MEDICAL UNIVERSITY – PLEVEN

FACULTY OF MEDICINE

DEPARTMENT OF DERMATOLOGY, VENEREOLOGY AND ALLERGOLOGY

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Hand eczema – clinical, epidemiological and etiological analysis

ABSTRACT OF A DISSERTATION THESIS

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1. Prof. Dr. Ivelina Yordanova, MD – Internal member for MU-Pleven, Department of Dermatology, Venereology and Allergology at the Faculty of Medicine
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The dissertation contains 108 printed pages:
Illustrated with 26 tables and 36 figures
Abbreviations and introduction – 2 pages.
Literature review – 29 pages.
Purpose and objectives of the scientific work – 2 pages.
Materials and methods – 7 pages.
Results of own research – 30 pages.
Discussion of the results – 10 pages.
Conclusions and contributions – 5 pages.
Scientific production related to the dissertation work – 2 pages.
Appendices – 6 pages.
Bibliography – 12 pages (contains 164 titles, 6 in Cyrillic and 158 in Latin, including Bulgarian authors)

CONTENTS

ABBREVIATIONS USED

AD	-	Atopic dermatitis
ACD	-	Allergic contact dermatitis/eczema
BDD	-	Bulgarian Dermatological Society
HE	-	Hand eczema
ESC	-	European standard series
Aesthetics	-	Group of hairdressers, manicurists, beauticians, makeup
DE	-	Dyshidrotic eczema
CA	-	Contact allergy
CD	-	Contact dermatitis
OAKD	-	Occupational allergic contact dermatitis
OCA	-	Occupational contact allergy
S-1000	-	European standard series
H-1000	-	Specialized Hairdressing Series
MN-1000	-	Specialized Series (Meth) Acrylate - Nails Artificial
PPD	-	p- Phenylenediamine
IPPD	-	N-Isopropyl-N-phenyl-4- phenylenediamine
MCI/MI (Kathon CG)	-	Methylchloroisothiazolinone & Methylisothiazolinone
Laura in l	-	Part of the Sesquiterpene lactone mix
Lyral	-	Hydroxysohexyl-3-cyclohexene
MDBGN	-	Methyldibromoglutaronitrile
MI	-	Methylisothiazolinone
BA	-	Butyl acrylate
EMA	-	Ethyl methacrylate
BMA	-	Butyl methacrylate
2-HEMA	-	2-Hydroxyethyl methacrylate
2-HPMA	-	Hydroxypropyl methacrylate
EGDMA	-	Ethylene glycol dimethacrylate
TREGDMA	-	Triethylene glycol dimethacrylate
HDDA	-	1,6-Hexanediol diacrylate
TMPTA	-	Trimethylpropane triacrylate
THFMA	-	Tetrahydrofurfuryl methacrylate
EA	-	Ethyl acrylate
2-HEA	-	2-Hydroxyethyl acrylate
TREGDA	-	Triethylene glycol diacrylate

I. INTRODUCTION

Allergic contact dermatitis (ACD) of the hands, i.e., hand eczema (HE), is an inflammatory, non-infectious disease that occurs as a result of skin contact with harmful chemical, physical, or biological agents in the environment. Histologically, it is characterized by spongiosis, varying degrees of acanthosis, and superficial perivascular lymphohistiocytic infiltrate.
It causes significant discomfort, not only because of characteristic symptoms such as itching and pain, but also because of its significant impact on social adaptation and quality of life.

The incidence of EP ranges from 10% to 14% in the general population, with data indicating that approximately one-third of cases begin before age 20. Early manifestations of the disease are often associated with atopic diathesis. EP occurs 1.5 to 2 times more often in women than in men.

There are different morphological forms of the disease, each caused by a different etiological agent. Among the most common etiological factors are metals, perfumes, organic solvents, preservatives, and detergents. At the same time, the same causative agent can lead to diverse clinical manifestations. Correct classification of ER is essential for choosing an appropriate therapeutic strategy and implementing effective preventive measures, including protecting the skin barrier and avoiding specific irritants and allergens in individual patients.

Occupational hand eczema (OHE) is a socially significant health problem and is one of the most frequently registered occupational diseases, with a frequency reaching 30% in some occupational groups. Skin contact with irritating substances such as detergents, chemicals, and cleaning agents, combined with frequent hand wetting and mechanical friction, significantly increases the risk of developing occupational hand eczema.

The COVID-19 pandemic has led to widespread increased use of hand hygiene practices and disinfectants as part of infection prevention measures. This increase in disinfection practices, including frequent hand disinfection, has been critical to reducing virus transmission and protecting public health.

The Bulgarian dermatological scientific community occupies a significant place in the international literature with clinical, epidemiological, and pathophysiological studies related to contact skin allergy – P. Mihaylov, N. Berova, Z. Penev, L. Stranski, M. Trashlieva, N. Tsankov, Z. Kazandzhieva, R. Yankova, R. Durlenski, A. Lazarova, M. Krasteva, D. Antonov, I. Angelova - Fischer. To date, however, publications in our country on the etiology and clinical features of the various subtypes of hand eczema are few, mainly describing rare clinical observations.

These circumstances motivated us to develop this work based on the current epidemiological, etiological, and clinical data on ER among the Bulgarian population in the regions of the cities of Pleven and Ruse.

II. PURPOSE OF SCIENTIFIC DEVELOPMENT

To establish the role of exogenous factors in the appearance and development of eczema on the hand, and to explore the epidemiology and clinical-morphological spectrum of the disease in the Bulgarian population.

To achieve the goal, the following **TASKS have been set for implementation:**

1. To establish the general contact allergy for the period 2009-2024 in the regions of the cities of Pleven and Ruse, with patients distributed by gender, age, professional profile, and the type of contact dermatitis determined by the localization of the pathological skin changes.
2. To determine the top allergens from the European standard S-1000 series for the region, and to compare the results with data from the National Campaign for Diagnosis and Prevention of Allergodermatoses in the country.
3. Based on the results obtained for the region, the frequency of hand eczema was determined, and patients were divided by gender, age, professional profile, affected anatomical areas, and the top allergens from the ECS S-1000.
4. To determine the frequency of allergic reactions to (meth) acrylates from the specialized professional series MN-1000 (Nails) in nail technicians and clients with hand eczema.
5. To conduct a comparative analysis of patients with hand eczema for the frequency of the disease in the period before the start of the Covid pandemic (2009-2019) and during and after the end of the pandemic (2020-2014), and to determine trends in the development of contact allergy in both periods of the study.
6. To conduct a pilot study on hand eczema among healthcare workers in contact with the coronavirus (SARS-CoV-2), tested with the ESC S-1000 together with a special Covid series, which consists of allergens found in disinfectants and personal protective equipment.
7. To offer recommendations for hand care during the Covid pandemic.

III. MATERIAL AND METHODS

III.1. CLINICAL MATERIAL:

- **Five hundred nineteen individuals of both sexes, selected and epicutaneously tested with ESC (S-1000) for the period 2009-2024, residents** of the cities of Pleven and Ruse. Of these, 260 showed 496 positive samples.
- **87 positive individuals with hand eczema** (33.5% of all 260 positive individuals) with a total of 172 positive tests) at a mean age of 36.46 ± 12.84. Of these, 18 were men (20.7%), and 69 were women (79.3%). In the age group up to 40 years, there were 11 men (12.6% of all patients) and 41 women (47.1% of all patients). Among those over 40 years of age, there were seven men (8%) and 28 women (32.2%).
- **Forty women aged between 21 and 71 years** (mean age 34.80 ± 10.085) were selected between November 2016 and November 2024. Twenty-six (65%) were nail technicians, and 14 (35%) were clients of nail salons. Each completed the nationally standardized registration form. They were patch-tested with a targeted series for contact

hypersensitivity to (meth)acrylates (cat . MN: 1000 (Nails); Chemotechnique Diagnostics , Vellinge , Sweden). All totaled 196 positive reactions.

- **361 patients with hand eczema** from the Euroderma clinic – 156 (43%) with a total of 143 positive reactions before the pandemic (2018 and 2019) and 205 (57%) with 178 positive tests during and after it (2020-2022). The gender distribution shows 44 men (28%) and 112 women (72%) before the pandemic, and 63 men (31%) and 142 women (69%) after.
- **Twenty-eight medical professionals** (21 women and seven men, average age 44.80 years) were tested with S-1000 and a special Covid-series, which consists of allergens found in disinfectants and personal protective equipment. The study was conducted in 2020. The group consisted of 5 doctors, five nurses, 4 laboratory technicians, 4 orderlies, 2 medical students, 3 volunteers in the Covid wards, 1 physiotherapist, 1 rehabilitator, and two dentists. Eight medical professionals had negative epicutaneous testing. Thirty-four positive tests were reported, with reactions to more than one allergen in 12 patients.

III.2. METHODS:

- **Epidemiological methods –** two retrospective, cross-sectional, comparative analyses, pilot study
- **Documentary method –** registration form for gender, age, profession, diagnosis; photo documentation, digital camera Canon PowerShot A310
- **Clinical method –** history, dermatological status;
- **Allergy method –** epicutaneous testing: S-1000, MN-1000, and Covid-series (Chemotechnique Diagnostics, Vellinge, Sweden). The results were reported according to the ESCD (European Society of Contact Dermatitis) and the ICDRG (International Contact Dermatitis Research Group).
- **Sociodemographic tool: MOAHLA Index tracks trends in age, sex, and clinical characteristics related to contact allergy** over the years.
- **Statistical methods –** the collected information was entered and processed using IBM SPSS Statistics 26.0.0.
  - Description of qualitative and quantitative variables
  - Variational analysis
  - Parametric and nonparametric methods for hypothesis testing
  - Correlation analysis
  - To reject the null hypothesis, a coefficient of $p<0.05$ is accepted.
- **Ethical aspects**

IV. RESULTS OF OWN RESEARCH

IV.1. Results of a retrospective clinical -epidemiological analysis to determine the prevalence of contact hypersensitivity

Of the 516 individuals of both sexes tested epicutaneously in the indicated period, 260 (50.4%) showed a positive patch test to at least one allergen from ECS S-1000. A total of 496 positive reactions were reported. They ranged in age from 6 to 78 years, with a mean age of 39.09 ± 14.11 years. There were 61 men (23.5% of 260) and 199 women (76.5%). Under 40 years of

age, there were 30 men (11.5%) and 115 women (44.2%), and over 40 years, there were 31 men (11.9%) and 84 women (32.3%) ***(table 1)***

The professional profile shows the highest frequency of CA among representatives of the general professional group, followed by office workers. ***(Table 2)***

Table 1: Crosstabulation of age -gender distribution of positive individuals

			gender		Total
			men	women	
Age group	<40	number	30	115	145
		% of Total	11.5%	44.2%	55.8%
	>40	number	31	84	115
		% of Total	11.9%	32.3%	44.2%
Total		number	61	199	260
		% of Total	23.5%	76.5%	100.0%

Table 2: Population distribution by occupation

		frequency	percentage	Valid Percent	Cumulative Percent
Valid	unemployed	52	20.0	20.0	20.0
	office	60	23.1	23.1	43.1
	medicine	31	11.9	11.9	55.0
	aesthetics	39	15.0	15.0	70.0
	others	78	30.0	30.0	100.0
	Total	260	100.0	100.0	

According to the type of dermatitis, the frequency of eczema on the upper limbs was 94 individuals (36.2%), dermatitis on the face and atopic dermatitis were 33 individuals (12.7%), and eczema on the lower limbs was 17 individuals (6.5%). Eighty-three (31.9%) were positive without clinical manifestations of allergic dermatitis or had another non-allergic diagnosis, but showed positive reactions in the epicutaneous test. ***(Fig. 1)***

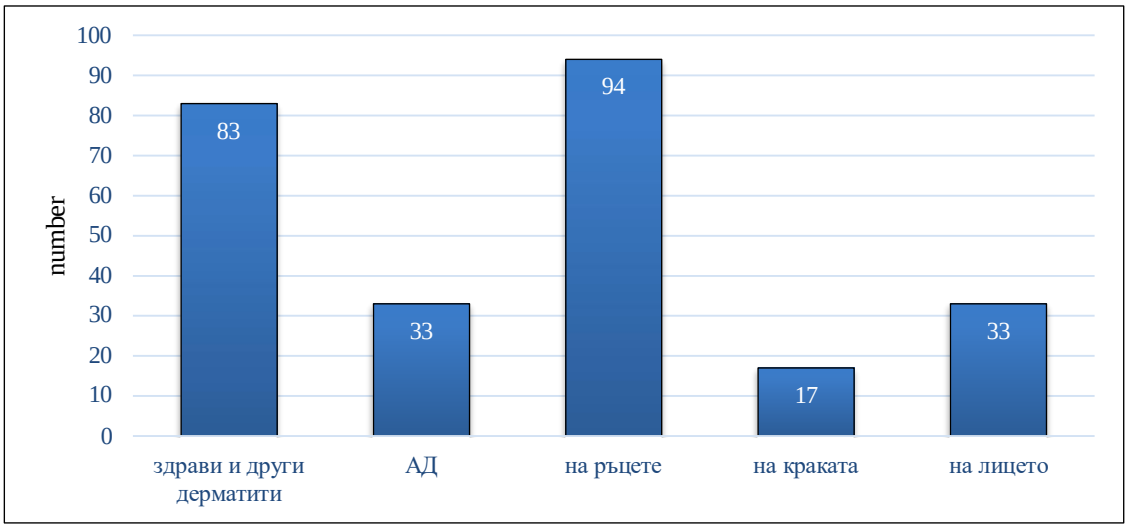


Figure 1: Distribution of patients according to type of dermatitis

The calculation of the MOAHLFA index outlines trends in the development of contact allergy in the cities of Pleven and Ruse, including the prevalence of the female gender, a high frequency of eczema on the hands, and the rarest on the lower extremities. We have not studied the frequency of occupational dermatitis. ***(Fig.2)***

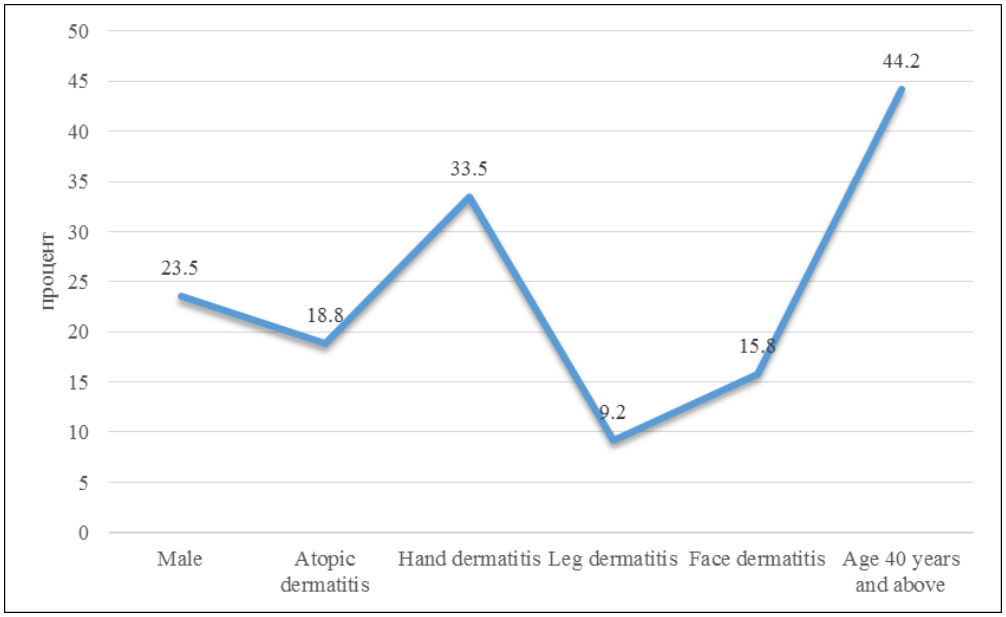


Figure 2: MAHLFA index characterizing CA

From the conducted epicutaneous testing, the most frequent positive reactions were to nickel 143 (28.8%), followed by those to cobalt 86 tests (17.3%), textile dyes 30 (6%), PPD 28 (5.6%), chromium 27 (5.4%), Peruvian balsam 25 (5%), and isothiazolinones 24 (4.8%). By allergen groups, metals caused 256 positive reactions (51.6% of all 496), preservatives 60 reactions (12.1%), fragrances 63 reactions (12.7%), dyes 58 reactions (11.7%), rubbers 16 reactions (3.3%), plastics and resins 21 reactions (4.2%) and the remaining other allergens 28 positive tests (5.6%). ***(Fig. 3)***

