

Frequency of Cognitive Decline in Asthma Patients and Associated Socio-Demographic Factors

Raja Rizwan-Ul-Haq Satti, Syed Abdul Rasheed*, Rubab Gul*, Muhammad Hammad Athar**

Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, **Combined Military Hospital/National University of Medical Sciences (NUMS) Malir Pakistan

ABSTRACT

Objective: To look for the relationship of various factors along with frequency of decline in cognition among the patients suffering from asthma.

Study Design: Cross sectional study.

Place and Duration of Study: Medicine department, Pak Emirates Military Hospital Rawalpindi Pakistan, from Aug to Oct 2018.

Methodology: One hundred and thirty-five asthma patients with duration of illness for more than a year evaluated by classified medical specialist or pulmonologist were recruited in this study. Decline in the cognition was recorded by the help of the British Columbia Cognitive Complaints Inventory (BC-CCI). Various socio-demographic factors were also correlated with the decline in cognition among these patients suffering from asthma.

Results: Out of 135 patients of asthma, 68 (50.4%) patients did not show any decline in cognition, 45 (33.3%) patients showed mild decline, 16 (11.8%) patients had moderate while 06 (4.4%) patients had severe cognitive decline on this screening instrument. Mean age of the patients participating in this study was 40.64 ± 3.12 years. Mean duration of illness among these patients of asthma was 5.29 ± 3.58 years. Use of more than one pharmacological agent for control of asthma and longer duration of asthma were significantly correlated with the presence of decline in cognition among the patients suffering from asthma (p -value < 0.05).

Conclusion: High risk patients for cognitive decline in our study were patients with long standing asthma or those using multiple medications for the control of asthma. Decline in cognitive ability emerged as a significant problem in the asthmatics who have been suffering from systemic illness rather than a neuro-psychiatric problem therefore screening of these individuals should be done at asthma clinic for this issue.

Keywords: Asthma, Cognitive decline, Socio demographic factors.

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INTRODUCTION

Cognition is one of the most important higher mental functions. It involves orientation, registration, recall, memory and language components. It is considered as ultimate function of brain and decline in this can be related to direct and indirect insult to the brain parenchyma.¹

Decline in the cognitive abilities is a prevalent health problem in all parts of the world especially among the elderly population.^{2,3} Cognitive decline is associated with or part of various medical conditions like heart disease,⁴ Type II diabetes Mellitus,⁵ chronic obstructive airway disease,⁶ and chronic kidney disease etc.⁷

Asthma lead to changes in the oxygenation of tissues causing disruption in homeostasis and changes in

the physiology of whole body in one way or another.⁸ Treatment of asthma also involves various agents which can cause direct or indirect effect on the cognitive abilities of individual.⁹ Therefore it can be postulated that illnesses which have a chronic course and involve multiple agents for the management predispose the individual towards this neuropsychiatric phenomenon of compromised cognition.

A large meta-analysis concluded that asthma brings about cognition problems among the patients.¹⁰ Asthma control was directly linked with the cognitive problems among the elderly in a study done in USA. Another study, revealed patients suffering from COPD suffer from various cognitive deficits during the course of their disease. Cognitive decline not only affects the overall quality of life but also directly affects the prognosis of underlying asthma as it can affect the medication adherence and other life style modifications which are necessary for achieving good asthma control in these patients.⁵

Correspondence: Dr Raja Rizwan-Ul-Haq Satti, Resident Medicine, Pak Emirates Military Hospital-Pakistan
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Age, gender, race, severity of asthma, education, general health status and history of intubation for asthma have been associated with the various degrees of cognitive decline among the patients suffering from inflammatory airway disease like asthma.¹⁰

Studies have been done in our setup regarding quality of life in asthma patients and knowledge of use of treatment modalities, but limited work so far has been done on the cognitive status of these patients. This study was planned with the objective to look for the relationship of various factors along with frequency of cognitive decline among the patients suffering from asthma presenting at PEMH Rawalpindi.

