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ORIGINAL ARTICLE

Asthma in Patients with Persistent Cough: A Cross-Sectional Analysis from a Primary Care Center in Karachi

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ABSTRACT

Objective: To determine the frequency and risk factors of asthma among patients having persistent cough attending primary care center in a tertiary care hospital of Karachi, Pakistan.

Methods: This cross-sectional study was conducted from June 2017 till May 2018 in a Primary Health Care Center Sikanderabad, Karachi. All patients coming to Primary Health Care Center above 5 years of age, presenting with cough for more than eight weeks were consecutively enrolled. Chest was examined and the patients underwent Peak Expiratory Flow Meter Test (PEF). If PEF was found <70% then office-based spirometry test was done. Those with Force Expiratory Volume in 1 second (FEV1) reversed >12% post bronchodilation was labeled asthmatic.

Results: Out of 150 subjects, mean age of the patients was 27.65 ±19.53 years. There were 78 (52%) females and 72 (48%) males. Frequency of cough, sputum, wheeze, and dyspnea was observed in 120 (80%), 21 (14%), 62 (41.3%), and 56 (37.3%) respectively. There were 44 (29.3%) asthmatic. The odds of asthma were 4.55 times significantly higher among smokers (aOR: 4.55, 95% CI: 1.62-12.79, p-value 0.004) and 3.14 times significantly higher among patients with dyspnea (aOR: 3.14, 95% CI: 1.27-7.74, p-value 0.013). MRC dyspnea score showed that among 44 asthmatic patients with dyspnea, grade 1 was found higher (n=33, 75%) followed by grade 2 (n=7, 16%), while grade 0 and grade 3 in 2 (5%) patients each.

Conclusion: The finding of this research showed a considerable number of patients with asthma. Smoking and dyspnea found important risk factors for asthma.

Keywords: Asthma, bronchodilation, PEF.

INTRODUCTION

The most prevalent chronic inflammatory airway disease worldwide is asthma which manifests as recurrent wheezing, coughing and shortness of breath, secondary to airway hyper responsiveness.[1] The global asthma report 2018 reported that asthma is a prevalent chronic disease estimated to impact up to 339 million individuals around the world.[2] The study also established a significant discrepancy in ARM (asthma-related mortality) between the developed and underdeveloped world.[2]

In recent years there has been much advancement in the methods of treatment, as well as in reaching a diagnosis of asthma. Despite these factors, the disease appears to have increased in prevalence over the past 20 years which has inevitably lead to higher mortality and resource utilization.[3]

The prevalence of Asthma is escalating at an alarming rate owing to various factors that need to be pondered upon. It is reported that, approximately 10% of the global population is afflicted by asthma, out of which 5% are categorized as suffering from severe disease.[4]

The burden of obstructive pathologies is seen more in Asians as compared to western population. Moreover, it is of note that morbidity rates are higher in lower-middle income countries. This trend may be associated with a multitude of factors including poor compliance, lack of follow-ups, improper use of inhalers, non-affordability of medication and a generalized lower socioeconomic status coupled with lack of education.[5]

The Global Initiative for Asthma (GINA) stated that in Pakistan the prevalence of asthma is about 4-5%; with another study revealing the prevalence in the city of Karachi being 15.8%. In a study Eagan *et al.*[6,7] have demonstrated a reduction in asthma incidence in subjects with a higher level of education. This paper aims to determine the predictors and prevalence of asthma among patients with persistent cough.

METHODS

This cross-sectional study was carried out in the Primary Health Care Center in Sikanderabad. Study was conducted between June 2017 and May 2018. In a previous study prevalence of Asthma came out to be 10%. Population of Sikanderabad comprise approximately 100,000 people. These figures were put in the WHO calculator and sample size came out to be 150.

All patients coming to Primary Health Care Center above 5 years of age, presenting with cough for more than eight weeks were consecutively enrolled in the study. Pulmonary tuberculosis was ruled out by undergoing sputum for gene X-pert. Patients with known pulmonary tuberculosis were excluded from the study. They were seen by consultant family physician who examined the chest and then the patients were asked to do the peak expiratory Flow meter test (PEF). If PEF was <70% then the consultant filled the pre-designed questionnaire formed by American Thoracic Society after informed consent and then office-based spirometry test was done. Those whose FEV1 reversed >12% post bronchodilation was diagnosed as asthmatics. The questionnaire also collected data about the possible risk factors associated with asthma. This included gender, ethnicity, pets, smoking, the number of years of education the participant had completed as well as any prior chemical exposure.

