ANALYSIS OF PSYCHOEMOTIONAL STATE AND INTELLECTUAL ABILITIES IN PATIENTS WITH ASTHMA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE - PRELIMINARY RESULTS

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SUMMARY

Background: In the literature we can find examples of comorbidity of the diseases of the respiratory tract and mental disorders. Among them a particularly significant position is occupied by chronic obstructive pulmonary disease (COPD) and asthma, which may be accompanied by anxiety, depressive and cognitive symptoms. The present research project was aimed to establish a connection between psycho-intellectual functioning and suffering from the aforementioned diseases.

Subjects and methods: The patients were divided into 3 groups. In the asthma group there were 11 people, mean age 54, who met the GINA criteria for asthma. The group of patients with COPD was formed by 12 people, mean age 67. The control group included 13 people, mean age 48. Patients from all the groups underwent spirometry, sputum induction and the following tests: Mini-Mental State Examination (MSSE), Trail Making Test (TMT A and B), Beck Depression Inventory – BDI (Beck et al. 1961) and State-Trait Anxiety Inventory for Adults - STAI 1 and 2.

Results: In the TMT tests results were the following: We can presume some deficiency when the time required by a patient to complete the task is longer than 78 seconds for Part A and 273 seconds for Part B. In our research the best mean time was obtained in control group (Part A - 30.04 s, Part B – 67.37 s), then in the asthma group (Part A - 35.54 s, Part B – 98.81 s) and in the COPD group (Part A - 42.80 s, Part B – 107.79 s). In our research study the lowest score for the Beck Depression Inventory was obtained in the control group (mean 6.15), then in asthma (mean 9.63) and in COPD (mean 13.61). Results for State-Train Anxiety Inventory were distributed as follows: mean score in the asthma group was 36.48 in Part 1 and 43.27 in Part 2, in the COPD group 36.41 in Part 1 and 42.66 in Part 2 and in the control group 32.61 in Part 1 and 36.75 in Part 2.

Conclusions: In our research the level of anxiety and depression measured by self-assessment questionnaires was higher in the study groups than in the control group. Also cognitive functions were worse than in the healthy controls, especially among COPD patients.

Key words: *asthma – COPD – anxiety – depression - cognitive functions*

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INTRODUCTION

In the literature we can find examples of comorbidity of the diseases of the respiratory tract and mental disorders (Zawada et al. 2013b). One of the common groups of comorbid conditions are chronic respiratory tract diseases, which constitute a growing *public health problem* in all countries throughout *the* world. Among them a particularly significant position is occupied by chronic obstructive pulmonary disease (further referred to as COPD) and asthma. Both mentioned diseases are characterized by airflow obstruction. The main difference is reversibility – pulmonary obstruction is reversible in asthma, while it is progressively worsening and irreversible in COPD. Both diseases, especially asthma have been found to be comorbid with depressive and anxiety disorders (Van Lieshout et al. 2008, Goodwin et al. 2004, Katon et al. 2004, Nascimento et al. 2002, Thomas et al. 2011). There is also a relationship between the level of anxiety experienced by the patient and the severity of asthma (Richardson 2006, Roy-Byrne 2008). The observations conducted so far suggest that this is the result of an indirect effect of cytokines on neurotransmission in the Central Nervous System.

Depression is characterized by immune activation, particularly the innate immune system (Raison 2006) There is scientific evidence for a relationship between depression and increased levels of the proinflammatory cytokines interleukin (IL)-1 and tumour necrosis factor (TNF). Furthermore frequently administered medications such as corticosteroids and H1-blockers also have an impact on a patient's mental condition (Brown et al. 2007, Brown 2009). They cause deficit of attention and psychomotor retardation, making social functioning difficult and worsening the quality of life.

Proper treatment in most cases can provide control of symptoms and allow the patient to function normally in society. It seems that it is necessary to consider the potential impact of psychological disorders on the therapeutic effects and quality of life of patients with chronic obstructive respiratory diseases such as asthma and chronic obstructive pulmonary disease.