METHODOLOGY

This cross-sectional study was performed at Pak Emirates Military Hospital Rawalpindi from Aug to Oct 2018. Patients of asthma reporting in the medical and pulmonology outpatient department of Pak-Emirates Military Hospital Rawalpindi were selected by consecutive sampling technique to get enrolled in this analysis. Sample size was calculated by using the WHO sample size calculator using the population prevalence proportion of 70%,¹¹ (sample size turned out to be >130 participants).

Inclusion Criteria: Sample population was between the age of 25 and 60 years with diagnosis of asthma for more than one year.

Exclusion Criteria: Patients with allergies secondary to identifiable causes and neuropsychiatric problems prior to the diagnosis of asthma were also not included in this study. As a lot of illicit substances also interfere with the cognition so patients having history of substance use were also excluded.

One hundred and thirty-five patients were left behind to get recruited in the study after the application of inclusion/exclusion criteria. British Columbia Cognitive Complaints Inventory (BC-CCI) is a validated and easy to administer tool to look for the cognitive deficits among the patients of various illnesses. It has 6-items in total. It is a self-rating scale and usually completed in five minutes. Following categories were made to classify the patients on the basis of score on this instrument.^{12,13}

- Normal 0-4
- Mild cognitive decline 5-9
- Moderate cognitive decline 9-14
- Severe cognitive decline 15-18

Medical and pulmonology OPD of PEMH Rawalpindi were the places from where the sample population was recruited and then inclusion and exclusion criteria were applied. BC-CCI questionnaire was distributed among the patients and researchers were present at time of the filling of questionnaire in order to facilitate the subjects after consent. This whole process was started once ethical review board committee of PEMH approved the study.

Age of the patients, education, smoking, poly-pharmacy and duration of illness were the factors which were studied along with the cognitive decline in our analysis and correlated with the presence and severity of cognitive decline in the patients of asthma in this study. As screening tool was used so neuropsychiatric team was not involved in the study but those patients whose diagnosis were not clear or had severe cognitive decline were referred to the neuropsychiatry clinic.

Statistics Package for Social Sciences version 24.0 was used in this study for all the statistical analysis. Pearson chi-square test was applied to establish the correlation between the independent variables and the cognitive decline. Independent variables in our study included age of the patients, education of the patient, gender of the patients, poly-pharmacy and duration of the illness among the asthma patients included in this study. The *p*-value of ≤ 0.05 was considered significant.

RESULTS

One hundred and forty-seven patients of asthma were initially contacted to get enrolled in this study. Three were not willing to participate in the study. Nine could not fulfill the criterion set for the study (Two were using alcohol, four had psychiatric illness prior to diagnosis of asthma, three had comorbid DM). Thus, 135 asthmatics were finally included in the study analysis. Out of these 135 patients of asthma, 68 (50.4%) patients did not show any decline in cognition, 45 (33.3%) patients showed mild decline, 16 (11.8%) patients had moderate while 06 (4.5%) patients showed severe cognitive decline on this screening instrument.

Mean age of the study participants was 40.64 ± 3.12 years. Mean duration of asthma among the patients in this study was 5.29 ± 3.58 years. Polypharmacy and long duration of illness had significant association with cognitive decline (*p*-value of <0.008 and 0.002 respectively) while increasing age, education and tobacco smoking were not found significantly associated in our study when chi-square was applied (Table).

Table: Characteristics of the asthmatic patients and their BC-CCI score.

