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The significance of selected psychopathological and personality variables in the course of allergic and non-allergic asthma

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Summary

Aim. The aim of this study was to carry out a comparative analysis of selected psychopathological and personality variables in patients with allergic and non-allergic asthma, as well as an attempt to determine the significance and strength of these variables in the clinical picture of both forms of the disease.

Methods. In all patients structured anamnesis, basic spirometry, and dyspnea measurement were carried out. The level of anxiety was determined using Spielberger's questionnaire. The intensity of depression was evaluated with Beck's Inventory. Neuroticism and extroversion-introversion were assessed by Eysenck's Inventory. The I-E scale was used to determine the perception of the locus of control.

Results. The lack of significant differences in the area of psychopathological and personality variables was found between the two types of asthma. The gender differentiated patients with respect to psychopathology. The intensity of extroversion correlated with the duration of the disease. In the case of neuroticism, the clinical form of the disease was associated with blurring the differences between genders. The intensity of dyspnea and the spirometric results correlated with the psychological background of the disease.

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Conclusions. No significant differences in the area of psychopathology and personality dimensions between the groups of patients with allergic and non-allergic asthma were found although psychological variables are associated with the course of asthma in adults.

Key words: asthma, psychopathology, personality

Introduction

Psychiatric morbidity in patients with bronchial asthma is an important clinical issue [1]. Anxiety and depressive disorders are of particular importance. In one of the studies it was found that anxiety syndromes occur in over 60% of asthma sufferers [2] whereas depressive disorders concern from 28% [3] to 66% [4] of these patients. Moreover, increasing number of publications describe a specific personality profile of asthma patients [5,6] and some personality dimensions e.g. extroversion can have a significant role in moderating the course of the disease e.g. resulting in its aggravation [7].

The psychological background to asthma thus remains associated with its course, which also affects its subjective manifestations. Nowobilski [8] demonstrated the relationship between dyspnea perception, anxiety-trait, anxiety-state, depression and neuroticism.

Asthma can be divided into two clinical types: allergic and non-allergic. These forms differ partly in etiology and course [9,10]. Allergic asthma usually occurs at a younger age, more often in male patients. It is connected with a more favorable prognosis and there is a possibility to identify specific allergens responsible for bouts of dyspnea. The non-allergic form usually appears in people aged over 40 years, and more often in female patients. It is marked by a more serious course with frequent co-occurrence of nasal polyps. Skin allergy tests are usually negative [10].

In the context of the present study, the most interesting element in scientific publications are reports on the differentials in psychopathological profiles of patients suffering from allergic and non-allergic asthma. Ciesielska-Kopacz [11] conducted a study demonstrating the differences between these two groups of asthma patients in terms of selected personality dimensions. Non-allergic patients showed distinct distrust of other people, a sense of uncertainty, a feeling of constant threat, worrying, low self-esteem and scrupulousness. In another study, a team of Belgian researchers demonstrated that a recurrence of illness, which required hospitalization, is the reason for the aggravation of anxiety-depressive symptoms greater in patients with the allergic form of asthma [12]. These authors put forward a hypothesis of higher adaptive capabilities in non-allergic asthmatics – because of an unpredictable course of illness (lack of allergens) – staying in hospital would not be associated with feelings of guilt and unsuccessful therapy. In the case of allergic asthma patients the recurrence may be experienced as a failure to comply with the doctor's recommendations (avoiding allergens) which could be associated with the onset of depressive symptoms.

Also of interest are the results obtained in a recent study conducted with a sample group of children [13]. After examining 431 patients it turned out that depressive symptoms occurred three times more often in girls with non-allergic asthma compared with a control group of healthy children. No similar relationship could be found among boys.

Comparative studies on patients with difficult asthma and aspirin-induced asthma carried out by Potoczek indicated differences between these groups in terms of severity of panic disorders which is higher in patients with difficult asthma. Similarly, the sense of coherence as a personality trait is weaker in this group and the use of immature personality defense mechanisms is more frequent. On the other hand, in aspirin-induced asthma there is more frequent co-occurrence of anxiety and depression [14-17].

Undertaking the presented study is justified by the differences in psychopathology of patients suffering from the two concerned forms of asthma as well as the reports on moderating the impact of psychopathological and personality factors on its course, also taking into account the subjective symptoms of the disease [18, 19].

