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Bronchial asthma control, quality of life, and psychiatric disorders vicious cycle: Asyut society point of view

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Abstract

Background: Poorly controlled bronchial asthma limits patients' quality of life (QOL), the condition which may potentiate the development of psychiatric disorders. The aim of this study was the assessment of anxiety and depression in bronchial asthma patients, and their interrelation with both level of asthma control and quality of life in our society.

Results: This study included 102 bronchial asthma patients, and 50 healthy control individuals. Patients had poorer QOL, and higher anxiety and depression scores compared to healthy control, moreover these scores were higher in uncontrolled asthma patients compared to controlled group. Poor QOL, frequent hospital admissions, and poor asthma control were the predictors for psychiatric disorders.

Conclusion: Depression and anxiety are frequently encountered in patients with bronchial asthma in our society; poor symptom control, poor QOL, and frequent hospital admissions are the main predictors for these psychiatric disorders.

Keywords: Bronchial asthma, Quality of life, Psychiatric disorders

Introduction

Bronchial asthma is one of the most common non-communicable chronic airway diseases, about 339 million people were diagnosed as bronchial asthma in 2016 worldwide, with 417,918 deaths related to bronchial asthma according to WHO report 2016 [1, 2]. According to GINA, 2020 [3] bronchial asthma patients are classified into three groups based on control of asthma symptoms (controlled, partially controlled, and uncontrolled), and despite the availability of wide range of medication still large percentage of asthmatic patients are involved in uncontrolled group [4]. It is documented that poor asthma control has a negative feedback on quality of life

(QOL) in patients with bronchial asthma, where studies reported female sex, increasing body weight, older age, lower level of education, familial history of asthma, poor asthma control are significant predictors of impaired quality of life in these patients [5, 6]. The relationship between asthma symptom control, QOL, and psychiatric disorders (e.g., anxiety, and depression) represent a vicious cycle, where disturbance in any of them will have a negative feedback on the other two factors. Studies documented association between psychiatric disorders and asthma symptoms [7]. Patients with anxiety or depression may have exaggerated response to bronchial asthma symptoms; on the other point of view, asthmatic patients usually have difficulty in perceiving bronchial asthma symptoms with the end result of impaired patient's deal with the action plan of asthma [8]. This process will lead to poor control of asthma, and poor QOL.

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Aim of the study

The aim of the current study was to assess presence of anxiety and depression in bronchial asthma patients in our society, and their interrelation with both level of asthma control and quality of life.

Methodology

One hundred and two bronchial asthma adult (> 18 years) patients, and 50 healthy non-smoker individuals (matching in age and sex) were included in this cross sectional study. Diagnosis of bronchial asthma and also patients' classification into controlled, partially controlled and uncontrolled asthma symptoms were based on criteria of GINA, 2019 [9].

Bronchial asthma patients who had co morbidities (e.g., diabetes mellitus, systemic hypertension, cardiac disease, or chronic liver or renal disease, others) were excluded from this study. Also the possibility of associated obstructive sleep apnea was excluded by history, in addition to the application of Stop Bang questionnaire [10].

Quality of life of both bronchial asthma patients, and control group were assessed using Arabic version of respiratory St. George's questionnaire [11].

Screening for psychiatric disorders (anxiety, and depression) was done using

Hospital Anxiety and Depression scale (HAD-A, HAD-D) [12]:

This is a questionnaire which includes 14 questions; seven for assessment of anxiety, and the remaining group for depression assessment. Each question scaled from 0 to 3 (where 0 is the best, and 3 is the worst), the total score range is 21, where score higher than 8 correlate with psychiatric illness.

Beck Depression Inventory (BDI) scale [13]:

It is a 21-item questionnaire used for depression assessment in both psychiatric and normal individuals each item is ranked from 0 to 3 scales.

The Hamilton Anxiety Rating Scale (HAM-A/HARS) [14]:

It measures both psychic and somatic anxiety through 14 items; each item is scaled from 0 to 4. Scale < 17 indicate mild severity, 18 to 24 mild to moderate severity and a scale of 25 to 50 indicates a moderate to severe case.