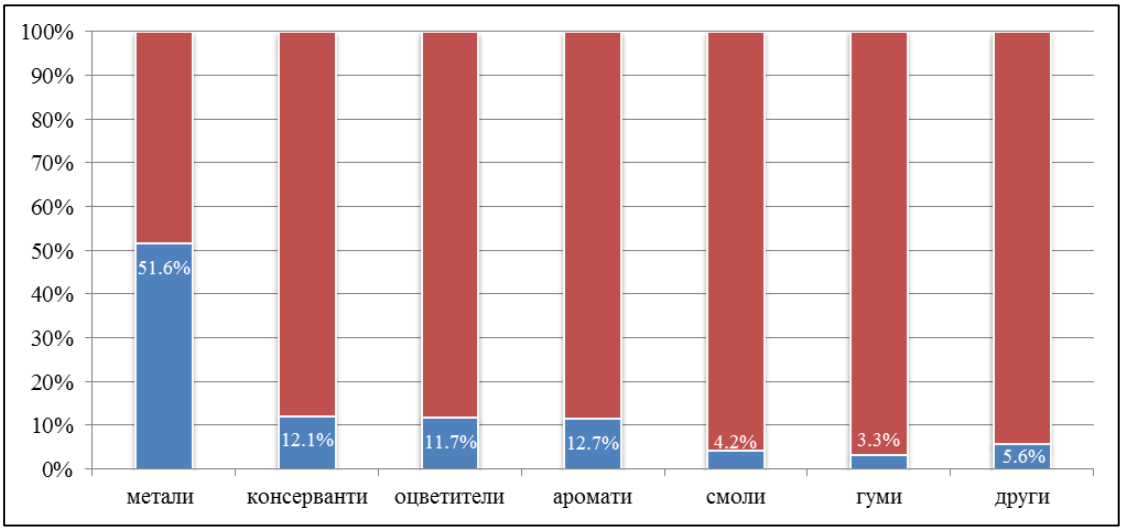


Figure 3: Percentage distribution of positive reactions to allergen groups

To measure the relationships between hand dermatitis and the main groups of allergens, the signed-rank test (Wilcoxon test) was applied. The test shows that all three comparisons

(metals, preservatives, and fragrances versus EP) are statistically significant ($p < 0.001$). Calculation of the effect of the relationship using the formula $r = Z / \sqrt{N}$ (where $N = 260$) shows a "medium to large effect" for metals*EP (0.48), a "small to medium" effect for preservatives*EP (0.25), and a "medium" effect for fragrances*EP (0.32). ***(Fig.4)***

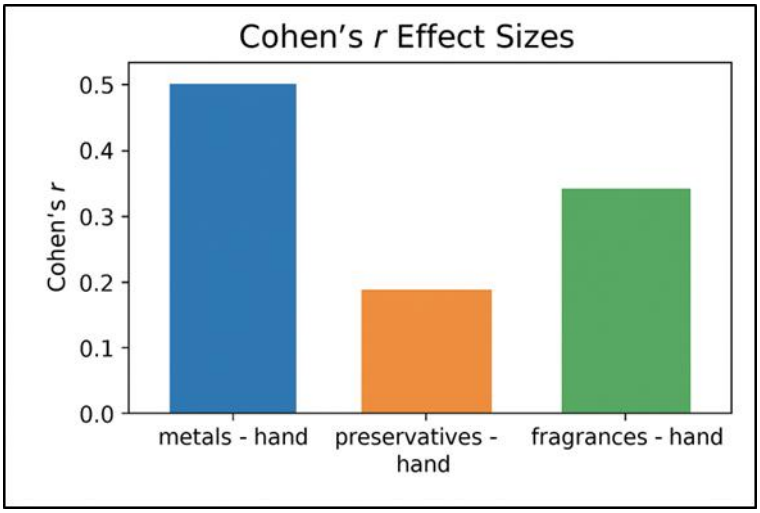


Figure 4: Visualization of the effect

Considering that patients with concomitant nickel and cobalt allergy often present with severe hand eczema and a poor prognosis (Thyssen, 2011), reactivity to metals was considered. Fifty-four patients (20.8% of all 260 positive individuals) had positive reactions simultaneously to nickel*cobalt, ten (3.8%) to nickel*cobalt*chromium, and three (1.15%) to cobalt*chromium.

To determine whether atopic diathesis is a risk factor for hand eczema, we examined the odds ratio (OR = 2.3542, CI 95 %: 1.5953 to 3.4743, $P < 0.0001$). Atopic diathesis is a significant risk factor for the development of hand eczema, with the risk being nearly 2.5 times higher for EP in atopic individuals.

IV.2. Results of a comparative analysis to determine the prevalence of contact hypersensitivity in the Pleven-Ruse region and data for the country (2009-2024)

During the study period (2009-2024), 16 National campaigns for the diagnosis and prevention of allergic skin diseases were carried out, offering free examinations and patch testing with the European Baseline Series S-1000, including the extended version of 42 allergens. The results are reported annually at national conferences to determine the "Allergen No. 1" each year and are stored in the dermatoallergology section of the Bulgarian Dermatology Society. This allows for comparison of the results from the entire country with those of individual research centers. For Bulgaria, 4491 individuals with 4775 positive reactions were tested.

It is striking that, when comparing the data for the country and the Pleven-Ruse center, there is a clear difference in contact hypersensitivity to nickel (20% in the country vs. 28% in our study) and to cobalt (11% in the country vs. 17% in our study). Other differences in the frequency of the top allergens are in the range of 0.5% to 3%, i.e., relatively insignificant. It should be borne in mind that differences in the data are common, as each region has its own specific ecological environment, industry, professional profile, etc. In order to test the hypothesis whether the arithmetic mean values for the top allergens are equal for the country and the Pleven-Ruse region, an analysis of variance was conducted, the result of which showed that there was no statistically significant difference in the data obtained for the country and those in the Pleven-Ruse region

(p=0.346). The results are similar across the allergen groups, with those for "metals" and "colorants" higher in Pleven-Ruse, and those for "preservatives", "fragrances", "resins", and "rubbers" prevailing in the summarized data for the country. ***(Table 3)***

Table 3: Comparative table of the country's results with ours

Allergen profile of frequent positive reactions		**Bulgaria** 4491 tested; 4775 +reactions		**Pleven-Ruse** 519 tested; 496 +reactions	
	Data collection	Number of +reactions	percentage	Number of +reactions	percentage
Top allergens	Nickel sulfate	963	20%	143	28%
	Cobalt chloride	541	11%	80	17%
	Potassium dichromate	294	6%	27	5.5%
	Bal sam Peru	263	5.5%	25	5%
	Fragrance mix I	190	4.2%	10	2%
	Kathon CG	210	4.4%	13	2.6%
	Colophony	198	4%	17	3.4%
	Text dyes	193	4%	30	6%
	p- Phenylenediamine	189	3.9%	28	5.6%
Allergen groups	metals	1798	38%	256	51.6%
	preservatives	874	18.3%	60	12.1%
	fragrances	578	12.1%	57	12.7%
	colorants	382	8%	58	11.7%
	resins	325	6.8%	21	4.2%
	tires	186	3.9%	16	3.3%

It must be concluded that our results for the period 2009-2024 are consistent with data on contact hypersensitivity among the Bulgarian population, as studied by epicutaneous testing (patch test) with allergens from the European standard series S-1000.

IV.3. Results of a clinical and epidemiological analysis of patients with hand eczema from the Pleven-Ruse region for the period 2009-2024.

Over the indicated period, 519 individuals of both sexes were tested epicutaneously in the cities of Pleven and Ruse. Of these, 260 showed positive reactions after testing with allergens from the European standard series S-1000, for a total of 496 positive reactions. Of these, **87 individuals (33.5% of all 260 positive individuals) with an average age of 36.46 ± 12.84 had eczema on the hand**. Of these, 18 were men (20.7%), and 69 were women (79.3%). In the age group up to 40 years, 11 were men (12.6% of all patients) and 41 were women (47.1% of all patients). Over 40 years, 7 were men (8%), and 28 were women (32.2%). One hundred sixty-eight positive tests were reported (34% of the total 496)**.** ***(Table 4.)***

Tracking the incidence of hand eczema over the years is presented in Figure 5 ***(Fig. 5)*** The high incidence of ER during and after the COVID-19 pandemic is striking (32.5% of patients until 2019 versus 50.7% of patients in the period 2021-2024). The highest number of patients with ER was registered in 2023 – 15 (17.2% of all 87 individuals)

Table 4: Crosstabulation for the distribution of patients with ER by gender and age

		Age groups		
		< 40 years	> 40 years	Total
male	Count	11	7	18

gend er		% within gender	61.1%	38.9%	100.0%
		% within age group	21.2%	20.0%	20.7%
		% of Total	12.6%	8.0%	20.7%
	female	Count	41	28	69
		% within gender	59.4%	40.6%	100.0%
		% within age_group	78.8%	80.0%	79.3%
		% of Total	47.1%	32.2%	79.3%
Total		Count	52	35	87
		% within n	59.8%	40.2%	100.0%
		% within age_group	100.0%	100.0%	100.0%
		% of Total	59.8%	40.2%	100.0%

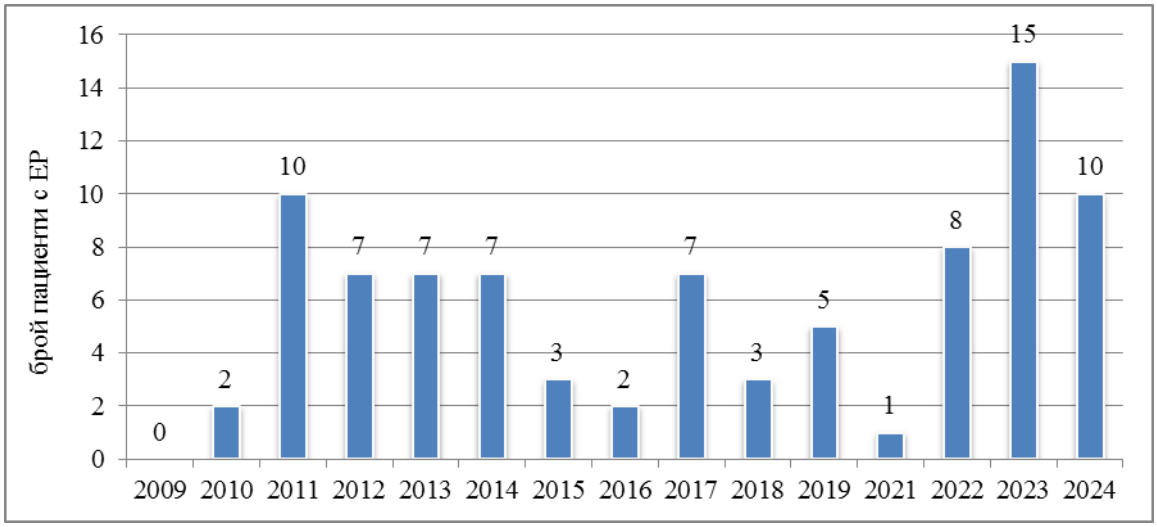


Figure 5: Number of patients with hand eczema over the years (n=87)

Their professional profile shows that the highest number of those employed in aesthetic procedures (hairdressers, beauticians, nail technicians) is 24.1%, followed by those with various professions (production, agriculture, teachers, engineers, artists, etc.) – 23%. Equal in number with 19.5% are the unemployed (pupils, students, pensioners, homemakers, unemployed) and office workers (technical assistants, secretaries, IT specialists, bathroom workers, lawyers). Representatives of medicine are 13.8%: doctors, nurses, orderlies, laboratory technicians, and dentists. (Fig...) Of the 87 patients, 13.8% have data on atopy (2.3% men and 11.5% women), and 3.5% have a clinic diagnosis of AD at the time of the study.

In the conducted epicutaneous testing, 34 individuals had one positive test, 35 were positive to two allergens, eight to three, seven to four, two to five, and one to six allergens. The total number of positive samples is 172.

The most common are positive reactions to nickel (48 reactions, 28% of all positive reactions), followed by those to cobalt (27 r., 15.7%), to Peruvian balsam (14 r., 8.1%), to p-phenylenediamine and textile dyes (9 r. each, 5.2%), to rosin (8 r., 11%), potassium dichromate and methylisothiazolinone (6 r. each, 3.5%), etc. ***(Fig. 6)*** In 20 individuals there is simultaneous reactivity to nickel*cobalt and in three Kathon CG*methylisothiazolinone.

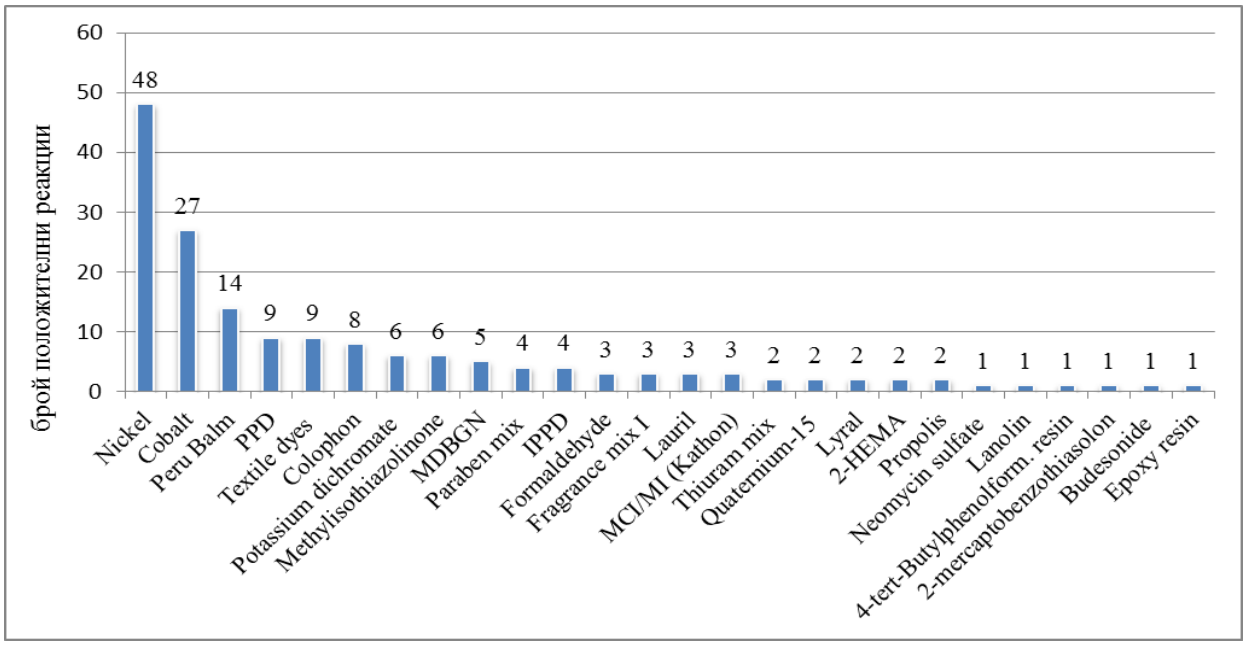


Figure 6: Frequency of allergens causing contact allergy in patients with ER

The distribution of positive tests by allergen groups shows the highest frequency of metals (81 positive reactions, 47% of all 172), followed by the group of preservatives (23 r., 13.4%), that of aromas (22 r., 12.8%), of dyes (18 r., 10.5%), of gums and resins (17 r., 10%). Outside these groups, the remaining allergens accounted for 14 positive tests (8.1%).

