

Dermatological diseases of the feet in Turkey: The analysis of 634 patients

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Abstract

Aim: Dermatological diseases of the feet may be hereditary, inflammatory, infectious or malignant. The patients may be primarily evaluated by general surgeons, orthopedists, primary care physicians and podiatrists. Moreover, foot health centers are becoming increasingly popular. Therefore, we aimed to determine the most common skin disorders affecting the feet to guide the physicians in managing of skin-related foot disorders.

Material and Methods: Between March 2017 and March 2019, 634 patients (55.5% female, 44.5% male) with skin disorders affecting feet were included in this study. The patients were evaluated in three groups according to the age including younger than 18, between the age of 18-65, and older than 65.

Results: The most common disease group and skin disease observed in all patients were infections 272 (42.9%) and onychomycosis 106 (16.7%), respectively. Onychomycosis was followed by ingrown nail 67 (10.6%), tinea pedis 56 (8.8%) and warts 53 (8.4%). The most common disease group and skin disease were infections 18 (34.6%) and ingrown nail 17 (32.7%) in patients younger than 18, and infections 199 (45%) and onychomycosis 76 (17.2%) in patients aged 18-65. Similarly, infections 55 (39.3%) and onychomycosis 27 (19.3%) were the most common disorders observed in patients older than 65.

Conclusion: This study revealed that the most common skin diseases affecting feet were onychomycosis, ingrown nail, tinea pedis and warts. However, frequency of these disorders varied depending on age. These results will guide the physicians in making diagnosis, differential diagnosis or referring the patients to a specialist when needed.

Keywords: Foot; nails; skin diseases

INTRODUCTION

Skin diseases of the feet include malignancy, infections, hereditary and inflammatory disorders (1). Feet and nails are prone to skin diseases as a result of wearing shoes for a long time, trauma, excessive moisture and direction of blood flow through the veins (2). Foot disorders are affected by poor hygiene, seasonal changes, body mass index and socioeconomic factors. Foot disorders usually initiate during adolescence, however, the incidence increases with age (3). Definitive diagnosis and appropriate treatment are crucial; as neglected disorders can cause pain, difficulty in wearing shoes, even severe complications which result in an amputated extremity (1).

Contact dermatitis, psoriasis, lichen planus, palmoplantar keratoderma, tinea pedis, onychomycosis, verruca plantaris, pitted keratolysis, corns, calluses, melanoma and Kaposi's sarcoma have been reported as common skin diseases of the feet (1). Besides, skin disorders like

palmoplantar keratoderma may be associated with breast cancer or internal tumors of pulmonary and gastrointestinal system (4). Tinea pedis may be complicated by recurrent cellulitis if it is left untreated. Cellulitis may lead to tissue necrosis and extremity amputations especially in patients with comorbidities like diabetes (5). Affected area, onset of the disease, subjective symptoms like pain and itching, trauma, shoe preference, physical activities, medications, past medical history and family history should be all considered in the examination of patients with foot problems (6).

Dermatologists play an important role in the management of these disorders. However, initial assessment of the patients may be performed by primary care physicians, general surgeons, orthopedists and podiatrists. Foot health centers have recently become increasingly popular. Therefore, we aimed to determine the most common skin

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disorders affecting the feet.

MATERIAL and METHODS

The study included 634 patients who were admitted to dermatology outpatient clinic with a skin lesion or a subjective symptom affecting the feet. The study has been approved by local ethics committee (20190328/2). The medical records of the patients were reviewed retrospectively between March 2017 and March 2019. The patients were divided into three groups based on age including younger than 18, between 18 and 65 and older than 65.

Past medical history, previous diagnoses, prior treatments, the definitive diagnoses we reached, dermatological examination and laboratory test results were evaluated. Direct microscopic examination of the skin or nail scrapings using 10% potassium hydroxide and matrix assisted laser desorption ionization time of flight mass spectrometry (MALDI-TOF MS) were used in the diagnosis of fungal infections. Onychomycosis caused by non-dermatophyte molds and yeasts were identified with MALDI-TOF MS. In addition, Wood's lamp examination, laboratory tests like complete blood count and chemistry panel, skin biopsy and histopathological evaluation, X-ray radiography, ultrasound and magnetic resonance imaging were performed when needed.

