Journal of the Turkish Academy of Dermatology
eISSN 1307-394X

Research

An Investigation on the Prevalence of Different Foot Skin Diseases and Their Risk Factors Among University Students

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Published:
J Turk Acad Dermatol 2007;**1 (2)**: 71202a
This article is available from: http://www.jtad.org/2007/2/jtad71202a.pdf
Key Words: Skin diseases, foot health, university students

Abstract

Objectives: Skin diseases seen on the feet increase in the university environment due to factors such as shared living conditions, failing to provide adequate hygiene, lower economic status, length of daily walking and wearing shoes continuously. Our aim in this study was to determine the skin diseases seen on the feet of university students, to specify the students' knowledge, attitudes and behaviors regarding foot health and foot care, and to reveal the risk factors playing a role in the development of these diseases.

Methods: A total of 302 university students who consulted the dermatology specialist in the Medico–Social Health Center due to any disease on their feet and agreed to participate in the research were included in the study. Subjects were requested to respond to a questionnaire.

Results: The most common foot diseases of the participants were tinea pedis (24.8%), sweaty feet (24.2%), and foot callosities (23.2%). The rates of being male gender, age 23 and above, low father's education level (primary school or lower), living in a rural area, failing to dry the feet properly and adequately after washing, and cutting the toenails improperly were found at a significantly higher rate in patients with fungal disease.

Conclusion: Educational activities regarding the protection of foot health and using healthy shoes should therefore be carried out in this age group.

Introduction

Feet are organs carrying the weight of the body and are subject to various environmental factors. Foot pathologies, mainly fungus diseases, generally start with puberty and increase as we get older. Almost 70% of adults have various foot problems [1, 2, 3]. Foot health is affected by factors such as mechanical effects originating from the shoes, personal hygiene, the environment we live in, seasonal characteristics, education, and economic status as well as traumas and effects related to the weight of the body [4].

Skin diseases seen on the feet are, according to the order of their frequency, fungus infections, bacterial infections, toenail pathologies, hyperkeratotic lesions, and eczematous lesions [4, 5]. While tinea pedis is frequently encountered in the summer due to hot and humid environmental conditions, complaints related to corns increase in the winter as a result of using tight and closed shoes. Shared living conditions such as military schools, boarding schools, and dor-

mitories also increase the frequency of some dermatological problems that are seen on the feet [5].

We think that skin diseases seen on the feet increase in the university environment due to factors such as shared living conditions, failing to provide adequate hygiene, lower economic status, length of daily walking and wearing shoes continuously. However, studies aiming to detect the skin diseases seen on the feet of university students and to determine the students' knowledge, attitudes and behaviors related to foot health and foot care are almost nonexistent both in our country and other countries.

Our aim in this study was to detect the skin diseases seen on the feet of university students, to determine the students' knowledge, attitudes and behaviors regarding foot health and foot care, and to reveal the risk factors playing a role in the development of these diseases.

Materials and Methods

This study was planned as a descriptive study and carried out at Gazi University Medico-Social Health Center between March and September 2006. A total of 302 university students who consulted the dermatology specialist in the Medico-Social Health Center due to any disease on their feet and agreed to participate in the research were included in the study. Students found not to have any dermatological problem by the dermatology specialist were referred to the relevant specialist.

Preliminary tests of the survey form to determine the socio-demographic characteristics, knowledge, attitudes, and behaviors of all students regarding foot health and foot care prepared according to the medical literature and specialist views and consisting of multiple choice and fill-in-the-blank type of questions were carried out on the students who would not be included in the study.

All subjects were required to sign an informed consent to be involved in the study. The data were transferred to the computer environment using the SPSS for Windows 11.0 package software and statistical analyses were carried out. Descriptive statistics were stated using percentages. In addition, each of the five most frequently observed diseases were considered a single case group and the students within or outside this subject group were compared according to their various demographic characteristics and habits related to foot care. The chi-square test was used to determine whether the observed differences were significant or not. Values with alpha error margins lower than 0.05 were considered statistically significant.

Results

A total of 302 students, 52.6% (n=159) male and 47.4% (n=143) female, participated in the study and the mean age was 21.8 ± 2.6 (range 18 to 28). The average monthly income of the families was 863.5 ± 509.7 YTL. Some demographic characteristics of the participants are shown in **Table 1**.

