

# Prevalence and Dermoscopic Patterns of Acral Melanocytic Nevi in Turkey

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**ABSTRACT** Although nevi are frequently encountered in the acral region, very limited studies have reported their prevalence in specific populations. We aimed to determine the prevalence of acral nevi, their dermoscopic patterns, and evaluate patient awareness in a Turkish population. We prospectively examined 2644 patients admitted to the outpatient dermatology clinics between October 2016 and October 2017. The characteristics of the detected acral nevi and dermoscopic images were recorded. A questionnaire of demographic characteristics was completed from all patients. Two hundred six of the 2644 patients had at least one acral nevus. Two hundred sixty nevi were examined. The general prevalence of acral nevi was 7.8%. Women were more likely to have acral nevi than men (8.7% vs. 6.3%;  $P=0.028$ ). Moreover, darker-skinned patients were also had significantly more acral nevi (8.6% in skin type III-IV vs. 6.0% in skin type I-II;  $P<0.001$ ). The prevalence of acral nevi was 9.4% before the age of 20, 9.5% in patients aged 20-40 years, and 4.6% after the age of 40. In addition, 51.5% of all nevi exhibited a parallel furrow, 13.5% were lattice-like, and 7.7% had a homogeneous pattern. The overall nevus awareness rate was 73.8% and was significantly higher in women at 78.3%. Our study is the first large-scale study of that showed the prevalence of acral nevi in Turkey. According to our study, the prevalence of acral nevi was higher in patients with female sex and darker skin type. We also found that the prevalence of acral nevi decreased over 40 years of age. The general awareness of nevi was higher in women.

**KEY WORDS:** acral nevi, prevalence, dermoscopy, nevus awareness, pattern analysis

## INTRODUCTION

Melanocytic nevi located in the acral regions present unique features. Due to their location, melanocytic lesions may be difficult for patients to become aware of, and are generally noticed incidentally or when changes are seen in the lesion (1,2).

Melanoma is a malignant tumor arising from melanocytes, the incidence of which is increasing rapidly worldwide, and that is one of the most common causes of skin cancer-related mortality (3). Acral lentiginous melanoma is the most common type of melanoma in individuals with darker skin colors or of Asian descent (4). According to reported data for Tur-

key, it constitutes 19-30% of all melanomas, higher than in other Western countries (3,5).

Clinical differentiation of melanocytic lesions in the acral region from early-stage malignant melanoma may be difficult (6). The palmar and plantar regions have their own unique structure. This consists of a thick cornified layer and parallel dermatoglyphics forming an individualized pattern (7). Dermoscopic examination of this region is therefore particularly important (1,2). Patterns differ significantly to those of other regions of the body (8). Previous studies have demonstrated the usefulness of dermoscopy in

enhancing the diagnostic accuracy of clinical examination in acral melanocytic lesions (9).

Very few regions of the world have been subjected to epidemiological analysis on the prevalence of acral melanocytic nevi. There have been no prevalence studies concerning acral melanocytic lesions in Turkey. This study was therefore planned in order to reveal the prevalence of acral nevi, to determine their patterns, and to evaluate patient awareness levels.

## PATIENTS AND METHODS

This cross-sectional study was prospectively performed between October 2016 and October 2017 at our Department of Dermatology clinics. Approval was granted by local ethics committee (2016/147). The sample size was calculated using Open Epi software. We targeted a mass rate above 1800 based on the requisite sample size to determine a 95% confidence interval in an absolute percentage point. We included 2644 participants. All patients presenting to hospital for any reason were included in the study with the receipt of consent during dermatological examination. All volunteers' personal data, Fitzpatrick skin type, and personal and family history of melanoma were investigated. Skin type analysis was based on the Fitzpatrick scale. Subjects with at least one nevus on acral volar skin underwent whole-body nevus examination. The anatomical sites of nevi in the acral regions were also evaluated and classified as thenar, hypothenar, finger, and center in the palmar region, while the plantar region was classified as heel, inner arch, outer arch, metatarsal region, center, and toes. At analysis, the inner arch and midline of the foot were regarded as a low-pressure region, while the heel, outer arch, metatarsus, and toes were regarded as a high-pressure region (10). Nevi were examined in detail using a digital dermatoscope (3Gen Dermlite III DL3N Polarized & Fluid Dermoscope w/ Pigment Boost), and the findings were transferred to a digital environment. During the photographing procedure, 60% alcohol (ethanol) were used to smooth the skin, reduce reflection, render the skin transparent, and thus enhance the image quality. The lesions' widest diameters were recorded using a compass during digital imaging. At least two dermoscopic images were obtained of all nevi. Once all nevus records had been obtained, pattern analysis was performed by two independent dermatologists. Nevi were attributed to one of the parallel furrow pattern variants (single line, single dotted line, double line, and double dotted line), lattice-like, fibrillar, homogeneous, globular, reticular, transition, atypical, or parallel ridge. Additionally, awareness of acral nevi, nevus duration, and whether nevi were acquired or congenital were investigated.

