

Psychological assessment of patients with bronchial asthma: focus on some predictors of abnormalities

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Background Bronchial asthma is a common chronic respiratory illness. Psychiatric comorbidity is a neglected zone in the care and management of such important physical disorders as bronchial asthma.

Objective The present study targeted a population sample of out-patient asthmatics, aiming at detailed psychocognitive evaluation. Predictors of depression, anxiety, and cognitive impairment were searched for by detailed assessment of patient sociodemographic and disease-related criteria.

Patients and methods A total of 50 patients with confirmed asthma diagnosis were recruited and subjected to detailed respiratory and psychiatric evaluation using Mini-Mental State Examination, Beck Depression Inventory-II, and Taylor manifest anxiety scale tests.

Results Mild, moderate, and severe depression were diagnosed in 26, 28, and 14% of patients, respectively, whereas mild, moderate, and severe anxiety were revealed in 32, 34, and 20%, respectively. Overall, 54% of the patients showed cognitive impairment. Asthmatic female patients were more common to have depression ($P=0.022$). The present analysis showed that predictors of cognitive impairment were older age, increasing frequency of hospital

admission for asthma in the past year, improper adherence to treatment, and uncontrolled asthma. Meanwhile better education level proved to be protective from abnormal cognitive function.

Conclusion There was high prevalence of depression, anxiety, and cognitive dysfunction among asthmatic patients in Sohag University. Improving patient education, patient adherence to treatment, and asthma level control may lessen the chance of cognitive abnormality.

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Introduction

Psychiatric disorders are more common among the general population. Anxiety and mood disorders are considered to be common psychiatric disorders, representing 14% and 7.8%, respectively [1]. In patients with chronic somatic illness, psychiatric comorbidities are usually noticed; specifically, cognitive dysfunction, depression, and anxiety disorders have been recorded among patients with asthma and chronic obstructive pulmonary disease [2].

Bronchial asthma is one of the most common chronic diseases worldwide [3]. Patients with asthma are more liable to psychiatric disorders. Population and clinic-based studies of outpatients with asthma have explored that adults with asthma demonstrated high levels of depression and anxiety disorders than adults without asthma, in spite of fluctuating rates that had been estimated [4,5].

These psychiatric comorbidities have a serious adverse effect on a patient's quality of life. In one study, the asthma-related quality of life scores were negatively associated with depression. Moreover, increased experience of anxiety was associated with more recognition of asthma-specific panic-fear and

hyperventilation symptoms during an asthma attack, regardless of the depressive status [6].

Patients who had cognitive deficits had problems in following doctors' instructions owing to either problems in understanding a given advice or putting it into practice, which leads to a vicious circle [2].

Higher rate of functional impairment and use of mental health services are usually associated with adults with asthma compared with those with either asthma or mental disorders alone [7].

So, the present study aimed at evaluation of depression, anxiety, and cognitive impairment in asthmatic patients presented to the outpatient asthma clinic, Sohag University hospital, and to assess which aspect in bronchial asthma contributes to these commonly encountered psychological disorders in patients having bronchial asthma.

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Patients and methods

Study design

A cross-sectional observational study was conducted at the asthma outpatient clinic of Chest Department and neuropsychiatric clinic of Neuropsychiatric Department at Sohag University hospital, which is located in Sohag governorate on the Eastern Nile bank, through a 6-month duration from September 2017 to February 2018.

Ethics statement

The study protocol was reviewed and approved by the ethics committee of Sohag Faculty of Medicine, and a written consent was signed by all participants after explanation about the nature of the study.

Subjects

A total of 50 patients with confirmed diagnosis of asthma according to Global Initiative of Asthma (GINA) 2018 [3] criteria were recruited in the present study from the asthma outpatient clinic, Sohag University Hospital, Sohag, Egypt.

Respiratory assessment

Thorough history taking and physical examination were done together with pulmonary function test to confirm typical match with asthma diagnosis.

Assessment of asthma symptom control was done according to the consensus-based GINA symptom control tool, and the patients were classified accordingly as well controlled, partly controlled, and uncontrolled [3].

