

# THE PREVALENCE OF ASTHMA WORK RELATEDNESS: PRELIMINARY DATA

WOJCIECH DUDEK<sup>1</sup>, IZABELA KUPRYŚ-LIPIŃSKA<sup>2</sup>, TOMASZ WITCZAK<sup>3</sup>,  
DOMINIKA ŚWIERCZYŃSKA-MACHURA<sup>4</sup>, MACIEJ KUPCZYK<sup>2</sup>, JOLANTA WALUSIAK-SKORUPA<sup>4</sup>,  
PIOTR KUNA<sup>2</sup>, and CEZARY PAŁCZYŃSKI<sup>2</sup>

<sup>1</sup> Dr Karol Jonscher City Hospital, Łódź, Poland  
Department of Internal Diseases and Cardiology

<sup>2</sup> Medical University of Lodz, Łódź, Poland  
Department of Internal Medicine, Asthma and Allergy

<sup>3</sup> The Regional Centre for Occupational Medicine, Łódź, Poland

<sup>4</sup> Nofer Institute of Occupational Medicine, Łódź, Poland  
Department of Occupational Diseases and Toxicology

## Abstract

**Objectives:** About 5–10% of asthmatics do not respond well to standard treatment plan. Occupational exposure may be one of the factors that can be linked with treatment failure. The aim of the study was to assess the prevalence of work-related asthma (WRA) among adult asthmatics under follow up in an outpatient allergy clinic and to create a useful tool for detecting individuals with possible WRA. **Material and Methods:** Preliminary 5-question questionnaire designed to recognize WRA was presented to 300 asthmatics. All patients with positive preliminary verification along with 50 subjects from control group were asked to fill up a detailed questionnaire. The WRA was diagnosed by positive match for asthma symptoms in combination with workplace exposure indicated in the detailed WRA questionnaire followed by confirmation of each WRA case by detailed exposure analysis. **Results:** Work-related asthma was recognized in 63 subjects (21% of study group). The preliminary questionnaire has 76.9% sensitivity and 94% specificity in recognition of WRA. Occupational exposure to irritants is a risk factor of WRA recognition (relative risk (RR) = 2.09 (1.44:3.03)). Working in exposure-free environment is a factor against WRA recognition (RR = 0.38 (0.24:0.61)). Among subjects with work-related asthma, the uncontrolled course of the disease is significantly more frequent ( $p = 0.012$ ). Subjects with WRA more often report sickness absenteeism due to asthma than those without WRA (9.6% vs. 3.2%, respectively), but the observed differences did not reach the statistical significance. **Conclusions:** Short 5-question questionnaire seems to be a promising tool to detect individuals with possible work-related asthma in the outpatient setting for further evaluation and additional attention.

## Key words:

Asthma, Occupational diseases, Epidemiology

Source of financial support: Statutory funding of Nofer Institute of Occupational Medicine – “Assessment of the prevalence of work related asthma in population of patients with asthma under follow up in an outpatient allergy clinic,” program No. IMP 11.5/2012/2014. Program managers: Wojciech Dudek, Ph.D., Prof. Cezary Pałczyński.  
Received: November 18, 2014. Accepted: April 13, 2015.

Corresponding author: W. Dudek, Dr Karol Jonscher City Hospital in Łódź, Department of Internal Diseases and Cardiology, Milionowa 14, 93-113 Łódź, Poland (e-mail: wdudek@data.pl).

## INTRODUCTION

Asthma is a worldwide problem, with an estimated 300 million affected individuals. The mortality due to asthma is currently estimated at 250 000 cases/year [1]. Although in many patients standard therapy is adequate to control the disease symptoms, it is estimated that for about 5–10% of asthmatics such treatment schedule is not sufficient [2,3]. About 10–25% of adult asthmatics may experience more severe symptoms due to work conditions [4]. It is reasonable to hypothesize that the occupational exposure is one of the factors that can be linked with treatment failure.

### Aim

The aim of the study was to assess the prevalence of work-related asthma (WRA) among adult patients with bronchial asthma under follow up in an outpatient allergy clinic and to create a short and easy tool for detecting individuals with possible WRA.

## MATERIAL AND METHODS

The study group comprised 300 consecutive asthmatic patients under follow up in an outpatient allergy clinic. In this group the routine medical examination was performed along with the standard spirometry and reversibility test/methacholine challenge. The study was

divided into 2 stages. In the “stage 1” all subjects completed the 5-question preliminary WRA questionnaire (Table 1).

Positive answer to at least 1 of the questions resulted in qualifying subject for the 2nd stage. In the “stage 2” all subjects completed a detailed WRA questionnaire containing demographic data, detailed job description, history of asthma and other allergic diseases, previously diagnosed sensitizations, the intensity of asthma symptoms (presence for the last 4 weeks – exertion limitations, dyspnea/cough symptoms, nocturnal awakenings due to asthma symptoms, usage of rescue medications and self assessment of asthma control), last year work absenteeism, hospitalizations and emergency care visits due to asthma exacerbation, detailed information of work-related factors that aggravate or trigger asthma symptoms.