## Statistical analysis

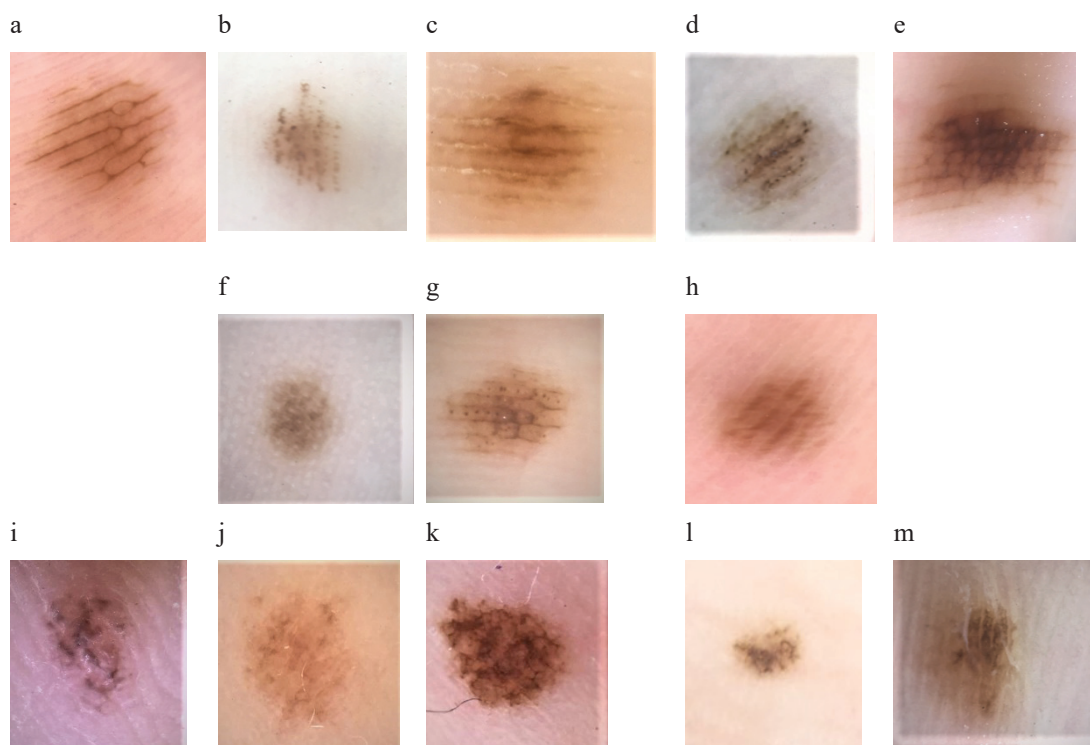
All data were transferred to SPSS 23.0 software (Armonk, NY: IBM Corp.) for analysis. Descriptive statistics were expressed as number (n) and percentage (%) for categorical variables, and as mean, standard deviation (SD), minimum (min), and maximum (max) values for numerical variables. The chi-square test was used for the comparison of categorical data. The Kolmogorov-Smirnov test was applied to assess compatibility with normal distribution. The Mann-Whitney U test was used in the comparison of non-normally distributed data. The Spearman correlation test was employed for correlation analysis of non-normally distributed measurement data.  $P < 0.05$  was regarded as statistically significant.

