was adopted and sample size estimation was not done because this was an exploratory survey. A total of 400 asthmatic participants (aged 12-50 years) in Tabuk city in Saudi Arabia, completed the survey (have the Social Media during two months (period of data collection) and diagnosis with Bronchial Ashtma more than 24 months. The online survey questionnaire was used in this study. The survey was open to all to participate. No personal information was collected during the survey. The data collected by two trained data collectors who were have knowledge of the goals of the study.

Inclusion/Exclusion Criteria

Inclusion criteria for participants consisted of the following: children more than 12 years old and adults to 50 years old who had asthma disease and experienced asthma symptoms in the last 24 months, and have any method of social media. On the other hand, Exclusion criteria for participants consisted of the following: children less than 12 years old and adults more than 50 years old who had not physician-diagnosed asthma and it symptoms are less than two years, and don't have any method of social media.

Study Tool

The researcher used online survey based-questionnaire has a standardized script of close-ended questions. The questionnaire was established through number of experts in this field and the authors, who providing guidance on the questions, and construction of the survey. The questions were contained 4 categories that included: socio-demographic characteristics of participated, medical history of participants, influences related with asthma disease, and health care provider factors. The questions of this survey were created on the standards established by the National Heart, Lung, and Blood Institute's Guidelines for the Diagnosis and Management of Asthma [9]. Questionnaires took approximately 15 min to complete.

The content validity of this questionnaire was achieved by ten experts from health professionals. Subsequently, this survey was piloted among 50 bronchial asthma patients. The internal consistency and reliability of this survey was subtracted statistically by Cronbach's alpha check which was above 0.7. Then, the questionnaire was translated to Arabic language in direction to assist the answering of participants.

Statistical Analysis

Descriptive statistics were performed for categorical and continuous variables by used SPSS program version 22. The

independent samples t-test was applied to investigate the differences between means. The chi-square test was used to determine the statistically significant differences between the different categorical variables.

RESULTS

Participant's Socio-demographic Characteristics

Four hundred participants participated in this study. 58.3% from participants were male (294/400) and 41.7% were female (106/400). The mean age from 12-28 was 44.8% (179/400) and 42.8% (171/400) of the participants belonged to the age group 29-39 years, and 12.4% (50/400) of them were from 40-50 years. In addition, 28.7% (115/400) of the participants were students and 7% (28/400) were retired.

According to the education level, 35.9% (144/400) of participants have university education level and 15% (59/400) have less than high school. Also, 52.2% (143/400) have 4-7 from family members. 64.4% (280/400) from participants were Rural and 90.6% (369/400) were live in Tabuk city in Saudi Arabia (Table 1).

Table 1 The socio-demographic characteristics among participants

Socio-demographic Characteristics	Frequency (n=400)	Percentage (%)
Q1 Gender		
Male	294	58.3%
Female	106	41.7%
Q2 Age (years)		
12-28	179	44.8%
29-39	171	42.8%
40-50	50	12.4%
Q3 Occupation		
I do not work	85	21.3%
Employee/worker	72	18.0%
Employee/worker with an unemployment contract	53	13.3%
Free work	47	11.7%
Retired	28	7.0%
Student	115	28.7%
Q4 Educational level		
Less than high school	59	15.0%
High school	64	15.9%
More than high school	133	33.2%
University	144	35.9%
Q5 Number of family members		
Less than 3	257	47.8%
4-7	143	52.2%
Q6 Residence		
Urban	120	35.6%
Rural	280	64.4%
Q7 Do you live in Tabuk city in Saudi Arabia?		
Yes	369	90.6%
No	31	9.4%

The Prevalence of Asthma among Participants

More than half of the participants 55% have prevalence of asthma and 45% don't have asthma. Table 2 shows this information.

Table 2 The prevalence of asthma among participants

Prevalence of Asthma	Frequency (n=400)	Percentage (%)
Asthma		
Yes	220	55%
N0	180	45%

The Relation between Asthma and Socio-demographic Characteristics among Participants

Table 3 shows that there are significant differences in gender, 85.9% from participants have asthma were male, but 58.3% from participants don't have asthma were male. Also, there are significant differences in asthma according to number of family, and rural. In other side, there aren't significant differences in asthma and other variables.

