Original article

doi:10.5633/amm.2025.0304

Estimation of Work Capacity among Worker with Allergic Contact Dermatitis in the Textile Industry

Marija Nedeva[1], Vesna Cifrevska Matevska[2], Lazar Bajic[1,3]

[1]University of Nis, Medical Faculty, doctoral studies, Niš, Republic of Serbia

[2]University Clinic of Dermatology, Ss. Cyril and Methodius, Skopje, Republic of North Macedonia

[3]University Clinical Center Niš, Clinic of Neurology, Niš, Serbia

Contact: Nedeva Marija

Maršal Tito 146/1, 91440 Negotino, Republic of North Macedonia

Email: nedevamarija57@yahoo.com

AMM Paper Accepted

Abstract

Work 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 there be repeated contact of the sensitized person with a potential sensitizer during the performance of those duties, occupational allergic contact dermatitis occurs – skin inflammation of the eczema type, which may have impact on diminished work capacity and even fully incapacitate a patient to perform those work duties. The aim of this paper is the estimate of work capacity of 98 examined workers in the textile industry, 9 of whom have diagnosed allergic contact dermatitis. The medical part of the expertise for the estimate of work 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 work capacity demanded a full job description, as well as description of the conditions in which the specific job is performed. When making the estimate of work capacity of a patient with occupational contact dermatitis, we kept in perspective the psycho-social approach of the diseased person, 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 and estimate of work capacity was done in isolation and with due respect of the individual.

Keywords: allergens, allergic contact dermatitis, work capacity evaluation, textile dye

AMM Paper Accepted

Originalni rad

doi:10.5633/amm.2025.0304

Procena radne sposobnosti radnika sa alergijskim kontaktnim dermatitisom u tekstilnoj industiji.

Marija Nedeva[1], Vesna Cifrevska Matevska[2,3], Lazar Bajić[1,3]

[1]Univerzitet u Nišu, Medicinski fakultet, student doktorskih studija, Niš, Srbija

[2]Univerzitetska klinika za dermatologiju Sv. Ćirilo i Metodije, Republike Severna Makedonija

[3]Univerzitetski klinički centar Niš, Klinika za neurologiju, Niš, Srbija

Kontakt: Nedeva Marija

Maršala Tita 146/1, 91440 Negotino, Republika Severna Makedonija

Email: nedevamarija57@yahoo.com.

AMM Paper Accepted

Radna sposobnost je fizička, psihička i intelektualna sposobnost radnika da pod odredjenim uslovima na radnom mestu obavljaju odredjeni posao, a da pritom ne štete svom zdravlju. Ako prilikom obavljanja posla dolazi do ponovljenog kontakta senzibilisane osobe sa mogućim senzibilzatorom, nastaje profesionalni kontaktni alergiski dermatitis - zapaljenje kože tipa ekcema koji moze uticati na smanjenje radne sposobnosti do kompletne nemogućnosti pacijenta da se bavi tim poslom. Cilj ovoga rada je procena radne sposobnosti obradom podataka od 98 pregledanih radnika tekstilne industrije kod kojih je kod 9-toro dijagnosticiran kontaktni alergijski dermatitis.Medicinski deo ekspertize za ocenu radne sposobnosti je obuhvatio tačnu i iscrpnu alergološku anamnezu, pozitivne patch testove na odredjene sumnjive alergene i odgovor na test eksozicije- eliminacije. Prakticni deo ocenjivanju radne sposobnosti je obuhvatao zahteve radnih operacija i uslove u kojima se oni odvijaju za konkretno radno mesto. Pri ocennjivanju radne sposobnosti bolesnika sa profesionalnim kontaktnim alergijskim dermatitisom imali smo u vidu psihosocijalni pristup obolele osobe, godine starosti, kvalifikacionu i stručnu spremu kao i

mogućnost društva da usvoji predloge medicinskih i drugih stručnjaka. Svaki slučaj u ocenjivanju radne sposobnosti posmatrali smo izolovano i sa dužnim postovanjem individua.

Ključne reči: alergeni, alerični kontaktni dermatitis, procena radne sposobnosti, tekstilne boje.

AMM Paper Accepted

INTRODUCTION

Work 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 which 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, 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. On the basis of 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 30 to 40% of all occupational skin diseases is 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.

AMM Paper Accepted

- Papular contact dermatitis caused by textile 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 Naphthiol AS (13).
- Phototoxic reaction to textile has been described (14), as well as contact depigmentation to azo dye, Solvent Xellow 3 (15).
- The clinical picture of atopic dermatitis which occurs on flexures is not rare (16).

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

AIM

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

MATERIAL AND METHODS

Ninety-eight workers were examined in the textile factory DOO Evro Mak – Negotino in the R.N. Macedonia. 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.

AMM Paper Accepted

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

Examined workers					
Sex	Men		Woman		Total
	No.	%	No.	%	No.	%
	4	4.08 %	94	95.91 %	98	100%
Workers with skin changes – type KD					
	Men		Woman		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	Woman	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	-	-	-

AMM Paper Accepted

Total	1	8	9

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

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

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

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

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

To one allergen 3 workers reacted: all to textile dye mix.

