Characteristics of Foot Ailments in Ege Region

Ege Bölgesindeki Ayak Problemlerinin Özellikleri

Filiz ÖĞCE,[a]
Halit ÖZYALÇIN, MD,[b]
Sevgi ÖZKAN[c]

[a]Ege University Izmir Atatürk School of Health,
[b]Department of Orthopedics and Traumatology,
Ege University Faculty of Medicine, İzmir
[c]Pamukkale University
Denizli Health Services,
Vocational Collage, Denizli

Geliş Tarihi/*Received:* 21.08.2008
Kabul Tarihi/*Accepted:* 18.09.2008

Yazışma Adresi/*Correspondence:*
Filiz ÖĞCE
Ege University Izmir Atatürk School of Health, İzmir,
TÜRKİYE/TURKEY
filiz.ogce@.ege.edu.tr

ABSTRACT Objective: Foot pain is one of the most frequent health problems in the general population and is a challenging clinical situation for the health professional, since the etiology of painful and deformed feet is poorly understood. The aim of the study was to investigate the foot pain and plantar foot loading characteristics to determine foot ailments in people who live in Ege Region. Pedography was used to analyse foot loading parameters during barefoot walking. We also aimed to find a correlation between the clinical diagnosis and pedographic findings. **Material and Methods:** A total of 1321 subjects (2642 feet) were evaluated. Subjects were categorized according to foot type to examine the effects on foot problems. Foot discomfort was noted according to individuals' complaints and clinical diagnosis. **Results:** In the present study lowering of transverse arch has been seen as the most common foot ailment (80.5%) in the study population. The other common foot problems were pesplanovalgus (19.3%) and lateral foot loading (16.4%). Foot disorders were mostly seen in overweight women, and this increased with increasing age. Most of the subjects had Greek foot type (59.1%) and lowering of transverse arch was found least often in this foot type. **Conclusion:** There was direct relationship of foot problems with gender, age, body mass index, foot type and profession. In some cases clinic diagnoses were found to disagree with pedographic analysis. This study highlights the importance of foot loading examination for people of all ages for early diagnosis of foot deformities.

Key Words: Foot deformities; public health; dissent and disputes

ÖZET Amaç: Ayak ağrısı genel popülasyonda sık karşılaşılan sağlık problemlerinden biridir. Ağrı ve deforme olmuş ayağın etyolojisi tam anlaşılamadığından sağlık çalışanlarını da klinikte zorlayan bir durumdur. Araştırma, Ege Bölgesinde yaşayan insanların ayak problemlerini belirlemek için ayak ağrısı ve plantar ayak basış özelliklerini incelemek amacıyla planlanmıştır. Ayağın yüklenme parametreleri yalınayak yürüme sırasında pedografi kullanılarak analiz edilmiştir. Aynı zamanda klinik tanı ve pedografi analizi arasındaki uyumu bulmak da amaçlanmıştır. **Gereç ve Yöntemler:** Toplam 1321 kişi, 2642 ayak değerlendirilmiştir. Hastalar, ayak problemlerine olan etkisini incelemek için ayak tiplerine göre sınıflandırılmıştır. Ayak rahatsızlıkları, bireylerin şikayetleri ve klinik tanı esas alınarak kayıt edilmiştir. **Bulgular:** Çalışma grubunda en yaygın ayak problemi (%80.5) olarak transvers ark çökmesi saptanmıştır. Genel olarak bulunan diğer ayak problemleri %19.3 ile pesplanovalgus ve %16.4 ile ayak lateraline yüklenmedir. Ayak sorunları özellikle kilolu bayanlarda görülmekte ve bu durum yaşla birlikte artmaktadır. Bireylerin yarıdan çoğunun (%59.1) ayak yapısı Yunan ayak tipine uymakta ve transvers ark çökmesi de en az bu grupta görülmektedir. **Sonuç:** Ayak problemleri ile cinsiyet, yaş, beden kitle indeksi, ayak tipi ve meslek arasında anlamlı bir ilişki görülmektedir. Bazı vakalarda klinik tanı ile pedografi sonuçları arasında uyumsuzluk bulunmuştur. Bu çalışma, ayak basış incelemesinin ayak problemlerinin erken tanılanması açısından tüm yaş gruplarında önemli olduğuna ışık tutmaktadır.