Spirometry was performed to assess the pulmonary function, and a cut-off value of forced expiratory volume in one second (FEV₁) 60% predicted was chosen to categorize patients into more than or less than 60% predicted, as this value was shown to have prognostic value [8].

History of ICU admission because of asthma exacerbation was assessed. History of severe attacks and frequency of hospital admission in the last year were also recorded.

Other allergies, comorbidities, and detailed medication history were recognized.

Adherence to asthma medication was measured by using the eight-item Morisky medication adherence scale. It has been found to be valid for assessing medication adherence and predicting health outcomes in patients with asthma [9].

Psychiatric assessment

The following psychometric tests were used:

- (1) Mini-Mental State Examination (MMSE): the original MMSE is the most commonly used cognitive screening test worldwide. The examination takes 7–10 min to complete. The total score is 30, and it tests a broad range of cognitive functions, including orientation, recall, attention, calculation, language processing, and constructional praxis [10]. A perfect score is 30 points; a score of 24 is the recommended, and is the most frequently used cut-off point for dementia; a score of 23 or lower indicates dementia [11].
- (2) Beck depression inventory (BDI) [12]: it is a widely used 21-item self-report questionnaire that was designed to measure the presence and severity of depressive symptoms. The scale measures various components of the depressive experience; the affective, cognitive, somatic, and motivational aspects of the disorder. Each item in the BDI consists of four possible responses on a four-point Likert scale ranging from 0 to 3. The total score on this instrument ranges from 0 to 63. Responses were classified as follows: 0–13 considered normal, 14–19 mild depression, 20–28 moderate depression, and 29–63 severe depression. We use the Arabic version [13].
- (3) Taylor manifest anxiety scale (TMAS) [14]: it is used as a general indicator of anxiety as a personality trait. It is not intended as a specific measure of anxiety as a clinical entity. This early instrument is derived from Minnesota Multiphasic Personality Inventory and is presented in a long version (50 items) and a short one (28 items). In this study, we used an Arabic translation of the long version of the scale. True and false responses are used for each item. Responses were counted; a score from 0 to 50 was given. Interpretation was as follows: 0–16: normal, 17–24: mild, 25–35: moderate, and 36–50: severe [15].

All psychometric tests were performed by trained psychologists in out-patient psychiatric clinic who were blinded to the detailed characteristics of the underlying asthma disease.

Statistical analysis

Data was analyzed using SPSS computer program version 24.0 (SPSS Inc., Chicago, Illinois, USA).

Quantitative data were expressed as mean±SD, median, and range. Qualitative data were expressed as number and percentage. The data were tested for

normality using Shapiro–Wilk test. Independent samples *t*-test was used for normally distributed data. The nonparametric Mann–Whitney test was used for data that were not normally distributed.

χ^2 -test and Fisher's exact test were used for comparison regarding qualitative variables as appropriate. Regression analysis was used to determine factors associated with depression, anxiety, and abnormal cognitive function among the studied patients. A 5% level was chosen as a level of significance in all statistical tests used in the study.

Results

A total of 50 asthmatic patients were included in the present study, and most of them (41, 82%) were females. Their mean age was 36.96 years. Other characteristics are shown in Table 1. Only 34% of the studied patients were controlled on treatment, though 46% reported good adherence to treatment. Moreover, 42% of the patients showed reduced respiratory function with FEV₁ less than 60% predicted.

On considering their asthma medications, 45 (90%) patients were on regular inhaled corticosteroids, 22 (44%) patients were using long-acting B2 agonist, and only two (4%) were on antileukotrienes. A total of 12 (24%) patients were frequent oral corticosteroid users.

Results of psychometric assessment are shown in Figure 1 and Figure 2.

Comparison between asthmatic patients with and without psychiatric and cognitive abnormalities in terms of sociodemographics and disease related parameters was done.

The sex difference showed statistical significance in term of presence of depression, whereas the education level and age showed significance in term of abnormal cognitive function. Other criteria are shown in Table 2, which showed no statistical significance.

Upon assessment of relation between disease-related criteria and abnormal cognitive function, we found that increasing frequency of hospital admission together with intermediate and poor treatment adherence showed statistical significance. Other criteria are shown in Table 3.