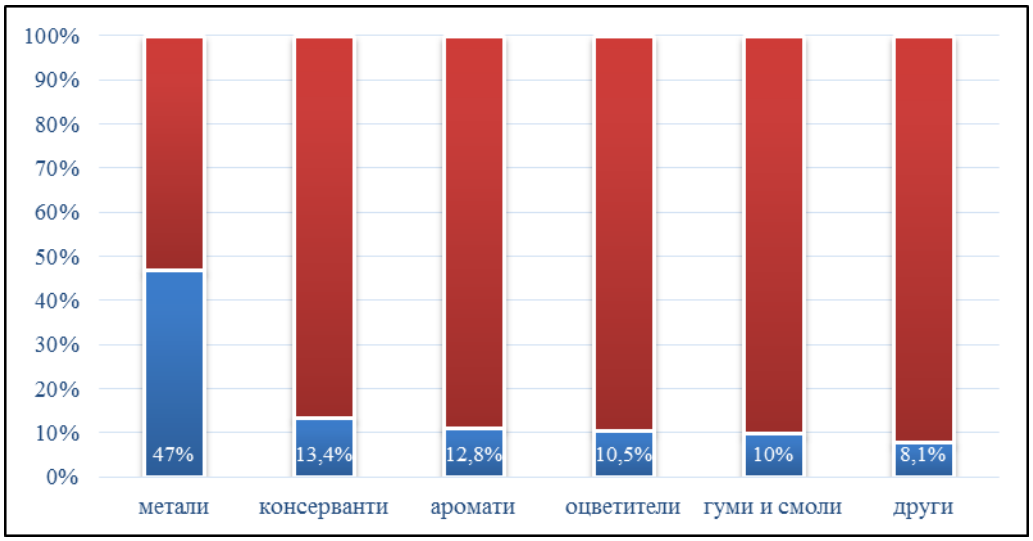


Figure 7: Group distribution of positive reactions, expressed in percentages

EP and metal allergy

Of the 87 patients with EP, eight men (9.2%) and 40 women (46%) were positive for nickel. Under 40 years of age, 3.5% of men and 20.7% of women were, and over 40 years of age, 5.7% of men and 25.3% of women were. Among family and personal data for atopy and a positive nickel test, 10.3% were, and all three with clinical AD activity were nickel-positive. By professional occupation, 55% (48 individuals) are nickel-positive, most often among office workers (13.8%), general occupations (12.6%), and those employed in aesthetic procedures (11.5%).

Nickel allergy is associated with reactivity and sensitization to other metals. In this regard, 31% of those positive for nickel had a single positive reaction to the test, 23% reacted positively to nickel and cobalt, 2.3% reacted positively to nickel and chromium, the same number to chromium and cobalt, and 1.15% reacted positively to all three metals (both nickel and cobalt and chromium).

To assess the influence and relationship between the factors cobalt chloride (Cobalt chloride) and nickel sulfate (Nickel sulfate) on the studied indicator (EP), one-way analysis of variance (ANOVA) and Pearson's χ^2 test were applied. ***(Table 5)***

Table 5: Analysis of variance (ANOVA) of the nickel*cobalt relationship for the development of hand eczema

			Sum of Squares	df	Mean Square	F	Sig.
Cobalt_chloride * Nickel_sulfate	Between Groups	(Combined)	1,210	1	1,210	5,910	,017
	Inside Groups		17,410	85	,205		
	Total		18,621	86			

The results show that the interaction between the two antigens has a statistically significant effect on the dependent variable (hand eczema) – F = 5.910, p = 0.017. Additionally, the results of the chi- square test confirm the presence of a significant relationship between the categorical values of the studied factors – $\chi^2(1) = 5.655$, p = 0.017. Fisher's t-test (p = 0.021) also supports this relationship. ***(Table 6)***

Table 6: Crosstabulation cobalt*nickel with Pearson χ^2-test

			Nickel_sulfate		Total
			-	+	
Cobalt chloride	-	Count	32	28	60
		% within Cobalt chloride	53.3%	46.7%	100.0%
		% within Nickel sulfate	82.1%	58.3%	69.0%
		% of Total	36.8%	32.2%	69.0%
	+	Count	7	20	27
		% within Cobalt chloride	25.9%	74.1%	100.0%
		% within Nickel sulfate	17.9%	41.7%	31.0%
		% of Total	8.0%	23.0%	31.0%
Total		Count	39	48	87
		% within Cobalt chloride	44.8%	55.2%	100.0%
		% within Nickel sulfate	100.0%	100.0%	100.0%
		% of Total	44.8%	55.2%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5,655 [a]	1	,017		
Continuity Correction [b]	4,602	1	,032		
Likelihood Ratio	5,861	1	,015		
Fisher's Exact Test				,021	,015
Linear-by-Linear Association	5,590	1	,018		
N of Valid Cases	87				

Based on these results, it can be concluded that there is a statistically significant interaction between cobalt chloride and nickel sulfate, with a significant impact on allergic dermatitis.

EP and allergy to preservatives

Among the preservatives, 23 of 172 reactions (13.4%) were positive. They were detected in 19.5% of the tested: 3.4% in men and 16.1% in women. One patient (1.1%) had data on atopy. The affected were office workers and medical staff (4.6% each), and those employed in aesthetics (3.4%). The most common were + reactions to methylisothiazolinone (3.5%), followed by MDBGN (2.9%) and Paraben mix (2.3%). No positive patch tests to Benzisothiazolinon and Diazolidinyl urea have been reported.

The results of contact allergy to preservatives in patients with EP are presented in the following table. ***(Table 7)***

Table 7: Frequency of positive reactions to preservatives

preservatives	Number of (+) reactions	Percentage
Methylisothiazolinone	6	3.5%
MD B GN	5	2.9%
Paraben mix	4	2.3%
Formaldehyde	3	1.7%
Methylchlorisothiazolinone / Methylisothiazolinone (Kathon)	3	1.7%
Quaternium-15	2	1.2%
Diazolidinyl urea	0	0%
Benzisothiazolinone	0	0%

EP and fragrance allergy

The fragrance group is represented by 22 positive tests – 12.8% of all 172 positive reactions. Positive patch tests were observed in 21.8% of those tested – 6.9% in men and 14.9% in women. Only one person (1.1%) had data on atopy. Those affected were unemployed persons (5.7%), medical professionals, and those employed in aesthetics (4.6% each). The most common are + reactions to Peru Balm (8.1%), followed by Sesquiterpene lactone mix and Fragrance mix I (2.9% each). In patients with hand eczema, no positive tests for Fragrance Mix II, Linalool, or Limonene were observed. The results of contact allergy to aromatic substances in patients with EP are presented in the table ***(Table 8)***

Table 8: Frequency of positive reactions to fragrances

fragrances	Number of (+) reactions	Percentage
Peru Balm	14	8.1%
Sesquiterpene lactone mix (Lauryl)	3	1.7%
Fragrance mix I	3	1.7%
Hydroxysohexyl-3-cyclohexene (Lyral)	2	1.2%
Fragrance mix II	0	0%
Linalool	0	0%
Limonene	0	0%

No statistically significant associations were found between the two groups of allergens with hand eczema, either for "preservatives" (χ^2 (1)=0.79, p=0.664, N=260, Cramer's V=0.076) or for "fragrances" (χ^2 (1)=1.494, p=0.222, N=260, Cramer's V=0.027).

IV.4. Results of the study on the frequency of allergic reactions to (meth) acrylates from the specialized professional series MN-1000 (Nails) in nail technicians and clients, all with hand eczema.

Between November 2016 and November 2024, 40 positive women aged 21 to 71 years were selected, 26 of whom were manicurists and 14 were clients of nail salons. The aim and objectives of this study were to identify (meth) acrylate antigens from the manicurist-targeted MN-1000 series (cat . MN: 1000; Chemotechnique Diagnostics, Vellinge, Sweden), which are the cause of hand ACD in nail technicians and their clients, as well as to study the clinical characteristics of the dermatitis. Patient data (gender and age, professional activity, and atopy), clinical characteristics of dermatitis, and results of patch testing with the targeted series MN-1000 for contact hypersensitivity to acrylates were evaluated.

With positive reactions to acrylates and methacrylates (mean age 34.80 ± 10.085). Twenty-six (65%) were nail technicians, and 14 (35%) were clients of nail salons. In the 20-29 age group, manicurists were 27.5%; in the 30-39 age group, 22.5%; and in the 40-49 age group, 6%. Among the clients, up to 29, 15% were; from 30 to 39, 10% were; in the age group 40-49, 2.5% were; and over 50, 7.5% were. The distribution of positive individuals by age and status is presented in the table. ***(Table 9)***

Table 9: Age characteristics of patients

age * occupation Crosstabulation					
			social status		Total
			manicurist	client	
age	20-29 years old	Count	11	6	17
		% of Total	27.5%	15.0%	42.5%
	30-39 years old	Count	9	4	13
		% of Total	22.5%	10.0%	32.5%
	40-49	Count	6	1	7
		% of Total	15.0%	2.5%	17.5%
	over 50 years old	Count	0	3	3
		% of Total	0.0%	7.5%	7.5%
Total		Count	26	14	40
		% of Total	65.0%	35.0%	100.0%

Pathological skin changes were localized on the face in 8 patients (20%), on the scalp in two (0.5%), on the neck in four (10%), on the palms in 30 (75%), on the fingers and nails in 28 (70%), on the back of the palms and forearms in 14 (35%), on the torso in two (0.5%) and on the lower limbs in one (0.25%). The number of topographic pathologies and the percentages exceed 40 individuals and 100%, because at least two topographic areas of the body are affected. However, the analysis of their localization shows that the upper limbs are most affected – in 27 patients (67.5%)- and that simultaneous involvement of the palms, fingers, and nails is observed in 19 patients (47.5%) – in 15 manicurists and 4 clients. ***(Fig.8)***

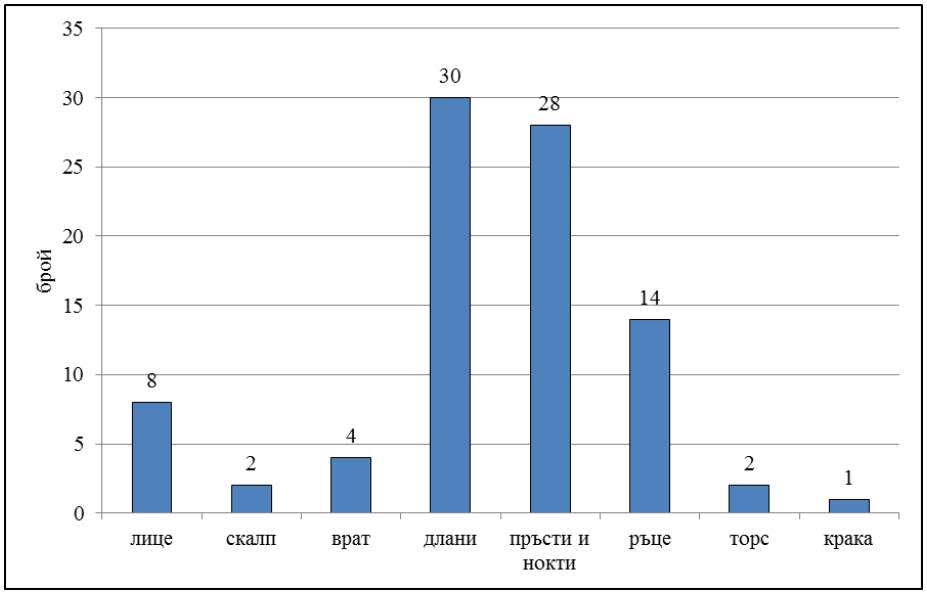


Figure 8: Number of affected anatomical areas in acrylate contact allergy

ACD presented as dermatitis on the face in two patients (5.0%), dermatitis on the face and hands in six (15.0%) (3 manicurists and four clients), and eczema on the hands was the most common (32, 80.0%). ***(Table 10)*** With χ^2-statistics, a statistical difference was found in the distribution by diagnosis of patients with and without dermatitis on the hands - $\chi^2(1) = 4.949$, $p = 0.026$.

Table 10: Crosstabulation of distribution according to the type of dermatitis

			patients		Total
			manicurist	client	
DERMATITIS	on the face	Count	1	1	2
		% of Total	2.5%	2.5%	5.0%
	on the hands	Count	23	9	32
		% of Total	57.5%	22.5%	80.0%
	hands and face	Count	2	4	6
		% of Total	5.0%	10.0%	15.0%
Total		Count	26	14	40
		% of Total	65.0%	35.0%	100.0%

The most common is sensitization within the first year after initial contact with the allergens (65.0%), followed by the period from 1 to 3 years (17.5%), the period from 3 to 5 years (10.0%), and after the 6th year (7.5%). From a professional point of view, it is important to emphasize that nail technicians develop ACD mainly by the third year of their practice – 19 of them (47.5%) by the first year and 3 (7.5%) by the third year.

The dermatological status shows that facial involvement in manicurists consists of mild to moderate pruritus and moderately pronounced erythema on the cheeks, with pityriasis versicolor desquamation. In manicurists, ER is localized on the volar surface of the palms and fingers, in the acute phase in the form of bullous pulpitis and perionixis, and in chronic with xerosis, moderately expressed palmar hyperkeratosis, and pityriasis desquamation, densification and desquamation of the skin on the distal phalanges with single cracks and onychodystrophic changes. The most common clinical manifestation of ACD of the hands, both for nail technicians and users, is chronic pulpitis with fissures and desquamation of the fingertips (with or without involvement of the perinhyium and nails). In polyacrylate allergy, the so-called “angry back” phenomenon may occur.

