Impact of Covid-19 on asthmatic patients in Western region in Saudi Arabia

Abdulrhman Nasser Zaher Alghamdi (1)
Amal Mohammed Albaqami (2)
Areej Mohammed Abdullah (2)
Doha Abdulrahmman Alsukhayri (2)
Hamad Albulrahman Alawi (2)
Ameera Saeed Baabbad (2)

(1) Assistant professor, Family Medicine Department, Taif University, Saudi Arabia
(2) Taif University, Saudi Arabia

Corresponding author* :
Amal Mohammed Albaqami
Phone: 0568107110
Email : amal109318@hotmail.com

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Abstract

Background: Respiratory symptoms are a characteristic feature present in covid-19 patients, and they usually range from mild to severe. Asthma is a chronic disease involving the airways that carry air in and out of the lungs. However, there is limited resources that discuss the relation between asthma and prevalence of COVID-19.

Aims: Identify the impact of covid19 on asthmatic patients.

Methodology: This is a descriptive cross-sectional study that was conducted to study the impact of COVID-19 on asthmatic patients, which was conducted using a prepared questionnaire which was distributed online among 300 patients with asthma. After collecting the data, MS Excel was used for data entry while SPSS version 24 was used for data analysis.

Results: In this study, we were able to collect data from 311 asthmatic patients in response to our questionnaire. Most of the asthmatic patients were females (67.2%) with a ratio of females: males of 2:1. Moreover, most patients thought that they control their asthma well and only 13.5 % indicated that they had frequent emergency visits because of asthma. The prevalence of COVID-19 in asthmatic patients was 64.3 % where a third of patients needed to go to hospital because of their bad condition, 12.6 % needed to be hospitalized in ICU and 56.4 % needed oxygen. Moreover, severity of COVID-19 symptoms and outcomes are related to the control of asthma where better control of asthma was associated with better outcomes including lower need for ICU admission and oxygen need.

Conclusion: Prevalence of COVID-19 in asthmatic patients was much higher than the general population especially in female patients aged between 31-40 years old. Moreover, COVID-19 had more severe outcomes in asthmatic patients including higher prevalence of ICU admission and oxygen need. Poorer outcomes of COVID-19 were associated with poor control of asthma.

Key words: Asthma, Covid-19, Western Region, Saudi Arabia

Introduction

A new coronavirus (severe acute respiratory syndrome coronavirus 2; SARS-CoV-2) infection started to spread in Wuhan city in China in early December 2019 and has spread around the world. This disease related with coronavirus was called corona¬virus disease 2019 (COVID-19), and this outbreak was announced as a pandemic on March 11, 2020, by the World Health Organization (WHO) [1]. On May 15, 2020, the spread had reached 4,580,498 confirmed cases and 305,618 deaths, and only 1,735,657 patients had recovered around the world [2]. SARS-CoV-2 protein spikes attach to a protein on the surface of cells, called angiotensin converting enzyme 2 (ACE2) receptors in host cells which are present in the lungs, heart, and intestine and, after all of the research, there are no specific treatments or vaccines for coronavirus [2–5].

Respiratory symptoms are a characteristic feature present in covid-19 patients, and they usually range from mild to severe. A considerable number of patients may present with acute respiratory distress syndrome (ARDS); these serious manifestations are usually coming in combination with some cytokine, specifically IL-6 [6]. Studies showed that co-morbidities such as cardiovascular patients (especially hypertension) and patients with disease that affects the metabolism (obesity and diabetes), and old age were considered as a risk factor for developing morbidity and mortality in COVID-19 affected individuals [7–9]. On the other hand, asthma and COPD are still not considered as a risk factor [10].

The Global Initiative for Asthma (GINA) Global Strategy for Asthma Treatment and Prevention of 2015 described asthma as a heterogeneous condition characterized by chronic inflammation of the airway and variable remodeling that results in a range of clinical presentations, treatment responses and natural history across the life course of the patient [11].

Asthma is a chronic disease involving the airways that carry air in and out of the lungs. These airways are inflamed in people with asthma. This chronic disease involves a history of respiratory symptoms including wheeze, shortness of breath, chest tightness and cough where these symptoms are varying over time and also vary in intensity. The expiratory airway limitation and hyper-responsiveness is due to exposure to a range of stimuli, such as exercise and inhaled irritants. At the population level, a group of individuals with asthma exhibit an accelerated decline in lung function over their lifetime [9,11]. Our goal is to identify the impact of covid19 on asthmatic patients.

