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Demodex infections in general polish population, in patients suffering from blepharitis, and among people who work with microscopes

Zakażenia nużeńcem w populacji polskiej – u chorych na zapalenie brzegów powiek i osób w grupie ryzyka, jakie stwarza praca z użyciem mikroskopu

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Summary:

In this study we examined 264 people to estimate the prevalence of *Demodex* infection. The subjects were divided into 4 groups. First two groups consisted of young people (mean age 22 years) and seniors (mean age 66 years) respectively. The third group included people who work with microscopes (mean age 44 years). Forth group consisted of patients with diagnosed blepharitis (mean age 65 years). From every individual 3-4 lashes were epilated from the eyelids of both eyes and examined under the microscope for *Demodex* mites. The statistical analysis based on logistic regression was used to estimate the probability of infection. Age was independent variable significant for this model ($p < 0.001$). Significant relation between age and probability of *Demodex* infection was showed. The lowest number of infected individuals was observed in the group of young subjects (only 5%), the highest in the blepharitis patients (74% infected). Among microscope users 30% were infected, in the group of seniors 34% were infected.

Słowa kluczowe: *Demodex*, demodekoza, zapalenie brzegów powiek.

Key words: *Demodex*, demodicidosis, blepharitis.

Introduction

Demodex [from gr demos (fat) dex (worm)] is a microscopic mite of animals (dogs, cats, rodents) and humans. The *Demodecidae* family comprises 100 species but in Poland 25 of them are noted (1). So far, 2 species characteristic for humans are known: *Demodex folliculorum* and *Demodex brevis*. *D. folliculorum* was first described in 1842 by Simon, who found mites in the follicles of the nose. *D. brevis* was later identified in 1963 by Akbulatova. This parasite is found in the follicular infundibulum (*D. folliculorum*) and sebaceous or meibomian glands (*D. brevis*). *D. folliculorum* is more common than *D. brevis* and it is characterized by a larger size – about 300-350 μm long and 40-50 μm wide whereas *D. brevis* is 200-230 μm long (2). They have an elongated body that consists of three segments: the gnathosoma, podosoma and opisthosoma. Adult parasites have four pairs of short, reduced legs which is an adaptation to parasitic existence (3). The mites can leave the hair follicles and walk around on the human skin, at a speed of about 8-16 mm per hour, but only males move, especially at night (4). The parasites are transferred through direct contact between people or by indirect contact with eggs dispersed in dust. Mites are more numerous in facial skin: the forehead, nose or chin. The risk of infection increases with age. The presence of the mites

on the skin of children is uncommon because their sebum production is very low. Children with acute lymphoblastic leukemia (ALL) are susceptible to proliferation of *Demodex* mites (5). The pathogenic role of *Demodex* in humans is still controversial but the number of reports about the role it plays in some ophthalmic and dermatological diseases is increasing. *Demodex* has been implicated in rosacea (6), blepharitis (7-9) and frequently in immunosuppressed patients with AIDS (10). The infestation may be asymptomatic (11).

In this study we estimated the prevalence of *Demodex* in patients with blepharitis, people who work with microscopes and compared them with groups consisting of young and older persons.

Materials and methods

264 people (range 20-88 years) were enrolled in the study and they were divided into 4 different groups. There were 2 criteria for classification: age and diagnosed blepharitis. The first group consisted of young students, the second of elder people. None of the individuals in these groups had any blepharitis symptoms. People who work with microscopes were in the third group and in the fourth comprised of patients with diagnosed blepharitis.

The young individuals from group 1 were students of the Medical University of Warsaw, 41 women and 53 men. The mean age in this group was 22. In the second control group with older individuals, the mean age was 66 with 72 women and 21 men. Microscope users with a mean age of 44 consisted of 20 women and 3 men. Patients in group 4 were recruited in the Department of Ophthalmology Medical University of Warsaw. The mean age of blepharitis patients was 65 (range 26-88 years old) – 32 were women and 22 were men.