Material

The study covered 93 subsequent asthma patients (66% of them – females), in stable state, reporting for planned medical check-up appointments. Because of the low number of patients with Ist level of advancement (intermittent asthma) calculations for three groups with Ist and IInd levels combined into one were made. Patients with allergic asthma made up 66.67% of patients examined while those with non-allergic asthma – 31.33%.

Table 1. **Distribution of the frequency of allergic and non-allergic asthma according to gender**

		Gender				Total	
		W		M			
		N	%	N	%	N	%
Asthma types	non-allergic	20	32,79	11	34,38	31	33,33
	allergic	41	67,21	21	65,63	62	66,67
Total		61	66,67	32	33,33	93	100,00

Abbreviations: W – women, M – men; N – number of cases.

Table 2. **Distribution of degrees severity (GINA) in groups of patients with allergic and non-allergic asthma**

		Asthma types				Total	
		allergic		non-allergic			
		N	%	N	%	N	%
GINA	II	20,00	41,67%	11,00	37,93%	31,00	40,26%
	III	9,00	18,75%	8,00	27,59%	17,00	22,08%
	IV	19,00	39,58%	10,00	34,48%	29,00	37,66%
Total		48,00	100,00%	29,00	100,00%	77,00	100,00%

$\chi^2(2) = 0.827$; $p = 0.661$

Abbreviations: n- number of patients; GINA- indicates the degree of advancement of the disease

The analysis of distribution of the degree of asthma severity in patients with allergic and non-allergic asthma showed no differentiation (χ^{2-} test).

Table 3. **Age of patients and duration of the disease vs. the forms of asthma: allergic and non-allergic**

Independent variables	$\overline{\chi}$		SD		p
	allergic	non-allergic	allergic	non-allergic	
Age	53,9	42,0	11,3	12,5	<0,001
Disease duration	14,1	15,0	9,4	12,6	>0,05

Abbreviations: $\overline{\chi}$ – mean value; SD – standard deviation; p – level of significance

Tools

Sociodemografic data were obtained using a structured interview. The severity of asthma (GINA) [20] and its type were assessed by specialists in pulmonology and allergology. A spirometric measurement was performed during abstinence from inhaled bronchodilators on the examination day. The dyspnea level determined by the patient during the examination was registered on 10-point Borg scale [21]. The evaluation did not include the measurement of dyspnoea during asthma attack. Only the patients who had no need of the use of inhaled β_2 mimetics were included. The type of the long-term pharmacotherapy was not recorded and separately analyzed and was only reflected by the severity of asthma measurement.

Selected psychopathological variables and personality dimensions were studied by using the following research tools: anxiety (State and Trait Anxiety Inventory (STAI) forms X-1, X-2) [22, 23], depression (Beck Inventory: BDI Long Form) [24, 25], extroversion-introversion, neuroticism and lie (MPI Maudsley Personality Inventory, MPI) [26]. The lie-subscale of this tool enables researchers to assess the tendency to hide personal problems as well as inclinations to the defensive idealisation of self-image in a socially accepted direction. The perception of the locus of control was assessed by Rotter Internal-External Control Scale [27].

Statistical analysis

Statistical analyses were performed using the STATISTICA software. The analysis of distribution of the degree of asthma severity were determined by the χ^2- test. The differences in psychopathology and selected personality aspects between allergic and non-allergic patients were studied with t-test. The multi-factor analysis of variance (ANOVA) was used to test the effects of categorical variables interaction in shaping the dependent variables. Although it was not necessary [28], the normality of distribution and the homogenaty of variance was verified and there were no significant violations of them. Links between quantitative variables were identified using correlation analysis.

Results

Table 4. **Values of selected spirometric variables in allergic and non-allergic asthma patients**

Spirometry	$\bar{\chi}$		SD		p
	allergic	non-allergic	allergic	non-allergic	
FEV_1	74,35	82,90	22,29	22,84	0,090
FEV_1 / FVC	72,66	74,78	11,06	12.33	0,405
$MEF_{25\%VC}$	59,27	65,50	27,43	30.98	0,329
$MEF_{50\%VC}$	51,16	60,18	29,91	30.95	0,181
$MEF_{75\%VC}$	49,06	57,71	31,78	31.96	0,223

Abbreviations: $\bar{\chi}$ – mean value; SD – standard deviation; p – level of significance; FEV_1 – forced expiratory volume in one second; FVC – forced vital capacity MEF 25. 50. 75% VC- maximal expiratory flow at 25, 50, and 75% of vital capacity;

The mean values of the analysed spirometric variables did not differentiate patients with allergic and non-allergic asthma.