Methodology

This is a descriptive cross-sectional study that was conducted to study the impact of COVID-19 on asthmatic patients. The study was conducted among asthmatic patients who live or who are residents in the western region of Saudi Arabia. The study included all male and female asthmatic patients who lived in any city of the western region. Non-asthmatic population, pediatric population and population with no access to internet connection were excluded from the study. The study sample size was calculated using electronic software Raosoft ® with confidence level of 95% and a confidence interval (margin of error) of 5.0 leading to a sample size of 300 patients. The study depended on a prepared questionnaire which was distributed online using the available social media. The questionnaire was designed to collect data about demographic factors of participants such as age, gender, residence, education level and type of work. Moreover, the questionnaire assessed the severity of asthma in patients including frequency of asthmatic symptoms, interference of symptoms with daily activity, the degree of asthma control and frequency for the need for emergency treatment. Finally, the questionnaire assessed the severity of COVID-19 in patients with positive COVID-19 including need for hospitalization, ICU and oxygen.

Moreover, the study was conducted after obtaining approval from each participant and all participants had the right to withdraw from the study at any time. Completed questionnaires were calculated. After collecting the data, MS Excel was used for data entry while SPSS version 24 was used for data analysis. Moreover, frequency and percentage were used for describing categorical variables such as age, gender and education of participants while mean, and standard deviation, were calculated for description of ongoing variables. Chi-test and t-test were used for describing the relation between different variables where p-value under or equal to 0.05 indicated significance.