The questionnaire collected data related to frequent phlegm (expulsion of phlegm on majority of the days of the month for 3 or more months successively) and frequent wheezing (audible whistling on exhaling within 2 years' time). MRC (Medical research council) dyspnea scale was used which categorized into 5 grades. If an individual was not experiencing any breathlessness unless aggressive exercise was carried out, it was considered as grade 0. If dyspnea was experienced while hurrying on a flat leveled surface or a small slope, it was considered as grade 1. Grade 2 was when an individual walked at a slower pace than others and may needed to rest after one mile (or 15 min of walking). If the individual needed to stop and rest after 100 yards walking on a leveled surface, it was considered as grade 3. Grade 4 was when the patient was unable to leave their home due to severe dyspnea and experienced severe episodes while changing clothes.

The data of the patients' height, age and sex were analyzed to predict values for Forced Vital Capacity (FVC) and Forced Expiratory volume per second (FEV1). The ratio of these values was further documented in milliliters (ml) along with percentages. A portable spirometer was used to record predicted lung volumes such as; FVC, FEV1 and their ratio (FEV1/FVC). Lung function tests were considered normal if the predicted percentage was ≥ 80% for FVC and FEV1 and the FEV1/FVC ratio was ≥0.7. These values are internationally used for categorizing lung volumes as normal or abnormal.[8] Obstructive lung function was defined as having FEV1 <80% and FEV1/FVC <70% and restrictive lung function was defined as having FEV1 <80% and FEV1/FVC >70%. Those whose FEV1 improved more than 12% were labeled Asthmatics.

Data were analyzed using SPSS 20. Mean and standard deviation were taken out for numerical data. Categorical data was shown in frequency and percentage. Chi-square was taken out to see association of risk factors with the outcome. P-value <0.05 was considered significant.

Univariable binary logistic regression was also applied to assess the significant association

between various qualitative variables and the presence of asthma. P-value <0.05 was considered significant. All significant variables in univariable analysis were selected for multiple logistic regression to calculate adjusted odds ratio (aOR). Backward LR method was applied.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

RESULTS

A total of 150 patients were included. Of these, mean age of the patients was 27.65 ±19.53 years. There were 71 (47.3%) patients with <20 years, 42 (28%) patients with 20-40 years and 37 (24.7%) patients with >40 years of age. Seventy-eight (52%) patients were females while 72 (48%) were males. Majority of the patients (n=105, 70%) were Pashtun, followed by Urdu speaking (n=23, 15%), while Punjabi and Sindhi were 12 (8%) and 10 (6.7%) respectively. Majority of the patients were literate, i.e. 105 (70%). Past history of asthma was observed in 76 (50.7%) patients. Smoking history was observed in 40 (26.7%) patients. Among these 40 individuals, ≤5 years of duration of smoking was observed in 22 (55%) while >5 years of smoking was observed in 18 (45%) patients. Frequency of cough, sputum, wheeze, and dyspnea was observed in 120 (80%), 21 (14%), 62 (41.3%), and 56 (37.3%) respectively.

There were 44 (29.3%) asthmatic. A significantly higher proportion of asthma was observed among males (p-value <0.001), smokers (p-value <0.001), duration of smoking (p-value 0.002), presence of cough (p-value <0.001), presence of wheeze (p-value <0.001), and presence of dyspnea (p-value 0.044). (Table 1)

The univariable regression analysis reported significantly higher association of asthma with gender (OR: 4.40, 95% CI: 2.04-9.51, p-value <0.001), smoking status (OR: 5.73, 95%2.61-12.59, p-value <0.001), and dyspnea (OR: 2.21, 95% CI: 1.01-4.85, p-value 0.047). Except gender, smoking and dyspnea was found significantly associated asthma in multivariate analysis. The findings revealed that after adjusting for all other covariates, the odds of asthma were 2.09 times insignificantly higher among males as compared to females (aOR: 2.09, 95% CI: 0.79-5.57, p-value 0.137). The odds of asthma were 4.55 times significantly higher among smokers as compared to non-smokers (aOR: 4.55, 95% CI: 1.62-12.79, p-value 0.004). The odds of asthma were 3.14 times significantly higher among patients with dyspnea as compared to patients without dyspnea (aOR: 3.14, 95% CI: 1.27-7.74, p-value 0.013). (Table 2)

MRC dyspnea score showed that among 44 asthmatic patients with dyspnea, grade 1 was found higher (n=33, 75%) followed by grade 2 (n=7, 16%), while grade 0 and grade 3 in 2 (5%) patients each. (Figure 1)

DISCUSSION

This study shows a high frequency of asthma. The disease burden was seen more among males and the mean age of the study population was almost thirty years. Smoking showed positive association with asthma in the current study however keeping pets, history of asthma and chemical exposure did not seem to impact the disease. This hyper reactive airway disease was manifested by cough and dyspnea.