Statistical analysis

Data were verified, coded by the researcher and analyzed using IBM-SPSS 24.0 (IBM-SPSS Inc., Chicago, IL, USA) [15]. Descriptive statistics: Means, standard deviations, and percentages were calculated. Test of significances: chi-square/Fisher's exact test was used to compare the difference in distribution of frequencies among different

groups. Student t-test analysis was carried out to compare the means of dichotomous data that follow the normal distribution. For continuous variables with more than two categories, one-way ANOVA test was calculated to test the mean differences between groups and repeated measure ANOVA (RM-ANOVA) test was calculated to test the mean differences of the data that follow normal distribution and had repeated measures (between groups, within groups and overall difference), post-hoc test was calculated using Bonferroni corrections for pairwise comparisons between the two study groups. A significant *p* value was considered when it is equal or less than 0.05. Significant variables from the univariate analysis were entered in the multivariable logistic regression model to test the independent predictors of anxiety and depression in patients with bronchial asthma using odds ratio (OR), 95% confidence interval (CI). Receiver operating characteristics (ROC) curve was used to assess different predictors. Cutoff points were chosen according to the highest sensitivity and specificity. Area under curve (AUC) was used to assess the accuracy and reported a 95% confidence interval and *p* value.

Ethical considerations

This study was approved based on Faculty of Medicine, Assiut University Institutional review board (IRB) of the prior to initiating the study (IRB no 17100089). A written consent form was assigned from each participant. This consent was clear and explained the aim of the study. Participants were included in this study without any incentives or rewards. The study was matched with the Declaration of Helsinki.

Results

One hundred and two bronchial asthma patients and 50 healthy individuals were included in the current study. There was no difference between both regarding age, and sex, body mass index of patients was 24.5 ± 5.01 , with no significant difference compared to control group. Patients with bronchial asthma had significantly poorer quality of life (HRQL), higher anxiety and depression scales compared to healthy control subjects (Table 1). Only 22.5% of bronchial asthma patients were well controlled according to GINA [9] guideline criteria, while 40.8% was uncontrolled (Fig. 1). All components of SGRQ except symptom component were significantly worst in partially controlled and uncontrolled asthma patients compared to well-controlled one (Table 2). As shown in Table 3, poor control of asthma symptoms was associated with increased frequency of both anxiety and depression. By performing univariate regression analysis five variables were

Table 1 Baseline data of the studied patients

Parameters	Bronchial asthma group (N:102)	Control group (N:50)	P value
Age/year	49 ± 7.7	49.4 ± 6.5	NS
Sex:			
Male: N(%)	42(41.18%)	27(54%)	NS
Female:N(%)	60(58.82%)	23(46%)	
Body mass index (BMI)	24.5 ± 5.01	23.4 ± 5.2	NS
Duration of disease(years)	17.02 ± 7.6		
PFT:			
FEV ₁ %	42.04 ± 6.8	83.64 ± 4.4	< 0.001*
Pre-FEV ₁ (L)	1.40 ± 0.5	2.56 ± 0.5	
Post-FEV ₁ (L)	1.93 ± 0.7		
FVC%	72.55 ± 7.2	94.46 ± 8.5	
Bronchodilator reversibility (ml):	465.51 ± 35.2		
Frequency of hospital admission last year:(n/%)	Non: 40(39.2%) Once: 60(58.8%) Twice: 2 (2%)		
SGRQ:			
Symptom score:	62.89 ± 9.3	6.19 ± 0.6	< 0.001*
Impact score:	58.23 ± 15.1	9.83 ± 0.4	
Activity score:	59.71 ± 12.6	6.49 ± 0.3	
Total score:	12.6 ± 59.45	0.2 ± 8.17	
Depression scales:			
HADS-D:	8.24 ± 2.4	5.89 ± 0.3	< 0.001*
BDI:	16.35 ± 6.3	8.84 ± 0.7	
Anxiety scales:			
HADS-A:	8.24 ± 1.8	6.38 ± 0.4	< 0.001*
HAMA:	13.20 ± 2.6	10.20 ± 1.1	