Socio Demographic Factors	No Cognitive Decline (BC-CCI 0-4) n (%)	Mild Cognitive Decline (BC-CCI 5-9) n (%)	Moderate Cognitive Decline (BC-CCI 9-14) n (%)	Severe Cognitive Decline (BC-CCI 15-18) n (%)	p-value
Total	68 (50.4)	45 (33.3)	16 (11.8)	6 (4.4)	
Age					
25-40	30 (44.1%)	17 (37.8%)	6 (37.5%)	2 (33.3%)	0.875
>40	38 (55.9%)	28 (62.2%)	10 (62.5%)	4 (66.7%)	
Education					
10 or less	53 (77.9%)	32 (71.1%)	12 (75%)	4 (66.7%)	0.830
>10	15 (22.1%)	13 (28.9%)	4 (25%)	2 (33.3%)	
Duration of Illness					
<5 years	63 (92.6%)	32 (71.1%)	13 (81.2%)	3 (50%)	0.005
>5 years	05 (7.4%)	13 (28.9%)	3 (18.8%)	3 (50%)	
Tobacco Smoking					
Non Smoker	34 (50%)	16 (35.5%)	5 (31.2%)	2 (33.3%)	0.319
Smoker	34 (50%)	29 (64.5%)	11 (68.2%)	4 (66.7%)	
Poly-Pharmacy					
No	36 (52.9%)	12 (26.6%)	4 (25%)	3 (50%)	0.019
Yes	32 (47.1%)	33 (73.4%)	12 (75%)	3 (50%)	

DISCUSSION

In our study asthmatic patients with long standing asthma and requiring multiple medications for achieving asthma control found to be at high risk of developing progressive cognitive decline. Screening of these individuals should be done in asthma clinics. Chronic systemic illnesses like COPD, Asthma, DM, HTN, Chronic kidney and Liver diseases etc. can all affect cognition and other higher mental functions by various mechanisms and sometimes subtle memory impairments can only be picked on psychometric testing or using various cognitive assessment tools like BC-CCI, MMSE etc. We did not find any study in Pakistan assessing severity of cognitive impairment in long term asthmatics but studies done in other parts of the world and results deduced were not different from our analysis.^{14,15} This highlights the need for further research to establish clear association and contributing factors, thus prevent the development of severe cognitive impairment in these asthmatic patients.

Factors which might be responsible for this finding are chronic hypoxia, Carbon dioxide retention, night sleep disturbance and systemic inflammation and inflammatory mediators.^{16,17} Medications used for this purpose may be adding to this phenomenon.^{18,19}

Dodd *et al*, discussed the association between long standing obstructive airway diseases (OAD) like COPD and asthma leading to overt dementia.¹⁷ There may be multiple factors as explained by Dodd *et al*, in the etiology such as chronic hypoxemic insults to brain, cerebral small vessel disease or drugs used for management of the disease which may affect the brain

lead to mild to severe cognitive decline.¹⁷ Caldera-Alvarado *et al*, in their study reported that patients with more age are at a higher risk for developing cognitive decline after diagnosis of asthma.²⁰ Our results could not support their findings and age was not a risk factor for cognitive decline in our patients. There is a gradual decline in cognition with aging in healthy individuals as well. Range of age of our sample population was small and we did not include patients of asthma above sixty years of age, which might be reason for our results.

Long duration of asthmatic illness was strongly related to presence and severity of cognitive decline in our study. It is in accordance with the existing literature and study of Ray *et al*, which showed that 70 percent of severe asthmatics had cognitive decline.¹¹

Polypharmacy is usually a reflection of poor disease control and long standing illness. Use of multiple medications is sometimes necessary to achieve good asthma control but at the cost of various medication side effects. Results of our analysis revealed that polypharmacy is associated with increased presence and severity of cognitive problems in asthma patients. Ancelin *et al*, and Furukawa *et al*, in their studies also revealed that patient who were managed with more than one medications for asthma had more decline in their cognition (p -value <0.05).^{9,19}

LIMITATIONS OF STUDY

This study was not free from limitations. Study design poses some methodological problems. Screening tools had a flaw to under or over rating of the symptoms by the target population. We could also not gather more sample size as

duration was only six months and inclusion and exclusion criteria was also very strict. In future if these limitations could be addressed, more generalizable results could be generated in this regard.

CONCLUSION

High risk patients for cognitive decline in our study were patients with long standing asthma or those using multiple medications for the control of asthma. Decline in cognitive ability emerged as a significant problem among the patients suffering from asthma which is a systemic illness rather than a neuro-psychiatric problem therefore screening of these individuals should be done at asthma clinic for this issue.

Conflict of Interest: None.

Author's Contribution

RRHS: Corresponding author, RAS: Design & analysis, GR: Data collection, AHM: Data collection.

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