The first five most common foot diseases of the participants were tinea pedis (24.8 %), hyperhidrosis (24.2 %), foot callosities (23.2 %), unguim incarnatus (14.5 %), and ver-

Table 1. Some Socio-demographic Characteristics of the Participants

Characteristics (n=302)	N	%
Gender		
Male	159	52.6
Female	143	47.4
Age		
22 and under	202	66.9
23 and over	100	33.1
Class		
1-2	148	49.0
3-4	154	51.0
Monthly income of the family		
500 and under	60	19.9
501-1000	195	64.6
1001-1500	32	10.6
1501 and over	15	5.0
Mother's education level		
Not literate	33	10.9
Literate	23	7.6
Primary school	175	57.9
Secondary school	32	10.6
High school	29	9.6
College/University	10	3.3
Father's education level		
Not literate	8	2.6
Literate	23	7.6
Primary school	138	45.7
Secondary school	29	9.6
High school	71	23.5
College/University	33	10.9
Longest place of residence		
Rural (village/town)	112	37.1
Urban (big city)	190	62.9
Total	**302**	**100.0**

Table 2. Diseases Detected on the Feet of the Participants

Diseases	n*	%
Tinea pedis	75	24.8
Hyperhidrosis	73	24.2
Foot callosities	70	23.2
Unguim incarnatus	44	14.5
Verruca vulgaris	30	9.9
Dryness and cracking of the heels	28	9.3
Flatfeet	19	6.3
Calcaneal spur	6	2.0
Onychomycosis	3	1.0
Shoe sores	3	1.0
Hallux valgus	1	0.3

* More than one disease was detected in some students

ruca vulgaris (9.9 %). The diagnosis of tinea pedis and onychomycoses were made clinically and microscopically. These diseases are shown in **Table 2**.

The practices of the participants regarding foot health and foot care are presented in **Table 3**. Those washing their feet one or more times a day constituted 85.1%, those with separate foot towels constituted 58.6%, and those drying their feet properly after washing constituted 51.3% of all the participants.

Socks were changed daily by 66.9%, and 80.5% stated that they used healthy socks (cotton, etc.). Those cutting their toenails properly constituted 41.4%, those with personal nail scissors 87.4%, those who had pedicure 6.0%, and those with their personal set while having pedicure 4.6%.

The most carefully considered factor in shoe selection was stated as a good fit (79.5%), followed by being economical (18.2%), and fashionable (14.6%). The same shoes were worn everyday by 28.8% while 48.3% of the participants stated that their average daily shoe wearing time was nine hours or more. Podiatry was recognized as the field dealing with foot care by 16.9% of the participants, and 78.5% answered six or more of the seven questions designed for measuring their knowledge levels correctly.

The knowledge levels of the participants were determined according to their answers to the seven questions about foot health

Table 3a. Practices of the Participants Regarding Foot Health and Foot Care

Practices (n=302)	n	%
Frequency of washing the feet		
Once daily or more	257	85.1
Less frequent than once daily	45	14.9
Existence of personal foot towel		
Yes	177	58.6
No	125	41.4
Status of drying feet after washing		
Yes	186	61.6
No	116	38.4
Drying feet properly		
Yes	155	51.3
No	147	48.7
Frequency of changing socks		
Everyday	202	66.9
Less frequent than once daily	100	33.1
Healthy sock usage (cotton, mercerized)		
Yes	243	80.5
Others	59	19.5
Cutting toenails properly		
Right	125	41.4
Wrong	177	58.6
Having personal nail scissors		
Yes	264	87.4
No	38	12.6
Status of having special toenail care (pedicure)		
Yes	18	6.0
No	284	94.0
Status of having a personal set for pedicure (n=18)		
Yes	14	4.7
No	4	1.3
Most important factors for selecting shoes*		
Fit the feet well	240	79.5
Economical	55	18.2
Fashionable (color/form)	44	14.6
Made of natural leather	23	7.6
Have flat soles	4	1.3
Look chic and high quality	3	1.0
Sports type	2	0.7
Status of wearing the same shoes everyday		
Yes	87	28.8
No	215	71.2
Daily shoe wearing time (average = 9 hours/day)		
Less than nine hours	156	51.7
Nine hours or more	146	48.3
Having shoe complaints		
Yes	26	8.6
No	276	91.4
Preference for summer shoes: slippers-sandals		
Yes	134	44.4
No	168	55.6

Table 3b. (*Continued*) Practices of the Participants Regarding Foot Health and Foot Care

Having shoe maintained		
Yes	108	35.8
No	194	64.2
Answers given to the question "What is podiatry?"		
A science field related to the feet and foot care	51	16.9
Other answers	251	83.1
Number of right answers to the knowledge questions (7 questions)		
5 and under	65	21.5
6 and over	237	78.5
Total	**302**	**100.0**

and although the rate of answering six or more questions correctly was higher in females, those in the 3rd or 4th grades, and subjects living in rural areas, there was no statistically significant difference.