Each patient was examined by epilation of 3-4 eyelashes from upper and lower lid margin of each eye. After epilation, the eyelashes were put on a slide with one drop of Hoyer medium (50 cm³ distilled water, 30 g arabic gum, 200 g chloral hydrate, 20 g glycerine) and covered with a cover slip (12). The samples were studied under a light microscope at magnifications 10 x and 20 x.

A positive result was the presence of adults, larvae or Demodex's eggs in the material. We did not differentiate between the two Demodex species.

Results

The results are presented in a table I.

The highest prevalence of Demodex sp. infection was observed in blepharitis patients – 74%, the lowest prevalence was found in group 1 with young students, only 5% of the individuals was infected. In the senior group with the mean age close to that of blepharitis patients, only 34% had parasites. Infection in group 2 was over two times less frequent than in group 4. People who had worked with microscopes exhibited an almost identical percentage of infection as the senior group. But the mean age was much lower: 44 years in group 3 compared to 66 in the seniors' group.

The highest number of parasite was 18 mites and 6 eggs in one sample. It belonged to a 76 year-old woman with blepharitis. In the other examined groups the highest number of parasites was lower – in the young person's group – 7 mites (22 year-old man), among the seniors – 15 mites (78 year old woman) and among people who work with a microscope: 7 mites in a 56 year-old woman.

In cases of a positive result for Demodex infection, 35 patients were treated with topical metronidazol in a gel or ointment applied to lid margin b.i.d. for no less than 2 months. After the treatment, the patients had a follow up examination. 45% patients adhered to the dosing scheme had no parasites in

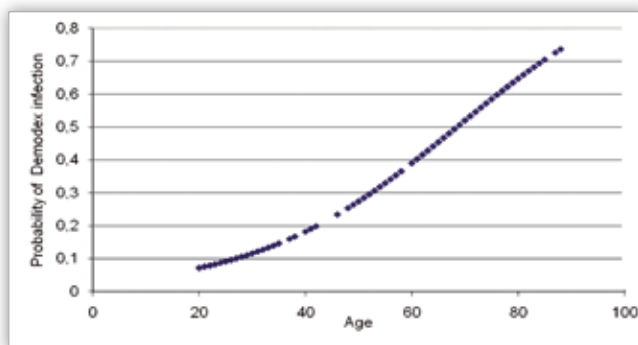


Fig. 1. Prediction of the probability of Demodex infection dependent on age (based on logistic regression).

Ryc. 1. Przewidywane prawdopodobieństwo zarażenia nużeńcem w zależności od wieku (na podstawie modelu logistycznego).



Fig. 2. Left eye 56 years old woman with blepharitis.

Ryc. 2. Lewe oko 56-letniej kobiety z zapaleniem brzegów powiek.

the control examination or the number of parasites was significantly lower (30%). In the second case the treatment was continued for the next few months and the control examinations were repeated.

Logistic regression with two independent variables (age and sex) was used to estimate probability of infection. Sex was insignificant for this model ($p > 0.05$) therefore in further analysis only one independent variable was tested – age ($p < 0.001$).

Exp (B) was more than one (1.054), it means that age effect was positive for probability to being infected with

Groups/ Grupy	Number of examined persons/ Liczba przebadanych osób	Mean age/ Średnia wieku	Number of infected people/ Liczba zakażonych osób	% of infected people/ % zakażonych osób
1. Young/ Młodzi	94	22	5	5%
2. Seniors/ Seniorzy	93	66	32	34%
3. Microscope users/ Pracujący z użyciem mikroskopu	23	44	7	30%
4. Blepharitis/ Zapalenie powiek	54	65	40	74%
Total/ Razem	264	49	84	36%

Tab. I. The prevalence of Demodex infection in different groups.

Tab. I. Zarażenie nużeńcem w różnych grupach.



Fig. 3. Right eye 56 years old woman with blepharitis
Ryc. 3. Prawe oko 56-letniej kobiety z zapaleniem brzegów powiek.