Table 3 The relation between asthma and socio-demographic characteristics among participants

Socio-demographic characteristics	Total (n=400)	Asthma n (%)		Statistical test	
		Yes (n=220)	No (n=180)	$\chi 2$	p-value
Q8 Gender					
Male	294 (58.3%)	189 (85.9%)	105 (58.3%)	38.651	0.000*
Female	106 (41.7%)	31 (14.1%)	75 (41.7%)		
Q9 Age (years)					
28-Dec	179 (44.8%)	99 (45.0%)	80 (44.4%)	0.027	0.987
29-39	171 (42.8%)	94 (42.7%)	77 (42.8%)		
40-50	50 (12.4%)	27 (12.3%)	23 (12.8%)		
Q10 Occupation					
I do not work	85 (21.3%)	41 (18.6%)	44 (24.4%)	10.541	0.061
Employee/worker	72 (18.0%)	33 (15.0%)	39 (21.7%)		
Employee/worker with an unemployment contract	53 (13.3%)	35 (15.9%)	18 (10.0%)		
Free work	47 (11.7%)	24 (10.9%)	23 (12.8%)		
Retired	28 (7.0%)	14 (6.4%)	14 (7.8%)		
Student	115 (28.7%)	73 (33.2%)	42 (23.3%)		
Q11 Educational level					
Less than high school High school	33 (15.0%)	35 (19.4%)	68 (17.0%)	5.287	0.152
High school	35 (15.9%)	37 (20.6%)	72 (18.0%)		
More than high school	73 (33.2%)	43 (23.9%)	116 (29.0%)		
University	79 (35.9%)	65 (36.1%)	144 (36.0%)		
Q12 Number of family members					
Less than 3	257 (47.8%)	171 (77.7%)	86 (47.8%)	38.66	0.000*
4-7	143 (52.2%)	49 (22.3%)	94 (52.2%)		
Q13 Residence					
Urban	120 (35.6%)	56 (25.5%)	64 (35.6%)	4.81	0.028*
Rural	280 (64.4%)	164 (74.5%)	116 (64.4%)		
Q14 Do you live in Tabuk city in Saudi Arabia?					
Yes	369 (90.6%)	206 (93.6%)	163 (90.6%)	1.314	0.252
No	31 (9.4%)	14 (6.4%)	17 (9.4%)		

*p-value significant at $p \leq 0.05$; n: number of the subjects; $\chi 2$: chi-square test

Factors Associated with Asthma among Participants

Table 4 shows that there are significant differences according to cooking habits, 70.5% cooking with liquefied petroleum gas (LPG) and 14% cooking with solid fuel have asthma but 45.6% no self-cooking and 19.4% cooking with solid fuel from participants don't have asthma. Also, there are significant differences in raise pets in home with asthma, 76.4% from participants have asthma that found pets in home and 46.7% from participants don't have asthma that found pets in home. Half of participants have asthma that pet dander like cats cause shortness of breath but (38.3% from participants don't have asthma that pet dander like cats cause shortness of breath ($p \leq 0.05$).

Also, there are significant differences according to car exhaust smoke cause to breathe, 50% from participants have asthma that show car exhaust smoke cause to breathe but 48.3% don't have asthma that complain of car exhaust smoke cause to breathe. In the other side, there aren't significant differences according to other variables that show in this table.

Table 4 Factors associated with asthma among participants

Factors Associated with Asthma	Total (n=400)	Asthma n (%)		Statistical test	
		Yes (n=220)	No (n=180)	$\chi 2$	p-value
Q15 Usual smoking habit					
Nonsmoker	220 (55.0%)	118 (53.6%)	102 (56.7%)	5.66	0.059
Cigarette smoker	114 (28.5%)	72 (32.7%)	42 (23.3%)		
Smoker of hookah/other products	66 (16.5%)	30 (13.6%)	36 (20.0%)		
Q16 Usual cooking habit					
No self-cooking	116 (29.0%)	34 (15.5%)	82 (45.6%)	55.48	0.000*
Cooking with liquefied petroleum gas (LPG)	218 (54.5%)	155 (70.5%)	63 (35.0%)		
Cooking with solid fuel	66 (16.5%)	31 (14.1%)	35 (19.4%)		
Q17 Do you raise pets in your home?					
Yes	252 (46.7%)	168 (76.4%)	84 (46.7%)	37.456	0.000*
No	148 (53.3%)	52 (23.6%)	96 (53.3%)		
Q18 Does pet dander like cats cause shortness of breath?					
Yes	181 (45.2%)	112 (50.9%)	69 (38.3%)	7.104	0.029*
No	108 (27.0%)	50 (22.7%)	58 (32.3%)		
Sometimes	111 (27.8%)	58 (26.4%)	53 (29.4%)		
Q19 Does car exhaust smoke cause you to breathe					
Yes	197 (49.3%)	110 (50.0%)	87 (48.3%)	7.624	0.022*
No	86 (21.5%)	37 (16.8%)	49 (27.2%)		
Sometimes	117 (29.3)	73 (33.2%)	44 (24.4%)		
Q20 Do you use air fresheners and perfumes in your home					
Yes	205 (51.2%)	104 (47.3%)	101 (56.2%)	3.596	0.166
No	70 (17.5%)	44 (20.0%)	26 (14.4%)		
Sometimes	125 (31.3%)	72 (32.7%)	53 (29.4%)		
Q21 Does the smell of perfume cause breathing problems?					
Yes	173 (43.2%)	100 (45.5%)	73 (40.6%)	3.358	0.187
No	115 (28.8%)	55 (25.0%)	60 (33.3%)		
Sometimes	112 (28.0%)	65 (29.5%)	47 (26.1%)		
Q22 Does stress and anxiety cause you breathing disorders?					