In recent years, diagnostic methods are constantly improving, there are newer and more effective methods of treatments, however, data on the significance of psychological disorders in the mentioned diseases is limited. Articles published so far provide a basis for believing that deepening this knowledge will give a

chance to extend the range of treatment methods with adequate psychopharmacotherapy providing an improvement in the patient's cooperation in the process of treatment and improve his quality of life.

SUBJECT AND METHODS

The present research project was aimed at establishing a connection between psycho-intellectual functioning and suffering from the aforementioned diseases. The first part of the project was dividing the patients into 3 groups (based on spirometry with reversibility test and physical examination) – the patients with asthma, COPD and the control group. All patients had to *sign a conscious consent* to *participate in the study*.

In the asthma group there were 11 people, mean age 54, who met the GINA criteria for asthma - typical symptoms, typical interview, variable and reversible airway obstruction on spirometry tests - recently or documented in the past and were in a stable period of the disease (based on medical history and physical examination).

The group of patients with COPD was formed by 12 people, mean age 67. Inclusion criteria for this group were: typical interview (exertional dyspnea, progressive, chronic, productive cough), FEV1/FVC <0.7 after inhalation of bronchodilators, and stable period of the disease (on the basis of medical history and physical examination).

The control group included 13 people, mean age 48, not suffering from other chronic diseases of the respiratory system and not reporting and never treated for any mental health disorders. Exclusion criteria for all three groups were: no *voluntary written conscious consent* to *participate in the study*, contraindications for sputum induction (poorly controlled asthma, COPD in stage III and IV according to GOLD), contraindications to perform spirometry (aneurysms of the aorta or cerebral arteries, history of retinal detachment or recent ophthalmic surgery, hemoptysis of unknown origin, pneumothorax, myocardial infarction or stroke during hospitalization, the state after surgery of the abdomen or chest), pregnancy, respiratory tract infectious disease currently or within the last 4 weeks, validated cognitive deficits disabling participation in the study (based on MMSE), psychiatric disorders requiring constant therapy and organic primary CNS damage. Patients from all the groups underwent spirometry, sputum induction and the following *tests*: Mini-Mental State Examination (MSSE), Trail Making Test (TMT A and B), Beck Depression Inventory – BDI (Beck et al. 1961) and State-Trait Anxiety Inventory for Adults - STAI 1 and 2 (Spielberger 1983). Statistical analysis was performed with Statistica v. 10.

RESULTS

Mini Mental State Examination was used to exclude patients with cognitive impairment (<25 points). Mean MMSE score was similar in all groups – around 28 points. The lowest score – 26 points was obtained by a patient from the COPD group. The Trail Making Test (TMT) measures attention, speed, mental flexibility, spatial organization, visual pursuits, recall, and recognition (Corrigan 1987). Both parts of the test consist of 25 circles printed on a sheet of paper, the patient's task is to connect the numbers (Part A) or numbers and letters (Part B) in ascending order. We can presume some deficiency when the time required by a patient to complete the task is longer than 78 seconds for Part A and 273 seconds for Part B. In our research the best mean time was obtained in the control group (Part A - 30.04 s, Part B – 67.37 s), then in the asthma group (Part A - 35.54 s, Part B – 98.81 s) and in the COPD group (Part A - 42.80 s, Part B – 107.79 s).
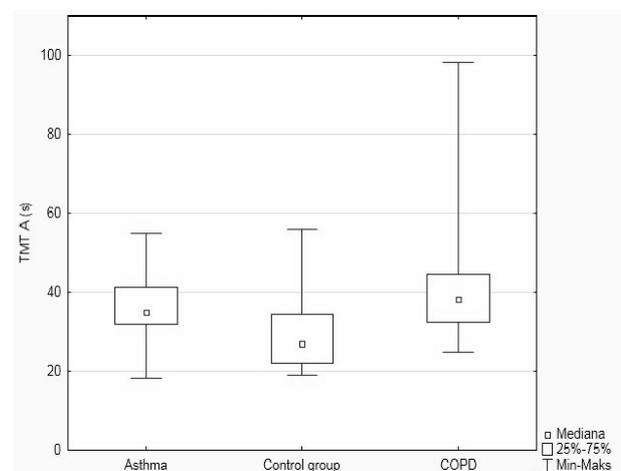