PFT pulmonary function test, pre-FEV₁ prebronchodilator forced expiratory volume in the first second, Post-FEV₁ post-bronchodilator. SGRQ St. George's Respiratory Questionnaire, HADS-A, HADS-D hospital anxiety and depression scales, BDI Beck's depression inventory scale, HAMA Hamilton anxiety rating scale, p value < 0.05 significant*

significantly associated with development of anxiety and depression in bronchial asthma patients, these variables were; increased frequency of hospital admission, poorer symptom control, lower FEV₁, FVC, and higher total SQRG score. Meanwhile multivariate regression analysis documented that only increased frequency of hospital admission, poorer symptom control, and higher total SQRG score were the most significant variables that can predict presence of anxiety and depression in bronchial asthma patients Table 4. As shown in Fig. 2 significant positive correlations were observed between (disease duration, and total SGRQ score) and scales of both depression and anxiety except for BDI scale. As demonstrated from ROC curve (Fig. 3) total SGRQ ≥ 55.04 had sensitivity 90%, specificity 63.2%, with AUC 81.84 in predicting anxiety in patients with bronchial asthma, while total SGRQ ≥ 61.1 had sensitivity 76.67%, specificity 78.95%, with AUC 76.05 in predicting depression in these patients.

Discussion

Association between chronic diseases and psychiatric disorders (e.g., anxiety, and/or depression) has significant drawbacks on general health compared to either disease alone [16]. This association leads to poor disease control secondary to noncompliance with medication, with subsequent impaired QOL, with the end result of more anxiety, and depression [16]. The rationales of the current study were to assess both QOL and psychiatric disorders in bronchial asthma patients compared to healthy control subjects, assess relationship between level of bronchial asthma control and QOL, and impact of impaired QOL on developing psychiatric disorders. Well-controlled bronchial asthma was reported in only 22.5% of the current study cases, this result reflects poor compliance with medication, where there is still a large percentage of population in our community refusing the inhaler medications. In the study of Woledesenbet et al. (2018) [17] only 26.9% of asthmatic patients were well controlled, the

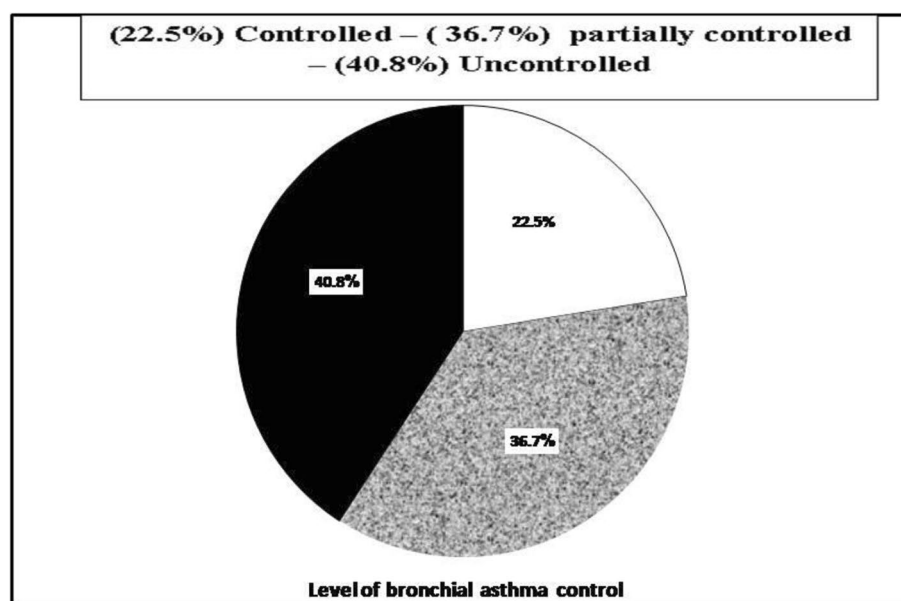


Fig. 1 Classification of bronchial asthma patients according to level of asthma control