Yes	186 (46.5%)	104 (47.3%)	82 (45.6%)	0.486	0.784
No	100 (25.0%)	52 (23.6%)	48 (26.7%)		
Sometimes	114 (28.5%)	64 (29.1%)	50 (27.8%)		
Q23 Does house dust cause breathing problems?					
Yes	193 (48.3%)	110 (50.0%)	83 (46.1%)	0.725	0.696
No	104 (26.0%)	54 (24.5%)	50 (27.8%)		
Sometimes	103 (25.8%)	56 (25.5%)	47 (26.1%)		
Q24 Does exercise (aerobic exercise) cause you breathing problems?					
Yes	226 (56.5%)	126 (57.3%)	100 (55.6%)	1.868	0.393
No	95 (23.8%)	47 (21.4%)	48 (26.7%)		
Sometimes	79 (19.8%)	47 (21.4%)	32 (17.8%)		
*p-value significant at p ≤0.05; n: number of the subjects; χ2: chi-square test					

The Relation between Allergy Symptoms and Asthma among Participants

Table 5 shows that there are significant differences according to allergy symptoms include: Itchy-watery eyes in the past one year and Skin rash in the past one year but there aren't significant differences according to Nasal congestion in the last one year and Rash affected other areas.

Table 5 The relation between allergy symptoms and asthma among participants

Allergy Symptoms	Total (n=400)	Asthma n (%)		Statistical test	
		Yes (n=220)	No (n=180)	χ2	p-value
Q25 Itchy-watery eyes in the past one year					
Yes	317 (70.0%)	191 (86.8%)	126 (70.0%)	17.028	0.000*
No	83 (30.0%)	29 (13.2%)	54 (30.0%)		
Q26 Nasal congestion in the past one year					
Yes	295 (70.0%)	169 (76.8%)	126 (70.0%)	2.377	0.123
No	105 (30.0%)	51 (23.2%)	54 (30.0%)		
Q27 Skin rash in the last one year					
Yes	288 (57.2%)	185 (84.1%)	103 (57.2%)	35.452	0.000*
No	112 (42.8%)	35 (15.9%)	77 (42.8%)		
Q28 Rash affected other areas					
Yes	229 (60.6%)	120 (54.5%)	109 (60.6%)	1.461	0.227
No	171 (39.4%)	100 (45.5%)	71 (39.4%)		
*p-value significant at p ≤ 0.05; n: number of the subjects; χ2: chi-square test					

The Relation between Risk Factors and Asthma among Participants

Table 6 shows that there are significant differences according to risk factors of asthma and have asthma include: History of/passive smoking, Family history of asthma and History of TB treatment there show the participants have asthma that have of these risk factor more than participants don't have asthma. In the other side, there aren't significant differences according to other risk factors include: Hepaatitis Virus positive and Hypertensive.