The total number of positive reactions was 196, with the highest frequency for 2-Hydroxyethyl methacrylate (75.0%), Hydroxypropyl methacrylate (70.0%), ethylene glycol dimethacrylate (62.5%), Ethyl acrylate (52.5%), 2-Hydroxyethyl acrylate, and Triethylene glycol diacrylate (both 45.0%). ***(Table 11)***

Table 11: Distribution of positive reactions to the different (meth)acrylates

Allergens (MN – 1000)	abbreviation	concentration and vehicle	manicurists	customers	total	percentage
			n = 26	**n = 14**	**n = 40**	**% of 40**
Butyl acrylate	BA	0.1% pet	9	6	15	37.5
Ethyl methacrylate	EMA	2.0% pet	9	1	10	25.0
Butyl methacrylate	BMA	2.0% pet	5	2	7	17.5
2-Hydroxyethyl methacrylate	HEMA	2.0% pet	22	8	30	75.0
2-Hydroxypropyl methacrylate	HPMA	2.0% pet	19	9	28	70.0
Ethylene glycol dimethacrylate	EGDMA	2.0% pet	16	9	25	62.5
Triethylene glycol dimethacrylate	TEGDMA	2.0% pet	3	5	8	20.0
1,6-Hexanediol diacrylate	HDA	0.1% pet	5	2	7	17.5
Trimethylpropane triacrylate	TMPTA	0.1% pet	0	0	0	0
Tetrahydrofurfuryl methacrylate	THFMA	2.0% pet	8	1	9	22.5
Ethyl acrylate	EA	0.1% pet	14	7	21	52.5
2-Hydroxyethyl acrylate	HEA	0.1% pet	12	6	18	45.0
Triethylene glycol diacrylate	TEGDA	0.1% pet	10	8	18	45.0
		Total reactions	**132**	**64**	**196**	

No patient showed a positive reaction to Trimethylolpropane triacrylate. Two women reacted to one allergen (NONE); one showed 11 positive tests; three had 10 positive allergens; three had eight positive acrylates. Cross-reactivity between antigens from the MN-1000 target series was documented, with simultaneous reactions to HEMA and HPMA occurring in 22 individuals (55.0% of all patients), HEMA*HPMA*EGDMA in 18 (45.0%), HEMA*HPMA*EGDMA*EA in 13 (32.5%), HEMA*HPMA*EGDMA*HEA in 14 patients (35.0%). Given the available cross-reactivity, the association between hand dermatitis and patients who are simultaneously positive for HEMA*HPMA is statistically significant, with a medium-strength correlation ($r=0.315$, $p<0.05$). ***(Table 12)***

Table 12: Correlation analysis for the relationship between hand eczema and both methacrylics

		EP	HEMA* HPMA
Hand eczema	Pearson Correlation	1	.315 *
	Sig . (2-tailed)		.048
	N	40	40
HEMA* HPMA	Pearson Correlation	.315 *	1
	Sig . (2-tailed)	.048	
	N	40	40

* .Correlation is significant at the 0.05 level (2-tailed).

Correlation analysis shows that 2-Hydroxypropyl methacrylate and Ethylene glycol dimethacrylate individually have a significant impact on the development of hand eczema, with a medium-strength relationship for both (meth) acrylates (for 2-HPMA, $r=0.435$, $p=0.005$, for EGDMA, $r=0.368$, $p=0.02$).

It should also be noted that the allergen association 2-NEMA*2-HPMA*EGDMA (54% of manicurists in our study), as well as 2-NEMA*2-HPMA*EGDMA*2-HEA (50% of them), is characteristic of professional ACD among nail technicians.

IV. 4. Results of a comparative analysis of patients with hand eczema for the frequency of the disease in the period before the start of the Covid pandemic (until 2019) and during and after the end of the pandemic (after 2020), and the trends for the development of contact allergy in both periods of the study are determined.

IV.4.1. Contact allergy in the 260 positive patients in the Pleven-Ruse region before and after the COVID-19 epidemic for the period 2009-2024. ECS-1000 and ECB-1000 were applied.

Depending on the period before and after the COVID-19 pandemic, the studied population is divided into two subpopulations: 193 patients in the years 2009-2019, of whom 42 were men, and 151 were women. They had a total of 354 positive epicutaneous samples (1.83 positive tests per person). In the years 2020-2024, 67 people had contact allergy, of whom 19 were men and 48 were women, with 142 positive tests (2.12 per person). ***(Table 13)***

Table 13: Distribution by gender and age group of patients from the two subpopulations

Age group				gender		Total
				man	woman	
<40	Periods	by 2020	Count	19	86	105
			% of Total	13.1%	59.3%	72.4%
		after 2020	Count	11	29	40
			% of Total	7.6%	20.0%	27.6%
	Total		Count	30	115	145
			% of Total	20.7%	79.3%	100.0%
>40	periods	by 2020	Count	23	65	88
			% of Total	20.0%	56.5%	76.5%
		after 2020	Count	8	19	27
			% of Total	7.0%	16.5%	23.5%
	Total		Count	31	84	115
			% of Total	27.0%	73.0%	100.0%
Total	periods	by 2020	Count	42	151	193
			% of Total	16.2%	58.1%	74.2%
		after 2020	Count	19	48	67
			% of Total	7.3%	18.5%	25.8%
	Total		Count	61	199	260
			% of Total	23.5%	76.5%	100.0%

Of the 260 positive individuals, 82 were without pathological exanthema – 74 in the period 2009-2019 and 8 in the years 2020-2024. The most affected areas of the body are the palms, face, and upper limbs. It is noteworthy that the frequency of involvement of the palms (80%), upper limbs (42%), and neck area (21%) is higher than that recorded before the pandemic, i.e., the anatomical areas of the body that come into contact with disinfectants, detergents, and personal protective equipment. ***(Fig. 9)***

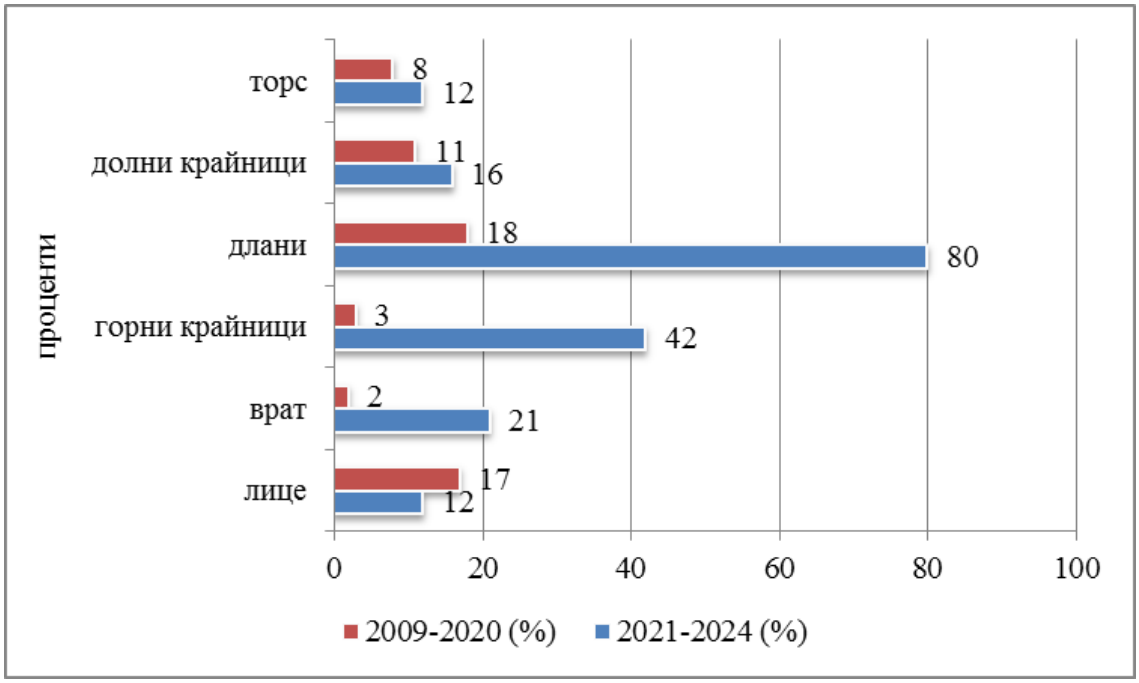
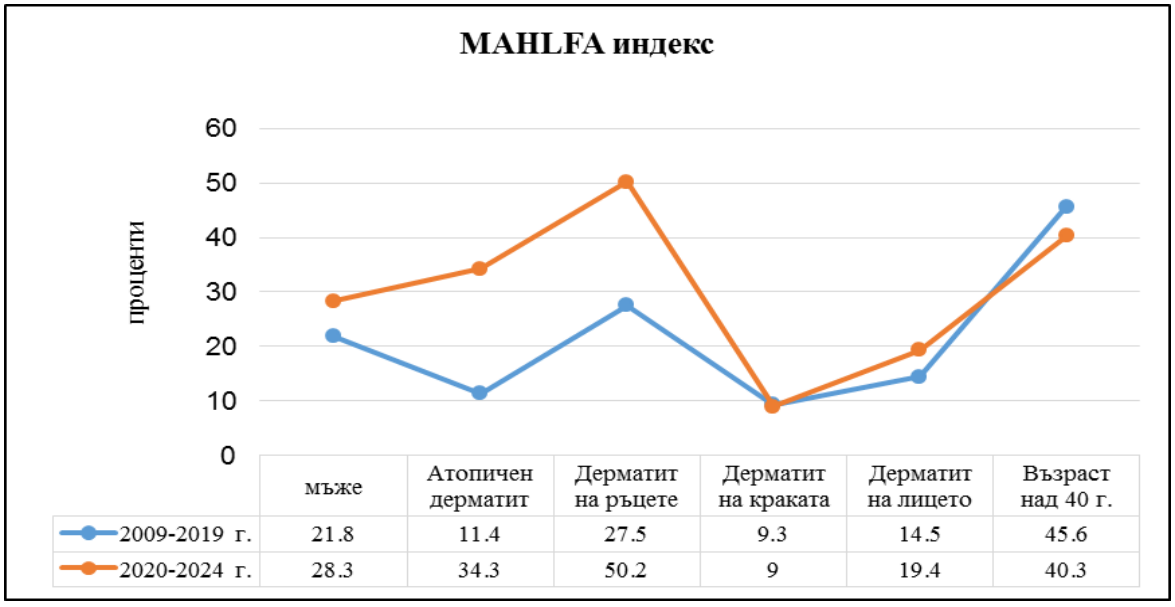


Figure 9: Percentage of affected anatomical areas in the two study periods

In order to determine the trends in the development of contact allergy over the years in the region, the MOAHLFA index was used to track contact hypersensitivity in population studies. The data are presented in percentages. The incidence of occupational dermatitis was not tracked in this study. ***(Fig.10)***



	мъже	Атопичен дерматит	Дерматит на ръцете	Дерматит на краката	Дерматит на лицето	Възраст над 40 г.
2009-2019 г.	21.8	11.4	27.5	9.3	14.5	45.6
2020-2024 г.	28.3	34.3	50.2	9	19.4	40.3

Figure 10: Comparison of trends in the development of contact allergy in the two study periods

Descriptive statistics revealed a statistically significant difference in the distribution of patients with atopic diathesis and those with hand dermatitis in both periods of the study, before and after the COVID-19 pandemic. ***(Table 14)*** At the same time, the risk of developing contact allergy in atopics during the pandemic and after it was 2.6 (OR=2.616; 95%CI 1.349 – 5.076; p=0.0045), and for developing hand dermatitis, it was 2.7 (OR=2.722; 95%CI 1.5332 – 4.8311; p=0.0006).

Table 14: Statistical significance when comparing the two groups of patients with CA

	2009-2019 (n=193)		2021-2024 (n=67)		χ^2	T-test
indicators	**n**	**%**	**n**	**%**	**p**	**p**
men	42	21.8	19	28.3	0.2 7 2	0. 274
Atopic dermatitis	26	1.5	23	34.3	0.001*	0.000*
Hand dermatitis	53	27.5	34	50.2	0.001*	0.001*
Dermatitis of the feet	18	9.3	6	9.0	0.918	0.5 74
Facial dermatitis	28	14.5	13	19.4	0. 344	0. 337
People over 40 years old	88	45.6	27	40.3	0.924	0.545

In both subpopulations, patch testing shows the highest frequency (in percentages) of positive reactions to nickel (31% and 23%) and cobalt (19% and 13%). The percentage ratios for potassium dichromate (5% to 8%), textile dyes (4% to 11%), and methylisothiazolinone (2% to 4%) indicate that contact hypersensitivity to them is more common among individuals selected in the period 2020-2024. An equal ratio was observed in both subgroups for Peruvian balsam (5% each), fragrance mix I (2% each), and caton (2% each). ***(Fig.11)***

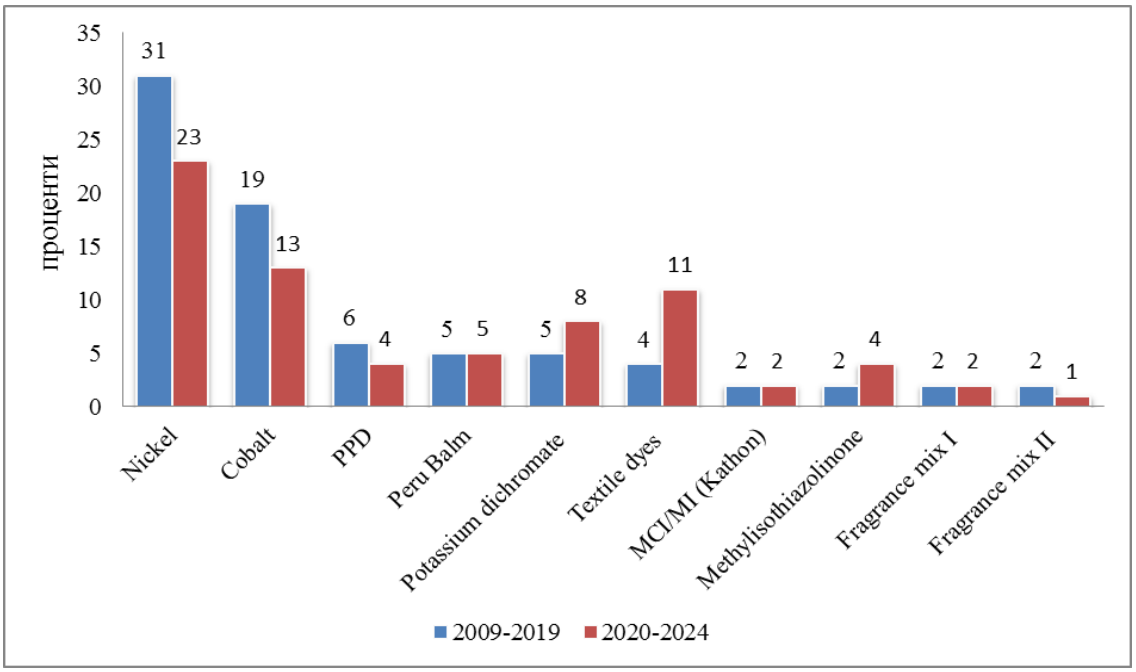


Figure 11: Percentage ratio of patch testing results in individuals from the two subpopulations for the most common allergens

In the studied population with hand eczema, 87 individuals were positive, 54 (62%) before the pandemic and 34 (38%) during and after the pandemic. Individuals with EP until 2020 showed a total of 108 positive reactions (2.03 p- ii per person), and those after 2020, 64 reactions. (1.88 per person). The highest frequency of positive tests was for nickel (58.5% of 108

tests before Covid and 50% of 64 tests during and after Covid), as well as for cobalt (30.2% and 32.4%). ***(Table 15)***

Table 15: Percentage ratio of the top 5 allergens in the two periods of the study

Allergens	2009-2020 (percentages)	2020-2024 (percentages)
Nickel(II) sulfate hexahydrate	58.5	50.0
Cobalt(II) chloride hexahydrate	30.2	32.4
Peru balm	13.2	20.6
Methyldibromo glutaronitrile	3.8	8.8
Textile dye mix	7.5	14.7

IV.4.2. Hand eczema in patients tested at the EuroDerma clinic before and after the COVID-19 epidemic (for the period 2018-2022); Extended European ECB-1000 series applied)