Dermatological diseases were evaluated in 14 groups such as infections, urticaria/ drug reaction/ erythema multiforme, dermatitis, pigmentary disorders, nail disorders, inflammatory disorders, nevi and benign tumors, malignancies, ulcers, calluses and corns, xerosis/keratoderma, vasculitis, blistering disorders and the other etiologies (hyperhidrosis, burn, pruritus, scar, insect bite).

Statistical analysis

Statistical analysis was performed using SPSS 20.0 Statistical Package Program. Descriptive statistics for categorical variables include number, percentage; the

mean±standard deviation and the median (minimum; maximum) for the numerical variables. The chi-square test was used to compare categorical variables. $P < 0.05$ was considered statistically significant.

RESULTS

The study included 634 patients, 352 (55.5%) female and 282 (44.5%) male. The mean age of the patients was 45.5 ± 20.87 (range: 3-94 years). 52 (8.2%) patients were younger than 18; 442 (69.7%) patients were between the age of 18-65 and, 140 (22.1%) patients were older than 65. The past medical history of 455 (71.8%) patients was unremarkable. However, 49 (7.7%) patients had hypertension, 35 (5.5%) patients had diabetes mellitus, 16 (2.5%) patients had chronic venous insufficiency, 13 (2.1%) patients had abnormal thyroid function tests, 9 (1.4%) patients had coronary artery disease, 4 (0.6%) patients had hyperlipidemia and 4 (0.6%) patients had asthma. The median disease duration was 6 months (range: 1 day-360 months). 204 (32.2%) patients did not receive any treatment previously. However, 430 (67.8%) patients were treated with topical agents, systemic agents, surgical procedures, cryotherapy, electrocauterization, phototherapy or iontophoresis for their skin conditions, previously. 112 (17.7%) patients were misdiagnosed previously. Figure 1 shows a patient with pustular psoriasis who was diagnosed with tinea pedis and treated with topical antifungal medications, previously. 203 (32%) patients stated that there were precipitating factors like stress or trauma for the development of skin disorders. 335 (52.8%) patients admitted subjective symptoms like itching, pain and bad smell. Unilateral lesions were observed in 265 (41.8%) patients, while 369 (58.2%) patients had bilateral lesions. 224 (35.3%) patients had a solitary lesion, 410 (64.7%) patients had multiple lesions. 334 (52.7%) patients had lesions on feet, 137 (21.6%) patients had nail involvement, 120 (18.9%) patients had

Table 1. The most common skin disease groups observed in patients

Younger than 18 (n=52)	Between the age of 18-65 (n=442)	Older than 65 (n=140)
Infections 18 (34.6%)	Infections 199 (45%)	Infections 55 (39.3%)
Nail disorders 18 (34.6%)	Nail disorders 58 (13.1%)	Dermatitis 15 (10.7%)
Dermatitis 5 (9.6%)	Inflammatory disorders 41(9.3%)	Ulcers 14 (10%)
Xerosis/keratoderma 3 (5.8%)	Xerosis/keratoderma 23 (5.2%)	Xerosis/keratoderma 11(7.9%)
Nevi/benign tumors 2 (3.8%)	Calluses and corns 18 (4.1%)	Nail disorders 8 (5.7%)
Pigmentary disorders 1(1.9%)	Dermatitis 17 (3.8%)	Inflammatory disorders 6 (4.3%)
Blistering disorders 1(1.9%)	Urticaria/drug reaction/EM 14 (3.2%)	Calluses and corns 6 (4.3%)
The other etiologies 3 (5.8%)	Pigmentary disorders 12 (2.7%)	Malignancies 4 (2.9%)
	Nevi/benign tumors 5 (1.1%)	Urticaria/drug reaction/EM 3 (2.1%)
	Vasculitis 3 (0.7%)	Blistering disorders 1(0.7%)
	Ulcers 2 (0.5%)	The other etiologies 5 (3.6%)
	Blistering disorders 1(0.2%)	
	The other etiologies 27 (6.1%)	

*EM: Erythema multiforme. The most commonly observed disease group in all patients was infections



Figure 1. Pustular Psoriasis. Erythematous squamous plaque

and pustules on the right foot. The patient stated that she was diagnosed with tinea pedis and treated with topical antifungal agents, previously