### The definition of WRA case

Work-related asthma case was recognized in all subjects that fulfilled all 3 of the following criteria.

1. Asthma confirmed by history of typical symptoms and positive result of reversibility test or nonspecific methacholine challenge.
2. Patient-confirmed relationship between asthma symptoms and workplace environment in the detailed questionnaire.

**Table 1.** Preliminary 5-question WRA questionnaire

Question	Positive answers of respondents with recognized WRA [n (%)]
1. Do the symptoms of shortness of breath/wheezing/chest tightness become more severe at work?	34 (65.4)
2. Does the cough become more severe at work?	41 (78.8)
3. Do the symptoms of runny or itchy nose/sneezing/blocked nose become more severe at work?	23 (44.2)
4. Do the asthma symptoms decrease during weekends?	18 (15.4)
5. Do the asthma symptoms decrease when on leave/vacation?	43 (82.7)

WRA – work-related asthma.

3. The exposure verified and confirmed by occupational medicine specialist based on job description in the detailed questionnaire (or, when inconclusive, supported by additional information provided by the employer).

Exposure factors were then analyzed for the possibility to trigger or exacerbate the asthma symptoms and classified as allergic or irritant. In 2 situations, when the subject reported asthma exacerbation at work due to stress and/or to physical exertion/strain, and there were no other factors confirmed in the workplace environment that can trigger or exacerbate asthma symptoms, diagnosis of WRA was confirmed; however, the workplace was then classified as “exposure free.”

The control group comprised 50 subjects with negative preliminary verification and they also were given the detailed WRA questionnaire. To evaluate the impact of occupational exposure on WRA recognition, the risk ratio (RR)

was calculated using EpiInfo7 (CDC, Atlanta, USA). To evaluate the significance of WRA recognition impact on the course of asthma and work absenteeism, the Mann-Whitney-Wilcoxon rank sum test was calculated (StatCalc 3.5, Systat Software GmbH, Erkrath, Germany).

## RESULTS

Study group comprised 300 adult patients (Table 2). Sixty-four (21.3% of the study cohort) subjects answered positively to preliminary WRA questionnaire. The WRA recognition was verified positively in 49 subjects. Among 50 subjects from the control group, the WRA recognition was verified positively in 3 cases (Table 3). When extrapolating the control group results to the rest of all negative cases, the overall number of WRA cases was finally estimated at 63 (21% of the study group). The preliminary questionnaire has 76,9% sensitivity and 94% specificity in recognition of WRA based on our definition of WRA case in the study group.

Among WRA subjects 12 were exposed to sensitizers, 6 to both sensitizers and irritant factors, 19 to irritant factors only and 15 were considered as working in exposure-free environment (11 subjects reported asthma symptoms exacerbation due to stressful situations, 4 due to physical overexertion) (Table 4). Occupational exposure to irritants is a risk factor for the WRA diagnosis (RR = 2.09 (1.44:3.03)).

**Table 2.** Characteristic of study group

Variable	Study group (N = 300)
Age [years] (M±SD)	35.7±7.9
Gender [n]	
females	162
males	138

M – mean; SD – standard deviation.

**Table 3.** Verification of work related asthma recognition based on the detailed WRA questionnaire accompanied by case confirmation performed by physician

Verification results	Study group [n]			Control group [n]		
	total (N = 64)	females (N = 31)	males (N = 33)	total (N = 50)	females (N = 27)	males (N = 23)
Respondents with confirmed WRA recognition	49	23	26	3	1	2
Respondents without confirmed WRA recognition	15	8	7	47	26	21

WRA – work-related asthma.

**Table 4.** Workplace exposure and work-related (WRA) recognition

Exposure at the workplace	WRA positive [n]	WRA negative [n]
Sensitizers only	12	8
Sensitizers and irritant factors	6	5
Irritant factors only	19	5
Without exposure to irritant factors or sensitizers	15	44

Working in the exposure-free environment was a factor against WRA diagnosis (RR = 0.38 (0.24:0.61)) (Table 5). Among subject with work-related asthma, the uncontrolled course of the disease is significantly more frequent: 18 (34.6%) vs. 9 (14.5%),  $p = 0.012$ . Subjects with WRA more often report sickness absenteeism due to asthma than those without WRA (9.6% vs. 3.2%), but the observed differences did not reach the level of statistical significance ( $p > 0.05$ ) (Table 6).

## DISCUSSION

The aim of our study was to evaluate the prevalence of work-related asthma among adult asthmatics. Sixty-three subjects were considered as WRA, which enabled us to estimate the WRA prevalence at 21%. The prevalence of WRA in our study does not differ much from that reported in other papers published to date [5,6]. In our study the exposure to irritant factors represents an important risk factor for the development of WRA. Results presented by

**Table 5.** Exposure impact on work-related asthma (WRA) recognition

Exposure	RR	95% CI	p
Sensitizers	1.42	0.95–2.10	0.140
Irritant factors	2.09	1.44–3.03	< 0.001
Exposure free	0.38	0.24–0.61	< 0.001

RR – relative risk; CI – confidence interval.