Table 6 The relation between risk factors and asthma among participants

Risk Factors	Total (n=400)	Asthma n (%)		Statistical test	
		Yes (n=220)	No (n=180)	χ2	p-value
Q29 History of/passive smoking					
Yes	290 (63.9%)	175 (79.5%)	115 (63.9%)	12.172	0.000*
No	110 (36.1%)	45 (20.5%)	65 (36.1%)		
Q30 Family history of asthma					
Yes	272 (60.6%)	163 (74.1%)	109 (60.6%)	8.335	0.004*
No	128 (39.4%)	57 (25.9%)	71 (39.4%)		
Q31 History of TB treatment					
Yes	238 (51.7%)	145 (65.9%)	93 (51.7%)	8.334	0.004*
No	162 (48.3%)	75 (34.1%)	87 (48.3%)		
Q32 Hepaatitis Virus positive					
Yes	211 (48.3%)	124 (56.4%)	87 (48.3%)	2.561	0.11
No	189 (51.7%)	96 (43.6%)	93 (51.7%)		
Q33 Hypertensive					
Yes	272 (65.0%)	155 (70.5%)	117 (65.0%)	1.354	0.245
No	128 (35.0%)	65 (29.5%)	63 (35.0%)		

*p-value significant at $p \leq 0.05$; n: number of the subjects; χ2: chi-square test

The Relation between Health Care Provider Factors and Asthma among Participants

Table 7 shows that there are significant differences according to health care provider factors include type of health care provider seen for asthma care, Nurse practitioner 51.8% have asthma and 36.1% don't have asthma. Also there are significant differences according to it don't availability of primary provider/representative after office hours that (45.5%) in participants have asthma and 32.2% in participants don't have asthma. There are significant relationship between waiting time in office at the time of appointment and asthma. 64.1% from asthma participants waiting time in office at the time of appointment and asthma and 77% from participants didn't have asthma that waiting time in office at the time of appointment and asthma. On the other side, there aren't significant relationships according to other variables.

Table 7 The relation between health care provider factors and asthma among participants

Health Care Provider Factors	Total (n=400)	Asthma n (%)		Statistical test	
		Yes (n=220)	No (n=180)	χ2	P-value
Q34 The general satisfaction with health care providers was trust?					
Yes	331 (78.9%)	189 (85.9%)	142 (78.9%)	3.418	0.064
No	69 (21.1%)	31 (14.1%)	38 (21.1%)		
Q35 Relationship between health care provider and patient good?					
Yes	294 (71.1%)	166 (75.5%)	128 (71.1%)	0.959	0.327
No	106 (28.9%)	54 (24.5%)	52 (28.9%)		
Q36 Education regarding asthma, asthma care, and medication use is given in an understandable manner?					
Yes	313 (77.2%)	174 (79.1%)	139 (77.2%)	0.203	0.652
No	87 (22.8%)	46 (20.9%)	41 (22.8%)		
Q37 Type of health care provider seen for asthma care					
Primary care doctor	154 (38.4%)	76 (34.5%)	78 (43.3%)	10.27	0.006*
Nurse practitioner	179 (44.8%)	114 (51.8%)	65 (36.1%)		
Others	67 (16.8%)	30 (13.6%)	37 (20.6%)		

Q38 It was continuity of provider					
Yes	204 (51.0%)	106 (48.2%)	98 (54.4%)	1.785	0.41
No	102 (25.5%)	61 (27.7%)	41 (22.8%)		
Sometimes	94 (23.5%)	53 (24.1%)	41 (22.8%)		
Q39 It availability of primary provider/representative after office hours?					
Yes	106 (26.5%)	43 (19.5%)	63 (35.0%)	13.45	0.001*
No	158 (39.5%)	100 (45.5%)	58 (32.2%)		
Sometimes	136 (34.0%)	77 (35.0%)	59 (32.8%)		
Q40 Ability to get an appointment for illness in a timely fashion?					
Yes	168 (42.0%)	90 (40.9%)	78 (43.3%)	3.468	0.177
No	111 (27.8%)	69 (31.4%)	42 (23.3%)		
Sometimes	121 (30.3%)	61 (27.7%)	60 (33.3%)		
Q41 Your waiting time in office at the time of appointment?					
Yes	281 (77.8%)	141 (64.1%)	140 (77.8%)	8.874	0.003*
No	119 (22.2%)	79 (35.9%)	40 (22.2%)		

*p-value significant at $p \leq 0.05$; n: number of the subjects; $\chi 2$: chi-square test

DISCUSSION

This public founded survey conducted by using a confirmed questionnaire, this was aimed to assess the prevalence, determinants of asthma disease and related risk factors in aged more than 12 years to 50 years and living in Tabuk city in Saudi Arabia. Global Asthma Network is show the attentive mostly on low or moderate-income countries [10]. This study high points the essential for native founded investigations in other countries, facing rebellious development.