During the specified period, 361 patients with hand eczema were tested at the center: 156 (43%) with a total of 143 positive reactions before the pandemic (2018 and 2019), and 205 (57%) with 178 positive tests during and after it (2020-2022). The gender distribution shows 44 men (28%) and 112 women (72%) before the pandemic, and 63 men (31%) and 142 women (69%) after. According to the type of dermatitis, 63 patients (40%) in the first period and 93 (45%) in the second had Irritant Contact Dermatitis. 93 (60%) and 112 individuals (55%) had Allergic Contact Dermatitis, respectively. ***(Table 16)***

Table 16: Distribution of patients by gender and diagnosis

periods		2018-2019		2020-2022	
indicators		number	percentage	number	percentage
gender	male	44	28%	63	31%
	female	112	72%	142	69%
Total		156	100%	205	100%
diagnosis	ICD	63	40%	93	45%
	AKD	93	60%	112	55%
Total		156	100%	205	100%

Positive reactions to nickel were 36 (25% of all 143 positive tests) before and 30 (17% of all 178 positive tests) after the pandemic. For cobalt, 16 (11.2%) before and 13 (7.3%) after; for Kathon CG, 23 (16%) before and 26 (15%) after the epidemic. The frequency of allergens causing

contact hypersensitivity in hand eczema for the two years before the infection and during the pandemic period (2020-2022) is shown in the following figures. ***(Fig. 11 and Fig. 12)***

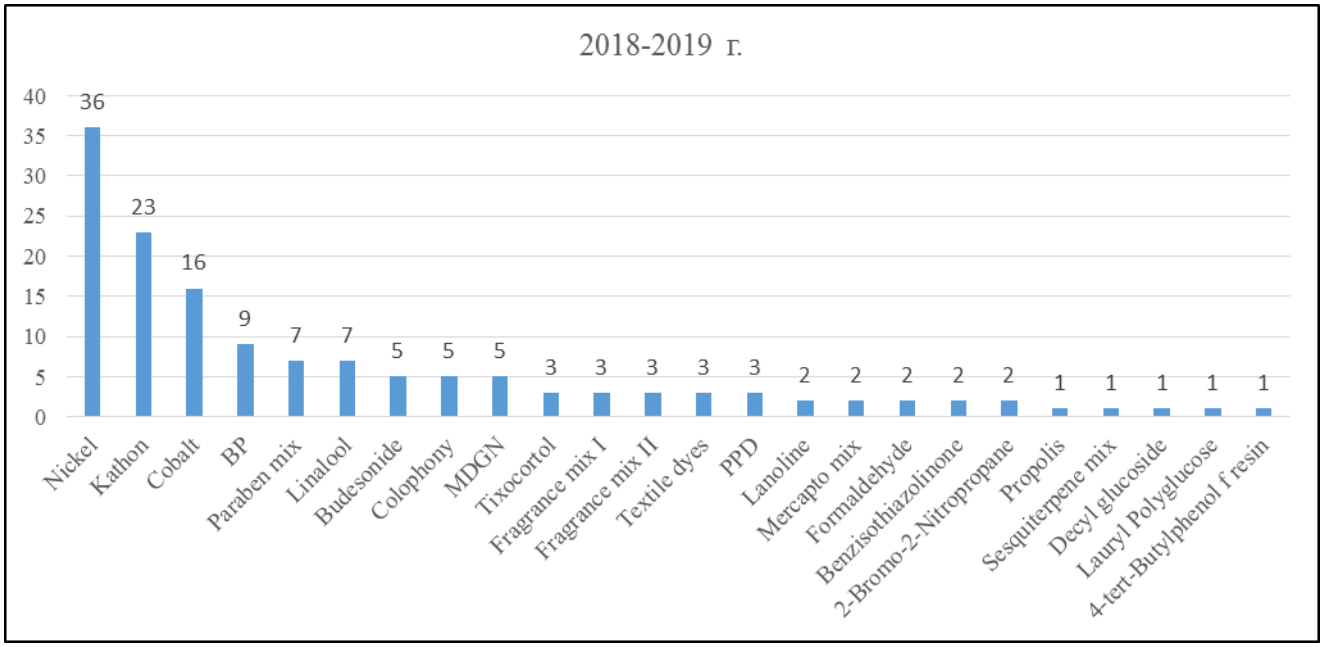


Figure 11: Frequency of allergens causing positive reactions before 2020

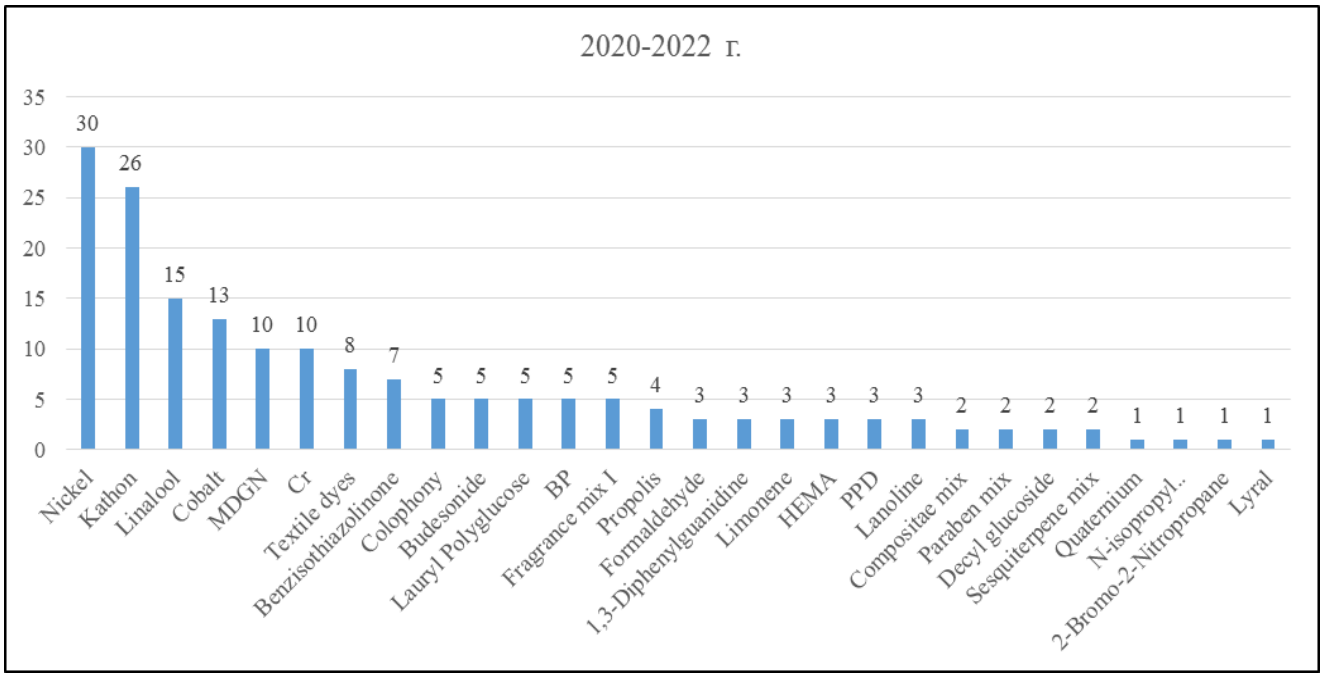


Figure 12: Frequency of allergens causing positive reactions after 2020

When determining the top allergens by both number and percentage, a higher percentage of positive reactions to preservatives, fragrances, and perfumes was observed during the COVID period compared to the years before COVID (2018-2019), while a significant decrease in positive reactions to metals was observed. Although Limonene and Linalool are part of the European Extended Series (EERS) from 2019, positive reactions to Limonene have been registered since the onset of Covid. ***(Fig.13)***

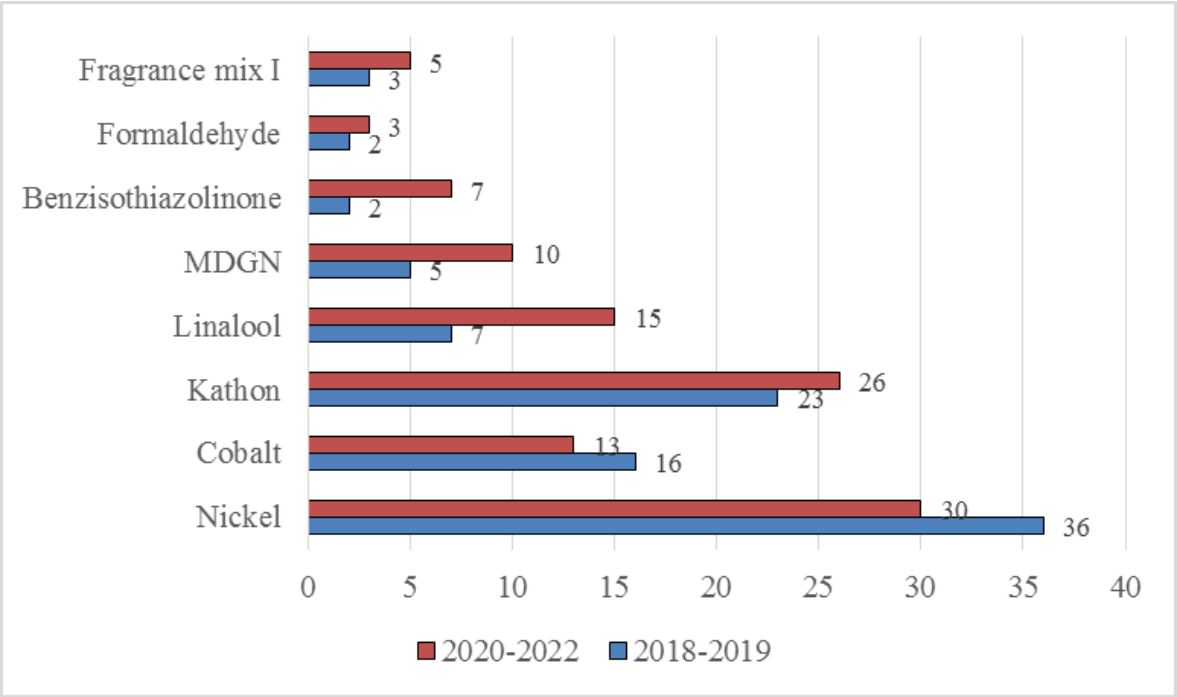


Figure 13: Comparative frequency (in numbers) of top allergens in the two studied periods

The results of the study confirm the view that increased disinfection and handwashing frequency lead to an increase in ER visits during COVID, as well as worsening of pre-existing eczema.

IV.5. Results of a pilot study on hand eczema among medical personnel working in contact with the coronavirus (SARS-CoV-2), tested with the ESC S-1000 together with a special Covid series.

Occupational skin diseases during the COVID-19 pandemic, including in healthcare, can be classified into four subgroups:

- Mechanical skin damage (occupational irritant skin disease);
- Skin damage associated with excessive water use.
- Allergic contact reactions (occupational allergic contact dermatitis);
- Exacerbation of pre-existing dermatoses (psoriasis, lichen, atopic dermatitis).

The clinical pattern is multifaceted, and the most affected skin areas are those in contact with protective equipment and disinfectants. Typical localization of Covid eczema is on the backs of the palms and at the interdigital and metacarpophalangeal joints.

During the Covid-19 pandemic (2020), the campaign focused on occupational skin adverse reactions among medical professionals working with Covid-19 patients. 28 medical professionals were examined and tested (5 doctors, five nurses, four laboratory technicians, four orderlies, two medical students, three volunteers in Covid wards, one physiotherapist, one rehabilitator, one physiotherapist, two dentists).

The gender distribution was 21 women and seven men, with a mean age of 44.80 years. Personal history of atopy was positive in 16 patients, including allergic conjunctivitis, atopic dermatitis, bronchial asthma, and hay fever. A family history of bronchial asthma was present in only one patient.

For diagnosis, the European Standard Series for Epicutaneous Testing S-1000 was used, together with a special COVID series containing allergens from disinfectants and personal protective equipment. The Covid allergens in the special series are 8 in number, as follows:

- 2- Hydroxy -2-Nitropropane-1,3-Diol
- Carba mix
- Mixed dialkyl thiourea
- Black rubber mix
- Bisphenol, 1,3-Diphenylguanidine
- iodopropynyl Butylcarbamate
- Ethyl acrylate

The Covid series is made by Chemotechnique diagnostics based on of a 2019 survey of professional allergies in medical specialists and presents most often common allergens in personal protective equipment (Warshaw et al. 2019) The main allergens are tires (Carba mix, Black rubber mix in gloves), eyeglass frames, helmets, textile dyes in the medical field clothing, metals in masks, shoes. The distribution of patients by Diagnoses and exanthema localization is shown in T***able 17.***

Table 17: Distribution by diagnosis and location of the rash

Diagnosis	Localization of the rash	Number of patients
Allergic contact dermatitis	trunk	8
Irritant contact dermatitis	trunk	5
Allergic contact dermatitis	hands	8
Perioral dermatitis	face	2
Scalp dermatitis	capillitium	1
Pruritus sine materiae	trunk	2
Facial dermatitis	face	2

The results showed negative epicutaneous testing in 8 patients and reaction to more than one allergen in 12 patients. The highest number of positive reactions was reported for nickel, followed by cobalt and methyldibromo glutaronitrile. Of the 28 patients tested with the "Covid" series, only 1 (3.6%) had a positive reaction to the Black rubber mix. The positive reactions to the various allergens from the European standard series and the COVID series are shown in the figure. ***(Fig.14)***

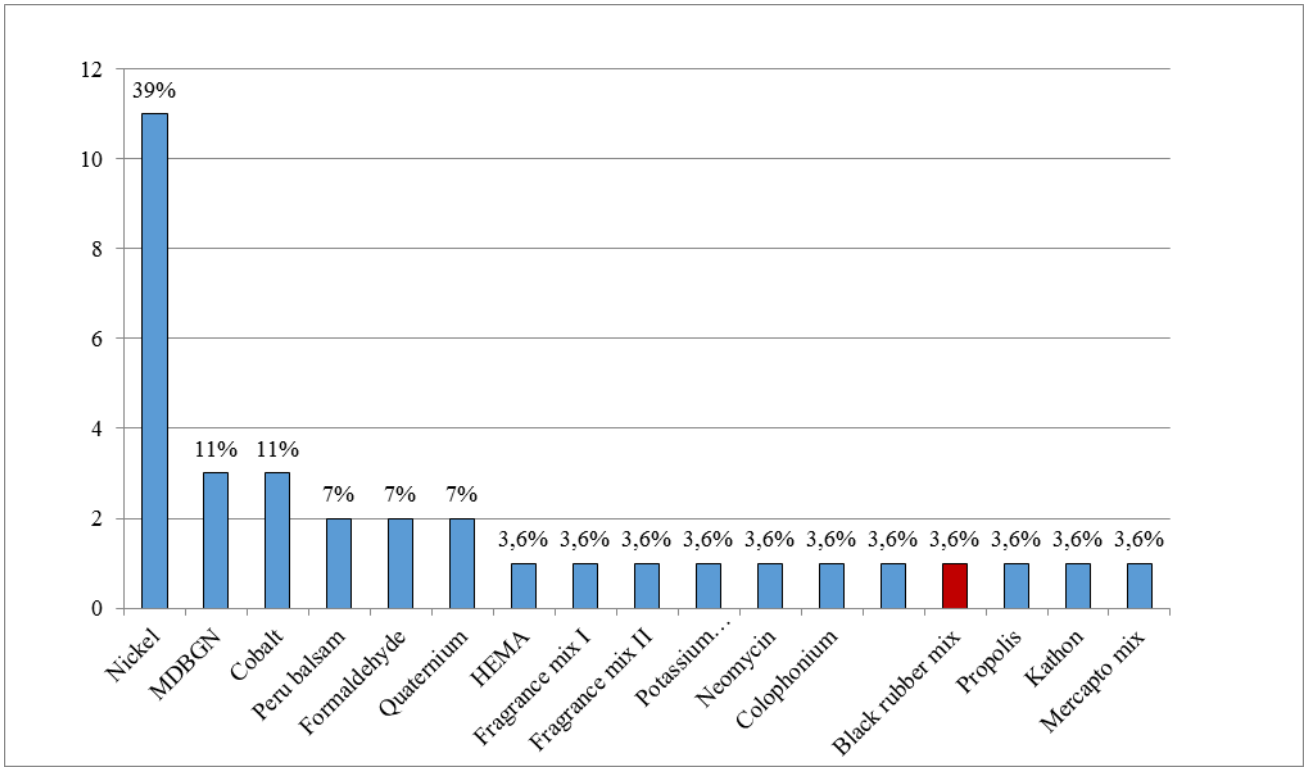


Figure 14: Number of positive reactions, expressed in percentage, to the tested allergens

Figure 15: Irritant contact dermatitis and Allergic contact dermatitis

In conclusion, our data constitute a sample from the first pilot study on changes in eczema among healthcare professionals in Bulgaria during the COVID pandemic. Compliance with hand hygiene recommendations is essential to preventing the spread of COVID-19.