Anahtar Kelimeler: Ayak deformiteleri; halk sağlığı; anlaşmazlık ve uyuşmazlıklar

Turkiye Klinikleri J Med Sci 2010;30(1):97-106

The foot is a complex structure which works in unison unless its balance is disturbed. In general where unbalance occurs it is reflected as foot pain. Foot pain is one of the most frequent health problems within the general population and is a challenging clinical situation for the health professional, since the etiology of painful and deformed feet is poorly understood.[1-3] In addition, foot pain is a general term that includes many different problems such as metatarsalgia, pesplanus, pescavus, hallux valgus, and epincalcanei etc. So, it must be carefully analysed to establish a correct diagnosis.[4] These problems are rarely life-threatening, however they are associated with gait abnormalities and reduced health-related quality of life.[2] It is not always easy to determine the problem from the patients' subjective description. Most of the time, that some objective measurements are needed to aid the diagnosis. Gait analysis can be useful for this purpose as it helps to distinguish between different disorders or different reasons for the same disorder.[5] In particular, pedography is a measurement tool for the early recognition of altered pressure patterns in the individual who suffers from foot pain. It is an easy to use, low cost investigation.[6]

Footwear has been indirectly implicated as the cause of orthopaedic forefoot problems in Western societies.[7] In general, few people are born with foot disorders; usually foot problems result from the person's behaviour such as wearing ill-fitting footwear, as it leads to biomechanical imbalance. In addition, deviation from normal pattern of walking often due to trauma or disease affects the musculoskeletal system causes imbalance of pressure on the foot, and all of these increase with increasing age.[2,8] Published studies show that, in societies that do not wear shoes, forefoot problems are relatively uncommon.[7]

The aim of this study was to examine foot-related pain and plantar foot loading characteristics to determine foot ailments in Turkish people.

MATERIAL AND METHODS

STUDY DESIGN

The study was conducted in Turkey to compare the subjective complaints of patients presenting with foot problems with clinical diagnosis using pedography. In addition, subjects were categorized according to foot type to examine the effects of foot type the Turkish population, on foot problems.

PARTICIPANTS

The sampling frame of the current study, which is intended to be descriptive, included patients, chosen with random pattern technique from 1432 patients who applied Ege University Hospital Orthopaedic Clinic over three years. A total of 1321 subjects (%92) with different foot complaints who accepted to participate in the research were assigned as the study population. Patients with any foot amputation were excluded from the study. Informed consent was obtained from all subjects. Approval was obtained from the local ethics committee.

INSTRUMENT

Foot disorders were objectively assessed using an Emed-SF system (Novel, Munich, Germany). The Emed platform has 2016 sensors with a range of one-127 N/cm^2, and a density of two sensors per square centimetre. It was calibrated to indicate a risk threshold for deformities.

METHOD

The subjects were asked to walk barefoot over a hidden capacitive platform embedded flush in the floor. Three acceptable trials were collected for both feet of each subject with normal step length and self-selected walking speed. A trial was deemed acceptable where the subject struck the Emed SF platform cleanly with one foot at a time.[5,9,10] Foot pressures of individuals were evaluated as dynamic and quantitative measures of standard.

Pedography results were categorised as lowering of transverse arch, pesplanus, pescavus, bunion, external rotational walking, equinus walking, metatarsus adductus, lateral foot loading, first-ray overload, fifth-ray overload, midfoot pressure, epincalcanei and abnormal walking according to plantar pressure distribution.

Foot types were determined by direct observation and foot ailments were noted according to

subject's description and clinic diagnosis. Subjects' complaints were categorized as forefoot pain, arch pain, heel pain, ankle pain, knee pain, bunion, flat feet, valgus gait, varus gait and frequent falls.

The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) 11.0 software. The comparisons of body mass index (BMI), age, sex, foot type, profession between subjects' complaints and pedographic results were evaluated with multiple spectral plots chi-square test and Fisher's exact test. The associations between clinical diagnosis and pedographic analysis were analyzed by kappa coefficient calculations. $p< 0.05$ was considered statistically significant.