In our study, more than half of the participants have of asthma and 45% don't have asthma, this result was inconsistent with other studies. The prevalence rates are renowned in New Zealand, Northern Europe, and Australia, (32%) but in southern Europe (Italy and Spain; was 14% and 2 to 7%, respectively) [11,12]. The inconsistencies in prevalence through studies influence to credited to very changed ecological exposures (indoor pollution, climate, or outdoor) between areas and the different genetic predispositions of personalities. The absence of standardised procedures and authenticated operative descriptions are a thoughtful obstruction to applying epidemiological investigation in sub-Saharan Africa and comparability in the comparable period [13].

In our study, there are significant differences in gender, 85.9% from participants have asthma from male but 58.3% don't have asthma. Also, there are significant differences in asthma according to number of family, and Rural. In other side, there aren't significant differences in asthma and other variables. The common features (age, residence and gender) of the respondents were nearly comparable to those defined by Pefura-Yone in Cameroon [11] and Obaseki in Nigeria [14]. The young age may be clarified by the initial beginning of asthma disease, which is the most common chronic disease affecting child [15].

The ecological disclosure was comparable in both urban and peri-urban region in this study, comprising mostly of the presence of flowers in the numerous, proximity of industries or factories for outdoor and cockroaches, and cats for indoor pollution as in previous studies [16,17]. In this study, there are significant differences according to cooking habits, 70.5% cooking with liquefied petroleum gas (LPG) and 14% cooking with solid fuel have asthma. Also, there are significant differences in raise pets in home with asthma, 76.4% from participants have asthma that found pets in home and 46.7% from participants don't have asthma that found pets in home.

Another study evaluated the prevalence rate of asthma disease (Self-reported and management) at 4.1% [2] but there numbers are not available in other regions on the assess of the prevalence rate of self-reported asthma to permit decision. Otherwise, another study conducted by Sembajwe, et al. was founded a connection between wheezing symptoms and the clinician diagnosed asthma disease with overall incomes to illuminate inter nations noticed modifications [18]. Also, another study conducted by Adeloye, et al. was explained an overall prevalence of 14% in people aged between 15 and 45 years old [19].

In our study Also, 76.4% from participants have asthma that found pets in home. This environmental factor cause irritation in chest asthma patients and lead to showing the breathing symptoms. The most common of environmental risk factors recognized in this study are related to out or indoor pollution such as mites, local animals (e.g., cats, dogs), and cockroaches. There biological pollutants release allergens into the atmosphere and development the sensitive immune reaction with following increase the prevalence of allergic diseases as informed study conducted by Leaderer, et al. [20].

With reverence to indoor pollution, the other studies didn't show any association with asthma disease as in other studies approved in sub-Saharan Africa [21] and India [22,23]. In our study, the family history of smoking was the main of risk factor of asthma, this result consistent with another study conducted by Corsello [24] showed the smoking still signifies an enormous millions of pediatrics suffer the harmful properties of passive smoke exposure and have trigger of asthma patients.

CONCLUSION

This study offers imperative information about the prevalence, determinants of asthma and associated risk factors in aged more than 12 years to 50 years and living in urban and peri-urban suburbs of Tabuk city in Saudi Arabia. More than half of the participants have of asthma and 45% don't have asthma. The main determent of asthma in this study was cooking with liquefied petroleum gas (LPG). Also, smoking was the main risk factor of asthma and found pets in home.

DECLARATIONS

Acknowledgements

The General Directorate of Human Resources Development in the Ministry of Health in Saudi Arabia is appreciated for their cooperation and giving us this opportunity to conduct the study. Also, we are grateful to all the mothers who participated in this study.

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1] Network, Global Asthma. "The Global Asthma Report 2014. Auckland, New Zealand: Global Asthma Network, 2014."

[2] To, Teresa, et al. "Global asthma prevalence in adults: findings from the cross-sectional world health survey." *BMC Public Health,* Vol. 12, No. 1, 2012, p. 204.

[3] Al Ghobain, Mohammed O., Mohamad S. Al-Hajjaj, and Mohamad S. Al Moamary. "Asthma prevalence among 16-to 18-year-old adolescents in Saudi Arabia using the ISAAC questionnaire." *BMC Public Health,* Vol. 12, No. 1, 2012, p. 239.

[4] Al-Moamary M. S., et al. "The Saudi initiative for asthma-2016 update: Guidelines for the diagnosis and management of asthma in adults and children." *Annals of Thoracic Medicine,* Vol. 11, 2016, pp. 3-42.