Table 2 Relationship between SGRQ and asthma symptom control categories

Asthma symptom control categories	Symptom mean \pm SD	Activity mean \pm SD	Impact mean \pm SD	Total mean \pm SD
Controlled (n/20)	61.54 \pm 11.7	53.32 \pm 10.1	44.43 \pm 8.9	46.94 \pm 10.16
Partially controlled (n/36)	62.04 \pm 9.9	53.21 \pm 13.8	57.53 \pm 11.2	58.36 \pm 9.25
Uncontrolled (n/46)	64.40 \pm 8.6	69.07 \pm 12.6	66.44 \pm 9.4	60.09 \pm 11.5
P value*	= 0.668*	= 0.003*	= 0.001*	= 0.000*

Table 3 Relationship between anxiety/depression and asthma symptom control

	No anxiety	Anxiety	P value*
Asthma symptom control			
Controlled	14 (36.8%)	6 (9.38%)	< 0.001
Partially controlled	22 (57.9%)	14 (21.87%)	
Uncontrolled	2 (5.26%)	44 (68.7%)	
	No depression	Depression	
Asthma symptom control			
Controlled	16 (42.1%)	4 (6.25%)	= 0.001
Partially controlled	18 (47.4%)	22 (34.38%)	
Uncontrolled	4 (10.5%)	38 (59.37%)	

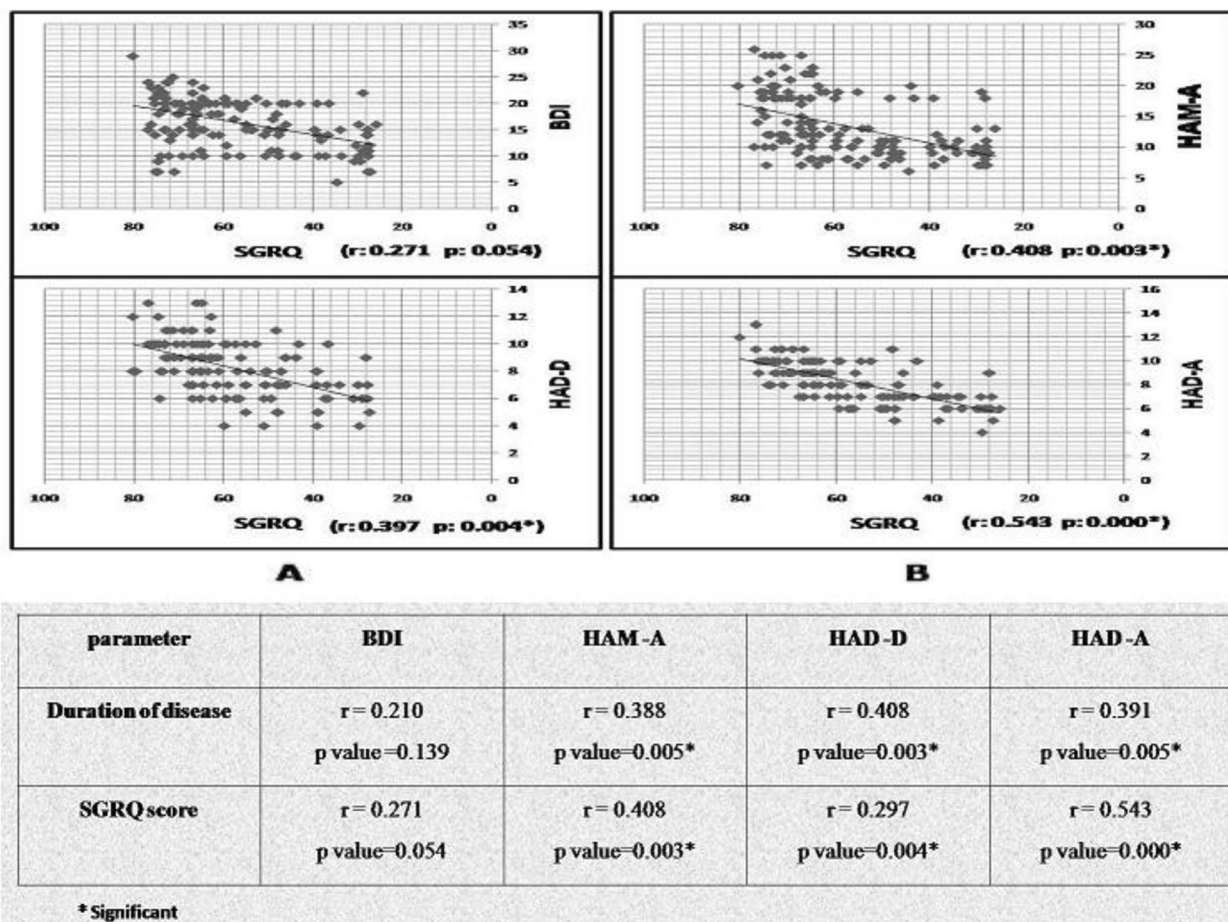
*MC Exact test was used to compare the proportion difference between groups