The verification of the differences with respect to psychopathological and personality variables between allergic and non-allergic asthma patients did not find statistical significance ($p>0.05$).

Table 5. **Psychopathology and personality variables vs allergic and non-allergic asthma (Student's t-test)**

	$\bar{\chi}$		SD		p
Variables	allergic	non-allergic	allergic	non-allergic	
Anxiety – state	40,11	37,66	11,67	9,01	0,316
Anxiety – trait	45,73	46,00	10,12	7,80	0,901
Depression	15,18	11,90	9,52	7,51	0,103
Extroversion/ Introversion	29,83	30,93	9,11	9,33	0,598
Neuroticism	26,67	25,58	11,90	10,08	0,671
Locus of control	11,04	11,40	3,52	3,56	0,656
Lie	25,87	23,89	5,54	5,17	0,110

Abbreviations: $\bar{\chi}$ – mean value; SD – standard deviation; p – level of significance;

The multi-factor analysis of variance showed only the correlation between the time of suffering from asthma and the extroversion values ($p=0.025$). Using the post-hoc Games-Howell test, a higher degree of extroversion was shown in the group of patients who had suffered from the disease for up to 10 years compared with the group of patients who had suffered for 11 to 20 years ($p=0.049$).

Table 6. **Analysis of variance (ANOVA) – effect of the asthma type x duration of disease interaction upon the extroversion values**

Source of variance	F	P
Asthma type	0,00	0,978
Disease duration	3,90	0,025
Allergy × Disease duration	2,91	0,060

Abbreviations: F – the Snedecor-Fisher distribution, p – level of significance

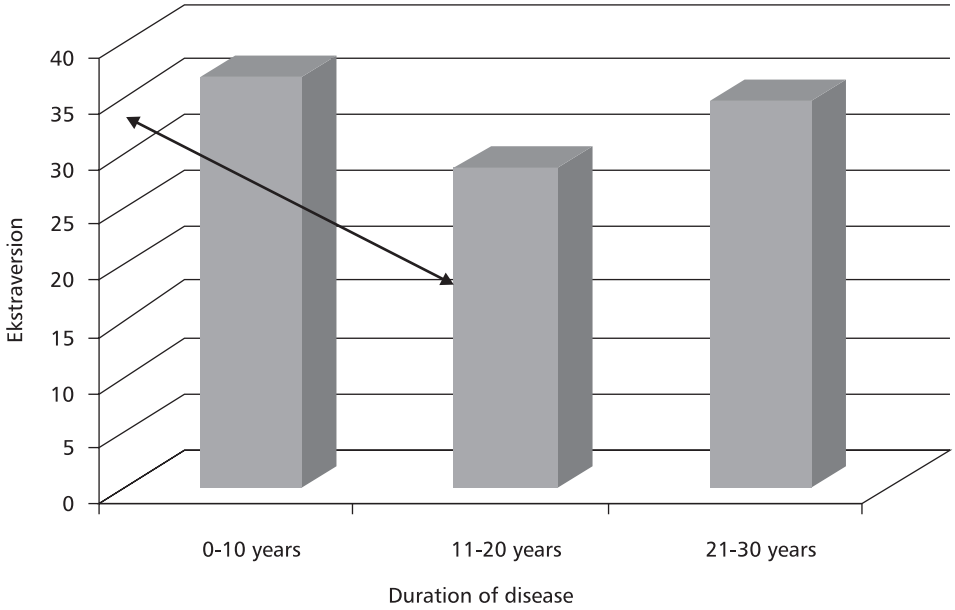

Fig. 1. **Extroversion levels in three groups of patients differentiated on the basis of length of disease**

The men attained lower values of psychopathological and personality variables than women in the cases of anxiety-state (p=0.028), anxiety-trait (p=0.008), depression (p=0.002), and neuroticism (p=0.017). However, the asthma type did not differentiate between the values of psychopathological and personality values obtained, neither generally nor separately in particular sub-groups distinguished by gender (p>0.05). In the case of neuroticism, the differences between genders were statistically insignificant in the group of patients with non-allergic asthma. In the group of allergic asthma sufferers, men had a lower average value of neuroticism (ANOVA, pair-wise comparisons p<0.001 with interaction gender-asthma type in ANOVA at the level of p=0.038) (Table 7 and Table 8).