The binary logistic regression analysis was used to identify predictors of depression, anxiety, and

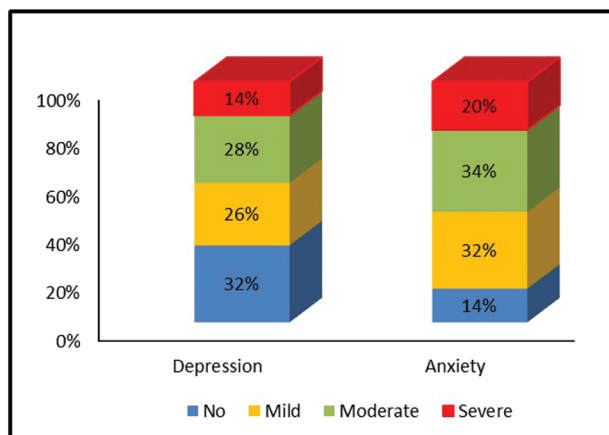
Table 1 Socio-demographic and other disease-related parameters

Characteristics	Summary statistics [n (%)]
Level of education	
Illiterate	34 (68)
Preparatory	2 (4)
Secondary	14 (28)
Marital status	
Single	9 (18)
Married	34 (68)
Divorced	7 (14)
Occupation	
Employee	3 (6)
Housewife	32 (64)
Manual worker	15 (30)
Smoking	
Nonsmoker	37 (74)
Passive smoker	10 (20)
Current smoker	3 (6)
BMI (kg/m ²)	
Mean±SD	30.51±6.75
Median (range)	31 (19–41)
Other allergies	
Yes	39 (78)
No	11 (22)
History of ICU admission	
Yes	10 (20)
No	40 (80)
History of severe attack in the past year	
Yes	35 (70)
No	15 (30)
Frequency of hospital admission in the past year	
Mean±SD	2.8±1.8
Median (range)	2.5 (0–6)
Comorbidity	
Yes	24 (48)
No	26 (52)
Adherence to treatment	
Good	23 (46)
Intermediate	16 (32)
Poor	11 (22)
Level of control	
Controlled	17 (34)
Partly controlled	15 (30)
Uncontrolled	18 (36)
Spirometry result (FEV ₁)	
<60% predicted	21 (42)
>60% predicted	29 (58)

FEV₁, forced expiratory volume in one second.

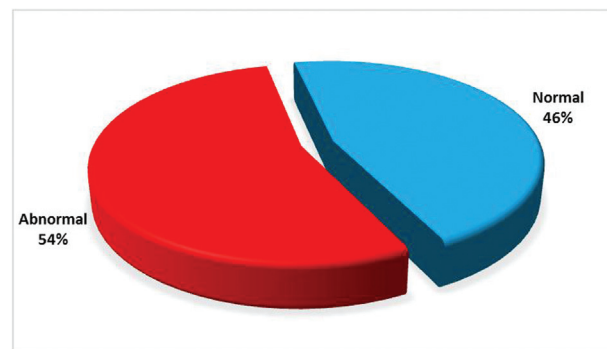
abnormal cognitive function. As shown in Table 4, the factor that showed significance was female sex for depression, whereas age, educational level, frequency of hospital admission, intermediate and poor treatment adherence, and uncontrolled asthma all showed significance for abnormal cognitive function. However, final model of regression analysis did not show statistical significance for any of these factors.

Figure 1



Prevalence of depression and anxiety among asthma patients.

Figure 2



Result of cognitive assessment in asthmatic patients.

Table 2 Relation between psychometric results and sociodemographic data, smoking, and BMI (N=50)