## RESULTS

A total of 2644 volunteers participated in the study. At least one acral nevus was found in 206 (7.8%) subjects at dermatological examination. The total number of nevi found was 260. The mean age of the participants was  $34.54 \pm 18.15$  years, 1660 (62.8%) of whom were women and 984 (37.2%) were men (female to male ratio: 1.7). Acral nevi were present in 144 (8.7%) women and 62 (6.3%) men and were statistically significantly more prevalent in women ( $P = 0.028$ ). Prevalence of acral nevi was 9.4% in subjects aged 20 or under, 9.5% at age 20-40, and 4.6% at age over 40. The prevalence of acral nevi at age over 40 was significantly lower ( $P < 0.001$ ). Nevi were present on the hand in 112 (4.2%) of all the patients, on the foot in 113 (4.3%), and on both in 0.71%. Participant demographic and clinical characteristics are shown in Table 1. We determined that 77.3% of subjects presented to hospital due to a specific skin disease, 16.3% for cosmetic purposes, 3.4% for skin cancer screening, and 3.0% for surgery. Acral nevi were present in 125 (6.1%) of the subjects presenting due to skin disease, 56 (13.0%) of those presenting for cosmetic purposes, eight (10.3%) of those presenting for surgery, and 17 (18.9%) of those presenting for skin cancer screening. The prevalence of acral nevi was significantly higher in subjects presenting for skin cancer screening ( $P < 0.001$ ). The prevalence of acral nevi was 8.6% in patients with skin type III-IV and significantly higher than patients with skin type I-II (6.0%) ( $P = 0.019$ ). A history of at least one episode of severe sunburn was present in 552 (20.9%) participants. Acral nevi were present in 11.8% of subjects with a history of sunburn, and the prevalence in subjects with sunburn was significantly higher ( $P < 0.001$ ).

We evaluated the correlation between the number of the nevi according to anatomic region. While





**Figure 1.** Dermoscopic patterns of the acral region. (a-d) Parallel furrow pattern; (a) single line, (b) single dotted line, (c) double line, (d) double dotted line, (e) lattice-like, (f) homogeneous, (h) peas in a pod, (i) fibrillar, (j) globular, (k) atypical, (l) reticular, (m) globular streak, (n) parallel ridge.

there was a significant correlation between the number of lower-extremity nevi ( $P=0.030$ ), there was no correlation between total nevi, head, neck, trunk, and upper extremity nevi counts ( $P=0.540$ ;  $P=0.247$ ;  $P=0.591$ ;  $P=0.399$ ).

One hundred ninety-two subjects were aware of the presence of nevi, and 68 were unaware. The general level of awareness of nevi was 73.8%, while awareness levels were 78.3% in women and 63.2% in men. Awareness was statistically significantly higher in women ( $P=0.012$ ). The awareness rate was 89% for nevi on the hands, but was significantly lower on the feet (57%,  $P<0.001$ ).

We also sought to determine whether nevi were congenital or acquired by inquiring into their time of appearance and duration. One hundred ten (42.3%) of the acral nevi evaluated were regarded as congenital and 80 (30.8%) as acquired, while no time of appearance could be determined in 70 (26.9%). The incidence of congenital nevi (46.2% vs. 32.9%) in both women and men was higher than that of acquired nevi (23.9% vs. 27.6%). The difference between nevus types in terms of sex was not statistically significant ( $P=0.132$ ).

Analysis of nevus location in terms of anatomical region on the hands and feet revealed that nevi on

the hands were most common on the fingers (42.2%), while those on the feet were most commonly on the inner arch (30.4%) and in the midline of the plantar region (30.4%).

The dermoscopic patterns seen in the acral region are shown in Figure 1. Patterns and sex distributions of nevi are shown in Table 2. A parallel furrow pattern was present in 51.5% of patients. Within the furrow

**Table 1.** Participant demographic and clinical characteristics

	n	%
Sex n (%)	2644	
Female	1660	62.8
Male	984	37.2
Reason for presentation to hospital n (%)		
Specific skin disease	2045	77.3
Cosmetic purposes	431	16.3
Skin cancer screening	90	3.4
Surgical purposes	78	3.0
Fitzpatrick skin type n (%)		
I-II	834	31.5
III-IV	1810	68.5
Family history of melanoma n (%)	37	1.4
Personal history of melanoma n (%)	-	-
Use of solar protection n (%)	486	18.4
History of sunburn n (%)	552	20.9