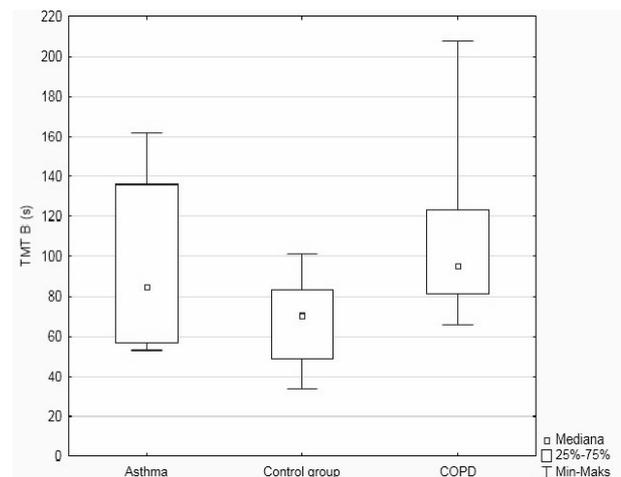**Figure 1.** Trial Making Test Part A

Figure 2. Trial Making Test Part B

The Beck Depression Inventory is a self-assessment questionnaire widely used for measuring the severity of depression, higher scores reveal greater depression. In our research study the lowest score was obtained in the control group (mean 6.15), then in asthma (mean 9.63) and in COPD (mean 13.61).
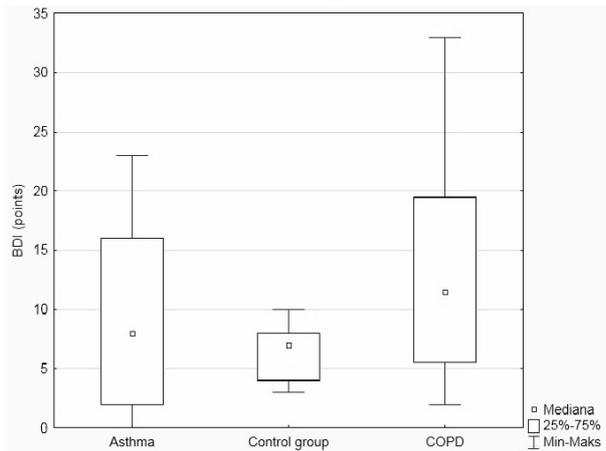
Figure 3. Beck Depression Inventory

State-Trait Anxiety Inventory for Adults is a self-report tool to measure anxiety. Higher scores are positively correlated with higher levels of anxiety. Results were distributed as follows: mean score in the asthma group was 36.48 in Part 1 and 43.27 in Part 2, in the COPD group 36.41 in Part 1 and 42.66 in Part 2 and in the control group 32.61 in Part 1 and 36.75 in Part 2.
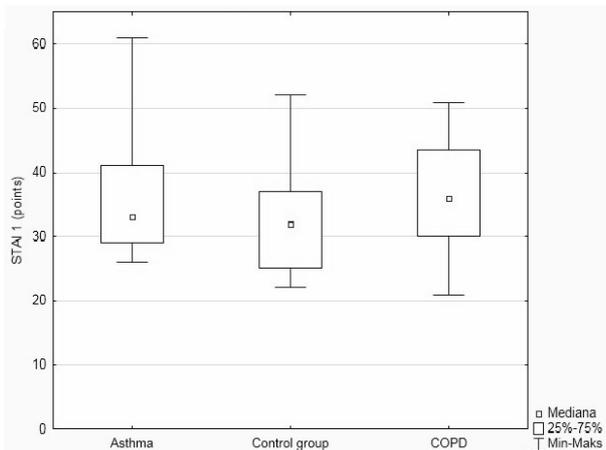