Table 7. **Effect of asthma type x gender on the values of neuroticism (ANOVA)**

Source of variance	F	p
Allergy	0,05	0,811
Gender	5,93	0,017
Allergy × Gender	4,42	0,038

Abbreviations: F – Snedecor-Fisher distribution, p – level of significance

Table 8. **Neuroticism vs asthma type: allergic and non-allergic by gender (ANOVA, pair-wise comparison)**

Asthma type	Difference between means	SD	p
allergic	11.53	2,82	0,001
Non-allergic	0,85	4,22	0,841

Abbreviations: SD – standard deviation, p – level of significance

The verification of relationships between asthma type and psychopathology and personality profile, divided by the degree of severity of the disease (using multi-factor ANOVA analysis of variance) did not show features of statistical significance ($p>0.05$). The clinical form of disease did not differentiate the examined psychological variables neither generally nor separately in particular sub-groups distinguished by the degree of asthma severity ($p>0.05$).

On the other hand, the intensity of dyspnea correlated positively with most of the studied psychopathological and personality variables (for anxiety – state: $p<0.01$, $r=0.43$; anxiety – trait: $p<0.01$, $r=0.31$; depression: $p<0.01$, $r=0.38$; neuroticism: $p<0.05$, $r=0.28$). It is worth noting that the above correlations continued after the controlling of spirometric variables, gender, and BMI in the analysis of partial correlations. Testing for the existence of possible differences in the strength of the above-mentioned correlations in patients with allergic and non-allergic asthma did not show features of statistical significance ($p>0.05$).

Anxiety – state correlated negatively with the spirometric variables: FEV_1 ($r=-0.21$, $p<0.05$), PEF ($r=-0.25$, $p<0.01$), and $MEF_{75\% VC}$ ($r=-0.18$, $p<0.05$), whereas anxiety – trait correlated with: FEV_1/FVC ($r=-0.20$, $p<0.05$), PEF ($r=-0.22$, $p<0.05$), $MEF_{25\% VC}$ ($r=-0.22$, $p<0.05$), and $MEF_{50\% VC}$ ($r=-0.19$, $p<0.05$). The depression intensity correlated negatively with all analysed results of spirometric variables except FEV_1/FVC. Similarly, in the case of dyspnoea, the attempt to check the difference between the strengths of the above correlations between the two types of asthma did not yield the results with statistical significance ($p>0.05$).

Discussion

The conducted analyses indicate the lack of significant differences between mean values of spirometric variables in allergic and non-allergic asthma (Table 4). These results may be indirectly indicative of the similar level of advancement of the disease in both examined groups of patients which is also partly confirmed by the analysis of the distribution of the degrees of asthma severity (Table 2).

Allergic or non-allergic type of asthma was also unrelated to the differentiation of patients with respect to the values of selected psychopathological and personality variables. These results are somewhat opposite to the results of studies by Ciesielska-Kopacz [11] where a higher level of psychological disorders was found in a group of patients with non-allergic asthma. In the cited study, these patients scored higher values in the sub-scale of psychopathy, depression, and hysteria (MMPI questionnaire). The different results can be explained by different set of used psychometric tools. The author of the article compared relatively static dimensions of the personality, connected with the tendency to react in psychopathological symptoms. Our analyzes concerned mainly dynamic psychological parameters or personality dimensions not referring directly to the psychopathological symptoms. Our studies also did not confirm the results of observations by Teiramaa [29] indicating higher values of extroversion in allergic patients. However, our observation of the relationship between the duration of suffering from asthma and the extroversion values appeared to be quite interesting. The multifactor variance analysis unambiguously indicates the existence of this interaction, with a simultaneous absence of significant differences in the extroversion values in patients with allergic and non-allergic asthma. Greater extroversion was demonstrated in the sub-group of patients with the duration of disease up to 10 years compared with the sub-group of patients suffering from 10 to 20 years. Similar results can be found in the study by Fernandes et al. [30] who also succeeded in observing the phenomenon of a decrease in extroversion in line with the progressing duration of the disease, as well as finding a negative correlation with the degree of asthma severity. We can thus talk about the modification of one of the personality dimensions in the course of suffering from asthma. This observation reveals that with the elongation of the time of the course of asthma (after ca. 10 years of the disease), the patients become more introverted which – in the light of one recent study – permits the conjecture of adoptive nature of this phenomenon. In this study [7] high values of extraversion were a risk factor for the occurrence of asthma symptoms in women. In our study the tendency of decreasing extraversion in line with the duration of disease was not of a linear nature. In the sub-group of patients suffering for over 20 years there is a repeated increase in this personality dimension (Fig. 1). It is difficult to interpret unequivocally the result on the basis of our study. Further research should be done for this purpose. In particular, our study did not analyzed the age as a grouping variable. In a larger group of patients it would be also justified to repeat the analyses of differences between the allergic and non-allergic asthma for particular ranges of the duration of these diseases.