result which is near to the present study. This study reported that bronchial asthma patients have worst quality of life, and higher depression and anxiety scores as compared to healthy control. The same observation

reported in uncontrolled asthma patients compared to well-controlled group. Studies documented that poorly controlled asthma negatively affects activities of daily life, affects quality of sleep, and leads to social activity deprivation, with subsequent development of anxiety and depression [18, 19]. Ali et al. 2020 [20] studied quality of life in asthmatic individual, and documented that failure to control asthma is one of the risk factors related to poor QOL, the result which comes in agreement with this study. Also, Katarzyna Lomper et al. 2016 [21] studied the impact of depression and anxiety on bronchial asthma personnel, they observed poor QOL in individuals with uncontrolled asthma symptoms, and lower mental and physical health scores. According to multivariate regression analysis in this study, increased frequency of hospital admissions, poor control of asthma symptoms, and increased SGRQ scores were the main predictors for developing anxiety and depression in bronchial asthma patients. SGRQ score ≥ 55.04 had sensitivity 90% and specificity 63.2%,

Table 4 Predictors of anxiety/depression among the asthmatic patients: logistic regression model

Variable	Univariate		Multivariate	
	OR (95% CI)	P value	OR (95% CI)	P value
• Age/years	1.011 (0.853–1.198)	= 0.497		
• Sex (female)	1.806 (0.459–7.104)	= 0.398	2.691 (1.037–6.590)	= 0.628
• Dis. duration/year	1.049 (0.958–1.148)	= 0.303		
• Hospital admission	12.244 (2.256–28.195)	= 0.004	2.987 (1.187–6.446)	= 0.016
• Asthma symp. control	3.510 (1.299–9.488)	= 0.013	1.102 (1.052–4.454)	= 0.041
• FEV ₁	0.828 (0.713–0.992)	= 0.003		
• FVC	0.938 (0.889–0.990)	= 0.019		
• Total SGRQ	1.194 (1.071–2.618)	= 0.006	1.068 (1.008–1.133)	= 0.027

**Fig. 2** Correlation between (disease duration, and SGRQ score) and (anxiety and depression scales) in bronchial asthma patients

with AUC 81.84 in predicting anxiety, while a value ≥ 61.1 had sensitivity 76.67% and specificity 78.95%, with AUC 76.05 in predicting depression in these patients. Repeated bouts of dyspnea that is reported with asthma attacks lead to stress, bad mood, emotional disorders, and anxiety [21]. It is well known that hyperventilation

related to anxiety induces bronchoconstriction, release of neuropeptides, and cytokines, which results in airway inflammation, and again initiation of asthmatic attack [22, 23]. Based on hygiene theory, microbiota change as a result of low level of bacteria exposure leads to marked increase of response of immune