RESULTS

A total of 2642 feet were evaluated and no statistical difference was found between left and right feet of the patients. Thus, the results were presented as 1321 subjects, 817 women and 504 men with an average age of 32 ± 19.5 (range, one to 78) years and a BMI of 25.4 ± 4.9 (range, 13.9 to 44.1) kg/m^2. The feet were classified into three types according to digital formulas; the Greek foot, in which the first toe is shorter than the second toe; the Egyptian foot, in which the first toe is longer than the second toe; and the squared foot, in which the first toe is the same length as the second toe.[11] In this group of subjects, 781 (59.1%) individuals had Greek foot type, 401 (30.4%) had Egyptian foot type and 139 (10.5%) had squared foot type. No statistically significant associations were observed between foot types and gender ($p> 0.05$).

Subjects' BMI related to sex and age is shown in Table 1. According to BMI; 66.3% of 16-25 years old subjects and 45.9 % of 26-45 years old subjects were in the normal range whereas 47.7% of those aged 41 and over were overweight. The majority of obese subjects were aged 41 and over. There was a highly significant correlation between the age group and BMI ($p= 0.000$) and between subjects' BMI and sex ($p= 0.000$). More than half of the women were overweight or obese.

Table 2 shows the differences between individuals' complaints-pedographic results and relations with sex. Forefoot pain ($p= 0.042$), arch pain ($p= 0.000$), heel pain ($p= 0.008$), bunion ($p= 0.001$) and callus ($p= 0.001$) complaints were found highly statistically significant in female subjects, whereas flat feet ($p= 0.000$) and valgus gait ($p= 0.000$) were found highly statistically significant in male subjects.

When pedographic results were examined; lowering of the transverse arch ($p= 0.000$), bunion ($p= 0.000$,) and fifth-ray overload ($p= 0.046$) were found to be significant in women, whereas, pesplanus ($p= 0.000$) and external rotational walking ($p= 0.031$) were found to be statistically significant in men. In addition, male subjects showed a normal pressure range more often than women ($p= 0.000$).

TABLE 1: Distribution of body mass index according to age groups and gender.

	BMI GROUPS							
	Underweight (Below 18.5)		Normal range (18.5 - 24.9)		Overweight (25.0 - 29.9)		Obese (30.0 and Above)	
	N	%	N	%	N	%	N	%
Age groups								
16-25	33	18.5	118	66.3	23	12.9	4	2.2
26-40	14	5.2	123	45.9	91	34	40	14.9
41-over	4	0.8	130	25.2	246	47.7	136	26.4
Sex								
Woman	42	6.5	231	35.8	231	35.8	141	21.9
Man	9	2.8	140	44.2	129	40.7	39	12.3

Statistical analysis using Chi-square test.

TABLE 2: Distribution of the subjects' complaints and pedographic results according to sex.

	Woman n= 817		Man n= 503		
	n	%	n	%	p value
Subjects' complaints					
Forefoot pain	220	26.9	110	21.8	0.042
Arch pain	115	14.1	39	7.7	0.000
Heel pain	144	17.6	61	12.1	0.008
Bunion	39	4.8	7	1.4	0.001
Flat feet	17	2.1	30	6.0	0.000
Valgus gait	66	8.1	86	17.1	0.000
Callus	102	12.5	36	7.2	0.001
Pedographic results					
Lowering of transverse arch	713	87.3	351	69.6	0.000
Pesplanus	124	15.2	131	26.0	0.000
External rotational walking	7	0.9	12	2.4	0.031
Bunion	28	3.4	2	0.4	0.000
Fifth-ray overload	26	3.2	7	1.4	0.046
Normal pressure range	17	2.1	34	6.7	0.000

Statistical analysis using Chi-square test.

The relations between the pedography results, clinical diagnosis and subjects' complaints and age are shown in Table 3. When the relationship between subjects' complaints and age was examined; forefoot pain, arch pain, heel pain, ankle pain, knee pain, bunion, flat feet, valgus gait, callus, and frequent falls complaints were found to be statistically significant (p> 0.05). There was a significant relation between symptom-free subjects and age, and symptom-freeness was decreased with increasing age (p= 0.000).

In clinical diagnosis; metatarsalgia, pesplanus, bunion, epincalcanei were found statistically important (p> 0.005).