Parameters	Depression [n (%)]		P value	Anxiety [n (%)]		P value	Cognitive assessment [n (%)]		P value
	No (N=16)	Yes (N=34)		No (N=7)	Yes (N=43)		Abnormal (N=7)	Normal (N=23)	
Sex									
Female	10 (62.5)	31 (91.2)	0.022*	5 (71.4)	36 (83.7)	0.595	23 (85.2)	18 (78.3)	0.715
Male	6 (37.5)	3 (8.8)		2 (28.6)	7 (16.3)		4 (14.8)	5 (21.7)	
Age									
Mean±SD	37.75 ±12.01	36.59±9.74	0.717	38.57±11.76	36.7±10.29	0.663	39.78±9.51	33.65±10.64	0.037*
Median (range)	39 (18–53)	36 (18–60)		41 (23–53)	38 (18–60)		40 (18–60)	32 (18–52)	
Education									
Illiterate	12 (75)	22 (64.7)	0.553	4 (57.1)	30 (69.8)	0.317	24 (88.9)	10 (43.5)	0.002*
Preparatory	1 (6.3)	1 (2.9)		1 (14.3)	1 (2.3)		1 (3.7)	1 (4.3)	
Secondary	3 (18.7)	11 (32.4)		2 (28.6)	12 (27.9)		2 (7.4)	12 (52.2)	
Marital status									
Single	3 (18.7)	6 (17.6)	0.782	0 (0.0)	9 (20.9)	0.398	5 (18.5)	4 (17.4)	0.071
Married	10 (62.6)	24 (70.6)		6 (85.7)	28 (65.1)		21 (77.8)	13 (56.5)	
Divorced	3 (18.7)	4 (11.8)		1 (14.3)	6 (14)		1 (3.7)	6 (26.1)	
Occupation									
Employee	1 (6.3)	2 (5.9)	0.098	0 (0.0)	3 (7)	0.754	0 (0.0)	3 (13)	0.143
House wife	7 (43.7)	25 (73.5)		5 (71.4)	27 (62.8)		19 (70.3)	13 (56.5)	
Manual worker	8 (50)	7 (20.6)		2 (28.6)	13 (30.2)		8 (29.7)	7 (30.5)	
Smoking									
Nonsmoker	11 (68.8)	26 (76.5)	0.414	3 (42.85)	34 (79.1)	0.127	20 (74.1)	17 (74)	0.879
Passive smoker	3 (18.7)	7 (20.6)		3 (42.85)	7 (16.3)		5 (18.5)	5 (21.7)	
Current smoker	2 (12.5)	1 (2.9)		1 (14.3)	2 (2.6)		2 (7.4)	1 (4.3)	
BMI									
Mean±SD	32.44±6.74	29.59±6.65	0.511	32.97±6.31	30.27±6.86	0.511	31.69±5.89	29.12±7.53	0.205
Median (range)	33 (21–41)	30 (19–41)		31 (22.8–40.4)	31 (19–41)		31 (19.5–41)	28 (19–41)	

* $P < 0.05$, statistically significant.

Discussion

Despite the fact that psychiatric co-morbidities are common among patients with asthma and chronic

obstructive pulmonary disease, they remain undiscovered and untreated in daily clinical practice. This might be owing to nonroutine use of the screening

Table 3 Relation between depression anxiety and cognitive assessment and disease-related criteria among patients with asthma