**Table 2.** Distributions of nevus patterns in men and women

Pattern	Total n (%)	Women n(%)	Men n(%)	P value
Parallel furrow	134 (51.5)	95 (51.6)	39 (51.3)	0.963
Single line	80 (59.7)	64 (67.4)	16 (41.0)	<b>0.005</b>
Single dotted line	21 (15.7)	11(11.6)	10(25.6)	<b>0.042</b>
Double line	17 (12.7)	10(10.5)	7(17.9)	0.241
Double dotted line	16 (11.9)	10(10.5)	6(15.4)	0.431
Lattice-like	35 (13.5)	23 (12.5)	12 (15.8)	0.612
Homogeneous	20 (7.7)	14 (7.6)	6 (7.9)	0.937
Peas in a pod	18 (6.9)	17 (9.2)	1 (1.3)	<b>0.043</b>
Fibrillar	17 (6.5)	12 (6.5)	5 (6.6)	0.986
Globular	9 (3.5)	4 (2.2)	5 (6.6)	0.077
Atypical	9 (3.5)	5 (2.7)	4 (5.3)	0.307
Reticular	3 (1.2)	2 (1.1)	1 (1.3)	0.875
Globular streak	5 (1.9)	4 (2.2)	1 (1.3)	1.000
Crista dotted	3 (1.2)	3 (1.6)	-	
Transition	4 (1.5)	3 (1.6)	1 (1.3)	0.851
Parallel ridge	3 (1.2)	2 (1.1)	1 (1.3)	0.875

pattern, a single line furrow pattern was present at a rate of 59.7%. A lattice-like pattern was present in 35 (13.5%) cases, and a homogeneous pattern in 20 (7.7%). A parallel ridge pattern was determined in three (1.2%) subjects. Comparison of the incidence of the commonly seen patterns, the furrow, lattice-like, and homogenous patterns revealed no statistically significant difference between the sexes, but the single line parallel furrow pattern and peas in pod pattern were significantly higher in women while the single dotted parallel furrow pattern was higher in men ( $P=0.005$ ,  $P=0.042$ ,  $P=0.043$ ). The peas in a pod pattern was the third most common pattern among women after the parallel furrow and lattice patterns. Patterns by nevus types (congenital or acquired) are shown in Table 3. The most common patterns in both types were the parallel furrow, lattice, and homoge-

neous patterns, while the fibrillar, globular, and peas in a pod patterns were more common in congenital cases. The distribution of nevus patterns by location is shown in Table 4. The parallel and lattice-like types were the most common patterns on both the hands and feet. The homogeneous pattern was the third most common on the hand, while the fibrillar pattern was more common on the foot, at 11.2%. The incidence of the peas in a pod pattern on the foot was equal to that of the fibrillar pattern. The peas in pod pattern and fibrillar pattern were significantly higher on the foot ( $P=0.018$ ,  $P=0.007$ ).

Analysis of nevus patterns in the anatomical regions of the hand identified the furrow pattern as the most common in all regions. The frequency of the homogeneous pattern was higher (18.2%) in the thenar region compared with the other areas. The frequency

**Table 3.** Distributions of patterns by nevus type

Pattern	Congenital n (%)	Acquired n (%)	P value
Parallel furrow	52 (47.3)	45 (56.2)	0.222
Single line	33 (63.5)	26 (57.8)	0.567
Single dotted	11 (21.2)	7 (15.6)	0.656
Double line	3 (5.8)	8 (17.8)	0.124
Double dotted	5 (9.6)	4 (8.9)	1.000
Lattice-like	15 (13.6)	12 (15.0)	0.956
Homogenous	9 (8.2)	5 (6.2)	0.824
Peas in a pod	13 (11.4)	1 (1.3)	0.020
Fibrillar	7 (6.4)	2 (2.5)	0.372
Globular	6 (5.5)	1 (1.2)	0.259
Atypical	4 (3.6)	3 (3.8)	1.000
Reticular	2 (1.8)	1 (1.2)	1.000
Globular streak	1 (0.9)	3 (3,8)	0.404
Crista dotted	2 (1.8)	-	-
Transition pattern	1 (0.9)	2 (2.7)	0.780
Parallel ridge	2 (1.8)	-	-