In the pedography analysis, some results were found to be statistically significant. When the differential group was examined by an advanced analysis;

In the 1-14 age group lowering of transverse arch and fifth-ray overload were seen less frequently (p=0.000 and p= 0.018), in contrast, pesplanus and metatarsus adductus were more common in this group (p= 0.000). The frequency of pescavus was found to be high in the 15-24 age group whereas it was found low in 25-40 years olds (p= 0.013). Equinus walking and midfoot pressure were seen less in 1-14 years olds (p= 0.005), and more in the 25-40 age group (p= 0.019). The frequency of lateral foot loading and bunions was found to increase with increasing age while, in contrast, normal pressure range decreased with age (p= 0.000). The frequency of epincalcanei (p= 0.036), and abnormal walking (p= 0.023) were found to be highest in 25-40 years old.

The distribution of subjects' complaints, clinical diagnosis and pedographic results according to profession is shown in Table 4. When we compared individuals' complaints with profession; arch pain (p= 0.013), forefoot pain, heel pain, bunion, callus and symptom-free were found as statistically significant (p= 0.000). For clinical diagnosis; metatarsalgia was found to be statistically important (p= 0.004). When the pedographic results were examined; lowering of transverse arch, pesplanus, pescavus (p= 0.027), equinus walking (p= 0.004), lateral foot loading, and bunion's (p= 0.008) links with profession were found to be statistically significant (p= 0.000). Advanced analysis demonstrated that;

TABLE 3: Distribution of the subjects' complaints, clinical diagnosis and pedographic results according to age groups.

	AGE GROUPS								
	1-14		15-24		25-40		41- ↑		
	n= 358		n= 161		n= 285		n= 517		
	n	%	n	%	n	%	n	%	p value
Subjects' complaints									
Forefoot pain	18	5.0	40	24.8	83	29.1	189	36.6	0.000
Arch pain	12	3.4	23	14.3	52	18.2	67	13.0	0.000
Heel pain	13	3.6	17	10.6	67	23.5	108	20.9	0.000
Ankle pain	17	4.7	23	14.3	44	15.4	73	14.1	0.000
Knee pain	4	1.1	2	1.2	14	4.9	16	3.1	0.017
Bunion	--	--	2	1.2	7	2.5	37	7.2	0.000
Flat feet	38	10.6	6	3.7	2	0.7	1	0.2	0.000
Valgus gait	139	38.8	5	3.1	3	1.1	5	1.0	0.000
Callus	5	1.4	15	9.3	35	12.4	83	16.1	0.000
Frequent falls	17	4.7	--	--	3	1.1	1	0.2	0.000
Symptom- free	62	17.3	32	19.9	16	5.6	28	5.4	0.000
Clinical diagnosis									
Metatarsalgia	2	0.6	10	6.2	18	6.3	53	10.3	0.000
Pesplanus	119	33.2	24	14.9	34	11.9	54	10.4	0.000
Bunion	--	--	--	--	1	0.4	12	2.3	0.001
Epincalcanei	--	--	--	--	1	0.4	8	1.5	0.021
Pedography results									
Lowering of transverse arch	151	42.2	145	90.1	273	95.8	495	95.7	0.000
Pesplanus	162	45.3	19	11.9	35	12.3	39	7.6	0.000
Pescavus	27	7.5	25	15.5	20	7.0	46	8.9	0.013
Metatarsus adductus	16	4.5	--	--	1	0.4	2	0.4	0.000
Equinus walking	6	1.7	3	1.9	18	6.3	27	5.2	0.005
Lateral foot loading	19	5.3	21	13.0	50	17.6	126	24.4	0.000
Mid foot pressure	5	1.4	5	3.1	15	5.3	27	5.2	0.019
Bunion	1	0.3	2	1.2	4	1.4	23	4.4	0.000
Epincalcanei	--	--	3	1.9	7	2.5	12	2.3	0.036
Abnormal walking	6	1.7	1	0.6	5	1.8	--	--	0.023
Fifth-ray overload	2	0.6	7	4.3	6	2.1	18	3.5	0.018
Normal pressure range	43	12.0	5	3.1	2	0.7	1	0.2	0.000

Statistical analysis using Chi-square test.

pesplanus and pescavus were found to be most common in students while bunions and lateral foot loading were least common in this group. In housewives, bunions were seen more and, in contrast, pescavus was seen less. Pesplanus and pescavus were found to be least common whereas lateral foot loading was found most often in retired subjects.