Parameters	Depression [n (%)]		P value	Anxiety [n (%)]		P value	Cognitive assessment [n (%)]		P value
	No (N=16)	Yes (N=34)		No (N=7)	Yes (N=43)		Abnormal (N=27)	Normal (N=23)	
Other allergies									
No	4 (25)	7 (20.6)	0.728	2 (28.6)	9 (20.9)	0.641	8 (29.7)	3 (13)	0.158
Yes	12 (75)	27 (79.4)		5 (71.4)	34 (79.1)		19 (70.3)	20 (87)	
ICU admission									
No	15 (93.7)	25 (73.5)	0.138	6 (85.7)	34 (79.1)	1	21 (77.8)	19 (82.6)	0.736
Yes	1 (6.3)	9 (26.5)		1 (14.3)	9 (20.9)		6 (22.2)	4 (17.4)	
History of severe attack									
No	6 (37.5)	9 (26.5)	0.514	2 (28.6)	13 (30.2)	1	8 (29.7)	7 (30.4)	0.951
Yes	10 (62.5)	25 (73.5)		5 (71.4)	30 (69.8)		19 (70.3)	16 (69.6)	
Comorbidity									
No	7 (43.8)	19 (55.9)	0.423	2 (28.6)	24 (55.8)	0.239	13 (48.1)	13 (56.5)	0.555
Yes	9 (56.2)	15 (44.1)		5 (71.4)	19 (44.2)		14 (51.9)	10 (43.5)	
Frequency of hospital admission									
Mean±SD	2.31±1.3	3.03±1.9	0.224	1.71±1.1	2.98±1.8	0.071	3.33±1.71	2.17±1.64	0.019*
Median (range)	2 (1–5)	3 (0–6)		1 (1–4)	3 (0–6)		4 (0–6)	2 (0–6)	
Adherence to treatment									
Good	7 (43.8)	16 (47.1)	0.939	2 (28.6)	21 (48.8)	0.337	8 (29.6)	15 (65.3)	0.041*
Intermediate	5 (31.2)	11 (32.3)		2 (28.6)	14 (32.6)		11 (40.8)	5 (21.7)	
Poor	4 (25)	7 (20.6)		3 (42.8)	8 (18.6)		8 (29.6)	3 (13)	
Level of control									
Controlled	7 (43.8)	10 (29.4)	0.482	5 (71.4)	12 (27.9)	0.078	6 (22.2)	11 (47.9)	0.091
Partly controlled	5 (31.2)	10 (29.4)		1 (14.3)	14 (32.6)		8 (29.7)	7 (30.4)	
Uncontrolled	4 (25)	14 (41.2)		1 (14.3)	17 (39.5)		13 (48.1)	5 (21.7)	
FEV ₁									
<60%	7 (43.8)	14 (41.2)	0.863	2 (28.6)	19 (44.2)	0.684	14 (51.9)	7 (30.4)	0.126
>60%	9 (56.2)	20 (58.8)		5 (71.4)	24 (55.8)		13 (48.1)	16 (69.6)	
Inhaled steroids									
No	1 (6.3)	4 (11.8)	1	0 (0.0)	5 (11.6)	1	2 (7.4)	3 (13)	0.651
Yes	15 (93.7)	30 (88.2)		7 (100)	38 (88.4)		25 (92.6)	20 (87)	
Oral steroids									
No	12 (75)	26 (76.5)	1	6 (85.7)	32 (74.4)	1	18 (66.7)	20 (87)	0.094
Yes	4 (25)	8 (23.5)		1 (14.3)	11 (25.6)		9 (33.3)	3 (13)	
LABA									
No	11 (68.8)	17 (50)	0.213	5 (71.4)	23 (53.5)	0.444	15 (55.6)	13 (56.5)	0.945
Yes	5 (31.2)	17 (50)		2 (28.6)	20 (46.5)		12 (44.4)	10 (43.5)	
Antileukotriene									
No	15 (93.7)	33 (97.1)	0.542	7 (100)	41 (95.4)	1	27 (100)	21 (91.3)	0.207
Yes	1 (6.3)	1 (2.9)		0 (0.0)	2 (4.6)		0 (0.0)	2 (8.7)	

FEV₁, forced expiratory volume in one second; LABA, long acting B2 agonist.

tools for depression and anxiety disorders, and on the contrary, patients often tend to refuse and ignore that they have these psychiatric conditions because of the stigma attached to them [2,16].

Many studies confirmed the relation of anxiety and depression with asthma [17]. These disorders are more common in asthmatics as compared with non-asthmatics, with prevalence varies from 9 to 65% [18].

In our study, depression was diagnosed in 68% of asthmatic patients, and it was graded into mild (26%), moderate (28%), and severe (14%) disease. However, 86% of the included asthmatic patients

had anxiety with mild (32%), moderate (34%), and severe (20%) degree, respectively. This high prevalence rate may be because of the lack of regular psychological counseling in pulmonary department. The percentage of moderate and severe depression and anxiety should be taken into consideration being of clinical relevance, as having major psychological or socioeconomic problem is one of the potentially modifiable risk factors for flare-ups of asthma even in patients with few symptoms [3].