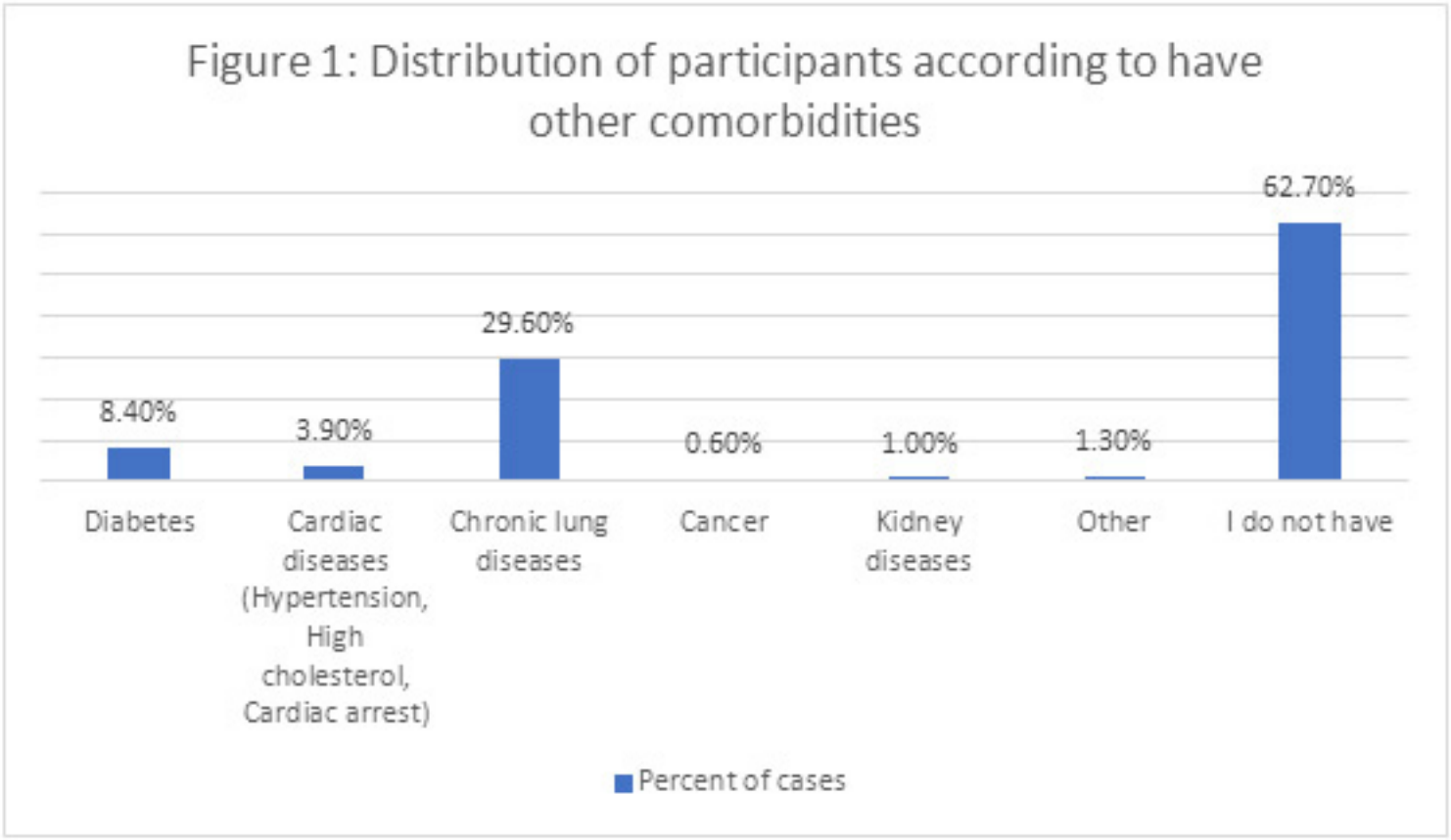
Results

Table 1: Demographic factors of participants (N=311)

		Count	Column N %
Gender	Male	102	32.8%
	Female	209	67.2%
Age	Less than 20 years	45	14.5%
	20-30 years	167	53.7%
	31-40 years	58	18.6%
	41-50 years	31	10.0%
	More than 50 years	10	3.2%
Nationality	Saudi	294	94.5%
	Non - Saudi	17	5.5%
Place of residence	Taif	84	27.0%
	Makkah	52	16.7%
	Jeddah	81	26.0%
	Yanbu	12	3.9%
	Medina	82	26.4%
Marital status	Single	214	68.8%
	Married	97	31.2%
Educational level	Primary school	6	1.9%
	Secondary school	20	6.4%
	High school	49	15.8%
	Bachelor	202	65.0%
	Postgraduate	34	10.9%
Job	Indoor work	63	20.3%
	Outdoor work	26	8.4%
	In and outdoor work	47	15.1%
	Unemployed	175	56.3%

In this study, we were able to collect data from 311 asthmatic patients in response to our questionnaire. Most asthmatic patients were females (67.2%) with ratio of females: males of 2:1. Moreover, most of participants were aged between 20-30 years old (53.7 %) and almost all participants were Saudi Arabian (94.5 %). Considering the residency, almost three quarters of the sample lived in Taif (27 %), Jeddah (26 %) and Medina (26.4 %) while 16.7 % lived in Makkah. Moreover, most participants were single (68.8 %) and had bachelor degree (65 %). Considering their work, we found that most participants were unemployed while 20.3 % of them had indoor jobs, and 8.4 % had outdoor jobs (Table 1).

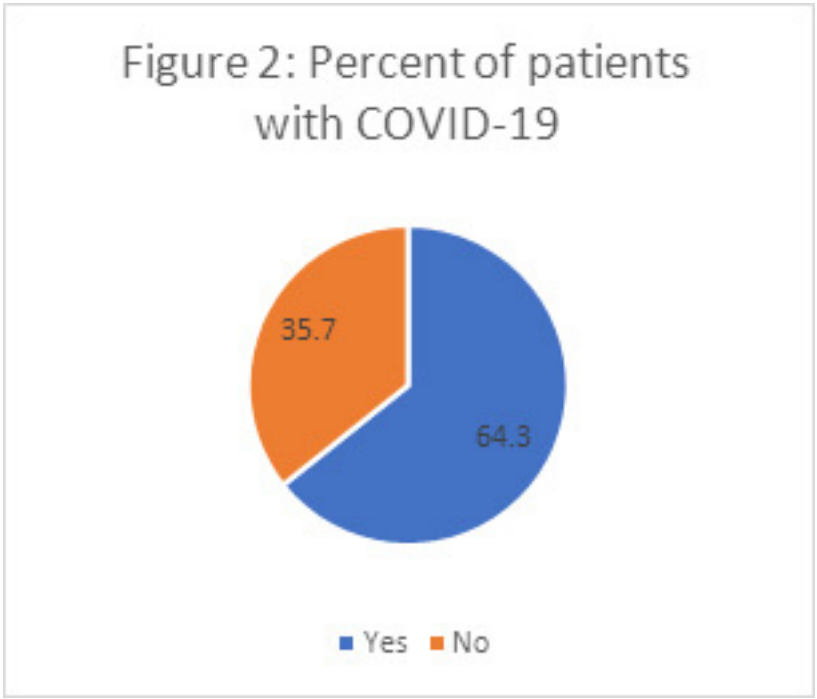
Moreover, we found, as shown in Figure 1, that most participants did not have other comorbidities (62.7 %) while chronic lung diseases other than asthma was the main comorbidities (29.6 %) followed by diabetes (8.4 %).