The relations of foot type and subjects' complaints and pedographic analysis revealed some statistically significant results which are shown in Table 5. There was a high statistical significance for the relationship between valgus gait-lowering of transverse arch and foot type. In advanced analysis, valgus gait was seen more in the Greek type, whereas lowering of transverse arch occurred more frequently in the Egyptian type when compared to the others, with statistically significance (p= 0.000).

The relation of BMI and subjects' complaints and pedography were investigated and significant relationships are shown in Table 6. The callus and

TABLE 4: Distribution of the subjects' complaints, clinical diagnosis and pedographic results according to professions.

	PROFESSION GROUPS										
	Civil servant n= 250		Worker n= 110		Retired n= 182		Student n= 289		Housewife n= 296		
	n	%	n	%	n	%	n	%	n	%	p value
Subjects' complaints											
Forefoot pain	77	30.8	33	30.0	75	41.2	45	15.6	97	32.8	0.000
Arch pain	31	12.4	13	11.8	20	11.0	31	10.7	58	19.6	0.013
Heel pain	56	22.4	23	20.9	29	15.9	19	6.6	76	25.7	0.000
Bunion	8	3.2	3	2.7	17	9.3	2	0.7	16	5.4	0.000
Callus	29	11.7	14	12.7	17	5.9	24	13.2	54	18.2	0.000
Symptom-free	10	4.0	10	9.1	9	4.9	76	26.3	17	5.7	0.000
Clinical diagnosis											
Metatarsalgia	20	8.0	9	8.2	20	11.0	7	2.4	27	9.1	0.004
Pedography results											
Lowering of transverse arch	244	97.6	98	89.1	171	94.5	240	83.0	283	95.6	0.000
Pesplanus	25	10.0	8	7.3	8	4.4	51	17.6	36	12.2	0.000
Pescavus	19	7.6	14	12.7	19	10.4	42	14.5	22	7.4	0.027
Equinus walking	13	5.2	6	5.5	6	3.3	3	1.0	22	7.4	0.004
Lateral foot loading	47	18.9	23	20.9	48	26.4	26	9.0	67	22.6	0.000
Bunion	9	3.6	1	0.9	3	1.6	2	0.7	15	5.1	0.008

Statistical analysis using Chi-square test.

TABLE 5: Distribution of the subjects' complaints, clinical diagnosis and pedographic results according to foot type.

	Greek n= 781		Egyptian n= 401		Squared n= 139		
	n	%	n	%	n	%	p value
Subjects' complaints							
Valgus gait	112	14.3	25	6.2	15	10.8	0.000
Pedography results							
Lowering of transverse arch	592	75.8	353	88.0	119	85.6	0.000

Statistical analysis using Chi-square test.

TABLE 6: Distribution of the subjects' complaints and pedographic results according to BMI.

	Under weight n= 51		Normal range n= 371		Over weight n= 360		Obese n= 180		
	n	%	n	%	n	%	n	%	p value
Subjects' complaints									
Callus	11	21.6	19	5.1	48	13.4	55	30.6	0.000
Symptom-free	3	5.9	46	12.4	16	4.4	11	6.1	0.001
Pedography results									
Lateral foot loading	8	15.7	59	15.9	82	22.8	48	26.7	0.012

Statistical analysis using Chi-square test.

BMI: Body mass index.

symptom-free group, and those in which lateral foot loading was found were found as statistically important (p> 0.05). In advanced analysis; people who have normal range of BMI scores had lesser callus complaint than the ones with abnormally high or low BMI scores. Non symptomatic subjects were found to fall within the normal range of BMI (p= 0.001) while those with lateral foot loading tended to be obese (p= 0.012).

The relations between the structure of the transverse metatarsal arch (TMA) and subjects' complaints and the pedography were investigated and significant results are shown in Table 7. Forefoot-arch and ankle pain besides bunion and callus complaints were found highly statistically significant in people who have lowering of the TMA (p< 0.05), whereas flat feet, valgus and varus gait were found statistically important in people who have TMA (p> 0.05). According to pedographic results; lateral foot loading was found statistically important in people who have lowering of TMA, whereas pesplanus, metatarsus adductus and normal pressure range were found statistically important in those who have TMA (p= 0.000).