Figure 4. State-Trait Inventory Part 1

We also performed a statistic analysis of correlation with the use of Spearman's rank correlation coefficient (Table 1).
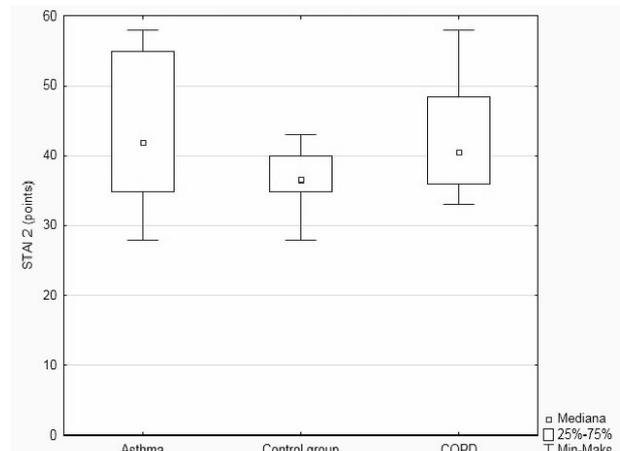

Figure 5. State-Trait Inventory Part 2

Spearman's rho from -1 to 0 indicates a negative correlation and from 0 to 1 a positive correlation. As it shows the percent of eosinophils (typical for inflammatory infiltration in asthma) and neutrophils (typical in COPD) is positively correlated with higher scores in all the conducted tests. In all performed tests a higher score indicated greater impairment in the measured factors. FEV1/FVC ratio (Tiffeneau index) which indicates obturation when lower than 70% correlates negatively with all scores – in other words more severe obturation is connected with worse psycho-emotional and cognitive functioning.

DISCUSSION

Patients with chronic pulmonary diseases present a greater predisposition to anxiety and depressive disorder compared with the population in general. COPD as a progressive irreversible disease is not surprisingly accompanied by a higher prevalence of psychological disorders (Zawada et al. 2013a). A review of the litera-ture revealed high comorbidity of chronic obstructive pulmonary disease (COPD) and states of anxiety and depression, prevalence of those symptoms in COPD patients varies up to around 50% (Mikkelsen 2004). According to Brenes (2003) anxiety disorders, espe-cially generalized anxiety disorders (GAD) are more

Table 1. Correlation between spirometry and induced sputum parameters and psychointelectual functioning measured by tests

	Spirometry	Induced sputum				
	FEV1/VC	Cells (x10 6/g)	Macrophages (%)	Lymphocites (%)	Eosinophils (%)	Neutrophils (%)
TMT A	-0.357655	0.299622	-0.191831	0.075149	0.150864	0.133180
TMT B	-0.482628	0.389050	-0.326671	0.055520	0.357471	0.051160
BDI	-0.226875	-0.075749	-0.257655	-0.102713	0.218688	0.314379
STAI 1	0.031447	0.165590	-0.103021	0.179921	0.005194	0.176431
STAI 2	-0.152961	-0.209388	-0.063149	0.062839	0.133143	0.079511