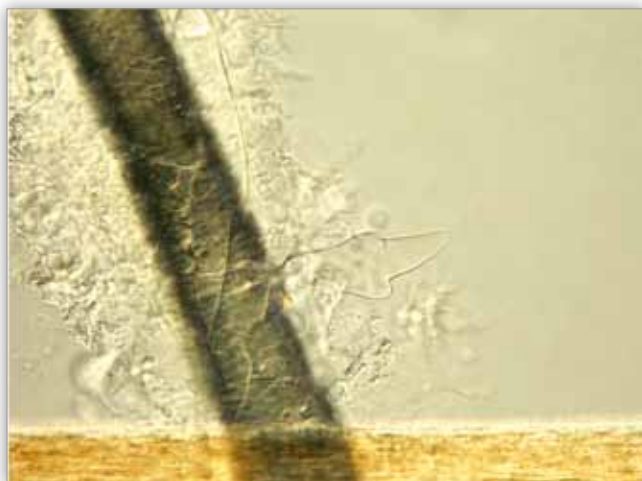


Fig. 4. Arrowed-shaped egg of *Demodex folliculorum*. Technic: Differential interference contrast.
Ryc. 4. Charakterystyczne jajo *Demodex folliculorum*. Technika: kontrast interferazowy (DIC).



Fig. 5. Photograph of an adult and larva of *Demodex*. Technic: Differential interference contrast.
Ryc. 5. Zdjęcie *Demodex* – osobnika dorosłego i larwy. Technika: kontrast interferazowy (DIC).

Demodex. Older patient had higher probability of infection. R^2 Nagelkerke's coefficient of determination reached 0.293 – it showed significant relation between age and probability of *Demodex* infection. For statistical analysis was used PASW Statistics 18 (Fig. 1-5).

Discussion

Studies similar to ours were conducted at Pomeranian Medical University in Szczecin (7,9). In 2003 they examined 5 different-age groups. In a group comprising medical students (20-21 years old) they observed 30% infected individuals whereas in similar group in our study we found parasites only in 5% of the cases. In a senior group (71-96 years) the infection in Szczecin was 95.2% while in our work only 34%. In the next survey by these authors in 2005, they obtained results similar to those from 2 years earlier. Despite the fact that the percentage of infected individuals is higher in Szczecin, their results demonstrated the same trend, that the prevalence of *Demodex* infection increases with patients' age.

In a study from Turkey (13) researchers obtained a prevalence of *Demodex* infection of only 28.8% in blepharitis patients which is much lower than our 74% in a comparable group. However in the Turkish study blepharitis patients were younger – the mean age was 36 years while in our study the mean age was 65 years. In another Turkish survey (14) the results were comparable – the infection in blepharitis patients was 29.72%.

Epilation of eyelashes followed by microscopic examination is an easy and effective method for detecting mites. Diagnosis towards *Demodex* infection could be considered as an additional test in blepharitis patients. It was observed by ophthalmologists that both antibacterial and antiparasitic treatment gave better results than antibacterial treatment alone. Recently, more information about *Demodex* and the role it could play in ophthalmologic and dermatological diseases has appeared.

In our study we examined people who work with microscopes because the possibility to be infected could be much higher through using the same equipment. Very often eyepieces are not cleaned before use which gives the opportunity for transmission of parasites. The results in our study confirmed this hypothesis. In the group consisting of people working with microscopes, the infection was estimated to be 30% which was comparable to the prevalence of infection in seniors, while the mean age of microscope operators was lower – 44 years compared to 66 in the senior group.

Conclusions

Demodex mites are an etiological factor of blepharitis.

There is a significant correlation between *Demodex* sp. infection and the age of examined individuals.

People who work with microscopes are at higher risk for *Demodex* infection.

Acknowledgments

We would like to thank dr Joanna Konieczna-Salamatin from Sociology Institute (University of Warsaw) for help in statistical analysis.

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The study was originally received 01.04.2010 (1209)/
Praca wpłynęła do Redakcji 01.04.2010 r. (1209)
Accepted for publication 04.10.2010/
Zakwalifikowano do druku 04.10.2010 r.

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