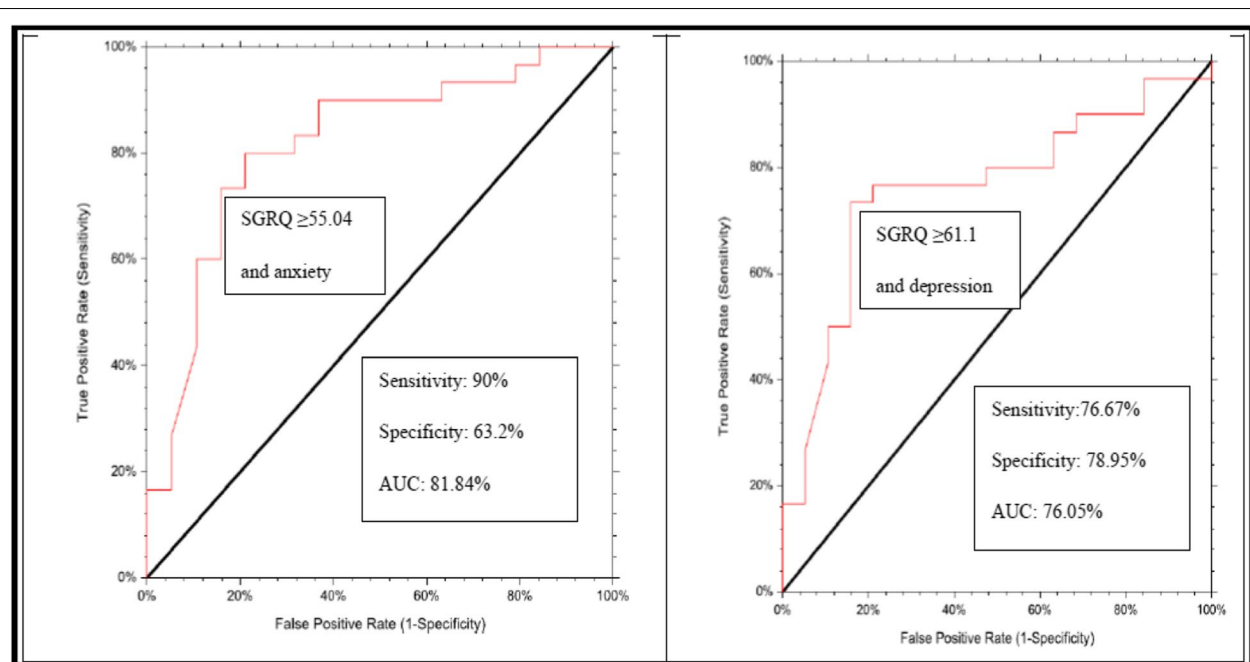


Fig. 3 Sensitivity and specificity of SGRQ in predicting anxiety and depression in bronchial asthma patients

system, the process which is risky for developing both psychiatric and allergic disorders [24]. The theory suggests the same pathophysiology of both depression and bronchial asthma. Several studies reported association, and correlations between QOL of patients with bronchial asthma, and presence of both anxiety and depression [25, 26]. To the best of our knowledge, this is the first study that addresses a cut-off point for SGRQ to predict development of anxiety and depression in bronchial asthma patients.

The recommendations of the current study are regular assessment of quality of life of bronchial asthma patients, and regular screening for presence of psychiatric disorders especially in patients with uncontrolled asthma, and higher SGRQ score.

Conclusion

Depression and anxiety are frequently encountered in patients with bronchial asthma in our society, poor symptom control, poor QOL, and frequent hospital admissions are the main predictors for these psychiatric disorders.

Abbreviations

QOL: Quality of life; WHO: World Health Organization; GINA Global: Initiative for asthma; SGRQ: St. George's Respiratory Questionnaire; HADS-A, HADS-D: Hospital Anxiety and Depression scale; BDI: Beck Depression Inventory scale; HAM-A/HARS: The Hamilton Anxiety Rating Scale; CI: Confidence interval; ROC

curve: Receiver operating characteristics; AUC: Area under the curve; BMI: Body mass index.

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Clinical trial number

Not applicable. This study is an observational study.

Authors' contributions

MME selected the research and help in writing. FAM collected patient's data and participated in writing manuscript. SHS and RME participated in data analysis, statistics, writing, and publication. All authors have read and approved the manuscript, and ensure that this is the case.

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There was no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study design was approved by the Scientific Ethics Committee of Faculty of Medicine of Assiut University (IRB no. 17100089). After meeting inclusion criteria, informed consent is obtained from surrogate decision maker before enrollment.

Consent for publication

Not applicable. There is no identifying images or other personal or clinical details of participants that compromise anonymity.

Competing interests

The authors declare that they have no competing interests.

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