Tinea pedis was detected in 24.8%, and onychomycosis in 1.0% of the subjects. The rates of being male, aged 23 or over, having a low level of income (less than 750 YTL per month), low father's education level (primary school or lower), living in a rural area, failing to dry the feet properly and adequately after washing, and cutting the toenails improperly were found at a significantly higher rate in patients with fungal disease compared to the others. The rates of low mother's education level, having pedicure, average daily time of wearing shoes of nine hours or more, and not preferring slippers and sandals as summertime shoes were higher in the subjects with fungal disease although the difference was not statistically significant.

The percentage of females and washing the feet less frequently than once daily was higher in subjects with hyperhidrosis but the difference was not statistically significant.

The percentage of being in the 3rd or 4th grade and an average daily time of wearing shoes of nine hours or more was higher in subjects with foot callosities. Although not statistically significant, the rates of being aged 23 or over and having shoe complaints were seen at slightly higher rates in subjects with tinea pedis.

In subjects with unguim incarnatus, the rates of being aged 22 or less, living in rural areas and wearing the same shoes everyday were found to be higher although not statistically significant.

The rates of being aged 22 or less, living in urban areas and average daily time of wearing shoes of nine hours or more were higher in the students with verruca vulgaris on their feet.

The risk factors determined for the five diseases most frequently detected in the participants are shown in **Table 4**.

Discussion

In this study, the skin diseases that were frequently observed on the feet of university students were tinea pedis, hyperhidrosis, foot callosities, unguim incarnatus and verruca vulgaris. In many of the previous studies, the skin disease which was most frequently observed in the feet was detected as tinea pedis. Epidemiologic studies have reported that the prevalence of tinea pedis varies between 3 and 52% [**7, 8, 9**]. It has been detected in 15% of the adult population in industrialized countries [**8**]. In a study carried out in Saudi Arabia among 647 adolescent students, the frequency of tinea pedis was 1.9% [**10**].

The factors leading to tinea pedis infection are stated as wet feet, shared living conditions, effects of the bacterial flora, wearing closed shoes, improper anatomical structure of the foot, low socio-economic level, and lack of a health education [**5**]. In our study, it was observed that having a low level of income and inadequate or improper sock usage and foot hygiene prepared the way for tinea pedis. Fungal diseases were seen at statistically significant levels especially in students who did not dry their feet sufficiently and properly after washing ($p<0.05$).

Tuncel et al. studied the frequency and patterns of skin diseases in adolescent and post-adolescent male boarding school students, and detected that the most frequently encountered skin disease in the 682 students between the ages of 14-25 was tinea pedis (32.5%) followed by onychomycosis (8.06%), verruca vulgaris (5.3%),

Table 4. Risk Factors Determined for the Skin Diseases Detected on the Feet of the Participants