We believe that the COVID series is not particularly suitable because it was created based on a 2019 study and is not adapted to the pandemic. The composition is dominated by the allergen "rubber, which is not a leading cause of a pandemic, and the series should mainly contain allergens found in disinfectants. The distribution of positive allergen results by group among our medical patients is shown in the figure. ***(Fig.16)***

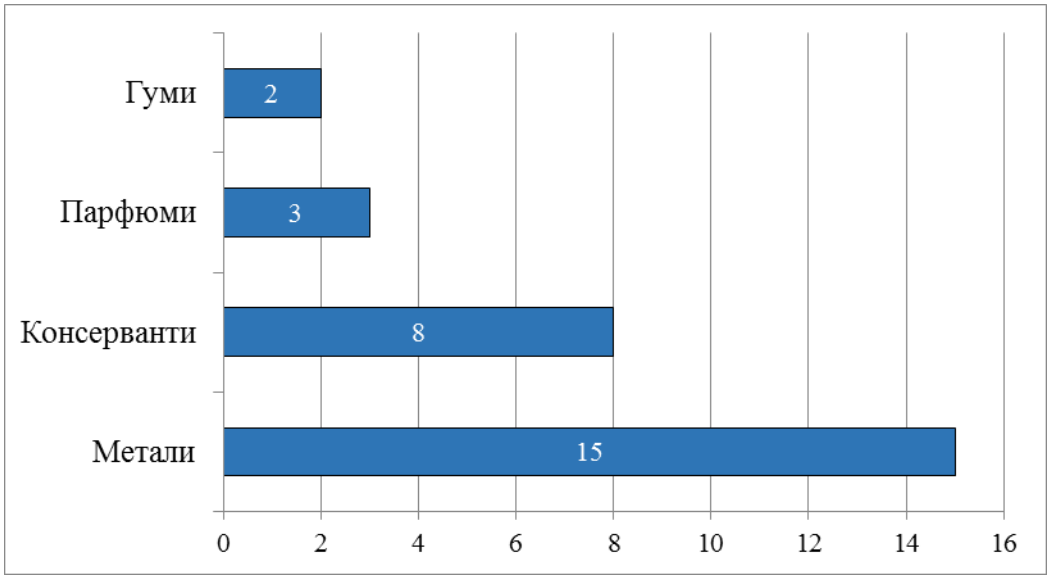


Figure 16: Number of positive reactions divided by group

As part of the 12th National Campaign for the Diagnosis and Prevention of Skin Allergic Diseases, we have developed recommendations for preventing hand eczema during the Covid pandemic. ***(Appendix)*** The development of hand eczema can be prevented by using appropriate skin care products. During the COVID pandemic, hand washing cannot be avoided, nor can the use of disinfectants. We recommend washing hands with lukewarm water to prevent irritation and drying. Disinfectants and soaps should be chosen carefully. Most soaps disrupt the skin's acid balance due to their alkaline pH and should therefore be avoided or replaced with shower oil. Hands should be dried carefully and without rubbing. After washing, carefully selected emollients with moisturizing and relipidizing properties are applied. It is also a good idea to use a barrier cream. Gloves should be the correct size and changed as often as possible. For severe eczema, it is recommended to wear cotton gloves under vinyl or nitrile gloves.

V. DISCUSSION OF THE RESULTS OF OWN STUDIES

Contact allergy and hand eczema.

Hand eczema is a socially significant disease due to its high prevalence, morbidity, and associated deterioration in quality of life and loss of working time from absences. Its annual prevalence is estimated at 10% in the general population, but only approximately half of patients seek professional dermatological care. The prevalence is much higher (up to 30%) in hazardous professions such as healthcare workers, homemakers, hairdressers, hygienists, and others.

Atopic dermatitis (AD) is a known risk factor for EP. However, studies on the association of EP with other atopic diseases, including parental involvement, are scarce. A Finnish study by Koskelo et al. (2022) presents interesting data on subjects born in 1966 (n = 6830) who completed a detailed health questionnaire, supplemented with information on parents. The aim was to investigate the association between ER and atopic diseases, parental factors, environmental

factors (animal husbandry, mold exposure), and lifestyle factors (obesity, smoking, alcohol consumption, and physical activity) at the population level. Of all the individuals surveyed, ER was reported in 900 (13.3%) individuals. All atopic diseases, parental allergies, female gender, and obesity increased the risk of ER, while physical activity decreased the risk of ER. No statistically significant association was found between ER and smoking or alcohol consumption.

In conclusion, the authors express the opinion that all atopic diseases, not only AD, appear to influence the development of ER, including parental and environmental factors and factors related to child rearing. In our study, patients with ER accounted for 33.5% of the 260 patients who tested positive. Of these, 13.8% had a personal and family history of atopy, while only 3.5% had clinical AD at the time of the study – results similar to some of those in the aforementioned study.

The strongest known endogenous risk factors for hand eczema are atopic dermatitis and dry skin. Ruff et al. (2018) found that atopic dermatitis is associated with a 3–4-fold increase in the prevalence of hand eczema, and that up to one-third of people with current hand eczema have a history of atopic dermatitis. It is noteworthy that more than half of people with active atopic dermatitis develop symptoms on their hands – i.e., hand eczema can also be part of atopic dermatitis. Hand eczema can also be the sole or predominant manifestation of atopic dermatitis, particularly in adults. Thyssen et al. (2013) and Weidinger and Novak (2024), based on population-based studies, reported that dry skin, a common feature of atopic dermatitis, is an independent risk factor.

In our study, of the 87 patients with EP, 13.8% had data on atopy (2.3% men and 11.5% women), and 3.5% had an AD clinic at the time of the study. To determine whether atopic diathesis is a risk factor for hand eczema, odds ratios were calculated, and it was found that atopic diathesis is a significant risk factor for the development of hand eczema, with the risk nearly 2.5 times higher in atopics ($p < 0.0001$)—the results of A. Popov (2023) should also be taken into account, who found that AD is not a risk factor for the manifestation of contact allergy in a Bulgarian population from the Pleven-Ruse region. These facts emphasize the importance of epicutaneous tests in cases where atopic dermatitis is considered the obvious etiology of eczema.

Metal allergy

Nickel is the most common cause of contact allergy worldwide. Nickel allergy can manifest in various ways, and atopy is a predisposing factor for the development of nickel eczema. Population studies from 1964-2007 were analyzed by Thyssen et al. (2010), who found that the average incidence of nickel allergy was 17.1% in women compared to 3% in men. Since the implementation of the EU Nickel Directive in the last decade, the prevalence of nickel allergy in the general European population is approximately 8% to 19% in adults and 8% to 10% in children and adolescents, with a strong female predominance, and a wide range of articles for both personal and professional use can cause dermatitis. Allergic nickel dermatitis can be localized to the site of exposure, be more widespread, or manifest as hand eczema.

Our results show that, from the conducted epicutaneous testing in 519 patients, 260 of whom had proven contact allergy (496 positive patch tests), the most frequent positive reaction was to nickel (28.8%). Among our 87 patients with EP to nickel, 46% were women and 9.2% were men, consistent with global trends toward a higher frequency of nickel dermatitis among women. Among family and personal data on atopy and a positive nickel test, 10.3% were, and all three with clinical AD activity were nickel-positive. The results differ from those of the analysis

by JP Thyssen et al. (2010), but it should be borne in mind that their study included a large number of patients and covered 40 years.

Nickel allergy is often associated with reactivity to other metals, usually caused by repeated exposure and sensitization rather than cross-reactivity. It is believed that simultaneous allergy to nickel-cobalt and nickel-chromium results from exposure to these metals through the same alloys and materials, or from contact with different metal products. In a study by Hegewald et al.. (2005) of 19,723 patients with dermatitis, 11% had a single positive reaction to a nickel test, 2.32% reacted positively to nickel and cobalt, 0.65% reacted positively to nickel and chromium, and 0.56% reacted positively to all three metals.

From the conducted epicutaneous testing in the period 2009-2024, positive reactions to the group of metals were: nickel 28.8%, cobalt 17.3%, and chromium 5.4%. At the same time, 31% of the positive for nickel individuals with EP had a single positive reaction to the test, 23% reacted positively to nickel and cobalt, 2.3% reacted positively to nickel and chromium, the same to chromium and cobalt, and 1.15% reacted positively to all three metals (and nickel, cobalt, and chromium). The ANOVA analysis shows that the interaction between nickel and cobalt has a statistically significant effect on hand eczema ($F = 5.910$, $p = 0.017$). Our data are comparable to those from the reviewed scientific literature on metal allergies, but it is important to note that patients with concomitant nickel and cobalt allergy often present with severe hand eczema with a poor prognosis.

Allergy to preservatives

Preservatives, especially isothiazolinones, are significant causes of ACD, including in the professional sphere. Our results show that the frequency of positive allergen tests for the group "preservatives" is 60 tests (12.1% of all 496 positive samples) in 47 individuals (18.1% of 260 positive). Contact allergy to at least one preservative occurs in 8 individuals (4 men and four women, 6.75%). The most common sensitizers are methylisothiazolinone and methyldibromoglutaronitrile, with 13 reactions (3% each), followed by Katon with 11 reactions (2.6%). These data are close to those presented in a Polish study by Kręcisz, Chomiczewska-Skóra, and Kieć-Świerczyńska from 2015, in which 405 patients were studied; 74 (including 52 women) showed positive results from the epicutaneous tests. Contact allergy to at least one preservative was observed in 47 (11.6%) patients, including 34 (11%) women and 13 (13.4%) men. Methylisothiazolinone was the most common sensitizer – 4.7% (5.2% women, 3.1% men).

In 2021, the North American Contact Dermatitis Group (NACDG) published results of a retrospective analysis (1994 to 2016) evaluating sociodemographic data and positive reactions to preservative patch tests. Of the 50,799 patients tested, 11,338 (22.3%) were positive for at least one preservative. The most common reactions were to methylisothiazolinone (12.2%), formaldehyde (7.8%), quaternium-15 (7.7%), and methyldibromo glutaronitrile (5.1%). A linear regression analysis of the tested preservatives showed that only methylchloroisothiazolinone/methylisothiazolinone ($p<0.005$) had a significant increase in positive frequency over time. The results were summarized and published by Atwater et al. in 2021

In Germany, the Information Network of Dermatological Clinics (IVDK) reported a rise in sensitization to Methylisothiazolinone (MI) from 2.0% in 2009 to 7.2% in 2013. Since 2014, the rate has been decreasing again. The increase in the concentration of methyldibromo glutaronitrile (MDBGN) in the patch test in 2016 led to a sudden increase in positive reactions

from 2.0% to over 4.5%. Allergic reactions to other preservatives were observed in less than 1% of the patients tested.

At Ankara University, Turkey, 201 patients were tested with a European baseline series and diagnosed with ACD between 2018 and 2020. The results showed that 17.4% (n = 35) of the patients were positive for preservatives. The most common allergen was methyldibromo glutaronitrile (9.5%), followed by methylchloroisothiazolinone/methylisothiazolinone (6.5%) and methylisothiazolinone (5%). The data were published by Sürgün and Boyvat in 2024.

As can be seen, the data from the above-cited studies on contact allergy to preservatives are highly diverse across countries and geographic latitudes. Our results are comparable to those of the study by Kręcisz, Chomiczewska-Skóra and Kieć-Świerczyńska (2015) and differ from those reported in other citations, which is quite acceptable, given that the socio-domestic and industrial-production spheres of individual regions largely influence the frequency and type of contact allergy. However, across all studies, the highest frequency of positive reactions was to Methylisothiazolinone (MI), methylchloroisothiazolinone/methylisothiazolinone (MCI/MI), and methyldibromo glutaronitrile (MDBGN).

Allergy to fragrances

Fragrance materials are usually complex mixtures. Contact allergy to them may mean allergy to only a single fragrance chemical, or to a part of a mixture. Most single-fragrance chemicals in natural complex substances can be defined. However, unidentified fractions are often present. Fragrance materials can be haptens, prehaptens, and/or prohaptens. The substances causing contact allergy are usually haptens, which are sensitizing chemicals that can penetrate the skin and bind directly to proteins, resulting in a protein-hapten complex. Many fragrances, however, are prehaptens and/or prohaptens. Prehaptens and prohaptens are non- or low-sensitizing on their own unless they are transformed into haptens within and outside the skin. For example, a prehapten can be transformed into a hapten by oxidation or photoactivation. The prohapten is bioactivated in the skinby bioactivation, mainly by enzymatic catalysis. Examples of aromatic prehaptens that require oxidation by air to cause contact allergy are linalool and Limonene. Patch testing is the standard procedure for diagnosing contact allergy. The baseline series used is recommended and formulated by experts from various working groups and is used for screening for CA, with aromatic markers introduced into the baseline series since the 1960s.

In our population studied over the period 2009-2024, 63 reactions (12.7% of all 496 positive patch tests) were positive for the fragrance group. The most common were those to Balsam Peru (Myroxolon, 5%), followed by Fragrance mix I (2%), Fragrance mix II (1.5%), Hydroxyisohexyl 3-cyclohexene carboxaldehyde (Lyral, 1%), and Sesquiterpene lactone mix (Lauryl, 1.2%).

Studying CA for the period 2008–2011 among 12,377 from different European countries and regions Diepgen and al . (2016) found that the prevalence of contact allergy to fragrances in the general population was 4.5% after patch testing with several fragrance markers, including Fragrance mix I, Balsam Peru, rosin, Fragrance mix II, Hydroxyisohexyl 3-cyclohexene carboxaldehyde, and Sesquiterpene lactone mix. The highest prevalence of contact allergy to fragrances has been reported for FM I, up to about 20% in patients with dermatitis by De Groot (2020) and Sukakul, Bruze, and Swedman (2024)

Comparing the results for the Pleven-Ruse region with those for the country, it is established that, for the period 2009-2024, our results are consistent with the data on contact

hypersensitivity among the Bulgarian population, as studied by epicutaneous testing with allergens from the European standard and the extended S-1000 series. The results for Balsam Peru are identical. It shows that there is no significant difference between the allergic characteristics of the 4491 tested for the country and the reported 260 positive (out of 519 tested) for the Pleven-Ruse region, i.e., the 519 participants tested by us represent a random sample of 4491 studied (for the country) and are representative of the sample of the prevalence among the general population.