frequent in patients with COPD than in the population as general – the frequency of GAD varies between 10 – 16 % in COPD patients while in the general population it is usually lower than 5 %. Depression in COPD patients is common (36-44%) however often undetected and untreated – on the one hand screening tools for depression and anxiety disorders are not routinely employed, on the other hand patients often deny that they are suffering from anxiety and depression for fear of stigmatization (Yohannes 2000). Additional risk factors for depression in patients with COPD are living alone, physical impairment and severity of airway obstruction (van Manen et al. 2002). Apart from lower quality of life there are also socioeconomic implications – patients with psychiatric comorbidity were spending twice as long time in hospital (Yellowlees et al. 1987). As for cognitive impairment there are studies indicating that cognitive function is only mildly impaired in COPD patients without hypoxemia (Dodd 2010). There is no doubt that asthma is an inflammatory disease but there are also a number of studies presenting evidence for increased inflammation in depression (Alesci 2005, Krishnadas 2012, Ford 2004, Maes 1999, Sluzewska 1995) therefore it is not surprising that asthma is associated with a higher risk of depression. In a study evaluating the relative impact of having depressive and/or anxiety disorder on asthma control and quality of life (Lavoie at al. 2006) it was found that both depression and anxiety are associated with worse asthma-related quality of life, but only depressive disorders are associated with worse asthma control. What is interesting, having both a depressive and anxiety disorder did not present additional risk for worse asthma control or quality of life. Many authors draw attention to the connection between the mental state of patients, progression of the disease and the effectiveness of treatment (Lavoie et al. 2005, Valenca et al. 2006). Patients with cognitive deficits less frequently obey doctors' recommendations due to the problems with understanding given advice and putting it into practice.This leads to the conclusion that cognitive deficits are often associated with poor control of the disease and the severity of symptoms.

CONCLUSIONS

The significance of psychological symptoms in patients suffering from asthma and chronic obstructive pulmonary disease is undeniable. In our study , the level of anxiety and depression measured by self-assessment questionnaires was higher than in the control group. Also cognitive functions were worse than in the healthy controls, especially in COPD patients. The limitation of the study is the small group of subjects, therefore this topic needs further investigation in a more numerous group, but the results obtained so far allow us to presume that the correlation will be confirmed.

References

1. *Alesci S, Martinez PE, Kelkar S, Ilias I, Ronsaville DS, Listwak SJ et al.: Major depression is associated with significant diurnal elevations in plasma interleukin-6 levels, a shift of its circadian rhythm, and loss of physiological complexity in its secretion: clinical implications. J Clin Endocrinol Metab 2005; 90:2522-30.*
2. *Beck AT, Ward CH, Mendelson M, Mock J & Erbaugh J: An Inventory for Measuring Depression. Arch Gen Psychiat 1961; 4:561-71.*
3. *Brenes GA: Anxiety and chronic obstructive pulmonary disease: prevalence, impact, and treatment. Psychosom Med 2003; 65:963-970.*
4. *Brown ES, Vera E, Frol AB, Woolston DJ & Johnson B: Effects of chronic prednisone therapy on mood and memory. J Affect Disord 2007; 99: 279–83.*
5. *Brown ES: Effects of glucocorticoids on mood, memory, and the hippocampus. Treatment and preventive therapy. Ann N Y Acad Sci 2009; 1179:41-55.*
6. *Carvalho NS, Ribeiro PR, Ribeiro M, Nunes Mdo P, Cukier A & Stelmach R: Comparing asthma and chronic obstructive pulmonary disease in terms of symptoms of anxiety and depression. J Bras Pneumol 2007; 33:1-6.*
7. *Corrigan JD & Hinkeldey MS: Relationships between Parts A and B of the Trail Making Test. J Clinical Psychology 1987; 43:402-9.*
8. *Dodd JW, Getov SV & Jones PW: Cognitive function in COPD. Eur Respir J 2010; 35:913–22.*
9. *Ford DE & Erlinger TP: Depression and C-reactive protein in US adults. Arch Intern Med 2004; 164:1010–4.*
10. *Goodwin RD, Fergusson DM & Horwood LJ: Asthma and depressive and anxiety disorders among young persons in the community. Psychol Med 2004; 34:1465-74.*
11. *Katon WJ, Richardson L, Lozano P & McCauley E: The relationship of asthma and anxiety disorders. Psychosom Med 2004; 66:349-55.*
12. *Kim LL, Simon BL, Barone S, Cartier A, Ditto B & Labrecque M: What is worse for asthma control and quality of life depressive disorders, anxiety disorders, or both? Chest 2006; 130:1039-47.*
13. *Krishnadas R & Cavanagh J: Depression: an inflammatory illness? J Neurol Neurosurg Psychiatry 2012; 83:495-502.*
14. *Lavoie KL, Cartier A, Labrecque M, Bacon SL, Lemière C, Malo JL et al.: B: Are psychiatric disorders associated with worse asthma control and quality of life in asthma patients? Rev Bras Psiquiatr 2006; 28:206-8.*
15. *Maes M: Major depression and activation of the inflammatory response system. Adv Exp Med Biol 1999; 461:25-46.*
16. *Mikkelsen RL, Middelboe T, Pisinger C & Stage K: Anxiety and depression in patients with chronic obstructive pulmonary disease (COPD). A review. Nord J Psychiatry 2004; 58:65.*

