

Nickel Hypersensitivity in Slavonia-Brod County 2004-2006

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SUMMARY The aim of the study was to assess the prevalence of nickel sulfate hypersensitivity in patients tested by standard allergen series at Department of Dermatology and Venereology, Dr. Josip Benčević General Hospital in Slavonski Brod over a three-year period. Patch testing with 5% nickel sulfate in vaseline applied on test strips was used to determine nickel sulfate hypersensitivity. During 36 months, 955 patients presenting to the Department Allergology Clinic underwent patch testing with a standard series of allergens including 5% nickel sulfate in vaseline. Positive reaction to nickel was recorded in 123 subjects. During the three-year period, positive reaction to nickel was recorded in 12.87% of study subjects, which was significantly lower than the prevalence of nickel hypersensitivity reported in the literature. Our study confirmed the lifestyle and habits to play a major role in the development of nickel hypersensitivity.

KEY WORDS: nickel hypersensitivity, contact allergy

INTRODUCTION

Allergic contact dermatitis and irritant dermatitis are among the most common dermatitides in industrialized societies. Allergic contact dermatitis is inflammatory dermatosis due to immune reaction type IV according to Gell and Coombs classification (1). The diagnosis is made on the basis of history data on contact with the suspected allergen and typical lesion distribution (2). Patch testing remains the main diagnostic method to demonstrate contact hypersensitivity. Nickel sulfate belongs to the most common contact allergens (3).

Allergic contact dermatitis manifests by skin lesions that usually appear 24 to 48 h of contact with the allergen to which the body has previously been sensitized. The aim of the present study was to assess the prevalence of nickel hypersensitivity in our patient population according to age at onset and occupation.

SUBJECTS AND METHODS

Patch test is a biological test used to determine the presence or absence of delayed allergic reaction to specific allergens. The allergens are prepared in vaseline or water, and allergen impregnated test strips are applied onto the skin of the back in vertical order but not over the spine. The strips are not applied higher than the spine of scapula because of oily and seborrheic skin, and not too laterally to prevent folding of test strips. The allergen is applied onto the commercially available test strips. After 48 h, the allergen is removed off the skin and first reading is performed, followed by second reading at 24 h, according to the International Contact Dermatitis Research Group (IC-DRG) regulations and generally adopted criteria for reaction severity evaluation (Table 1).

Table 1. Reading criteria

Reading criteria	Description of skin lesion
+	Mild erythema and edema
++	Edema, individual papules, occasional vesicles
+++	Numerous papules and vesicles, increased weeping

RESULTS

From January 2004 until December 2006, positive reaction to nickel was recorded in 123 of 955 patients, including 114 female and nine male patients (Fig. 1). Distribution of patients with positive nickel reaction according to occupation showed housewives to predominate, followed by students (Table 2). Patient distribution according to lesion localization revealed the highest prevalence of lesions in the hand area (Table 3). Table 4 shows patient distribution according to reaction severity. Positive reaction marked with + denoting a reaction with mild erythema and edema was most common, recorded in 99 patients, whereas strongly positive reaction marked with +++ was very rare, observed in only seven patients (Table 4). The distribution was statistically significant ($\chi^2=9.775$; $p \leq 0.05$) (Table 5).

DISCUSSION

Nickel sulfate is a crystalline compound that also occurs in a crystal form with six or seven water molecules. Nickel sulfate in vaseline is generally used on testing for nickel hypersensitivity. Nickel is a constituent found in coins, keys, doorknobs, faucets, kitchen utensils, vacuum cleaners, washing machines, dishwashers, sewing machines, razor blades, shavers, bicycles, dentures, glass frames, *bijouterie*, metal zippers, car spare parts,

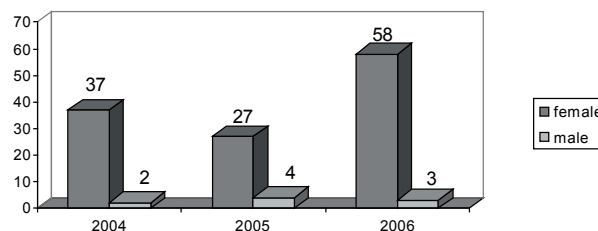


Figure 1. Patient distribution according to sex.

and numerous other consumer goods. Nickel is used as a catalyst, thus it is found in ceramics dyes and varnish as well as in fertilizers; it is used in the manufacture of insecticides and fungicides, in electronic industry and dye industry. Nickel is a constituent of metal alloys, which has probably caused the increased nickel hypersensitivity in construction workers.

