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Original Article

Frequency of nickel sensitivity in patients with shoe dermatitis

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Abstract

Objective To determine the frequency of positive patch tests for nickel in patients of shoe dermatitis.

Methods This was a descriptive study carried out in the outpatient department of Dermatology Unit-II, Mayo Hospital, Lahore. A total of 50 patients were inducted in the study with ages 12 and above and either sex, with shoe dermatitis. The patients were tested using patch tests with the allergen nickel sulfate hexahydrate 5% in petrolatum base using the European standard series.

Results Most of the patients were female i.e. 37 out of a total of 50. The mean age of patients was 31 years (14 to 65 years). Housewives and students were most commonly affected. 18% of the patients positively tested for nickel sulfate.

Conclusion Nickel sulfate hexahydrate is a frequent allergen causing shoe dermatitis .

Key words
Nickel sulfate, patch test, contact dermatitis.

Introduction

Contact dermatitis is an inflammation of the skin induced by chemicals that damage the skin directly (irritant contact dermatitis) or by specific sensitivity to allergens (allergic contact dermatitis). The latter, a delayed-type hypersensitivity response to exogenous agents is an acquired inflammatory reaction requiring absorption of antigen from the skin and recruitment of previously sensitized, antigen-specific T lymphocytes into the skin. Langerhans cells present the antigens to T-helper lymphocytes, which become sensitized, multiply and circulate in the blood vessels as memory cells.[1] Upon a second encounter, they sensitize the skin to these antigens. Allergic contact dermatitis may present clinically as acute, subacute, chronic or acute on chronic eczema. In acute phase, erythema, swelling, papules and papulovesicles are formed. In chronic phase, there are lichenified, dry erythematous plaques with hyperkeratosis, scaling and fissuring.[2]

Shoe dermatitis is a form of contact dermatitis resulting from exposure to shoes. Different chemicals, in conjunction with a hot and humid environment within the shoe, give rise to allergic shoe dermatitis. It is commonly caused by constituents like rubber, leather, adhesives and rarely by linings and dyes. The allergens commonly identified are rubber chemicals, chromate (in leather), nickel in buckles, and para-tertiary-butyl phenol formaldehyde resin (PTBPFR).[3]

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Patch testing is the gold standard for diagnosing the cause of allergic contact dermatitis.[4] Patch test requires controlled application of biological or chemical substances to detect allergic hypersensitivity to one of them. It can identify the sensitizing agent using European Standard Series. Once allergens are identified patients can avoid them in their environment, thus bringing about improvement in dermatitis.[5] European Standard series is the most commonly used allergens kit in the world.[6]

Shoe dermatitis is common in our population. It has a negative impact on quality of life of the patients. Patch test is very useful in detecting the offending allergens for the prevention and improving treatment outcomes. The purpose of our study was to determine the frequency of nickel sulfate 5% sensitivity in patients with shoe dermatitis by using European Standard Series.

Methods

A descriptive study, on fifty patients was conducted at outpatient department of dermatology Unit-II, KEMU/ Mayo Hospital, Lahore from January 1st, 2016 to May 31st, 2016. Non-probability purposive sampling technique was used. Patients of either sex, of age 12 years and above, clinically diagnosed cases of shoe dermatitis, willing to participate in the study were included. Pregnant females, patient taking topical or oral steroid and antihistamines for the last two weeks, patient taking immunosuppressive drugs or undergoing treatment with ultraviolet rays were not taken. Patient with acute eczema or erosions on skin of upper back and with tinea pedis diagnosed on direct microscopy were also excluded from the study.

After informed consent, detailed history and clinical examination of each patient was performed to know any other systemic or local disease. All patients were tested carefully by nickel sulfate hexahydrate 5% patch included in European Standard Series. Reading was taken at 48, 72, 120 hours and 7th day. All the data were recorded on a pre-designed proforma. The collected data were entered into SPSS-version 19 for analysis. Quantitative variables like age was presented as mean ± SD. Qualitative variables like gender, occupation, marital status, type of eczema and shoe were presented by using frequency table percentages.

Results

Fifty patients fulfilling the inclusion criteria completed the study. Mean age of patients was 31 years (**Table 1**). There were 13 male and 37 female patients. Majority of female patients were housewives (51%) and married (61%). The patients wore different types of shoes and the

Table 1 Demographic and clinical characteristics of the study population (n=50).