**Table 4.** Distribution of nevus patterns on the hands and feet

Pattern	Hand n (%)	Foot n (%)	P value
Parallel furrow	77 (57.0)	57 (45.6)	0.065
Single line	48 (62.3)	32 (56.1)	0.470
Single dotted	11 (14.3)	10 (17.5)	0.785
Double line	10 (13.0)	7 (12.3)	1.000
Double dotted	8 (10.4)	8 (14.0)	
Lattice-like	20 (14.8)	15 (12.0)	0.629
Fibrillar	3 (2.2)	14 (11.2)	<b>0.007</b>
Homogeneous	10 (7.4)	10 (8.0)	1.000
Globular	14 (3.0)	5 (4.0)	0.906
Reticular	3 (2.2)	-	
Globular radial	4 (3.0)	1 (0.8)	0.414
Peas in a pod	4 (3.0)	14 (11.2)	<b>0.018</b>
Crista dotted	2 (1.5)	1 (0.8)	1.000
Transition pattern	3 (2.3)	1 (0.8)	
Atypical	5 (3.7)	4 (3.2)	1.000
Parallel ridge	-	3 (2.4)	

of the lattice-like pattern was higher in the hypothenar region (27.3%) compared with other areas. Analysis of patterns in the anatomical regions of the foot identified the parallel furrow as the most common pattern, with the exception of the outer arch. The parallel furrow, lattice, and fibrillar patterns were equally distributed in the outer arch (28.6%). We determined that 46.4% of nevi exhibiting a lattice-like pattern were in the inner arch, that 70% of homogeneous patterns were in the inner arch and midline, and that 42.9% of fibrillar pattern nevi were in the metatarsal region. A statistically significant difference was observed in lattice and fibrillar pattern nevi in terms of regions of the foot exposed to high or low pressure ( $P=0.021$ ).

Nevi were also evaluated in terms of size. The mean nevus size was  $3.14\pm 2.39$  mm. The mean dimension of nevi on the hands was  $2.78\pm 1.24$  mm, and the mean size of nevi on the feet was  $3.52\pm 3.16$  mm. Nevi on the feet were significantly larger than those located on the hands ( $P<0.001$ ). The mean size of congenital nevi was  $3.4\pm 3.35$  mm, and the mean size of acquired nevi was  $3.03\pm 1.32$  mm. The difference in size between congenital and acquired nevi was not statistically significant ( $P=0.860$ ). No significant relation was determined between nevus patterns and size ( $P=0.153$ ).

## DISCUSSION

Despite acral melanocytic nevi being frequently observed, information concerning their prevalence is very limited in the literature. Very few regions of the world have been subjected to epidemiological analysis. There have been no prevalence studies of

acral melanocytic lesions from Turkey, and the present study is thus the first of its kind. The prevalence of acral nevi in our study was 7.8%. In the literature, Madankumar *et al.* reported a 36% prevalence for acral nevus in skin-of-color and non-Hispanic whites in the USA, Palicka *et al.* reported 28% in a population of 462, and a rate of 6.8% has been reported in Mexico (11-13).

Madankumar *et al.* (11) found a higher prevalence of acral nevus in skin-of-color patients. Similarly, Palicka *et al.* (12) showed that the prevalence of acral nevus increased directly in line with degree of skin pigmentation. Palmar or plantar nevi were found in 42.0% of black subjects and in 23.0% of whites. Consistent with the previous literature, acral nevus rates were also higher in darker skinned subjects in our study.

Acral nevi in our study were significantly more prevalent in women compared with men. Palicka *et al.* (12) also showed that acral nevi were more prevalent in white women than in men (27% vs. 18%). In their study of plantar nevi, Kogushi-Nishi reported a higher prevalence in women (12.1%) than in men (9.5%), although the difference was not statistically significant (14). The majority of studies assessing nevus patterns have also reported that acral nevi are more common among women (15-19).

An age-dependent decrease in the prevalence of acral nevus has been reported in the literature. A 2.2-fold higher prevalence has been determined in patients under age of 50 compared with those over 50 (12). In our study, we also observed a decrease in the prevalence of acral nevi in patients over 40. In contrast, however, Kogushi-Nishi *et al.* reported an increase in the prevalence of acral nevi with age (14).

Madankumar *et al.* determined the type in 83% of acral nevi, describing 40% as acquired nevus, 37% as congenital nevus, 18% as unknown type, and 6% as lentigo/nevus (11). Kogushi-Nishi *et al.* reported that nevi were present at birth in 3.2% of patients and that approximately half of patients (52.7%) became aware of their nevi before the age of 40, while 28.5% became aware between the age of one and 19 years (14). In our study, 42.3% of the nevi evaluated were regarded as congenital and 30.8% as acquired, while no exact time of emergence could be determined for 26.9%. The prevalence of congenital nevi was higher than that of acquired nevi in both women and men. Our acquired nevus rate was lower than that in the literature, but a significant proportion of our patients were unable to describe when their nevi had appeared.