[5] Moradi-Lakeh, Maziar, et al. "Prevalence of asthma in Saudi adults: Findings from a national household survey, 2013." *BMC Pulmonary Medicine,* Vol. 15, No. 1, 2015, p. 77.

[6] American Lung Association, 2018. https://www.lung.org/lung-health-and-diseases/lung-disease-lookup/asthma/asthma-symptoms-causes-risk-factors/asthma-risk-factors.html

[7] Eder, Waltraud, Markus J. Ege, and Erika von Mutius. "The asthma epidemic." *New England Journal of Medicine*, Vol. 355, No. 21, 2006, pp. 2226-35.

[8] Pavord, Ian D., et al. "After asthma: Redefining airways diseases." *The Lancet,* Vol. 391, No. 10118, 2018, pp. 350-400.

[9] Al-Moamary, Mohamed S., et al. "The Saudi initiative for asthma-2012 update: Guidelines for the diagnosis and management of asthma in adults and children." *Annals of Thoracic Medicine,* Vol. 7, No. 4, 2012, p. 175.

[10] Ellwood, Philippa, et al. "The Global Asthma Network rationale and methods for Phase I global surveillance: Prevalence, severity, management and risk factors." *European Respiratory Journal,* Vol. 49, No. 1, 2017, p. 1601605.

[11] Pefura-Yone, Eric Walter, et al. "Prevalence of asthma and allergic rhinitis among adults in Yaounde, Cameroon." *PLoS One,* Vol. 10, No. 4, 2015, p. e0123099.

[12] Janson C., et al. "The European Community Respiratory Health Survey: What are the man results so far? European Community Respiratory Health Survey II." *European Respiratory Journal,* Vol. 18, 2001, pp. 598-611.

[13] Pearce, Neil, et al. "Worldwide trends in the prevalence of asthma symptoms: Phase III of the International Study of Asthma and Allergies in Childhood (ISAAC)." *Thorax,* Vol. 62, No. 9, 2007, pp. 758-66.

[14] Obaseki, Daniel O., et al. "Low prevalence of asthma in sub Saharan Africa: A cross sectional community survey in a suburban Nigerian town." *Respiratory Medicine,* Vol. 108, No. 11, 2014, pp. 1581-88.

[15] Frontieres, Medecins Sans. "The International Union against tuberculosis and lung disease." DRTB drugs under microscope, 2011.

[16] Wjst, Matthias, and Daniel Boakye. "Asthma in Africa." *PLoS Medicine,* Vol. 4, No. 2, 2007, p. e72.

[17] Nyembue, Tshipukane Dieudonne, et al. "Prevalence and determinants of allergic diseases in a Congolese population." *International Forum of Allergy and Rhinology,* Vol. 2, No. 4, pp. 285-93.

[18] Sembajwe, Grace, et al. "National income, self-reported wheezing and asthma diagnosis from the World Health Survey." *European Respiratory Journal,* Vol. 35, No. 2, 2010, pp. 279-86.

[19] Adeloye, Davies, et al. "An estimate of asthma prevalence in Africa: A systematic analysis." *Croatian Medical Journal,* Vol. 54, No. 6, 2013, pp. 519-31.

[20] Leaderer, Brian P., et al. "Dust mite, cockroach, cat, and dog allergen concentrations in homes of asthmatic children in the northeastern United States: Impact of socioeconomic factors and population density." *Environmental Health Perspectives,* Vol. 110, No. 4, 2002, pp. 419-25.

[21] Jie, Yu, et al. "Urban *vs.* rural factors that affect adult asthma." *Reviews of Environmental Contamination and Toxicology,* Vol. 226, 2013, pp. 33-63.

[22] Agrawal, Sutapa. "Effect of indoor air pollution from biomass and solid fuel combustion on prevalence of self-reported asthma among adult men and women in India: Findings from a nationwide large-scale cross-sectional survey." *Journal of Asthma,* Vol. 49, No. 4, 2012, pp. 355-65.

[23] Trevor, Jennifer, Veena Antony, and Surinder K. Jindal. "The effect of biomass fuel exposure on the prevalence of asthma in adults in India-review of current evidence." *Journal of Asthma,* Vol. 51, No. 2, 2014, pp. 136-41.

[24] Corsello, Giovanni, and M. D. Stefania La Grutta. "Smoke exposure as a risk factor for asthma in childhood: A review of current evidence." *Allergy Asthma Proceedings,* Vol. 35. No. 6, 2014, pp. 454-61.