Kappa coefficients were computed between the results of clinical diagnosis and electronic pedography analysis, and some disagreements were found between the clinic examination diagnosis and diagnosis by pedography analyzer in case of epincalcanei (12%), bunion (22%), pesplanus (32%) and pescavus (0.7%).

DISCUSSION

We have reported the findings from 1321 Turkish people's foot ailments. Over 80 percent of the study population had a foot problem of some kind. It was clarified that some foot disorders directly related to age, gender, BMI and profession.

The majority of the cases in our study had the Greek foot type (59.1%), followed by the Egyptian foot type (30.4%) and the squared type (10.5%). The corresponding percentages in the Gunal study were similar at 41%, 30%, and 29% respectively.[11] He mentioned that while Viladot rarely found pathological changes in the forefoot of the Greek foot type, he found high prevalence in his study.[11] Our findings indicated that valgus gait, one of the subjects' complaints, was more common in the Greek

TABLE 7: Distribution of the subjects' complaints and pedographic results according to structure of transverse metatarsal arch.

	Lowering of TMA n= 1064		TMA n= 257		
	n	%	n	%	p value
Subjects' Complaints					
Arch Pain	150	14.1	4	1.6	0.000
Forefoot Pain	319	30.0	11	4.3	0.000
Ankle Pain	140	13.2	17	6.6	0.003
Bunion	44	4.1	2	0.8	0.007
Flat feet	18	1.7	29	11.3	0.000
Valgus gait	37	3.5	115	44.7	0.000
Valgus gait	8	0.8	6	2.3	0.038
Callus	127	12.0	11	4.3	0.000
Symptom free	110	79.7	28	20.3	0.434
Pedographic Results					
Pesplanus	116	10.9	140	54.5	0.000
Metatarsus Adductus	6	0.6	13	5.1	0.000
Lateral foot loading	199	18.7	16	6.2	0.000
Normal pressure range	1	0.1	50	19.5	0.000

Statistical analysis using Chi-square test.

foot type while lowering of transverse arch was found least often in this foot type. However, further research should be conducted to determine which foot type is most symptomatic and to determine Turkish foot type in a larger population.

Results of our study indicate that the body mass index was higher in women than in men, and increased with increasing age.

Symptom-free subjects had normal range of BMI (12.4%) whereas obese subjects have more callus (30.6%) and lateral foot loading (26.7%) problems. These findings can be explained by weight overload (obesity) as an aggravating factor as suggested by Bardelli et al and Widhe and Widhe.[10,12]

In this study it was observed that forefoot, arch and heel pain including bunion and callus were found most often in women; whereas flat feet and valgus gait were more frequent in men. Similarly, Springett et al found that women suffered from corns and callus more frequently than men .[13] Although footwear alone is not sufficient to explain the bunion problem, the higher incidence in women compared to men is believed to be due to tightly fitting women's footwear.[14,15] The significant association between sex and these problems reflects women's tendency to be overweight and two wear ill-fitting shoes.[2] Bunion and fifth-ray overload were also seen in pedographic analysis of women, in agreement with the findings of Manna et al.[8]

We have found pesplanus and external rotational walking to be more common in the male population.

Although generally patients' complaints were seen to increase in 25-40 year and older age groups, flat feet, frequent falls and valgus gait seen to increase in 1-14 year age group. Moreover, it has been shown that the rates of forefoot pain including bunion and callus generally increase with age. With regard to clinical diagnosis; metatarsalgia, bunion and epincalcanei were found in subjects over 41 years of age, The possible reason is that people in 25-40 year age group have an active daily life, wear ill fitting shoes and put on excess weight over the years causing the foot deformities by the time they are 41 years old or older. Pesplanus was found most often in the 1-14 year age group, and in pedographic analysis, similar results were seen. Looking at this in more detail, by dividing the 1-14 year age group into two subgroups as 1-6 and 7-14 years we have seen that pesplanus, valgus gait and metatarsus adductus were found more in 1-6 year-old children.

Metatarsalgia is the most frequent cause of forefoot pain and it is a descriptive rather than a proper diagnostic term. In our study we mean "an acute or chronic pain in relation to one or more metatarsophalangeal joints caused by damage to the anatomical structures" as stated by Bardelli et al.[12] In this study 878 (88.1%) patients with metatarsalgia were found and were compared with 1242 (62.1%) patients reported by Viladot and Troncoso.[12] In our study 330 (25.0%) subjects had metatarsalgia (forefoot pain).