Allergy to acrylates

In recent years, the widespread use of artificial nails and gel manicures has led to an increased incidence of sensitization to (meth)acrylates among manicurists and their clients. According to literature, various studies report an incidence of ACA from nail aesthetics products ranging from 60 to 95%.

In our sample, most patients developed ACD after a relatively short period of exposure, <1 year in 68.75% of our patients, which is consistent with the data of Ramos et al (2014). In both manicurists and clients, hand eczema with fissure pulpitis is the most common clinical manifestation. However, skin lesions may also appear on the face and eyelids, the trunk and lower extremities, and respiratory symptoms may occur, which may be explained by autotransfer or "airborne" exposure to allergens. Ectopic lesions may result from exposure to airborne dust generated by nail sculpting or by evaporation of (meth) acrylates—monomers during procedures. Eczema of the wrists and forearms can also occur, for example, due to contact with contaminated work surfaces or tools.

The mechanism of sensitization is related to the processing and preparation of the photoacrylic gels and adhesives used in the sculpting of artificial nails. The material used to shape the nails contains a mixture of acrylate monomers and polymers, and according to literature data, methyl methacrylate (MMA), HEMA, and TEGDM are considered the strongest sensitizers. The most commonly used method is mixing powdered acrylic polymer with liquid acrylic polymer and subsequently applying it to the nail, after which the manicure is hardened with UV light.

In our studies, the most common positive allergens were 2-HPMA (87.5%), EGDMA (81.25%), and 2-HEMA (75%). Sensitization to acrylates and methacrylates in AKD does not always imply the highest frequency of positive reactions to 2-HEMA. It is also shown by the Aalto-Korte analysis and al. (2010) on 66 positive patients, who reported the most frequent positive tests to EGDMA, followed by those to 2-HEMA and 2-HPMA. Studying the patterns of association between different allergens, the authors suggested that exposure to methacrylates may cause cross-reactivity with acrylates, whereas exposure to acrylates usually does not lead to cross-allergy to methacrylates. Based on the analysis, they expressed the opinion that there is also an association with reactions to Triethylene glycol diacrylate (TREGDA), which is common in professional ACD. In our study, cross-reactivity between methacrylates and TREGDA among manicurists was found in 56.25% of cases, with manicurists being 31.25%. The lack of positive reactions to Trimethylopropane triacrylate (TMPTA) may be due to a low amount or low concentration of the allergen in the patch test preparation, which is below the dose required to induce a positive reaction. This hypothesis is described in detail by Goon et al. (2011), who state that, besides evaporation, other factors such as adsorption, polymerization, and chemical degradation could explain the reduction in the amount of allergen in the preparation and therefore lead to false negative results.

When reviewing the scientific literature on acrylate contact allergy, the studies by Uter and Geier (2015), Spencer et al. (2016), and Raposo et al. (2017) summarize their results for manicurists and consumers of modern nail cosmetic products over 10, 13, and 5-year periods, respectively. The publications report the cross-linking reactions of the different acrylate allergens. In the Raposo et al. (2017) study, for example, 93.4% of the 230 acrylate-allergic individuals studied showed hypersensitivity to 2-HEMA+2-HPMA+EGDMA. In our study, the highest frequency of cross-reactivity was between HEMA and HPMA (in 62.5%), followed by HEMA+HPMA+EGDMA in 56.25% of patients, as was the case in the multicenter study by Gonçalo et al. from 2018 in 136 patients with (meth)acrylate-induced ACD. Our results are entirely consistent with published data from extensive epidemiological studies.

Hand eczema and the COVID-19 pandemic

Babino et al. (2022) investigated contact dermatitis associated with the COVID-19 pandemic. They found that wearing personal protective equipment, frequent handwashing, and surface disinfection increased the risk of irritant or allergic contact dermatitis, with the most commonly reported symptoms being skin dryness, itching, and redness. The skin sites primarily affected were the hands, cheeks, forehead, and nose.

A German study evaluates changes in handwashing frequency and hand eczema incidence, and risk factors associated with ER visits following the SARS-CoV-2 outbreak in January 2020. Kendziora et al. (2020) analyzed data from 512 patients with a mean age of 49 years (243 women, 267 men), and identified frequent hand disinfection (p=0.039), atopic dermatitis (p=0.006), and young age (p=0.0499) as risk factors for symptoms of ER. According to our data, the risk of developing contact allergy in atopics during the pandemic period is OR 2.6 (p=0.0045), and for developing hand dermatitis is OR 2.7 (p=0.0006), which overlaps with the results of the German study.

Back in 2020, Cavanagh and Wambier noted that the problem of hand dermatitis during the Covid pandemic is significant for many reasons: First, it is suggested that hand dermatitis due to frequent washing may create a pathway for the entry of coronavirus 2 (SARS-CoV-2), in particular, the viral spike protein of SARS-COV-2 binds to angiotensin -converting enzyme two receptors to initiate the entry of the virus. The functional ACE2 receptor of the virus is abundantly expressed in the skin on blood vessels and capillaries of the skin, basal cells of the epidermis, and hair follicles. ACE2 is also present in eccrine glands. Second, dryness, skin irritation, and itching can be debilitating, leading to absenteeism and reduced productivity, with important implications during the pandemic. Therefore, basic skin care measures should be taken after handwashing to address these concerns.

According to D. Elston (2020), atopy, winter season, low humidity, frequent hand washing, working in wet environments, use of gloves, and duration of employment are important risk factors for occupational hand dermatitis among healthcare workers, especially during the pandemic. Of 542 frontline healthcare workers, 526 (97.0%) had skin lesions at the base of the nose, hands, cheeks, and forehead, with the nose being the most commonly affected site due to mask wearing (83.1%). At the same time, frequent hand hygiene was associated with a higher incidence of hand dermatitis, but the duration of wearing a face shield was not significantly associated with the risk of facial lesions.

There is a direct correlation between handwashing frequency and eczema in the same area, a phenomenon widely reported even before the current pandemic. A study conducted in Wuhan

by Lin et al. (2020) reported that 74.5% of healthcare workers with hand eczema washed their hands more than 10 times per day, which was identified as an important predisposing factor. An Indian study by Jundal and Pandhi (2020) reported 16 patients with hand eczema within 10 days, caused by excessive disinfectant use. The use of gel disinfectants after handwashing with soap and the prolonged use of multi-layered latex gloves, for example, were considered to contribute to 24 new cases of hand eczema in a study conducted in Italy by Gasparini et al. (2020). During the Covid pandemic, a high incidence of ICDs was also reported among Chinese healthcare workers. A double-masked randomized trial reported the need for emollients to prevent desquamation and chafing. In Saudi Arabia, a several-fold increase in handwashing frequency was reported during the COVID pandemic, including among those who had never used hand sanitizers before. During the 2014 Ebola outbreak, due to strict hand hygiene protocols, the incidence of hand eczema increased significantly and was more severe with soap than with alcohol-based hand sanitizers.

To investigate the occurrence of hand eczema among healthcare professionals during COVID-19 in Munich, Gürtler et al. (2020) compared two groups: doctors and nurses working in COVID-19 wards and those working in a private medical center. Eczema-related symptoms such as xerosis, erythema, desquamation, rhagades, and, as subjective symptoms, pain and itching. Dryness is the most frequent, followed by erythema and itching.

Kiely et al. (2021) assessed the extent of dermatitis associated with COVID-19 in an Irish hospital between April and May 2019. Of the 270 participants included, 223 (82.6%) reported dermatitis symptoms, with the most common location being the hands and the most common symptom being dry skin.

Turkish dermatologists Erdem et al. (2020) were the first to conduct a study on the presence of eczema-related symptoms among the same healthcare workers before and during the COVID pandemic. The increase in these symptoms was more prevalent in females and in healthcare workers with atopic predisposition. Another study from the same region, by Celik and Ozkars (2020), aimed to investigate the prevalence and risk factors for hand eczema (HE) and its associated symptoms in 564 healthcare workers (349 doctors and 215 nurses) during the COVID-19 epidemic. The results showed that female gender, atopic diathesis, frequent hand washing, and more frequent use of moisturizing creams were independently associated with the risk of clinical manifestation of HE. According to the authors, the most common clinical symptoms were skin dryness, itching, erythema, and desquamation, localized mainly on the palmar dorsum and in the interdigital spaces of the hands—this is what we are observing in our patients at the Covid eczema clinic.

VI. CONCLUSIONS AND CONTRIBUTIONS OF THE SCIENTIFIC WORK

VI.1. CONCLUSIONS

1. **Of the 516 individuals examined, 260 (50.4%) had contact allergy data, of whom 496 positive reactions were reported.**
    - Patients were aged 6-78 years, with a mean age of 39.09 ± 14.11 years. Men accounted for 23.5% of all positives, and women for 76.5%. Under 40 years of age, 11.5% were men and 44.2% were women, and over 40 years of age, 11.9% were men and 32.3% were women;

- The highest share is 30% for representatives of professions related to production and agriculture, teachers, engineers, artists, etc.; 23% are office workers; 20% are unemployed; 15% are employed in the field of aesthetic procedures; 12% are in healthcare.
- The most common are dermatitis of the upper extremities (36.2%), dermatitis of the face and atopic dermatitis (12.7% each), and dermatitis of the lower extremities (6.5%). Of the positive individuals, 31.9% have no clinical manifestation of allergodermatosis or have another non-allergic diagnosis, but have shown positive reactions in epicutaneous testing;
- For dermatitis of the upper extremities, a statistically significant relationship was found with allergens from the groups of metals ($p < 0.001$), preservatives ($p < 0.001$), and fragrances ($p < 0.001$), with the effect size being strongest for metals ($r = 0.48$).
- In individuals with atopic diathesis, the risk of developing hand eczema is nearly 2.35 times higher ($p < 0.001$).

2. **The most common positive reactions were to nickel (28.8% of all positive reactions), cobalt (17.3%), textile dyes (6%), PPD (5.6%), potassium dichromate (5.4%), Peruvian balsam (5%), and isothiazolinones (4.8%).**
    - Our results are consistent with data on contact hypersensitivity in the Bulgarian population from the national database of the Dermatoallergology Section of the Bulgarian Dermatology Association.
3. **Of the 260 individuals with hand eczema, 87 (33.5%) had an average age of 36.46 ± 12.84, and 172 tests were positive (34% of all 496). Of these, 20.7% were men and 79.3% were women. In the 40-year-old age group, 12.6% were men and 47.1% were women: over 40 years, 8% of men and 32.2% of women.**
    - Their professional profile shows that the highest number of people employed in aesthetic procedures (manicurists, hairdressers, beauticians) is 24.1%.
    - The most common are positive reactions to nickel (28% of all 168 positive reactions), to cobalt (15.7%), to Peru balsam (8.1%), to p- phenylenediamine and textile dyes (5.2% each), to rosin (11%), potassium dichromate and methylisothiazolinone (3.5% each), etc.
    - The interaction between nickel and cobalt had a statistically significant effect on hand eczema ($p < 0.05$)
4. **Forty women aged between 21 and 71 years (mean age 34.80 ± 10.085) tested positive for acrylates and methacrylates. 65% of them were manicurists, and 35% were clients of nail salons.**
    - Pathological skin changes are localized to the palms in 75%, the fingers and nails in 70%, and the palms, fingers, and nails in 47.5%. Fifteen manicurists (58%) have professional ACD of the hands.
    - The total number of positive reactions to allergens from MN-1000 was 196, with the highest frequencies for 2-Hydroxyethyl methacrylate (75.0%), Hydroxypropyl methacrylate (70.0%), and Ethylene glycol dimethacrylate (62.5%).

- 2-Hydroxypropyl methacrylate and Ethylene glycol dimethacrylate have a significant impact on the development of hand eczema with a medium-strength relationship for both (meth) acrylates (for 2-HPMA, r=0.435, p=0.005, for EGDMA, r=0.368, p=0.02).

5. **Of the 361 patients with hand eczema tested at the Euroderma clinic, 43% had a total of 143 positive reactions before the pandemic (2018 and 2019), and 57% had 178 positive tests during and after it (2020-2022).**
    - To determine the trends in the development of CA before and after the Covid-19 pandemic, and compare the data in the two periods, statistical significance in favor of the period after 2020 was found in the comparison for atopic dermatitis ($p < 0.001$) and hand dermatitis ($p < 0.001$)
    - The risk of developing contact allergy in atopics during the pandemic is 2.6 times higher ($p < 0.005$), and for developing CAD on the hands is 2.7 times higher ($p < 0.005$)
    - When comparing the CA data from the two 2020-2022 periods, a higher percentage of positive reactions to preservatives, fragrances, and perfumes was observed, along with a significant decrease in positive reactions to metals.
    - Positive reactions to Limonene have been recorded since the emergence of COVID-19.
6. **Of the 28 medical specialists, 75% were women and 25% were men, with an average age of 44.80 years. 57% of the patients had a history of atopy ;**
    - ACD on the arms is 28.6%; ACD on the torso is also 28.6%; ICD on the torso is 18%.
    - The highest number of positive reactions was reported to nickel (39%), followed by cobalt and methyldibromo glutaronitrile (both 11%).
    - From the Covid series, only one patient (3.6%) had a positive reaction to Black rubber mix.
    - As part of the 12th National Campaign for the Diagnosis and Prevention of Skin Allergic Diseases, a recommendation has been developed to prevent hand eczema during the COVID-19 pandemic.

VI.2. CONTRIBUTIONS OF SCIENTIFIC DEVELOPMENT

VI.2.1. Original contributions

1. For the first time in Bulgaria, an analysis of the etiological causes of ACD on the hands is being conducted, both for individual allergens and for individual groups of allergens.
2. For the first time in Bulgaria, a pilot study on hand eczema is being conducted among medical personnel who come into contact with the coronavirus (SARS-CoV-2).

VII.2.2. Scientific and theoretical contributions

1. For the first time in the country, the demographic and clinical data of patients with hand eczema in the Pleven and Ruse districts are described.

2. For the first time in the country, contact allergy data is being compared before and after the COVID-19 pandemic.

VII. 2.3. Scientific, practical, and confirmatory contributions

1. The fact that nickel is the No. 1 allergen is confirmed.
2. The fact that (meth) acrylates are allergens with high allergenic potential, clinically manifested with ER both professionally in manicurists and in their clients, is confirmed.
3. The results obtained for contact allergy in individuals with ER in the Pleven and Ruse districts are similar to both the data from the National Database of the Bulgarian Allergy Association and those published in scientific journals over the last 15 years.

