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ESTIMATION OF WORKING CAPACITY AMONG WORKERS WITH ALLERGIC CONTACT DERMATITIS IN THE TEXTILE INDUSTRY

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Working capacity is the physical, mental and intellectual capacity of the worker to perform certain work duties under specific conditions, all the while without harming their health. Should the sensitized person have repeated contact with a potential sensitizer during the performance of those duties, occupational allergic contact dermatitis may occur—skin inflammation of the eczema type, which can impact working capacity and even fully incapacitate the individual from performing those work duties. The aim of this paper was the estimate of the working capacity of 98 examined workers in the textile industry, 9 of whom have been diagnosed with allergic contact dermatitis. The medical part of the expertise for the estimate of working capacity encompassed a precise and comprehensive allergologic history, positive patch tests to certain potential allergens and responses to exposure—elimination test. The practical part of the estimate of the working capacity demanded a full job description, as well as a description of the conditions in which the specific job was performed. In estimating the working capacity of a patient with occupational contact dermatitis, we kept in perspective the psycho-social approach of the affected person, including their age, level of professional qualification, and the likelihood that the company would accept the suggestions given by medical and other professionals. Every case where we performed an estimate of the working capacity was done in isolation and with due respect for the individual.

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Introduction

Working capacity is the physical, mental and intellectual capacity of the worker to perform certain work duties under specific conditions without harming their health.

Allergic contact dermatitis is an eczema-type skin inflammation that occurs upon repeated contact of the sensitized person with a sensitizer. If this occurs during the performance of work duties, it is classified as Occupational Allergic Contact Dermatitis (OACD), which is more frequently registered in women (1).

Data shows (2) that out of all occupational diseases, dermatoses make up between 20–90% (in different countries), while the highest percentage belongs to contact dermatoses. Based on extensive resources, Knajter (3) makes the deduction that in the whole occupational pathology, skin impairment represents 20–50%, depending on the work group, industry, region, state and other factors. There are reports (4) stating that from 30% to 40% of all occupational skin diseases are eczema, with eczematous dermatitis (5) being the most frequent reason for occupational skin morbidity in the USA.

The acute stage of allergic contact dermatitis is characterized by erythema, papulae, tiny vesicles and oozing, while the chronic stage is marked by infiltration, lichenification and desquamation.

However, the clinical picture may vary, depending on the type of allergen. This is exactly what happens with allergic contact dermatitis caused by textile—Textile contact dermatitis (6).

It may present in the shape of:

-Erythema multiforme-like lesions as an atypical manifestation of hypersensitivity to disperse dyes (7, 8).

-Purpuric contact dermatitis caused by hypersensitivity to textile dyes and resins (9, 10). This partly depends on climatic factors (heat, humidity), leading to profuse sweating.

-Papular contact dermatitis caused by textiles is a rare condition. Cases have been described after exposure to formaldehyde. The description is similar to papular and purpuric dermatitis (11).

-Pigment contact dermatitis is an atypical manifestation registered in multiple cases. It may be the result of hypersensitivity to disperse dyes (12) and to azo dyes, which contain Naphthol AS (13).

-Phototoxic reaction to textile has been described (14), as well as contact depigmentation to azo dye, Solvent Yellow 3 (15).

-The clinical picture of atopic dermatitis which occurs on flexures is not rare (16).

The estimation of working capacity is one of the most complicated and delicate tasks that qualified institutions with adequate professional teams need to perform.

Aim

The aim of this paper was the estimation of the working capacity of workers with diagnosed allergic contact dermatitis employed in the textile industry.

Materials and Methods

Ninety-eight workers were examined in the textile factory DOO Evro Mak, Negotino in the Republic of North Macedonia. An extensive history was recorded for all of them. The clinical presentation of allergic contact dermatitis on their hands was registered in 9 workers, 8 of whom were women and 1 man.

Epicutaneous tests of the European Standard Series of allergens (ESS) were performed on the workers who exhibited skin changes. Testing was done at the University Clinic of Dermatology in Skopje.

Work ability assessment was performed on 9 out of 98 textile industry workers diagnosed with allergic contact dermatitis. Ninety-four (95.91%) of the workers examined were female, while 4% (4.08%) were male. Eight (88.88%) of the workers diagnosed with allergic contact dermatitis were women, and only one (11.11%) was a man (Table 1).

Three workers tested positive to one allergen, four workers tested positive to two allergens, and two workers tested positive to three allergens.

The most common allergens for our patients were textile dye mix, p-paraphenylenediamine (PPD) and formaldehyde.