To two allergens 4 workers reacted: all to textile dye mix, PPD.

To three allergens 2 workers reacted: all to textile dye mix, PPD and formaldehyde.

It is determined that in all workers with allergic contact dermatitis, the changes in the skin are known to have been caused by harmful matters, that the localization of the primary skin lesions is identical to the localization of the maximum exposure and that the duration of exposure fits the nature of the suspected agents and type od skin disease.

With these workers exposure outside of the workplace was eliminated and it was determined that there is 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 the skin symptomatology.

AMM Paper Accepted

The assessment of work capacity is conducted by a Commission for work capacity assessment in accordance with the Rulebook of the company, the members and the manner of functioning of the commission for work capacity assessment.

DISCUSSION

According to the latest data, occupational dermatoses make up 1-2% in 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 the quality of life of the 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, are the chemicals used in the process of fabric treatment in order 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, which are most frequently the hands.

Textile fibers are: natural wool, flax, cotton and silk and the synthetic derivatives of cellulose and polyamides (21). Other materials such as metals, rubber components, dyes may be added to give the fibers specific features (22).

It used to be a common belief that wool can cause an allergic reaction. However, now the absence of evidence of allergy is 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 only cause irritation if the fibers are of a larger diameter. Clothing made from Merino wool is better tolerated as the fibers are of a smaller diameter (23).

Allergy to cotton is extremely rare (24). 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 (25).

AMM Paper Accepted

However, allergic contact dermatitis is not rare, and this is because textile is prepared with biocides (26), which cause contact dermatitis. To name a few: triclosan, zinc pyrithione, MCI/MI, dichloro-octylisothiazolinone, dimethyl fumarate and silver particles (27,28,29). Substances used after dying (benzanthrone) or textile treatment (sulphites) may cause allergic contact dermatitis (30,31). 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 (23, 32, 33, 34, 35).

Textile dyes are rarely the cause of allergic reactions of type I (36,37). 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 (DD) 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 (38).

Before DDs were included in the baseline series, p- paraphenylenediamine (PPD) was considered as 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 textile (38). 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 European baseline series which includes TDM, Textile series and own material “as is” as well as with extracts made from it.

The estimation of work capacity is performed by a Work capacity committee on the basis of:

AMM Paper Accepted

-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 containing 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 in order to minimize skin contact with allergic substances, improving safety measures, health education and good personal hygiene, should in turn have important impact on lowering the number of workers with occupational dermatoses (11).

CONCLUSION

When making the estimate of work capacity of a patient with occupational allergic contact dermatitis (OACD), one must keep in perspective the psycho-social approach to the diseased person, 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 work 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 work capacity should include a description of job operations and the conditions in which the job is performed for every specific post.

AMM Paper Accepted

REFERENCES

1. Jovanović M, Poljački M, Đuran V, Matović Lj. Epidemiološki pregled rezultata patch testiranja i profesionalna ekspozicija standardnim kontaktnim alergenima sa najučestalijim pozitivnim reakcijama u period od 1987 do 1991 godine.Zbornik radova IX Kongresa alergologa i kliničkih imunologa Jugoslavije, 1992, nov 1-6

2.Hjorth N, Fregert S. Contact Dermatitis. U: Rook A, Wilkinson DS, Ebling FJD (eds) Textbook of Dermatology. Blackwell, Sci publ Oxford 1979:363-441.

3. Knajtner I. Profesionalne bolesti kože. Medicinska knjig. Beograd Zagreb 1989.

4.Studinicin AA, Skriokin JK. Klisifikacia ekcemi. Vestn Dermatol 1979;5:3-10.

5. Soter N, Fitzpatrick T. Eczemstous Dermatitis. In: Fitzpatrick T (ed) Dermatology in Generak medicine. McGraw-Hill. Book Company, New York 1971; 663-669.

6. Lazarov A, Cordoba M, Plosk N, Abraham D. Dermatology Online Journal, 2003;9(3):1

7. Belsito DV. Textile Dermatitis. Am J Contact Dermatitis. 1993; 4:249-252.

8. Pecquet C, Assier-Bonnet H, Artigou C, Verne-Fourment L, Salag P. Atypical presentation of textile dye sentization. Contact Dermatitis. 1999;40-51.

9. Lazarov A, Trattner A, David M, Ingber A. Textile Dermatitis in Israel: A retrospective study. Am J Contact Dermatitis. 2000; 11:26-29.

10. Komericki P, Abere W, Arbab E. Kovachevich Z, Kranke B. Pigmented purpuric contact dermatitis from Disperse Blue 106 and 124 dyes. J Am Acad Dermatol 2001; 45:456-8.

11. Khanna M, Sasseville D. Occupational contact dermatitis to textile dyes in airline personnel. Am J Contact Dermatitis, 2001;12: 208-210.