SCIENTIFIC PRODUCTION RELATED TO THE TOPIC OF THE DISSERTATION

1. Publications

1. Angelova A, Hitova M, Kazandzhieva Zh. Hand eczema in healthcare professionals during the COVID-19 pandemic. GP MEDIC, 2021; 3(2):11-13; ISSN 2603- 4719
2. Angelova A, Hitova M, Kazandzhieva Zh. Unusual localization of allergic contact dermatitis from nickel. Dermatology and Venereology, 2022; (2):29-31; ISSN 0417- 0792
3. Mahmud I, Angelova A, Hitova M, Kazandzhieva Zh. Allergic contact dermatitis caused by ethylene glycol dimethacrylate, hydroxypropyl methacrylate, and 2-hydroxyethyl methacrylate. Dermatology and Venereology, 2022; (2):32-34; ISSN 0417- 0792
4. Gospodinova KD, Angelova AD, Gergovska MD, Grozeva DT. Allergic Contact Dermatitis: a Study Among Manicurists and Clients. Journal of Biomedical and Clinical Research , 2023; 16(2):186-193; eISSN1313-6917

2. Participation in scientific forums

1. A. Angelova, J. Kazandzhieva. "Covid" eczema. XXIX Sofia Dermatological Days "Prof. Asen Durmishev" 4 - 7 November 2021, Sofia
2. A. Angelova, Zh. Kazandzhieva, M., Hitova, N., Tsankov. Allergy to perfumes - diagnosis and prevention. XXIX Sofia Dermatological Days “Prof. Asen Durmishev“ 4 - 7 November 2021, Sofia
3. A. Angelova, M. Hitova, Zh. Kazandzhieva. Results of the XII national campaign "Diagnosis and prevention of skin and allergic diseases." EuroDerma Clinic Sofia. July 3-5, 2021, Hotel Rilets - Rila Monastery
4. A. Angelova, D. Gospodinov, Z. Kazandzhieva. Hand eczema - allergic hypersensitivity before and after COVID-19. XXX Sofia Dermatological Days, 3-6 November 2022, Sofia
5. A. Angelova, K. Gospodinova, D. Gospodinov. Allergic contact dermatitis in hairdressers. XXIII Scientific and Practical Conference of the Bulgarian Dermatological Society - Pleven Branch, December 1-4, 2022, Tryavna, Bulgaria
6. A. Angelova, M. Gergovska, Zh. Kazandzhieva. Report of the XIV National Campaign for Diagnosis and Prevention of Skin Allergic Diseases. XIV Conference on Dermatoallergology and Immunomediated Inflammatory Diseases "Yin and Yang in Dermatology" June 9-11, 2023, Pomorie

7. D. Dervish, A. Angelova, Zh. Kazandzhieva. Results 06.23 – 03.2024 EuroDerma Clinic. XV Conference on Dermatoallergology and 3rd Practical School on Dermatoallergology "Hidden Aspects in Dermatoallergology and Immune-Mediated Diseases" 05-07 April 2024, Plovdiv
8. A. Angelova, J. Kazandjieva, M. Hitova. E- poster Allergic contact dermatitis in healthcare workers during the COVID-19 pandemic. 31st EADV Congress Milan – Italy 07 Sep – 10 Sep 2022

APPLICATIONS

- **European Standard Series – S-1000**
- **European Standard Extended Series – ECB-1000**
- **Specialized Series for Manicurists – MN-1000**
- **Recommendations for preventing hand eczema during the pandemic**

Application 1

European standard series

(cat. N: S-1000; Chemotechnique Diagnostics, Vellinge, Sweden)

№	Art.No	Name	Conc
1	P-014A	Potassium dichromate	0.5% pet
2	P-006	p-Phenylenediamine (PPD)	1.0% pet
3	Mx-01	Thiuram mix	1.0% pet
4	N-001	Neomycin sulfate	20.0% pet
5	C-017A	Cobalt(II)chloride hexahydrate	1.0% pet
6	B-004	Benzocaine	5.0% pet
7	N-002A	Nickel(II)sulfate hexahydrate	5.0% pet
8	C-015	Clioquinol	5.0% pet
9	C-020	Colophonium	20.0% pet
10	Mx-03C	Paraben mix	16.0% pet
11	I-004	N-Isopropyl-N-phenyl-4-phenylenediamine (IPPD)	0.1% pet
12	W-001	Lanolin (wood alcohol)	30.0% pet
13	Mx-05A	Mercapto mix	2.0% pet
14	E-002	Epoxy resin, Bisphenol A	1.0% pet
15	B-001	Peru balsam (Myroxolon pereirar resin)	25.0% pet
16	B-024	4-tert-Butylphenolformaldehyde resin (PTBP)	1.0% pet
17	M-003A	2-Mercaptobenzothiazole (MBT)	2.0% pet
18	F-002B	Formaldehyde	2.0% aq
19	Mx-07	Fragrance mix I	8.0% pet
20	Mx-18	Sesquiterpene lactone mix (Lauril)	0.1% pet
21	C-007A	Quaternium-15	1.0% pet
22	M-008	2-Methoxy-6-n-pentyl-4-benzoquinone	0.01% pet
23	C-009B	Methylisothiazolinone+ Methylchloroisothiazolinone	0.02% aq
24	B-033B	Budesonide	0.01% pet
25	T-031B	Tixocortol-21-pivalate	0.1% pet
26	D-049E	Methyldibromoglutaronitrile (MDBGN)	0.5% pet
27	Mx-25	Fragrance mix II	14.0% pet
28	L-003	Hydroxyisohexyl-3-Cyclohexene Carboxaldehyde	5.0% pet
29	M-035B	Methylisothiazolinone	0.2% aq
30	Mx-30	Textile dye mix	6.6% pet

Application 2

European Comprehensive Baseline Series
(cat. ECB-1000; Chemotechnique Diagnostics, Vellinge, Sweden)

1.	P-014A	Potassium dichromate	0.5% pet
2.	P-006	p-PHENYLENEDIAMINE (PPD)	1.0% pet
3.	Mx-01	Thiuram mix	1.0% pet
4.	N-001	Neomycin sulfate	20.0% pet
5.	C-017A	Cobalt(II)chloride hexahydrate	1.0% pet
6.	Mx-19	Caine mix III	10.0% pet
7.	N-002A	Nickel(II)sulfate hexahydrate	5.0% pet
8.	H-010	2-Hydroxyethyl methacrylate	2.0% pet
9.	C-020	COLOPHONIUM	20.0% pet
10.	Mx-03C	Paraben mix	16.0% pet
11.	I-004	N-Isopropyl-N-phenyl-4-phenylenediamine (IPPD)	0.1% pet
12.	W-001	LANOLIN ALCOHOL	30.0% pet
13.	Mx-05A	Mercapto mix	2.0% pet
14.	E-002	Epoxy resin, Bisphenol A	1.0% pet
15.	B-001	Peru balsam	25.0% pet
16.	B-024	4-tert-Butylphenolformaldehyde resin (PTBP)	1.0% pet
17.	M-003A	2-Mercaptobenzothiazole (MBT)	2.0% pet
18.	F-002B	FORMALDEHYDE	2.0% aq
19.	Mx-07	Fragrance mix I	8.0% pet
20.	Mx-18	Sesquiterpene lactone mix	0.1% pet
21.	S-011	SODIUM METABISULFITE	1.0% pet
22.	P-022	Propolis	10.0% pet
23.	C-009B	METHYLISOTHIAZOLINONE+ METHYLCHLOROISOTHIAZOLINONE	0.02% aq
24.	B-033B	Budesonide	0.01% pet
25.	T-031B	Tixocortol-21-pivalate	0.1% pet
26.	D-049E	METHYLDIBROMO GLUTARONITRILE	0.5% pet
27.	Mx-25	Fragrance mix II	14.0% pet

28.	L-003	HYDROXYISOHEXYL 3-CYCLOHEXENE CARBOXALDEHYDE	5.0% pet
29.	M-035B	METHYLISOTHIAZOLINONE	0.2% aq
30.	B-003B	BENZISOTHIAZOLINONE	0.1% pet
31.	Mx-32	Textile dye mix II	1.6% pet
32.	D-065	DECYL GLUCOSIDE	5.0% pet
33.	B-015B	2-BROMO-2-NITROPROPANE-1,3-DIOL	0.5% pet
34.	D-044A	DIAZOLIDINYL UREA	2.0% pet
35.	O-004	2-n-Octyl-4-isothiazolin-3-one	0.1% pet
36.	Mx-29A	Compositae mix II	5.0% pet
37.	H-031A	Hydroperoxides of Linalool	1.0% pet
38.	H-031B	Hydroperoxides of Linalool	0.5% pet
39.	H-032A	Hydroperoxides of Limonene	0.3% pet
40.	H-032B	Hydroperoxides of Limonene	0.2% pet
41.	S-005	SORBITAN SESQUIOLEATE	20.0% pet
42.	S-004	SORBITAN OLEATE	5.0% pet

Application 3

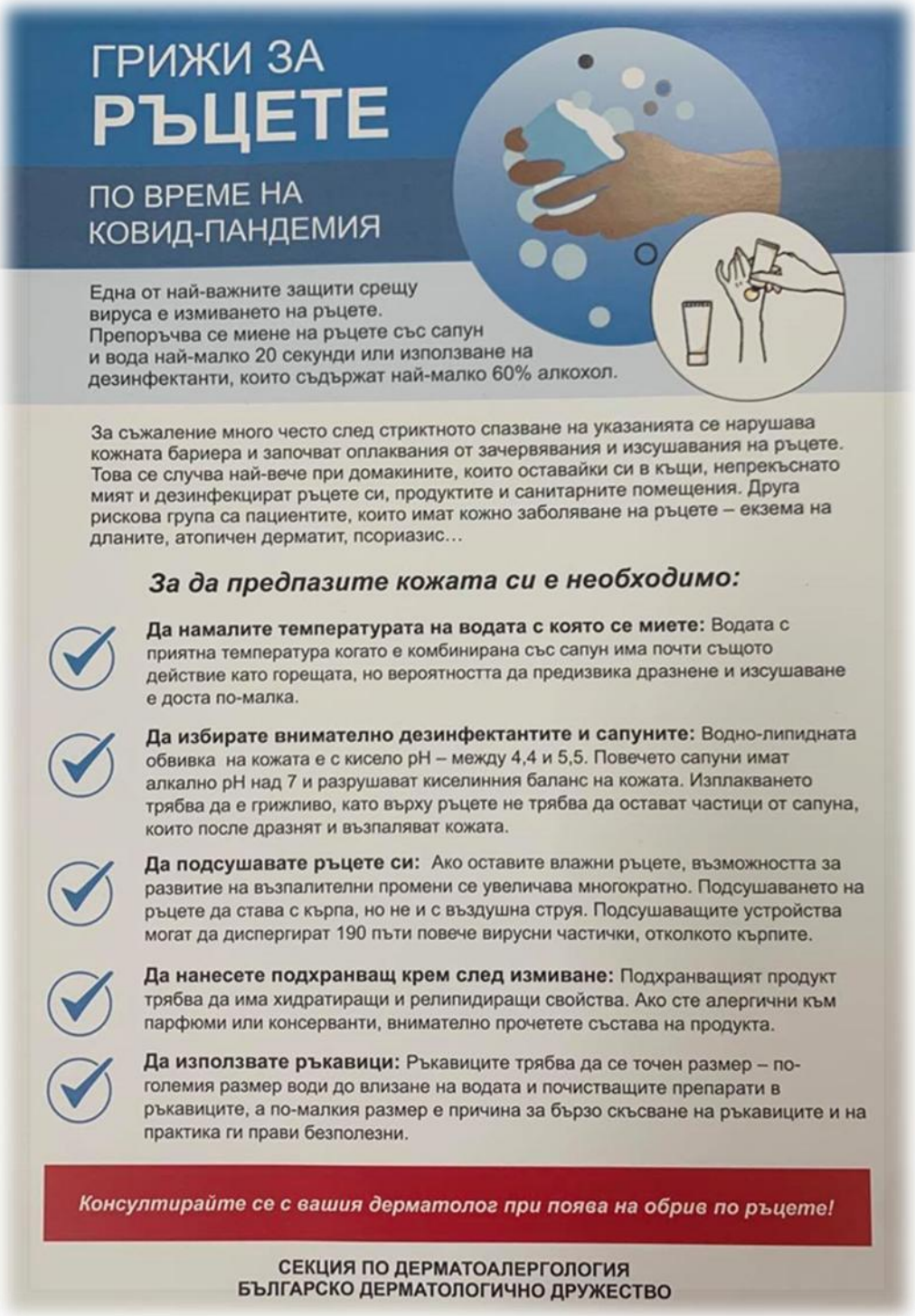
(Meth) Acrylate Series - Nails
(cat. MN: 1000; Chemotechnique Diagnostics, Vellinge, Sweden)

№	Art.No	Name	Conc.
1	B-018	Butyl acrylate	0.1% pet
2	E-012	ETHYL METHACRYLATE	2.0% pet
3	B-021	BUTYL METHACRYLATE	2.0% pet
4	H-010	2-Hydroxyethyl methacrylate	2.0% pet
5	H-018	Hydroxypropyl methacrylate	2.0% pet
6	E-007	Ethylene glycol dimethacrylate	2.0% pet
7	T-018	Triethylene glycol dimethacrylate	2.0% pet
8	H-004	1,6-Hexanediol diacrylate	0.1% pet
9	T-021	Trimethylolpropane triacrylate	0.1% pet
10	T-027	Tetrahydrofurfuryl methacrylate	2.0% pet
11	E-004	Ethyl acrylate	0.1% pet
12	H-009	2-Hydroxyethyl acrylate	0.1% pet
13	T-017	Triethylene glycol diacrylate	0.1% pet

Application 4

Recommendations for preventing hand eczema during the pandemic

(Conclusion № 7)



ГРИЖИ ЗА РЪЦЕТЕ

ПО ВРЕМЕ НА КОВИД-ПАНДЕМИЯ

Една от най-важните защити срещу вируса е измиването на ръцете. Препоръчва се миене на ръцете със сапун и вода най-малко 20 секунди или използване на дезинфектанти, които съдържат най-малко 60% алкохол.

За съжаление много често след стриктното спазване на указанията се нарушава кожната бариера и започват оплаквания от зачервявания и изсушавания на ръцете. Това се случва най-вече при домакините, които оставайки си в къщи, непрекъснато мият и дезинфекцират ръцете си, продуктите и санитарните помещения. Друга рискова група са пациентите, които имат кожно заболяване на ръцете – екзема на дланите, атопичен дерматит, псориазис…

За да предпазите кожата си е необходимо:

- **Да намалите температурата на водата с която се миете:** Водата с приятна температура когато е комбинирана със сапун има почти същото действие като горещата, но вероятността да предизвика дразнене и изсушаване е доста по-малка.
- **Да избирате внимателно дезинфектантите и сапуните:** Водно-липидната обвивка на кожата е с кисело pH – между 4,4 и 5,5. Повечето сапуни имат алкално pH над 7 и разрушават киселинния баланс на кожата. Изплакването трябва да е грижливо, като върху ръцете не трябва да остават частици от сапуна, които после дразнят и възпаляват кожата.
- **Да подсушавате ръцете си:** Ако оставите влажни ръцете, възможността за развитие на възпалителни промени се увеличава многократно. Подсушаването на ръцете да става с кърпа, но не и с въздушна струя. Подсушаващите устройства могат да диспергират 190 пъти повече вирусни частички, отколкото кърпите.
- **Да нанесете подхранващ крем след измиване:** Подхранващият продукт трябва да има хидратиращи и релипидиращи свойства. Ако сте алергични към парфюми или консерванти, внимателно прочетете състава на продукта.
- **Да използвате ръкавици:** Ръкавиците трябва да се точен размер – по-големия размер води до влизане на водата и почистващите препарати в ръкавиците, а по-малкия размер е причина за бързо скъсване на ръкавиците и на практика ги прави безполезни.

Консултирайте се с вашия дерматолог при поява на обрив по ръцете!

СЕКЦИЯ ПО ДЕРМАТОАЛЕРГОЛОГИЯ
БЪЛГАРСКО ДЕРМАТОЛОГИЧНО ДРУЖЕСТВО