Three workers reacted to one allergen, all to the textile dye mix

Four workers reacted to two allergens, all to the textile dye mix, PPD

Two workers reacted to three allergens, all to the textile dye mix, PPD and formaldehyde.

It was determined that all workers with allergic contact dermatitis experienced skin changes caused by harmful substances. The primary skin lesions were located in areas matching the maximum exposure sites, and the duration of exposure was consistent with the nature of the suspected agents and the type of skin disease.

With these workers, exposure outside of the workplace was eliminated, and it was determined that there was solely occupational exposure at the workplace.

Exposure elimination tests were performed. In all patients, they showed that the duration of the elimination was beneficial to the improvement of skin symptomatology.

The assessment of the working capacity was conducted by a Commission for Working Capacity Assessment, following the company's Rulebook on the members and functioning of the assessment commission.

There was 1 female worker aged < 20 years, 3 female workers aged 21-30 years, 2 female workers and 1 male worker aged 31-40 years, 1 female worker aged 41-50 years and 1 male worker aged 51-60 years (Table 2).

The most common allergens for our patients were textile dye mix, PPD and formaldehyde.

Three (33%) of the workers tested were positive for one allergen, all to the textile dye mix. Four (44%) were positive for two allergens, all to the textile dye mix, PPD. And two were positive for three allergens, all to the textile dye mix, PPD and formaldehyde (Table 3).

Table 1. Distribution of examined workers and workers with skin changes by sex

Examined workers						
Sex	Men		Women		Total	
	No.	%	No.	%	No.	%
	4	4.08%	94	95.91%	98	100%

Workers with skin changes—type KD						
Sex	Men		Women		Total	
	No.	%	No.	%	No.	%
	1	11.11%	8	88.88%	9	100%

Table 2. Distribution of workers with skin changes—type KD by age.

Total number of examined workers with changes to their skin by age			
Age	Men	Women	Total
< 20 years	-	1	1
21–30 years	-	3	3
31–40 years	1	2	3
41–50 years	-	1	1
51–60 years	-	1	1
> 60 years	-	-	-
Total	1	8	9

Table 3. Number of workers tested positive to one, two and three allergens.

Allergen number	1 allergen	2 allergens	3 allergens
Number and % of workers	3 (33%)	4 (44%)	2 (22%)

Discussion

According to the latest data, occupational dermatoses make up 1–2% of the total number of all occupational diseases, including occupational injuries (6). Should occupational injuries be excluded from this group, skin diseases represent 35–50% of all occupational diseases. Occupational skin diseases, contact dermatitis in particular, represent a significant problem (7, 8) and are the reason for 75% of sick day leaves.

Occupational skin diseases among workers in the textile industry are a continuous problem that affects quality of life of workers. The joint emergence of occupational irritant contact dermatitis and occupational allergic contact dermatitis and their synergy are of great importance among workers (9). Those workers are in constant contact with textile products of different kinds, and the main culprit for changes in the skin among them is the chemicals used in the process of fabric treatment to give it certain quality and performance. The constant contact leads to the possibility of sensitization of the skin and the occurrence of changes in the same region of contact, most frequently the hands.

Textile fibers are natural wool, flax, cotton and silk and the synthetic derivatives of cellulose and polyamides (17). Other materials such as metals, rubber components, and dyes may be added to give the fibers specific features (18).

It used to be a common belief that wool could cause an allergic reaction. However, the absence of evidence of allergy is now evident. It is obvious that the allergens are linked to the processing of wool (ex., chemical dyes) added to modern clothing made of wool. Wool can irritate only if the fibers are of a larger diameter. Clothing made from Merino wool is better tolerated as the fibers are of a smaller diameter (19).

Allergy to cotton is extremely rare (20). Cotton clothing may cause erythema or itching because of skin irritation.

The same applies to silk, although there is a case of contact urticaria to silk (21).

However, allergic contact dermatitis is not rare, and this is because textile is prepared with biocides (22) which cause contact dermatitis. To name a few: triclosan, zinc pyrithione, MCI/MI, dichloro-octylisothiazolinone, dimethyl fumarate and silver particles (23–25). Substances used after dying (benzanthrone) or textile treatment (sulphites) may cause allergic contact dermatitis (26, 27). Formaldehyde, urea-formaldehyde resin, and melamine-formaldehyde have been used in the textile industry since 1920 to prevent wrinkling. It has been found that they all may cause a reaction. Based on numerous studies in various countries, the release of formaldehyde is documented for various types of fibers. However, it is suggested that wool is most certainly the textile material for this sensitivity (19, 28–34).