Dumas et al. also support the role of irritants in work-related asthma [7]. However, there were 15 WRA subjects who reported aggravation of asthma symptoms in exposure-free environment. Most of them have pointed towards stress as a trigger for their asthma symptoms, which confirms an earlier observation by Eng et al. that psychological factors may affect people with asthma [8]. Work-related asthma subjects experience prolonged work disruption [9].

In our study, subjects with WRA more often reported sickness absenteeism due to asthma than non-WRA subjects, but the results were not statistically significant probably

**Table 6.** Impact of work-related asthma (WRA) recognition on course of asthma and work absenteeism

Level of disease control	WRA positive [n (%)]	WRA negative [n (%)]	p
Impact of WRA recognition on course of asthma among respondents			
controlled	14 (26.9)	27 (43.6)	0.067
partially controlled	20 (38.5)	26 (41.9)	0.713
uncontrolled	18 (34.6)	9 (14.5)	0.012
Impact of WRA recognition on work absenteeism			
respondents reporting at least 1 day on leave due to asthma exacerbation in the last year	5 (9.6)	2 (3.2)	0.161

due to low number of cases, and further study in this area is needed. Individuals with WRA are more likely to have their asthma poorly controlled. Lutzker et al. state that adults with WRA report poorer asthma control and higher health care involvement than non-WRA individuals [10]. In our study, the uncontrolled course of asthma is significantly more frequent among WRA compared to non-WRA subjects ( $p = 0.012$ ). There is a clear need that all asthmatics be asked and evaluated for occupational factors that can aggravate symptoms and impair the level of asthma control. There is significantly greater chance that people with WRA will not respond well to standard treatment plan. Unfortunately, health care providers often do not try to find out whether patient's asthma is work-related [10].

## CONCLUSIONS

The proposed preliminary short 5-question questionnaire might be a useful, fast and easy tool that can replace more detailed, time consuming and exposure-based tool for WRA detection. It can be used by physicians in outpatient settings to detect individuals with possible WRA for further evaluation and additional attention.

## REFERENCES

1. Bousquet J, Mantzouranis E, Cruz AA, Ait-Khaled N, Bae-na-Cagnani CE, Bleecker ER, et al. Uniform definition of asthma severity, control, and exacerbations: Document presented for the World Health Organization Consultation on Severe Asthma. *J Allergy Clin Immunol.* 2010;126:926–38, <http://dx.doi.org/10.1016/j.jaci.2010.07.019>.
2. Sorkness RL, Bleecker ER, Busse WW, Calhoun WJ, Castro M, Chung KF, et al. Lung function in adults with stable but severe asthma: Air trapping and incomplete reversal of obstruction with bronchodilation. *J Appl Physiol.* 2008;104:394–403, <http://dx.doi.org/10.1152/jappphysiol.00329.2007>.
3. Chen A, Tantisira K, Li L, Schuemann B, Weiss S. Repeatability of response to asthma medications. *J Allergy Clin Immunol.* 2009;123:385–90, <http://dx.doi.org/10.1016/j.jaci.2008.10.015>.
4. Moscato G. Focus on work-related asthma. *Eur Ann Allergy Clin Immunol.* 2013;45(3):67–73.
5. Tice CJ, Cummings KR, Gelberg KH. Surveillance of work-related asthma in New York state. *J Asthma.* 2010;47(3):310–6, <http://dx.doi.org/10.3109/02770900903497162>.
6. Petsonk EL. Work-related asthma and implications for the general public. *Environ Health Persp.* 2002;110 Suppl 4:569–72.
7. Dumas O, le Moual N, Siroux V, Heederik D, Garcia-Aymereich J, Varraso R, et al. Work related asthma. A causal analysis controlling the healthy worker effect. *Occup Environ Med.* 2013;70(9):603–10, <http://dx.doi.org/10.1136/oemed-2013-101362>.
8. Eng A, Mannetje A, Pearce N, Douwes J. Work-related stress and asthma: Result from a workforce survey in New Zealand. *J Asthma.* 2011;48(8):783–9.
9. Vandenplas O. Socioeconomic impact of work-related asthma. *Expert Rev Pharmacoecon Outcomes Res.* 2008;8(4):395–400, <http://dx.doi.org/10.1586/14737167.8.4.395>.
10. Lutzker LA, Rafferty AP, Brunner WM, Walters JK, Wasilevich EA, Green MK, et al. Prevalence of work-related asthma in Michigan, Minnesota, and Oregon. *J Asthma.* 2010;47(2):156–61, <http://dx.doi.org/10.3109/02770900903509073>.