When we investigated the incidence of disorders in different professions, we found that arch (19.6%) and heel pain (25.7%) besides callus (18.2%) were the most common foot complaints reported by housewives. Equines walking (7.4%) and bunion (5.1%) were the most common foot ailments determined by pedography in housewives. The possible reasons are for that may be the obesity of the housewife group possibility of wearing ill-fitting shoes to follow fashion. On the other hand, complaints of forefoot pain (41.2%) and bunion (9.3%) and pedography showing lateral foot loading (26.4%) were the most common foot ailments in the retired group.

The existence of a transverse metatarsal arch has been questioned.[16] Some authors suggest that TMA existed, while others suggest that there is no functional metatarsal arch of the foot.[17,18] The American Association of Orthopaedic Surgeons summed up the current belief in the USA as; "A transverse arch is suggested to exist at the MTH when no weight is being borne; it does not exist during weight-bearing". Luger et al and Kanatlı et al found that there was no distal transverse metatarsal arch during the stance phase.[15,18] In our study we have seen a higher percentage (80.5%) of

patients had lowering of TMA whereas 19.5% of patients had TMA during weight bearing. It is understood that lowering of TMA is a pathological situation since the latter group (19.5%) is in the normal pressure distribution range.

Seitz questioned whether an absent arch implied a pathological forefoot condition such as metatarsalgia.[19] According to Saxl, pressure calluses underneath the 2nd, 3rd and 4th metatarsal heads corresponded to lowering of transverse arch.[20] Debrunner noted that weight bearing occurs at the 1st and the 5th metatarsal heads in the normal forefoot.[21] Lowering of the remaining metatarsal heads created unphysiological loads underneath them, which lead to callus formation.[9] In this study, when we examined effects between lowering of TMA and subjects' complaints as well as the other pedography results, we have seen that, subjects who had lowering of TMA had more forefoot pain complaints besides higher rates of lateral foot loading than those who had TMA, similar to earlier results mentioned above. On the other hand, pes planus and metatarsus adductus were the most common foot ailments examined in subjects who had transverse arch. It might be expected that the existence of pesplanus and metatarsus adductus would be more associated with lowering of the TMA due to the imbalances of ligaments and muscles of the arch area,[22] but our study had contradictory results. In addition, excessive lateral foot loading reflected the gait model that the patients, who had lowering of TMA, had created to compensate for foot pain.

As a result of these problems, some surgical corrections may be unavoidable. However, many of them may be prevented by the use of roomy, comfortable footwear after the pedography examination. Therefore, it is important to make people aware of the damage associated with ill-fitting footwear and education is the key to success. Health care professionals, especially nurses play an important role in this education.

In our study, some foot abnormalities diagnosed by pedography were found to be in disagreement with clinic examination. The most striking contradiction was found with pesplanus. The foot arch was found to be normal by pedography in 122 subjects who had been diagnosed as pesplanus according to clinic examination. Similarly, pescavus was found in 10 subjects who were diagnosed as pesplanus by clinical examination.

CONCLUSION

Some conditions such as diabetes, arthritis and circulatory disorders may present their initial symptoms in the feet, so foot ailments can be the first sign of more serious health problems. Therefore, foot health should be considered important for people at all ages. Increased public awareness is an important step in reducing the incidence of foot problems especially in women since they are inclined to use ill-fitting footwear. It is not easy to persuade women who want to follow fashion at the cost of deteriorating their foot health. Unfortunately, most health care providers are not familiar with their roles and responsibilities with respect to foot health. Nurses can take an active role for solving this problem. For this purpose, nurses' interest in foot health can be focused more on education and awareness issues within the population.

In clinical practice, physical examination of the foot and footprints can give limited information related to the high pressure locations while radiology is helpful in providing quantitative measurement for the diagnosis of foot problems. However for determination of foot pain of unclear origin without any osseous changes, electronic pedography examination is an objective diagnostic method. Mass screening could be carried out using this method since it is dynamic, non-invasive and easy to use.

Acknowledgement

We thank to Brendan McHugh (Senior Lecturer at the University of Strathclyde in Glasgow) for English grammar check and also critical reading of manuscript and Mehmet Zencir (Lecturer at the University of Pamukkale, Biostatistics) for statistic check.