Frequency of disease groups observed in all patients were; infections (n=272, 42.9%), nail disorders (n=84, 13.2%), inflammatory disorders (n=47, 7.4%), dermatitis (n=37, 5.8%), xerosis/ keratoderma (n=37, 5.8%), calluses/ corns (n=24, 3.8%), urticaria/ drug reaction/ erythema multiforme (n=17, 2.7%), ulcers (n=16, 2.5%), pigmentary disorders (n=13, 2.1%), nevi and benign tumors (n=7, 1.1%), malignancies (n=4, 0.6%), vasculitis (n=3, 0.5%), blistering disorders (n=3, 0.5%) and the other etiologies (n=35, 5.5%). The most common skin disease observed in all patients were onychomycosis 106 (16.7%), ingrown nail 67 (10.6%), tinea pedis 56 (8.8%), warts 53 (8.4%), psoriasis vulgaris 29 (4.6%), xerosis 29 (4.6%), callus 23 (3.6%), stasis dermatitis 13 (2.1%), diabetic foot ulcer 10 (1.6%), palmoplantar psoriasis 10 (1.6%), contact dermatitis 10 (1.6%), urticaria 8 (1.3%), keratoderma 8 (1.3%), erythrasma 7 (1.1%), hyperhidrosis 7 (1.1%), vitiligo 7 (1.1%), neurodermatitis 7 (1.1%), insect bite 7 (1.1%),

Table 2. The most common skin diseases of the foot observed in patients according to the age groups

Younger than 18 (n=52)	Between the age of 18-65 (n=442)	Older than 65 (n=140)
Ingrown nail 17 (32.7%)	Onychomycosis 76(17.2%)	Onychomycosis 27(19.3%)
Warts 12 (23.1%)	Ingrown nail 45(10.2%)	Tinea pedis 13(9.3%)
Atopic dermatitis 4 (7.7%)	Tinea pedis 43(9.7%)	Stasis dermatitis 11(7.9%)
Onychomycosis 3 (5.8%)	Warts 40(9%)	Diabetic foot ulcer 10(7.1%)
Xerosis 3 (5.8%)	Psoriasis vulgaris 27(6.1%)	Xerosis 9(6.4%)
Insect bite 2(3.8%)	Callus 17(3.8%)	Callus 6(4.3%)
Hand foot and mouth disease 2 (3.8%)	Xerosis 17(3.8%)	Ingrown nail 5(3.6%)
Hyperhidrosis 1(1.9%)	Urticaria 8(1.8%)	Cellulitis 3(2.1%)
Epidermolysis bullosa 1(1.9%)	Palmoplantar psoriasis 8(1.8%)	Drug eruption 3(2.1%)
Melanocytic nevus 1(1.9%)	Erythrasma 7(1.6%)	PPD 3(2.1%)
Paronychia 1(1.9%)	Contact dermatitis 7(1.6%)	Mycosis fungoides 3(2.1%)
Congenital nevus 1(1.9%)	Vitiligo 7(1.6%)	Psoriasis vulgaris 2(1.4%)
PIH 1(1.9%)	Hyperhidrosis 6(1.4%)	Stasis ulcer 2(1.4%)
Leukonychia 1(1.9%)	Pruritus 6(1.4%)	Keratoderma 2(1.4%)
Contact dermatitis 1(1.9%)	Lichen planus 5(1.1%)	Palmoplantar psoriasis 2(1.4%)

PIH: Postinflammatory hyperpigmentation; PPD: Pigmented purpuric dermatoses

17 (32.7%) patients younger than 18-year-old had ingrown nail, while 76 (17.2%) patients aged 18-65 and 27 (19.3%) patients older than 65 were diagnosed with onychomycosis

pruritus 6 (0.9%), lichen planus 6 (0.9%), postinflammatory hyperpigmentation 6 (0.9%), pigmented purpuric dermatoses 5 (0.8%), scabies 5 (0.8%), atopic dermatitis 5 (0.8%), cellulitis 5 (0.8%), nail psoriasis 5 (0.8%), drug eruption 5 (0.8%), melanocytic nevus 5 (0.8%), pincer nail 4 (0.6%), erythema multiforme 4 (0.6%), paronychia 4 (0.6%), onychogryphosis 3 (0.5%), stasis ulcer 3 (0.5%), nummular dermatitis 3 (0.5%), mycosis fungoides 3 (0.5%), burn 2 (0.3%), epidermolysis bullosa 2 (0.3%), scar 2 (0.3%), arterial ulcer 2 (0.3%), hand foot and mouth disease 2 (0.3%), pustular psoriasis 2 (0.3%), leukocytoclastic