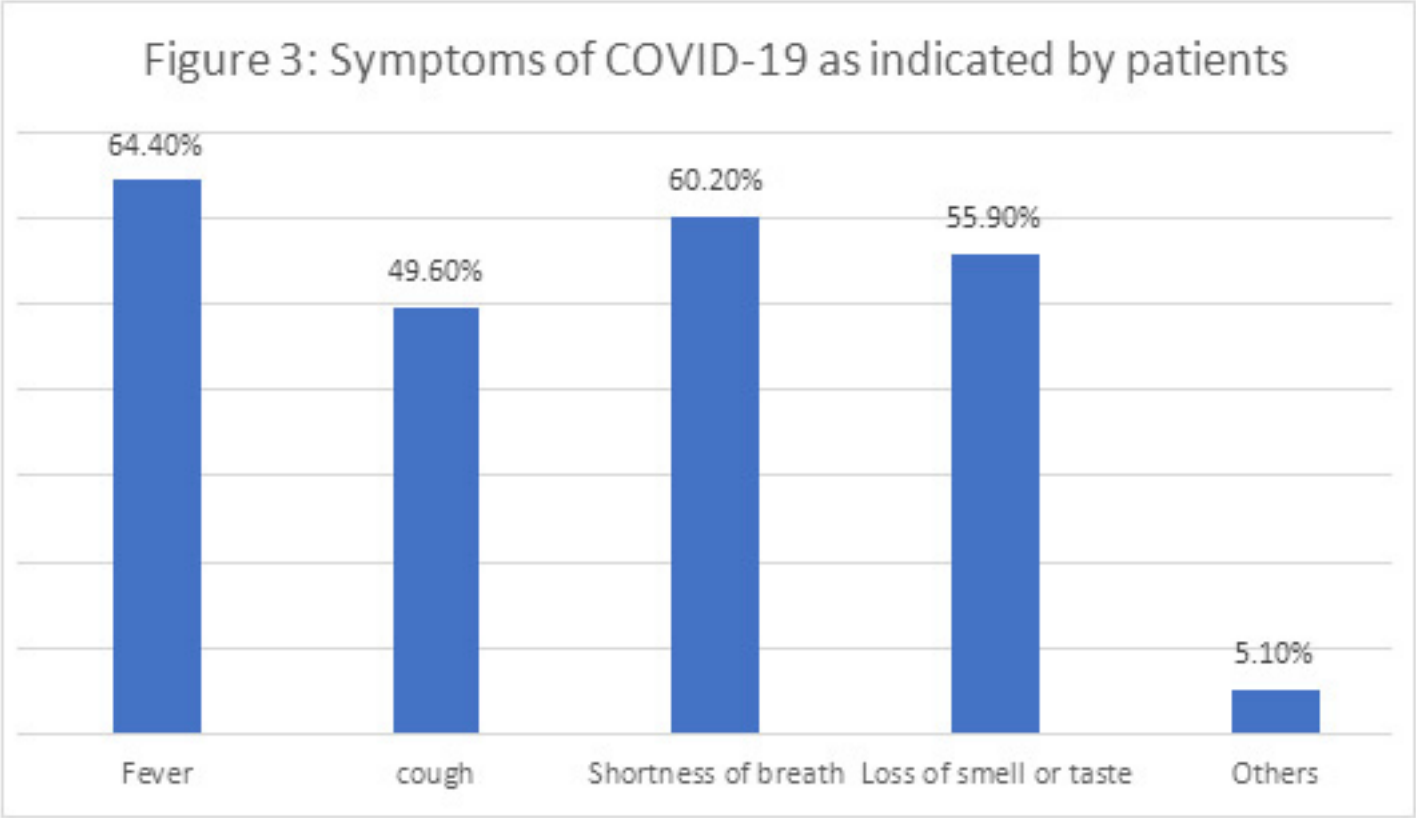


Furthermore, we found that 84.2 % of our patients need one asthma inhaler that is used when needed and 72.3 % of them had symptoms of asthma in less than two days per week while 4.8 % had a daily symptom of asthma. Moreover, 66.6 % of participants indicated that asthma symptoms waked them less than twice per month while 20.6 % 3-4 times per month. Furthermore, 41.8 % of patients reported that asthma symptoms had little interference on their daily activity and 26 % indicated moderate interference. In addition, 70.1 % of participants indicated needing to use inhaler to control symptoms in two days or even less weekly and 10.9 % needed them daily. Finally, most patients thought that they control their asthma well and only 13.5 % indicated that they had frequent emergency visits because of asthma (Table 2).

Table 2: Severity of Asthma and its symptoms among our sample			
		N	N%
Are you using	One asthma inhaler as needed	262	84.2%
	Two asthma inhalers continuously	46	14.8%
	Others	3	1.0%
Symptoms of asthma appear	Less than two days a week	225	72.3%
	More than two days a week	62	19.9%
	Daily	15	4.8%
	More than once a day	9	2.9%
Waking up due to asthma symptoms	Less than twice a month	207	66.6%
	3-4 times a month	64	20.6%
	More than once a week, but not daily	31	10.0%
	Daily	9	2.9%
Asthma symptoms interfere with daily activities:	NEVER	94	30.2%
	Little resistance	130	41.8%
	Moderate resistance	81	26.0%
	Severe resistance	5	1.6%
Need to use an asthma inhaler to control symptoms	Two days or less a week	218	70.1%
	More than two days a week, but not daily	52	16.7%
	Daily	34	10.9%
	More than once a day	7	2.3%
Asthma control	Good	282	90.7%
	Not Good	29	9.3%
Emergency visits because of asthma:	Sometimes	269	86.5%
	Frequent	42	13.5%

Considering infection with COVID-19 virus, we found that 64.3 % of asthmatic patients reported that they had previous infection with COVID-19 (Figure 2). Among patients with COVID 19, the main symptoms included fever (64.4 %), shortness of breath (60.2 %) and loss of smell or taste (55.9 %) (Figure 3).