Feature	
Mean age (years)	31.53± 11.91
Minimum	14
Maximum	65
Gender	
Males	13
Females	37
Types of shoes	
Sandal	16 (32%)
Chappal	14 (28%)
Court Shoes	9 (18%)
Canvas shoes	5 (10%)
Joggers	3 (6%)
Moccasin	2 (4%)
Khussa	1 (2%)
Aggravating factors	
Sweating	40 (80%)
Footwear	10 (20%)
Clinical patterns	
Dorsal	39 (78%)
Plantar	10 (20%)
Heel	1 (2%)

Table 2 Frequency positive patch test (n=50).

Allergen	*N (%)*
Nickel sulfate hexahydrate 5%	9 (18)

majority wore sandals (27%). Sweating was the most frequent aggravating factor (80%) followed by the type of shoe worn (20%). Clinical patterns of shoe dermatitis were also noted. 38 patients had dorsal pattern, 11 had plantar and 1 had heel dermatitis. Patch test with nickel sulfate hexahydrate 5% as an allergen was applied and 18% patients showed positive result (**Table 2**).

Discussion

Foot dermatitis, sometime combined with hand dermatitis, is a common indication for patch testing, and series have been devised in the past to look specifically for allergy to constituents of footwear or of stockings or shoes. The common allergens in shoes and socks or stockings are well recognized.[7] Multiple studies on shoe dermatitis have been performed all over the world. Certain important differences may be due to geographic and social disparity.

This study was designed to find the frequency of nickel sulfate hexahydrate 5% sensitivity in patients with shoe dermatitis by patch test using European Standard Series. In this study mean age of patients was 31 year. The majority of patients with shoe dermatitis fall into the age group of 14 to 65 years, which may be explained by the fact that it is the most active stage of life, necessitating more travel and more frequent use of footwear, leading to increased risk.[6,8] Patients of all ages, ranging from 3 to 80 years, have been reported to be affected by footwear dermatitis.[8]

Gender distribution of patient showed that there were 26% male and 74% females patients included in the study. Male to female ratio in this study was 1:4. In a local study from Lahore the male to female ratio was 1:4.7 which is almost same as in this study.[9] Possible reasons for the higher number of females in our study may be due to their exposure to a wide variety of shoes, constantly changing fashion and their increased awareness of cosmetic disfigurement. Results of the sex prevalence of footwear dermatitis have largely been contradictory perhaps emphasizing a wide variety of footwear used by women and the uncommon use of socks, exposing them to direct contact with a multitude of potent sensitizers in footwear. In addition, the increased awareness of cosmetic disfigurement in women leads to more frequent reporting of cases. A few studies, however, have shown almost equal and comparable sex incidences, including a study from Australia, out of 55 patients with footwear dermatitis, 47% were women and 53% were men.[10]

The most frequent clinical pattern observed in this study was dorsal seen in 39 (78%) patients. The allergy to nickel sulfate hexahydrate was observed in 18% patients in this study. In a study from Israel, 24 of 58 patients with suspected foot dermatitis had positive patch test to nickel (12%).[11]

A Pakistani study by Rani *et al*.[9] carried out at Mayo hospital, Lahore, 109 patients were patch tested with European Standard and shoe series and somewhat variable results (22.7%) were reported.[9] A study carried out in India showed almost similar result to nickel sensitivity (16.5%) as ours.[12]

An Indian study by Bajaj *et al*.[13] on one hundred and five patients with foot dermatitis over a period of 18 months showed a positive reaction in 47 cases to one or more allergens. Nickel sulfate hexahydrate was the 3rd most common allergen seen in this study.

In our study, the commonest shoe type worn by the patients were sandals and as the majority of the patients were females with history of wearing very ornate shoes where stones set in metal clasps were used. Fisher *et al*.[14] also found

that shoe dermatitis among patients was caused by metallic nickel sulfate found in shoe buckles, shoe eyelets or other shoe accessories. Febriana *et al*.[15] recently reported in his study that 6 patients had nickel sensitivity in Indonesian patients with foot eczema attributed to shoes.

Conclusion

It is concluded from our study that nickel sulfate is a frequent allergen causing shoe dermatitis. Measures need to be taken to reduce the manufacturing of articles containing high nickel content. Public needs to be educated and awareness programs to be set up to reduce the problem.

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