These findings were in line with many studies, such as Jaffary *et al.* [19], who revealed that the rates of anxiety and depression were 77.5 and 63%, respectively, whereas Shakoor *et al.* [20], reported

Table 4 Univariate binary logistic regression analysis of predictor variables of depression, anxiety, and abnormal cognitive function among patients with asthma

Characteristics	Depression		Anxiety		Cognitive assessment	
	OR (CI 95%)	P value	OR (CI 95%)	P value	OR (CI 95%)	P value
Sex						
Female	6.2 (1.3–29.46)	0.022*	2.06 (0.33–12.81)	0.439	1.59 (0.37–6.83)	0.527
Male	1		1		1	
Age	0.99 (0.93–1.05)	0.71	0.98 (0.91–1.06)	0.656	1.06 (1.002–1.13)	0.043*
Education						
Illiterate	1	0.678	1	0.182	1	0.550
Preparatory	0.55 (0.03–9.52)	0.351	0.13 (0.01–2.58)	0.811	0.42 (0.02–7.34)	0.002*
Secondary	2 (0.47–8.59)		0.8 (0.13–4.96)		0.07 (0.01–0.37)	
Marital status						
Single	1	0.82	NA	NA	1	0.735
Married	1.2 (0.25–5.77)	0.697			1.29 (0.29–5.71)	0.113
Divorced	0.67 (0.09–5.13)				0.13 (0.01–1.61)	
Occupation						
Employee	2.29 (0.2–30.96)	0.534	NA	NA	NA	NA
House wife	4.08 (1.09–15.22)	0.036	0.83 (0.14–4.87)	0.837	1.28 (0.37–4.4)	0.696
Manual worker	1		1		1	
Smoking						
Nonsmoker	1	0.987	1	0.084	1	0.820
Passive smoker	0.99 (0.22–4.54)	0.224	0.21 (0.03–1.24)	0.204	0.85 (0.21–3.44)	0.676
Current Smoker	0.21 (0.02–2.58)		0.18 (0.01–2.56)		1.7 (0.14–20.42)	
BMI	0.94 (0.85–1.03)	0.166	0.96 (0.85–1.09)	0.534	1.06 (0.97–1.16)	0.180
Other allergies						
No	1	0.726	1	0.652	1	0.168
Yes	1.29 (0.32–5.24)		1.51 (0.25–9.11)		0.36 (0.08–1.55)	
ICU admission						
No	1	0.126	1	0.686	1	0.671
Yes	5.4 (0.62–46.96)		1.59 (0.17–14.93)		1.36 (0.33–5.55)	
History of severe attack						
No	1	0.429	1	0.929	1	0.951
Yes	1.67 (0.47–5.92)		0.92 (0.16–5.39)		1.04 (0.31–3.49)	
Comorbidity						
No	1	0.425	1	0.197	1	0.555
Yes	0.61 (0.19–2.03)		0.32 (0.06–1.82)		1.4 (0.46–4.28)	
Frequency of hospital admission	1.28 (0.89–1.84)	0.182	1.65 (0.92–2.98)	0.094	1.52 (1.06–2.17)	0.024*
Adherence to treatment						
Good	1	0.957	1	0.702	1	0.041*
Intermediate	0.96 (0. –3.83)	0.730	0.67 (0.08–5.3)	0.172	4.13 (1.06–16.09)	0.046*
Poor	0.77 (0.17–3.49)		0.25 (0.04–1.81)		5 (1.03–24.28)	
Level of control						
Controlled	1	0.648	1	0.130	1	0.308
Partly controlled	1.4 (0.33–5.93)	0.233	5.83 (0.59–57.1)	0.091	2.09 (0.51–8.67)	0.033*
Uncontrolled	2.45 (0.56–10.68)		7.08 (0.73–68.61)		4.77 (1.14–19.98)	
FEV ₁						
< 60%	0.9 (0.27–2.99)	0.863	1.98 (0.35–11.35)	0.444	2.46 (0.77–7.89)	0.13
> 60%	1		1		1	
Inhaled steroids						
No	1	0.551	NA	NA	1	0.513
Yes	0.5 (0.05–4.88)				1.88 (0.29–12.33)	
Oral steroids						
No	1	0.910	1	0.524	1	0.104
Yes	0.92 (0.23–3.67)		2.06 (0.22–19.09)		3.33 (0.78–14.26)	
LABA						
No	1	0.217	1	0.383	1	0.945
Yes	2.2 (0.63–7.7)		2.17 (0.38–12.46)		1.04 (0.34–3.19)	
Anti-leukotriene						

(Continued)

Table 4 (Continued)

Characteristics	Depression		Anxiety		Cognitive assessment	
	OR (CI 95%)	P value	OR (CI 95%)	P value	OR (CI 95%)	P value
No	1	0.586	NA	NA	NA	NA
Yes	0.46 (0.03–7.77)					

CI, confidence interval; FEV₁, forced expiratory volume in one second; LABA, long acting B2 agonist; OR, odds ratio.

anxiety and depression to be 75.5 and 63.3%, respectively; both studies were conducted in asthmatics.