The frequency of asthma in our target population was three times higher than the figures in the previous study however it matches with a recently published study conducted in Arabia, in 2016.[9,10] In a Korean study conducted in 2013[9] and a study in Taiwan revealed an extremely low prevalence of Asthma.[11] It is noted that prevalence seems to vary greatly with the year of conduction of the respective studies and their geographical regions. Furthermore, a notable increase in prevalence over a short time period is highly suggestive of the fact that the cause of this trend can be attributed to environmental risk factors, rather than simple genetic causes.[12]

Past study's findings depict, females were more likely to become asthmatic, whereas in our study, the disease burden was seen more in males.[13] A previous study in Korea showed that the prevalence of asthma among female patients was three times the value for males in that study.[9]

Another study in India also concluded that the airway-predominant diseases were more

Table 1: Comparison of asthma with the associated risk factors (n=150)

Variables	Total	Asthma		
		Yes	No	
	n (%)	n (%)	n (%)	p-value
Age, years				
<20	71	20 (28.2)	51 (71.8)	0.105
20-40	42	17 (40.5)	25 (59.5)	
>40	37	7 (18.9)	30 (81.1)	
Gender				
Male	72	32 (44.4)	40 (55.6)	<0.001
Female	78	12 (15.4)	66 (84.6)	
Educational status				
Illiterate	45	10 (22.2)	35 (77.8)	0.210
Literate	105	34 (32.4)	71 (67.6)	
Ethnicity				
Pashton	105	29 (27.6)	76 (72.4)	0.135
Punjabi	12	7 (58.3)	5 (41.7)	
Sindhi	10	2 (20)	8 (80)	
Urdu Speaking	23	6 (26.1)	17 (73.9)	
Past History of Asthma				
Yes	76	23 (30.3)	53 (69.7)	0.801
No	74	21 (28.4)	53 (71.6)	
Exposure to chemicals				
Yes	18	7 (38.9)	11 (61.1)	0.343
No	132	37 (28)	95 (72)	
Smokers				
Yes	40	23 (57.5)	17 (42.5)	<0.001
No	110	21 (19.1)	89 (80.9)	
Duration of smoking (n=40)				
≤40	22	18 (81.8)	4 (18.2)	0.002
>40	18	5 (27.8)	13 (72.2)	
Presence of cough				
Yes	120	44 (36.7)	76 (63.3)	<0.001
No	30	0 (0)	30 (100)	
Presence of sputum				
Yes	21	5 (23.8)	16 (76.2)	0.549
No	129	39 (30.2)	90 (69.8)	
Presence of wheeze				
Yes	62	41 (66.1)	21 (33.9)	<0.001
No	88	3 (3.4)	85 (96.6)	
Presence of dyspnea				
Yes	94	33 (35.1)	61 (64.9)	0.044
No	56	11 (19.6)	45 (80.4)	

All data presented as number (%)
Chi-square test applied, pvalue <0.05 taken as significant

Table 2: Regression analysis of variables associated with Asthma (n=150)

Variables	aOR (95% CI)	p-value
Gender		
Male	2.09 (0.79-5.57)	0.137
Female	Ref	
Smokers		
Yes	4.55 (1.62-12.79)	0.004
No	Ref	
Presence of dyspnea		
Yes	3.14 (1.27-7.74)	0.013
No	Ref	