Textile dyes are rarely the cause of allergic reactions of type I (32, 33). It is more frequently the case of type IV reactions. The classification of dyes is conducted according to chemical structure or according to method of application. Different dyes are used for synthetic and natural fibers. Disperse dyes (DDs) are used for coloring synthetic textiles, polyester, nylon and mixed fibers (16). Around 60% of all DDs are azo dyes, while about 25% are anthraquinone dyes containing quinophthalone, methine, naphthylamide, naphthoquinone and nitro dyes (34).

Before DDs were included in the baseline series, PPD was considered the screening allergen for textile dye dermatitis. It was later discovered that PPD is not a marker allergen for the detection of sensibilization to all azo dyes found in textiles (34). A total of 26 DDs is used for testing.

The most common allergens are textile dye mix, which is a global allergen dominated by azo and anthraquinone bases; PPD, which is used in textile dyes; and formaldehyde, which is used as an anti-wrinkle finish. One must not ignore the effect of nickel, as most textile workers are in contact with it when performing their jobs (10).

Testing for textile dermatitis is recommended with the use of the European baseline series, which includes TDM, Textile series and own material “as is” as well as with extracts made from it.

The estimation of working capacity is performed by a Work Capacity Committee based on:

-Worker’s personal history (atopic constitution or previous allergic manifestations on the skin or other organs)

-Work history (job position they occupy and where the changes occurred)

-Job description of the position the worker occupies (contact with fabrics, textile dust,

scissors, chalk, and duration of contact—in the course of the full working day or occasionally)

If the contact is continuous, workplace exposure should exist for at least a year, and 2–3 years if the contact is occasional.

Dermatologist's report provides the diagnosis of Allergic Contact Dermatitis with description of the clinical condition and course of the disease—chronic illness with severe relapses, course of the disease at the workplace and home, duration of relapses after exposure and whether rehabilitation occurs with or without treatment.

The trend to create prevention programs to minimize skin contact with allergic substances, improving safety measures, health education and good personal hygiene, should, in turn, have an important impact on lowering the number of workers with occupational dermatoses (11).

Conclusion

When estimating the working capacity of a patient with OACD, one must keep in perspective the psycho-social approach to the diseased person, including their age, level of professional qualification and the likelihood that the company would accept the suggestions given by medical and other professionals. Every case where an estimate of working capacity is done must be viewed in isolation and with due respect to the state of the individual with occupational skin diseases. The estimation of working capacity should include a description of job operations and the conditions in which the job is performed for every specific post.

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PROCENA RADNE SPOSOBNOSTI RADNIKA SA ALERGIJSKIM KONTAKTNIM DERMATITISOM U TEKSTILNOJ INDUSTRIJI

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Radna sposobnost predstavlja fizičku, psihičku i intelektualnu sposobnost radnika da pod određenim uslovima na radnom mestu obavljaju određeni posao, a da pritom ne nanose štetu svom zdravlju. Ako prilikom obavljanja posla dolazi do ponovljenog kontakta senzibilne osobe sa mogućim senzibilizatorom, nastaje profesionalni kontaktni alergijski dermatitis–zapaljenje kože poput ekcema, koje može uticati na smanjenje radne sposobnosti i dovesti do potpune nemogućnosti obavljanja posla. Cilj ovog rada bila je procena radne sposobnosti do koje se došlo obradom podataka dobijenih posle pregleda devedeset osam radnika zaposlenih u tekstilnoj industriji. Kontaktni alergijski dermatitis dijagnostikovan je kod devet radnika. Medicinska ekspertiza za ocenu radne sposobnosti obuhvatila je preciznu i iscrpnu alergološku anamnezu, *patch* testove pozitivne na određene sumnjive alergene i odgovor na test ekspozicije/eliminacije. Praktični deo ocenjivanja radne sposobnosti podrazumevao je zahteve radnih operacija i uslove u kojima su se one odvijale na konkretnom radnom mestu. Pri ocenjivanju radne sposobnosti ispitanika sa profesionalnim kontaktnim alergijskim dermatitisom uzeti su u obzir psihosocijalni pristup oboleloj osobi, godine starosti, stručna sprema, kao i mogućnost preduzeća da usvoji predloge medicinskih i drugih stručnjaka. Svaki ispitanik je prilikom ocenjivanja radne sposobnosti posmatran izolovano i sa dužnim poštovanjem.

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***Ključne reči**: alergeni, alergijski kontaktni dermatitis, procena radne sposobnosti, tekstilne boje*