REFERENCES

1. Ashman CJ, Klecker RJ, Yu JS. Forefoot pain involving the metatarsal region: differential diagnosis with MR imaging. Radiographics 2001;21(6):1425-40.
2. Dawson J, Thorogood M, Marks SA, Juszczak E, Dodd C, Lavis G, et al. The prevalence of foot problems in older women: a cause for concern. J Public Health Med 2002;24(2):77-84.
3. Dıraçoğlu D. [Musculoskeletal pain among medical staff]. Türkiye Klinikleri J Med Sci 2006;26(2):132-9.
4. Coughlin MJ. Common causes of pain in the forefoot in adults. J Bone Joint Surg Br 2000;82(6):781-90.
5. Rosenbaum D, Becker HP. Plantar pressure distribution measurements, technical background and clinical applications. Foot Ankle Surg 1997;3(1):1-14.
6. Greiner B, Dohle J, Schulze W, Ostermann T, Hamel J. The visual assignment of pedographic examination results to anatomical reference areas of the forefoot: a pedographic-radiological study of healthy and abnormal morphology of the forefoot. Foot Ankle Surg 1999;5(4):219-26.
7. Coughlin MJ. Women's shoe wear and foot disorders. West J Med 1995;163(6):569-70.
8. Manna I, Pradhan D, Ghosh S, Kar SK, Dhara P. A comparative study of foot dimension between adult male and female and evaluation of foot hazards due to using of footwear. J Physiol Anthropol Appl Human Sci 2001;20(4):241-6.
9. Daentzer D, Wülker N, Zimmerman U. Observations concerning the transverse metatarsal arch. Foot Ankle Surg 1997; 3(1):15-20.
10. Widhe T, Widhe B. Preschool children referred for pes planus or pes adductus: rotation alignment and plantar pressure pattern at 16 years. Foot Ankle Surg 2000;6(2):89-93.
11. Günal I, Koşay C, Veziroğlu A, Balkan Y, Ilhan F. Relationship between onychocryptosis and foot type and treatment with toe spacer. A preliminary investigation. J Am Podiatr Med Assoc 2003;93(1):33-6.
12. Bardelli M, Turelli L, Scoccianti G. Definition and classification of metatarsalgia. Foot Ankle Surg 2003;9(2):79-85.
13. Springett KP, Whiting MF, Marriott C. Epidemiology of plantar forefoot corns and callus, and the influence of dominant side. The Foot 2003;13(1):5-9.
14. Ayub A, Yale SH, Bibbo C. Common foot disorders. Clin Med Res 2005;3(2):116-9.
15. Nyska M, Liberson A, McCabe C, Linge K, Klenerman L. Plantar foot pressure distribution in patients with hallux valgus treated by distal soft tissue procedure and proximal metatarsal osteotomy. Foot Ankle Surg 1998;4(1):35-41.
16. Luger EJ, Nissan M, Karpf A, Steinberg EL, Dekel S. Patterns of weight distribution under the metatarsal heads. J Bone Joint Surg Br 1999;81(2):199-202.
17. Gürsel Y, Kamanlı A, Ulus Y, Tuncer S, Erdoğan MF, Tansu A, et al. [Foot deformities And correlation with diabetic foot in diabetics] Türkiye Klinikleri J Med Sci 1998;18(3):170-5.
18. Kanatli U, Yetkin H, Bolukbasi S. Evaluation of the transverse metatarsal arch of the foot with gait analysis. Arch Orthop Trauma Surg 2003;123(4):148-50.
19. Debrunner HU. Orthopädisches Diagnostikum. 5th ed. Thieme, Stuttgart, New York; 1987.p. 195-8.
20. Saxl A. Beziehungen zwischen Insuffizienz des Längs- und Quergewölbe des Fußes, Z Orthop Chir 1934;60:442-8.
21. Seitz L. Die vorderen Stützpunkte des FuBes unter normalen und pathologischen Verhältnissen. Z Orthop Chir 1901; 8: 37-78.
22. Hunt AE, Smith RM. Mechanics and control of the flat versus normal foot during the stance phase of walking. Clin Biomech (Bristol, Avon) 2004;19(4):391-7.