vasculitis 2 (0.3%), morphea 2 (0.3%), pitted keratolysis 1 (0.2%), livedo reticularis 1 (0.2%), dermatofibroma 1 (0.2%), melanonychia 1 (0.2%), congenital nevus 1 (0.2%), scleroderma 1 (0.2%), melanoma 1 (0.2%), onycholysis 1 (0.2%), pemphigus vulgaris 1 (0.2%), bullous pemphigoid 1 (0.2%), dermatitis herpetiformis 1 (0.2%), anonychia 1 (0.2%), leukonychia 1 (0.2%), varicella 1 (0.2%), prurigo nodularis 1 (0.2%) and decubitus ulcer 1 (0.2%), respectively.

The most common disease groups in patients younger than 18 were; infections 18 (34.6%), nail disorders 18 (34.6%), dermatitis 5 (9.6%), xerosis/

keratoderma 3 (5.8%), nevi and benign tumors 2 (3.8%), pigmentary disorders 1 (1.9%), blistering disorders 1 (1.9%) and the other etiologies 3 (5.8%) (Table 1).

Table 3. The most common skin diseases of the foot and disease groups among women

Women (n=352)	
Disease group	Skin disease
Infections 151(42.9%)	Onychomycosis 65(18.5%)
Nail disorders 45(12.8%)	Ingrown nail 35(9.9%)
Inflammatory disorders 24(6.8%)	Warts 35(9.9%)
Xerosis/keratoderma 24(6.8%)	Tinea pedis 24(6.8%)
Dermatitis 20(5.7%)	Xerosis 19(5.4%)
Calluses and corns 15(4.3%)	Callus 15(4.3%)
Urticaria/drug reaction/EM 11(3.1%)	Psoriasis vulgaris 15(4.3%)
Pigmentary disorders 7(2%)	Neurodermatitis 7(2%)
Ulcers 6(1.7%)	Insect bite 6(1.7%)
Nevi/benign tumors 4(1.1%)	Stasis dermatitis 6(1.7%)
Malignancies 4(1.1%)	Palmoplantar psoriasis 6(1.7%)
Blistering disorders 2(0.6%)	Keratoderma 5(1.4%)
Vasculitis 1(0.3%)	PIH 5(1.4%)
The other etiologies 22(6.3%)	Urticaria 5(1.4%)
	Melanocytic nevus 4(1.1%)

EM: Erythema multiforme
PIH: Postinflammatory hyperpigmentation
Infections were observed in 151 (42.9%) female patients, while 65 (18.5%) female patients were diagnosed with onychomycosis

Table 4. The most common skin diseases of the foot and disease groups among men

Men (n=282)	
Disease group	Skin disease
Infections 121(42.9%)	Onychomycosis 41(14.5%)
Nail disorders 39(13.8%)	Ingrown nail 32(11.3%)
Inflammatory disorders 23(8.2%)	Tinea pedis 32(11.3%)
Xerosis/keratoderma 13(4.6%)	Warts 18(6.4%)
Dermatitis 17(6%)	Psoriasis vulgaris 15(5.3%)
Ulcers 10(3.5%)	Xerosis 10(3.5%)
Calluses and corns 9(3.2%)	Callus 8(2.8%)
Urticaria/drug reaction/EM 6(2.1%)	Diabetic foot ulcer 8(2.8%)
Pigmentary disorders 6(2.1%)	Stasis dermatitis 7(2.5%)
Nevi and benign tumors 3(1.1%)	Contact dermatitis 6(2.1%)
Vasculitis 2(0.7%)	Vitiligo 5(1.8%)
Blistering disorders 1(0.4%)	Hyperhidrosis 4(1.4%)
The other etiologies 13(4.6%)	Erythrasma 4(1.4%)
	Atopic dermatitis 4(1.4%)

EM: Erythema multiforme
Infections were observed in 121 (42.9%) male patients, while 41 (14.5%) male patients were diagnosed with onychomycosis