aOR: Adjusted Odds Ratio Applied

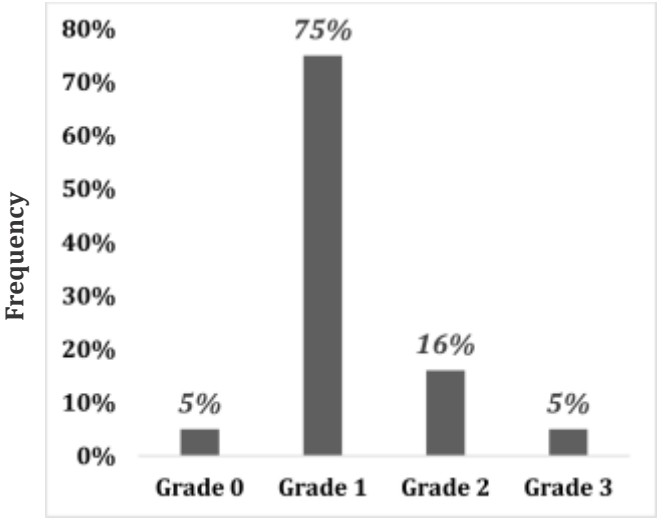

Figure 1: MRC dyspnea score among patients with asthma (n=44)

common among females.[14] Therefore the results obtained in our study are contradictory to the data found in older publications, which categorically state that adult females are more susceptible to developing asthma. Further research is needed to identify the possible social, environmental or genetic cause for the association between gender and asthma.

A study conducted in the Netherlands in the year 2007 revealed that the direct exposure to a chemical 'Diacetyl' in the factory caused fixed air way obstruction in the workers. Another study stated that exposure to Sulfur Mustard can lead to persistent and clinically significant lung disease. Similarly, in our study more than half of the patients diagnosed with obstructive lung disease had documented exposure to various occupational chemicals.[15] It was found that annually a significant number of cases of adult asthma had a direct correlation with chemical exposure.[16] However the percentage for such xposure to chemicals in asthmatics was statistically insignificant in our study.

It has been previously confirmed that smoking is directly associated with asthma and it increases the disease severity. Our findings are supportive of this causative relationship and suggest that more than half of the asthmatics in our study were smokers. A study in 2011 showed that 25% of the patients suffering from asthma were smokers. It concluded that asthmatics who smoke are more likely to have poorer disease control. This effect may be attributed to the diminished response to corticosteroid therapy caused by cigarette smoke.[17] The frequency of this positive association is higher in our target population as compared to previous literature quoted above. This difference may be indicative of strong environmental factors, dietary habits or socioeconomic status, which may be affecting our target population and warrants further investigation and research.

Wheezing is one of the characteristic findings of asthma. However, wheezing cannot be taken as a diagnostic marker for asthma. Common differentials for persistent wheezing include extrinsic intra thoracic airway compression, luminal obstruction and Cystic Fibrosis.[18] Our study found that most of the patients with obstruction had heavy wheezes while in asthmatics, slightly more than half experienced wheezing. Both these frequencies were found to be statistically significant. A study conducted in Tasmania in 2018 reported approximately one fifth of the participants experiencing wheezing

which is a lot lower in comparison to our obtained value.[19] An older study in Sydney found approximately 68-79% of asthmatics to be wheezes. This value is more comparable to the findings in this study.

In our study, people who had completed 6-10 years of formal education had the highest prevalence of asthma which was a statistically non-significant finding. In a previously published study, it was reported that lack of education and uneven distribution of resources may have an influence on the increased ARM in developing countries.[20] Ethnicities were also compared in our study and Punjabis appeared to have the highest prevalence of asthma. However, this finding was also statistically non-significant.

Our research also focused on the frequency of asthmatics in our target population who owned pets. It was found that 26.8% of the asthmatics kept pets, but this value was statistically non-significant. Similarly, a meta-analysis focused on ownership of pets including cats, dogs, birds and rodents, and its association with asthma revealed similar findings like ours and have reported established no significant association between exposure to furry or feathered pets and development of asthma.[21]

The finding of this study could be highlighted in the light of limitation that the sample in our study mostly comprised of Pashtun population of Sikanderabad which is an underprivileged area. Most of them keep livestock such as goats, cows and other domestic animals. Furthermore, it is noticed in our experience that their education status is also low which could have confounded the true associations with Asthma. A multicenter study where all the ethnicities could be evaluated is the need of the hour to determine the true burden of the disease.

CONCLUSION

Asthma prevalence is considerably higher among patients having persistent cough. Smoking and dyspnea found important risk factors for asthma. More research is required in our part of the world regarding identifying other risk factors of asthma and their prevalence in order to reduce its morbidity and mortality.

AUTHORS' CONTRIBUTION: FJ substantially contributed to the conception and design of the study. FJ, AA worked in the acquisition, analysis, and interpretation of data. AZ, HS drafted the manuscript. FJ revised it critically for the important intellectual content and gave the final approval of the manuscript.

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