The high prevalence of nickel hypersensitivity in housewives is no surprise due to their daily contact with dishes, cookers, and other household appliances, many of which are made of nickel. The growing prevalence of positive reaction to nickel among young people could be attributed to the increasing use of piercing at an ever younger age. The highest prevalence of contact dermatitis is recorded on hands as the most common clinical picture. Although wearing fancy jewelry is present in both sexes, it is more common in women, thus the rate of nickel hypersensitivity is also higher in females. The second most common localization are facial lesions, mostly auricles due to the frequent contact with nickel in ear-rings and ear-clips.

Many materials contain nickel and chromium and/or cobalt (occasionally in traces only), and the individuals with nickel hypersensitivity may frequently exhibit parenteral hypersensitivity reaction to chromium and nickel. In some cases, it

Table 2. Distribution of study subjects with positive reactions according to occupation

Year	2004		2005		2006		Total
	M	F	M	F	M	F	
Sex (M/F)							
n	2	37	4	27	3	50	123
Occupation							
Housewife	0	17	0	13	0	19	49
Retired	0	1	0	1	0	0	2
Industrial worker	0	0	0	0	0	0	0
Clerical worker	1	3	1	2	1	5	13
Construction worker	1	1	2	1	1	5	11
Student	0	8	1	4	1	10	24
Salesman	0	2	0	3	0	6	11
Cleaning woman	0	2	0	3	0	5	10
Hair-dresser	0	3	0	0	0	0	3

Table 3. Patient distribution according to lesion localization

Year	2004		2005		2006		Total
Sex (M/F)	M	F	M	F	M	F	
Positive reaction	n	n	n	N	n	N	
	2	37	4	27	3	50	123
Lesion localization							
Hands	1	17	1	7	2	16	44
Extremities	0	10	2	3	1	10	26
Trunk	0	5	1	5	0	13	24
Face	1	5	0	12	0	11	29

Table 4. Patient distribution according to reaction severity

Year	2004		2005		2006		Total
N	235		287		433		955
Sex (M/F)	M	F	M	F	M	F	
Positive reactions (n)	2	37	4	27	3	50	123
+	2	28	3	26	2	38	99
++	0	6	0	1	1	9	17
+++	0	3	1	0	0	3	7

may manifest as systemic symptoms (cutaneous or gastrointestinal) in response to the ingestion of food containing a high amount of nickel. The condition is confirmed by significant improvement on nickel-free diet. Exposure testing may result in the occurrence of lesions indicative of contact dermatitis, generalized eczema or generalized urticarial lesions (4).

Numerous cases of contact hypersensitivity to dental materials have been described. In addition to nickel sulfate, hypersensitivity to gold sodium sulfate, mercury, palladium chloride, cobalt chloride and 2-hydroxyethyl methacrylate has been reported (5). Nickel is a frequent causative agent of contact allergy, and is quite often found in combination with other metals. It is also implicated in the etiology of vesicular contact dermatitis. In many studies, nickel has been identified as the most common allergen (6). Wongpyvabovorn and Puvabanditsin report on the prevalence of nickel hypersensitivity of 18.60% (7).

Whereas literature data report on the prevalence of nickel hypersensitivity from 35.4% to 43% (8,9), and Kruljac *et al.* on 28% (10), we found it to be only 12.87%.

Rare cases of respiratory manifestations of nickel hypersensitivity in the form of rhinitis and bronchial asthma have also been described, exclusively involving female patients with a history of some type of allergy. The patients underwent patch testing, nasal provocative testing with nickel sulfate, computed tomography of paranasal sinuses, spirometry as well as bronchial challenge

Table 5. Statistical analysis

Allergen	Year	+	++	+++	χ^2	p
Nickel Sulfate	2004	30	6	3	9.775	0.05
	2005	29	1	1		
	2006	40	10	3		

testing with methacholine and oral nickel challenge testing. Considerable improvement was noted upon cessation of nickel ingestion (11).

There are rare cases of contact hypersensitivity to peripheral venous catheters. Macular exanthema has been reported in two patients. In these cases, accurate diagnosis is of utmost importance for potential complications during the postoperative and postpartum period (12).

In conclusion, it is noted that positive reactions to nickel should be continuously monitored, with special reference to the age at occurrence, since lifestyle and habits appear to play a major role in the etiology of nickel hypersensitivity.

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