17. *Nascimento I, Nardi AE, Valença AM, Lopes FL, Mezzasalma MA, Nascentes R et al.: Psychiatric disorders in asthmatic outpatients. Psychiatry Res 2002; 110:73-80.*

18. *Raison CL, Capuron L & Miller AH: Cytokines sing the blues: inflammation and the pathogenesis of depression. Trends Immunol 2006; 27:24–3.*

19. *Richardson LP, Lozano P, Russo J, McCauley E, Bush T & Katon W: Asthma symptom burden: relationship to asthma severity and anxiety and depression symptoms. Pediatrics 2006; 118:1042-51.*

20. *Roy-Byrne PP, Davidson KW, Kessler RC, Asmundson GJ, Goodwin RD, Kubzansky L et al.: Anxiety disorders and comorbid medical illness. Gen Hosp Psychiatry 2008; 30:208-25.*

21. *Słuzewska A, Rybakowski JK, Laciak M, Mackiewicz A, Sobieska M & Wiktorowicz K: Interleukin-6 serum levels in depressed patients before and after treatment with fluoxetine. Ann NY Acad Sci 1995; 762:474–6.*

22. *Spielberger CD: Manual for the State-Trait Anxiety Inventory STAI (Form Y) ("Self Evaluation Questionnaire") Palo Alto: Consulting Psychologists Press, Inc, 1983.*

23. *Thomas M, Bruton A, Moffat M & Cleland J: Asthma and psychological dysfunction. Prim Care Respir J 2011; 20:250-6.*

24. *Valença AM, Falcão R, Freire RC, Nascimento I, Nascentes R, Zin WA et al.: The relationship between the severity of asthma and comorbidities with anxiety and depressive disorders. Respir Med 2005; 99:1249-57.*

25. *Van Lieshout RJ & Macqueen G: Psychological factors in asthma. Allergy Asthma Clin Immunol 2008; 4:12-28.*

26. *Yellowlees PM, Alpers JH, Bowden JJ, Bryant GD & Ruffin RE: Psychiatric morbidity in patients with chronic airflow obstruction. Med J Aust 1987; 146:305.*

27. *Yohannes AM, Baldwin R & Connolly MJ: Depression and anxiety in elderly outpatients with chronic obstructive pulmonary disease: prevalence, and validation of the BASDEC screening questionnaire. Int J Geriatr Psychiatry 2000; 15:1090-6.*

28. *Zawada K, Bratek A & Barczyk A: Analiza zaburzeń funkcji poznawczych nasilenia lęku i depresji u chorych z astmą, przewlekłą obturacyjną chorobą płuc oraz zespołem nakładania astmy i POChP. Pneumonol Alerg Pol 2013a; 81: Suppl 1:1.*

29. *Zawada K, Burzynska-Kozmin A & Krysta K: 2779 – Patients with obesity hypoventilation syndrome and mental disorders. Eur Psychiatry 2013b; 28: Suppl 1:1.*

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