The most common skin diseases in patients younger than 18 were stated in Table 2. The most common disease groups in patients aged 18-65 were; infections 199

(45%), nail disorders 58 (13.1%), inflammatory disorders 41 (9.3%), xerosis/ keratoderma 23 (5.2%), calluses and corns 18 (4.1%), dermatitis 17 (3.8%), urticaria/ drug reaction/ erythema multiforme 14 (3.2%), pigmentary disorders 12 (2.7%), nevi and benign tumors 5 (1.1%), vasculitis 3 (0.7%), ulcers 2 (0.5%), blistering disorders 1 (0.2%) and the other etiologies 27 (6.1%). The most common skin diseases in patients aged 18-65 were stated in Table 2. The most common disease groups in patients older than 65 were; infections 55 (39.3%), dermatitis 15 (10.7%), ulcers 14 (10%), xerosis/ keratoderma 11 (7.9%), nail disorders 8 (5.7%), inflammatory disorders 6 (4.3%), calluses and corns 6 (4.3%), malignancies 4 (2.9%), urticaria/ drug reaction/ erythema multiforme 3 (2.1%), blistering disorders 1 (0.7%) and the other etiologies 5 (3.6%). The most common diseases in patients older than 65 were also stated in Table 2. The most common disease groups and skin diseases observed in women and men were stated in Table 3 and Table 4, respectively.

DISCUSSION

Elderly people develop foot problems two times more frequently than in general population. Insufficient foot care, improperly fitting shoes, negligence, infections, vascular and metabolic diseases make elderly people prone to dermatological disorders of the feet. Aging skin is characterized by dehydration, loss of elasticity and vascularity, decreased subcutaneous fat tissue and decreased activity of sweat or sebaceous glands. Moreover, the nail plates of the elderly are usually thick and hard, which lead to difficulty in cutting the nails (7). Hsu investigated foot problems in 426 patients aged 65 and older. Hsu reported that 36% of the patients had skin and nail disorders. Callus, plantar wart and hyperkeratosis were the most common disorders. Long nails and onychogryphosis were observed especially in neglected patients (8).

Within this study, the mean age of the patients was 45.5±20.87, and 22.1% of the patients were older than 65. Foot problems seem to have tendency to affect patients with advanced age. Within this study, onychomycosis (16.7%) was the most common disorder among all the patients. Similarly, onychomycosis was the most common disorder observed in female patients (18.5%) and male patients (14.5%). When the patients were evaluated according to their age, onychomycosis was the most commonly observed disorder in patients aged between 18-65 (17.2%) and patients older than 65 (19.3%). Besides onychomycosis, ingrown nail (10.6%), tinea pedis (8.8%) and warts (8.4%) were also common disorders of the feet. Nevertheless, frequency of these disorders varied depending on age. Onychomycosis is the fungal infection of nails usually caused by dermatophytes. Onychomycosis has been associated with various risk factors including trauma, tinea pedis, psoriasis, immunosuppression and diabetes mellitus (9,10). Within this study, onychomycosis was more common in patients with diabetes mellitus (23.1%) compared to patients without diabetes mellitus (21.4%). However, the results were not statistically

significant ($p=0.88$). Furthermore, diabetic foot ulcers and infections are serious complications of diabetes mellitus (11). Therefore, risk factors for the development of tinea pedis, callus, skin fissure, wart, nail and foot deformities, neuropathy and peripheral vascular diseases should be checked in patients with diabetes (11,12). Within this study, diabetic foot ulcer was the fourth most common disorder affecting feet in patients over the age of 65.

The management of common skin diseases in primary care is crucial since the patients with a skin disease on the foot are usually referred to primary care physicians. Furthermore, patients may admit to orthopedists and general surgeons to diagnose and treat clinical foot problems. Podiatrists are also responsible for the protection and care of the foot health. However, scientific studies about podology are still not adequate in Turkey (6,13-15).

CONCLUSION

In conclusion, this study revealed that the most common skin disease affecting feet was onychomycosis. Ingrown nail, tinea pedis and warts were also commonly observed. Our results will hopefully contribute to medical literature in the field of foot health to guide physicians to reconsider dermatological diseases of the foot.

Competing interests: The authors declare that they have no competing interest.

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