In the present study, it was found that depression was more common in females than males ($P=0.022$), but anxiety was equally distributed in males and females ($P=0.595$). Similar to the present findings, other published works in the literature showed that in asthmatic patients, females had more depressive symptoms when compared with male (70.2 vs. 54.9%) [21], and noted that asthmatic females experienced higher degrees of somatic symptoms and anxiety than asthmatic males [22]. However, this is not a universal finding, as other researchers demonstrated that anxiety and depression were equally prevalent in females and males [19].

Overall, 54% of the studied group, whose mean age was 36.96 years, had cognitive impairment. This was in agreement with previous studies which revealed that asthma was associated with increased risk of cognitive impairment that reached up to 78% even when controlling demographic characteristics, self-rated health status, inhaled corticosteroid use, and FEV₁/forced vital capacity [23]. A meta-analytic review published in 2017 stated that there was cognitive burden associated with asthma, particularly among vulnerable groups with severe asthma [24]. This could be owing to increased risk of intermittent cerebral hypoxia in severe asthma. Our colleague in Sohag University diagnosed cognitive impairment in 60% of their studied asthmatic patients [25].

Previous Egyptian studies assessed the relation of these psychocognitive disorders to either atopic status [26] or level of control [27]. In a trial to document which factors in patient sociodemographic characteristics and disease-related criteria might predict these psychocognitive disorders among the studied patient sample, we examined these factors in details.

Increasing age was one of the predictor variables of abnormal cognition. It is known that skills of cognition

decrease with age [28]. The proposed mechanism is an affection of cerebral oxygenation [29].

In addition, the present study revealed that the high frequency of hospital admission in the past year was associated with cognitive impairment. This is an important point to highlight because hospitalization or emergency care visit for asthma in the past year was identified by GINA as one of the factors that increase risk of asthma-related mortality. The present study proved that it was also related to asthma-related morbidity in the form of cognitive function impairment. Intermediate and poor adherence to treatment, which were found in 32 and 22% of patients, respectively, and uncontrolled asthma came in the list of the present analysis of predictors of cognitive dysfunction. The relation between these factors and cognition is bi-directional because impaired patient cognition can affect treatment adherence and ability of the patient to correctly follow physician instructions as an asthma action plan.

Previous Egyptian study used the same Morisky treatment adherence scale and reported that the prevalence of moderate and low treatment adherence in Egyptian asthmatic population was 19.8 and 71.7%, respectively [30]. Therefore, proper treatment adherence should be carefully checked and targeted in all asthmatic patients.

Frequent and regular use of oral corticosteroid did not show significant relation to cognitive impairment, neither did other asthma medications. This finding was not in line with the assumption that the treatment of asthma could compromise cognition; in particular, corticosteroid therapy was associated with cognitive changes [31].

Increasing level of education was the only protective factor that guards against cognitive impairment in the present study.

Study limitation

The relatively small number of the study population is a limitation; however, this can be argued by the meticulous respiratory evaluation and multiple

psychometric tests that were utilized, which was time consuming and cumbersome.

Conclusion

There was a high percentage of depression, anxiety, and cognitive dysfunctions among asthmatic patients in the present study.

The current study revealed that increasing age, high frequency of hospital admission, intermediate and poor adherence to treatment, and uncontrolled asthma were found to be risk factors for cognitive dysfunctions, which suggests that increasing the level of education could be a protective factor in term of abnormal cognitive function.

In the dilemma of management of bronchial asthma, assessment and care for psychiatric and cognitive comorbidity should not be forgotten.

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Conflicts of interest

There are no conflicts of interest.

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