In our sample, most participants had both symptoms and positive lab results of having COVID 19 (64.2 %) while 20.2 % had symptoms with negative results. Moreover, 70.9 % of patients had symptoms of COVID-19 for 2-4 days before diagnosed while 7.3 % needed more than 2 weeks of having symptoms until having diagnosis with COVID-19. Moreover, 76.8 % of patients with COVID-19 visited hospitals for 1-3 times per month and 8.8 % need to have visits for more than 6 months after infection. Moreover, a third of patients needed to go to hospital because of their bad condition, 12.6 % needed to be hospitalized in ICU and 56.4 % needed oxygen (Table 3).

Table 3: Severity of COVID-19 infection on patients

		N	N %
What applies to you from the following?	The presence of symptoms and the result is positive	156	64.2%
	The presence of symptoms and the result is negative	49	20.2%
	No symptoms, positive result	38	15.6%
How long did your symptoms last before you were diagnosed with COVID-19	2-4 days	156	70.9%
	A week	48	21.8%
	2 weeks or more	16	7.3%
How many visits did you have to the emergency department after confirming that you had covid19:	1-3 times /month	149	76.8%
	3-6 times/month	28	14.4%
	More than 6 months	17	8.8%
Did you go to hospital because your condition was bad:	Yes	82	33.1%
	No	166	66.9%
Have you been admitted to the intensive care unit?	Yes	31	12.6%
	No	216	87.4%
Did you need oxygen?	Yes	137	56.4%
	No	106	43.6%

In Table 4, we discussed the relation between incidence of COVID-19 and severity of its symptoms and demographic factors of patients. Considering the gender, we found a significant difference between genders considering the prevalence of COVID-19 where the prevalence of COVID-19 was higher in males than in females (p=0.011) however there was no significant difference between genders considering severity of COVID-19. Moreover, we found that prevalence of COVID-19 was highest in the population with age between 31-40 years old which was significantly higher in the need for ICU and oxygen (P=0.001, 0.012 and 0.00). Furthermore, we did not find significant difference between participants according to their job, however severity of COVID-19 was higher in patients with comorbidities.