12. Shah SA, Ormerod AD. Pigmented purpuric clothing dermatitis due to disperse dyes. Contact Dermatitis. 2000;43:360.

13. Ancona-Alayon A, Escobar-Marques R. Gonzales-Mandoza A, Bernal Tapia JA, Macotela-Ruiz E, Jurado-Mendoza J – Occupational pigmented contact dermatitis from Naphthol AS. Contact Dermatitis. 1976;2:129-34.

AMM Paper Accepted

14. Hjorth N. Phototoxic textile dermatitis ("bikini dermatitis"). Arch Dermatology. 1976;112:445-447.

15. Bajaj AK, Misra A, Misra K, Rastogi S. The azo dye Solvent Yellow produces depigmentation. Contact Dermatitis. 2000;42(4):237-238.

16. Malinauskiene L, Bruze M, Ryberg K, Zimerson E, Isaksson M. Contact allergy from disperse dyes in textiles: a review. Contact Dermatitis 2013;68:65-75.

17. Mathias CGT. Occupational Dermatoses. In: Zenz C, Dickerson OB, Horvath EP. Eds. Occupational Medicine. St.Luis Mosby, 19949:3-131.

18. Pal M, Wilde NS, VanBeurden MM, Coenraszads PJ, Bruynzeel DP. Nutrification of occupational skin disease by dermatologists in the Netherlands. Occupational Medicine 2009;59:38-43.

19. Cherry N, Meyer RD, Adesech A, Brooke R, Oswen-Smith V, Swales C et all. Surveillance of occupational skin disease. ERIDER AND OPRA. Br J Dermatol 2000;142:1128-34.

20. Jovanović MA, Beck MH. Profesionalne dermatoze. U: Karadaglić Đ, ur. Dermatologija. Beograd 2016: 1585-1614.

21. Svedman C, Engfeldt M, Malinauskiene L. Textile Contact Dermatitis: How Fabrics Can Induce Dermatitis. Current Treatment Option in Allergy; 2019;6:103-11.

22. Le Coz C-J. Cloting. In: Johansoen Jd, Frosch PJ, Lepoittevin J-P, editors. Contact dermatitis. 5th ed. Berlin:Springer-Verlag; 2011.p.793-819.

23. Zallman M, Smith PK, Tang MLK, et al. DE+ebunking the myth wool allergy: reviewing the evidence for immune and non-immune cutaneous reactions. Acta Derm Venereol. 2017;97:906-15.

24. Gonzales de Olano D, Subiza JL, Civantos E. Cutaneous allergy to cotton. Ann Allergy Asthma Immunol 2009;102: 263-4.

25. Vandevenne A, Moren MA, Goossens A. Immunological contact urticaria caused by silk shirt an atopic patient. Contact Dermatitis, 2015;72:240-1.

26. Hamnerius N, Ponten A, Mowitz M. Textile contact dermatitis caused by octylisothiazolinone in compression stockings. Contact Dermatitis. 2018;78:419-21.

AMM Paper Accepted

27. Aerts O, Goossens A, Lambert J, Lepoittevin JR. Contact Allergy caused by isothiazolineone derivatives: an overview of non-cosmetic and unusual cosmetic sources. Eur J Dermatol, 2017; 27:115-22.

28. Windler L, Height M, Nowack B. Comparative evaluation of antimicrobialis for textile application. Environ Int. 2013;53:62-73.

29. Unekoji A, Fukai K, Sowa-Osako J, Manabe M, Kikugawa M, Ishli K, et al. Allergic Contact dermatitis caused by the preservative 4,5-dichloro-2-n-octyl-4-isothiazolon-3-one in black trousers. Contact Dermatitis. 2016;75:326-8.

30. Svedman C, Zimerson E, Bruze M. Allergic contact dermatitis caused by benzanthrone in a pair of trousers. Contact Dermatitis, 2014;71:54-64.

31. Aerts O, Duchateau N, Lambert J, Bechtold T. Sodium metabisulfite in blue jeans: an unexpected cause of textile contact dermatitis. Contact Dermatitis. 2014;70:183-92.

32. Reich HC, Warshaw EM. Allergic contact dermatitis from formaldehyde-releasers. Dermatitis, 2010;21(2):65-76.

33. de Groot A, Flyvholm MA, Kensen T, et al. Formaldehyde releasers: relationship to formaldehyde contact allergy. Contact Dermatitis. 2009;61:63-85.

34. de Groot AC, Maibach HI. Does allergic contact dermatitis from formaldehyde in clothes treated with durable press chemical finishes exist in the USA? Contact Dermatitis, 2010;62:127-36.

35. Dubnika Hauksson I. Contact allergy to formaldehyde. Diagnosis and Clinical relevance. Thesis University of Lund; 2014.

36. Nilsson R, Norlinder R, Wass U, Meding B, Belun L. Astma, rhinitis and dermatitis in workers exposed to reactive dyes. Br J Ind Med. 1993;50:65-70.

37. Estlander T. Allergic dermatoses and respiratory diseases from reactive dyes. Contact Dermatitis 1988; 18:290-7.

38. Malinauskiene L. Contact allergy to textile dyes. Clinical and experimental studies on disperse azo dyes. Thesis, University of Lund; 2012.

AMM Paper Accepted

AMM Paper Accepted