On the other hand, an attempt to verify the effect of gender and the type of asthma on the values of selected psychological variables did not show differences for the two

clinical types of the disease, permitting only the determination of differences between genders.

A result, which needs to be commented upon, is obtaining significant interaction in the multi-factor analysis of variance between the type of asthma and gender of patients with respect to neuroticism (Table 7). The differences between genders were significant in the group with allergies – men had a lower mean value (Table 8) whereas they were statistically insignificant in the group of non-allergic subjects. The asthma type was thus associated with the disappearing of differences between genders with respect to one of the personality dimensions. Such a result permits the conjecture that the etiology of asthma is not unimportant for the psychological background of the disease. Moreover, there are studies describing the increased risk of the occurrence of asthma in the case of increased values of neuroticism [31]. In this context, one can presume that in patients with non-allergic asthma, this personality dimension is associated with complex etiological mechanisms, in women and men equally. The triggering of a dyspnea attack depends on a number of vegetative-immunological factors, while psychological dimensions associated with the variability of the disease (in this case: neuroticism) perhaps differentiate allergic and non-allergic patients developing differently in both genders.

The verification of the effect of interaction between the degree of severity (advancement) of the disease and asthma type upon the developing of psychological variables showed that the asthma type did not differentiate psychopathological and personality dimensions, neither generally nor separately in particular groups established on the basis of the disease advancement.

Reports on greater levels of psychiatric disorders in asthmatics with more advanced forms of asthma can be found in publications Esponosa et al. [32], examined a group of 120 adults (60 patients with asthma and 60 patients in a control group) with respect to the co-occurrence of anxiety-depression disorders and their relationship with the degree of disease advancement. It turned out, that patients with severe advancement of asthma suffered depression disorders more often, although no such correlations were shown in the case of anxiety disorders. This correlation was not found in our study either.

Then, the analysis of correlation between psychopathological and personality variables, and the intensity of dyspnea in asthma patients showed that only in the case of extroversion and perceiving the locus of control, can the statistical significance not be proven. No significant differences were found in the strength of this relationship between the groups distinguished on the asthma type analysed. In the course of comparisons between groups, the psychopathology-dyspnea correlation disappeared with respect to some psychological variables, rendering further comparative analysis impossible. Similar results can be found in the paper by Ekici et al. [33] also showing a significant relationship between depression symptoms and the feeling of dyspnea. Unfortunately, as of today, the body of professional publications does not include studies on the strength of psychopathology-dyspnea interaction, comparing patients with allergic and non-allergic asthma. This type of studies could be of paramount significance in attempts to understand the complex mechanisms of the relationship between psychological factors and the course of these two clinical forms of the disease. The results obtained in our study do not permit the differentiation of allergic and non-

allergic patients in that respect, which permits saying that ignoring anxiety-depression disorders can be considered to be a therapeutic error, both in the case of the group suffering from allergic as well as non-allergic asthma.

In subsequent calculations we have demonstrated correlations between the functional examinations of the respiratory system and the majority of psychopathological and personality dimensions. Similarly, in the case of dyspnea the differences in the strength of described correlations between allergic and non-allergic forms of asthma could not be demonstrated.

Nowobilski [34] and Krommydas [4] also described the correlations with features of significance along the axis of the psychopathology-functional state of respiratory system. However, in their studies, these researchers did not take into account the differentiation of two clinical forms of bronchial asthma.

Conclusions

1. The lack of significant differences in the field of psychopathology and personality dimensions in groups of patients with allergic and non-allergic asthma does not justify marking any of these two groups as requiring different psychological responses.
2. Feeling breathlessness and the results of functional examinations of the respiratory system have a certain relationship with the psychological background of the disease but without differentiating the two clinical types of asthma.
3. Female asthma sufferers are the group of patients which may require particular attention from clinicians due to higher, comparing with men, values of psychopathological indicators.
4. Neuroticism does not differentiate genders of patients with respect to complex etiology of the disorder in the case of non-allergic asthma.

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