Table 4: The relation between severity of COVID-19 and demographic factors of Asthmatic patients

		Did you have COVID19		Did you go to hospital because your condition was bad:		Have you been admitted to the intensive care unit?		Did you need oxygen?	
		Yes	No	Yes	No	Yes	No	Yes	No
Gender	Male	67.6%	32.4%	34.1%	65.9%	13.1%	86.9%	58.3%	41.7%
	Female	62.7%	37.3%	32.5%	67.5%	12.3%	87.7%	55.3%	44.7%
	P- value	0.011*		0.799		0.054		0.199	
Age	Less than 20 years	68.9%	31.1%	37.5%	62.5%	7.5%	92.5%	87.5%	12.5%
	20-30 years	58.7%	41.3%	31.3%	68.7%	8.7%	91.3%	48.2%	51.8%
	31-40 years	86.2%	13.8%	38.2%	61.8%	25.9%	74.1%	57.4%	42.6%
	41-50 years	48.4%	51.6%	24.1%	75.9%	6.9%	93.1%	46.2%	53.8%
	More than 50 years	60.0%	40.0%	33.3%	66.7%	22.2%	77.8%	44.4%	55.6%
	P- value	0.001*		0.697		0.012*		0.00*	
Job	Indoor work	74.6%	25.4%	46.3%	53.7%	22.2%	77.8%	58.5%	41.5%
	Outdoor work	76.9%	23.1%	36.4%	63.6%	14.3%	85.7%	45.5%	54.5%
	In and outdoor work	66.0%	34.0%	29.3%	70.7%	12.2%	87.8%	37.5%	62.5%
	Unemployed	58.3%	41.7%	28.2%	71.8%	8.4%	91.6%	63.3%	36.7%
	P- value	0.057		0.111		0.081		0.024*	
Comorbidities	Yes	60.3%	39.7%	43.5%	56.5%	26.1%	73.9%	60.2%	39.8%
	No	66.7%	33.3%	26.9%	73.1%	4.5%	95.5%	54.2%	45.8%
	P- value	0.26		0.007*		0.00*		0.362	

Moreover, in Table 5, we discussed the relation between incidence of COVID-19 and severity of its symptoms and severity of asthma and its impaction on patients. We found that patients indicated that severity of COVID-19 symptoms was significantly higher in patients who reported that they did not control their asthma symptoms where they needed ICU and more visits to hospital, than those who indicated good asthma control (P=0.017, 0.003) however, no difference was found considering prevalence of COVID -19.

Table 5: The relation between severity of COVID-19 and severity of asthma symptoms

		Did you have COVID19		Did you go to hospital because your condition was bad:		Have you been admitted to the intensive care unit?		Did you need oxygen?	
		Yes	No	Yes	No	Yes	No	Yes	No
Asthma symptoms interfere with daily activities:	NEVER	64.9%	35.1%	22.9%	77.1%	10.0%	90.0%	49.3%	50.7%
	Little resistance	60.8%	39.2%	34.0%	66.0%	6.1%	93.9%	52.5%	47.5%
	Moderate resistance	67.9%	32.1%	41.1%	58.9%	21.9%	78.1%	66.2%	33.8%
	Severe resistance	80.0%	20.0%	25.0%	75.0%	25.0%	75.0%	100.0%	0.0%
	P- value	0.586		0.107		0.001*		0.096	
Asthma control	Good	64.5%	35.5%	30.6%	69.4%	10.4%	89.6%	54.4%	45.6%
	Not Good	62.1%	37.9%	53.8%	46.2%	30.8%	69.2%	73.1%	26.9%
	P- value	0.791		0.017*		0.003*		0.069	
Emergency visits because of asthma:	Sometimes	65.8%	34.2%	30.3%	69.7%	11.0%	89.0%	53.9%	46.1%
	Frequent	54.8%	45.2%	48.6%	51.4%	21.6%	78.4%	70.3%	29.7%
	P- value	0.165		0.029*		0.071		0.064	

Discussion

On March 11, 2020, the World Health Organization declared COVID-19 a global pandemic. Since then clinicians around the world have been particularly concerned about the impact of patients 'pre-existing chronic diseases (particularly lung and cardiovascular diseases) on the course of this new disease. While hypertension and diabetes are closely related to the frequency and severity of COVID-19 cases, care-related data suggest that COVID-19 did not affect asthmatic patients to nearly the same extent [12–14]. In order to understand the impact of COVID-19 on patients with asthma, we conducted a cross-sectional study that collected data from asthmatic patients in the western region, Saudi Arabia.