Various characteristics of the participants	Estimated relative risk(&)				
	T. pedis	Hyper-hidrosis	Callosities	Unguim incarnatus	Verruca
Gender					
Male	3.6*	0.7	-	-	-
Female					
Age distribution					
23 and over	2.5*	-	1.4	0.6	0.5
22 and under					
Class					
3-4	1.6	-	2.0*	0.4*	-
1-2					
Income level of the family					
750 or less	1.9*	0.7	-	-	-
751 or more					
Father's education					
Primary school or less	2.7*	0.7	-	0.6	2.3*
Secondary school or more					
Mother's education					
Primary school or less	1,9	0.5*	-	-	-
Secondary school or more					
Longest place of residence					
Rural (village/town)	1.8*	-	-	1.7	0.6
Urban (big city)					
Frequency of washing the feet					
Once daily or more	2.0	0.5	2.6	-	-
Less frequent than once daily					
Drying feet after washing					
No	1.7*	-	-	-	-
Yes					
Drying feet properly					
No	1.8*	0.6	1.6	-	-
Yes					
Using healthy socks (cotton, mercerized)					
Yes	1.2	1.7	-	-	-
Others					
Cutting toenails					
Incorrectly	2.0*	-	-	0.7	-
Correctly					
Is personal set used for pedicure (n=18)					
No	-	-	-	-	6.0
Yes					
Status of wearing the same shoes everyday					
Yes	0.8	-	-	1.5	0.5
No					
Daily shoe wearing time (n=191) (average=9 hours)					
9 hours and more	1.3	-	2.3*	-	2.0
Less than 9 hours					
Having complaints about the shoes					
Yes	0.4	-	1.9	-	-
No					
Preference for summer shoes: slippers-sandals					
No	1.4	-	0.7	-	0.6
Yes					
Having shoes maintained					
No	-	0.5	1.5	-	-
Yes					
Selecting suitable shoes					
Yes	-	2.1	-	-	-
No					

* p<0.05. Those with &-p values of 0.300 and over have not been included in the table

unguim incarnatus (4.1%), and callosities (3.6%) [7]. At the end of the study, they stated that skin diseases of the foot were very common among the male boarding school students, an increase was detected in the tinea pedis frequency with age, and they thought that living in close contact with others in boarding schools, using shared bathrooms, undergoing foot trauma during the sports activities and insufficient hygiene conditions prepared a suitable environment for foot disease.

Similarly, studies carried out on different groups such as military personnel, marathon runners and homeless males living on the streets have reported tinea pedis as the most frequently encountered skin disease (56%) [5, 8, 9].

Hyperhydrosis and offensive odor formation, which claimed the second place in our study, may be connected to insufficient foot hygiene and usage of closed shoes for long periods as well as structural reasons [5]. Similarly, hyperhidrosis was found in students washing their feet less frequently than once daily in our study.

Foot callosities are generally formed as a result of the thickening in the normal skin due to excessive pressure and friction formed because of wearing tight shoes [11]. The most important risk factor for callosities in our study was wearing shoes for an average of nine hours or more daily. In addition, the risk of corn formation was higher in students complaining about their shoes and those who did not look after their shoes. However, no relation was detected between the heel height and callosities formation.

Unguium incarnatus is often observed in the big toe and generally develops as a result of cutting the toenails improperly and choosing tight shoes which are not suitable for the foot [9]. According to the evaluation of the results of our study, and contrary to what was expected, no relation was detected between unguium incarnatus and heel height, the method of cutting toenails and shoe selection.

In a comprehensive study carried out in Thailand, the incidence of foot disease was explored evaluating 2000 participants with dermatologic examinations and surveys, and it was reported that foot disease was detected in 37.1% of the patients, These diseases were eczema (12.7%), psoriasis (8.8%), metatarsal corns (3.2%), pigmented spots (1.5%), bacterial infections (0.9%), verruca (0.6%), tinea pedis (3.8%), and onychomycosis (1.7%). It was stated that tinea pedis might be connected to the sandal-type shoes being used while peripheral vascular disease and activities causing foot trauma predisposed to onychomycosis [6].

We believe that the lower prevalence of tinea pedis compared to our study and other studies originates from the conditions of environment and climate.

Oğur *et al.* detected that 43% of the health technician students were uncomfortable with their shoes, 17.4% had consulted to a doctor previously due to tinea pedis and their knowledge levels regarding foot hygiene was not connected to their classes that they attended or to the income levels of their families. The knowledge level increased by 32.8% with the education provided in the form of conferences [4]. In our study, knowledge levels regarding foot health and foot care was higher in females and in students attending advanced grades.

Tinea pedis and onychomycosis are diseases seen rather frequently in adults but rarely observed before puberty and in little children. However, the prevalence of dermatophyte infection has been increasing in children and adolescents all over the world in recent years [2].

Educational activities regarding the protection of foot health and using healthy shoes should therefore be carried out in this age group [3, 12]. Considering that almost 70% of the individuals in the society experience health problems related to their feet at least once in their lives, and that foot pathologies start to increase in adolescence, it can be suggested that foot health screening in this age group should be performed more frequently [1, 5, 10].

Many university students do not get medical help for these complaints. We therefore need to try to take measures and provide periodic education before these diseases develop and inform the students on the benefits of early treatment.

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