In our study, we collected data from 311 asthmatic patients in the western region, Saudi Arabia. In this population, we found that females represented two thirds of asthmatic patients. The prevalence of asthma in females was reported in other studies including the study of Izquierdo et.al., who collected data from 71,182 asthmatic patients finding that 59 % of them were females [15], the study of P. Pignatti, which found that 65.7 % of the asthmatic patients were females [16] and the study of Uchmanowicz who reported that 71% of asthmatic patients were females [17]. Moreover, chronic lung diseases other than asthma were the main comorbidities (29.6 %) followed by diabetes (8.4 %). In contrast, the study of Uchmanowicz reported that Arterial hypertension and diabetes were the most common comorbidities found among asthmatic patients [17]. Considering the severity of asthma among our patients, we found that symptoms of asthma ranged between mild to moderate where most patients thought that they control their asthma well and only 13.5 % indicated that they had frequent emergency visits because of asthma.

Considering infection with COVID-19 virus, we found that 64.3 % of asthmatic patients reported that they had previous infection with COVID-19. This prevalence was much higher than reported in other studies including the study of Izquierdo et.al. who reported a prevalence of 1.41 % of asthmatic patients [15]. However, many other studies had reported that the prevalence of COVID-19 was significantly higher in asthmatic patients rather than non-asthmatic patients [18–20] which suggests the possibility that individuals with asthma may be more likely than individuals without asthma to be diagnosed with COVID-19 in Saudi Arabia. Among patients with COVID 19, the main symptoms include fever (64.4 %), shortness of breath (60.2 %) and loss of smell or taste (55.9 %). The study of Johnston SL, indicated that the most frequent presentation signs of COVID19, dry cough and shortness of breath also were common [21]. Moreover, a third of patients needed to go to hospital because of their bad conditions; 12.6 % needed to be hospitalized in ICU and 56.4 % needed oxygen.

Considering the impact of demographic factors that increase the prevalence of COVID-19 and lead to poor outcomes including ICU admission and oxygen need, we found that female gender, and age between 31-40 years old were associated with increased prevalence of COVID-19 while age between 31 and 40 years and comorbidities increase the risk for poor outcomes including need for ICU admission and oxygen need. These results were opposite to the results of Elhadi M, in the general population who needed ICU because of COVID-19 findings that most patients who need ICU were males and older patients over 60 years old [22]. However, the study conducted by Izquierdo J, showed that females represented 66 % of asthmatic patients who had COVID-19 and COVID-19 prevalence was higher in older age and asthmatic patients who had other comorbidities [15].

Considering the relation between incidence of COVID-19 and severity of its symptoms and severity of asthma and its impact on patients, we found that patients who reported that they did not control their asthma symptoms needed ICU, and more visits to hospital than those who indicated good asthma control. These results indicate that prevalence of COVID-19 was higher in asthmatic patients over the prevalence of other comorbidities. Moreover, this indicates that severity of COVID-19 symptoms and outcomes are related to the control of asthma where better control of asthma was associated with better outcomes including lower need for ICU admission and oxygen.

Our study had some limitations which could not be avoided which include depending on self-reported questionnaire which could lead to some personal bias where there was not a method to ensure the truth of the participants about the provided data. Moreover, the depending on online method for distribution of the questionnaire may lead to some sampling bias toward younger participants and those who are more likely to use social media applications. On the other hand, this study was, to our knowledge, the first study to assess the impact of COVID-19 on asthmatic patients in the western region, Saudi Arabia.

In conclusion, prevalence of COVID-19 in asthmatic patients was much higher than the general population especially in female patients who were aged between 31-40 years old. Moreover, COVID-19 had more severe outcomes in asthmatic patients including higher prevalence of ICU admission and oxygen need. Poorer outcomes of COVID-19 were associated with poor control of asthma.

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