The most commonly determined pattern in acral melanocytic nevi in previous studies was the parallel furrow pattern, reported at a rate of 35-61% (1,8,10,11,15-17,19-23). The parallel furrow pattern was also the most common in the present study, at 51.5%. The single line furrow pattern constituted 59.7% of furrow pattern cases, and we also found that the single dotted furrow pattern was more prevalent more in men while the single line furrow pattern more in women. Similarly to the present study, Emiroğlu *et al.* described the single line furrow as the most common furrow pattern type at 58.6%, followed by the single dotted line at 16.1%, the double line at 8.0%, and the double dotted line at 17.2% (23).

The lattice-like pattern has generally been the second most common pattern in previous studies, at between 6% and 21% (1,8,10,11,15-17,19-23). This was also the second most common pattern in our study, at 13.5%. Özdemir *et al.* described the fibrillar pattern as the second most common at 12.2%, after the parallel furrow pattern, in their study from Turkey (10). The reported prevalence in the literature was between 5% and 33% (1,8,10,11,14,18,20,23). The fibrillar type was the fifth most common pattern in total in the present study, at 6.5%, and the third most common pattern in the plantar region, at 11.2%.

The most important dermoscopic characteristic in acral melanomas is the parallel ridge pattern (24). Saida *et al.* found a parallel ridge pattern in 42 (98%) out of 43 cases of malignant melanoma (8). Kogushi-Nishi *et al.* (14) found nevi with a parallel ridge pattern in five (2.2%) members of a control group with no melanoma diagnosis, Madankumar *et al.* (11) reported that two lesions exhibited a parallel ridge pattern, and Minagava *et al.* (25) detected parallel ridge pattern in one patient among congenital melanocyte

nevi located acrally (4%). The parallel ridge pattern was present in three cases (1.2%) in our study. The parallel ridge pattern is strongly associated with acral melanoma. However, three young adult patients with a parallel ridge pattern stated that these 2-3 mm nevi had existed for a long time and did not change over time. They refused to undergo a biopsy. Patients were informed about this pattern, which can also be seen in congenital nevi. Close follow-up in terms of melanoma was recommended.

Malvehy and Puig (1) found a homogeneous pattern, described as one of the minor dermatological patterns, at a prevalence level of 7.1%, Altamura *et al.* (15,16) found a prevalence of 9.3% and 4.3%, Özdemir *et al.* found a prevalence of 6.4% (10), Emiroğlu *et al.* found 5.7% (23), and Aktaş and Aytekin (18) a prevalence of 6.0%. Malvehy, Altamura, and Madankumar *et al.* reported a higher prevalence of the homogeneous pattern than of the fibrillar pattern in the palmar region (1,11,15). In our study, the homogeneous pattern was the third most common type, after the parallel furrow and lattice-like patterns (n=20, 7.7%).

The acral reticular pattern was described by Malvehy and Puig (1) and reported at a rate of 2.4%, while Altamura *et al.* (15,16) reported rates of 2.6% and 2.1%, Özdemir *et al.* (10) reported 4.3%, and Aktaş and Aytekin reported rates of 8.9% (18). The rate in our study was substantially lower, at only 1.2%.

Özdemir *et al.* (10) described the globular streak pattern in a study from Turkey. The appearance of this pattern involves dark brown globules and linear or curved lines. This pattern, first described by Özdemir *et al.* (10) at a prevalence of 5.3%, was reported at 7.6% by Emiroğlu *et al.* (23) and at 3% by Aktaş Aytekin (18). However, the level in our study was low, at 1.9%.

The atypical pattern was described by Akasu *et al.* (22). Malvehy and Puig reported an atypical pattern prevalence of 13.8% in their study of a patient group with dysplastic nevus syndrome. All nevi with atypical patterns were excluded, but no histopathological findings suggestive of malignancy were encountered (1). In studies from Turkey, and in agreement with the present study, Özdemir *et al.* (10) reported a rate of 3.2% and Emiroğlu *et al.* (23) a rate of 3.8%.

The crista dotted and peas-in-a-pod patterns seem characteristic dermoscopic features of acral CMN (25). In our study, the peas in pod pattern was found to be more prevalent in the female sex and in the congenital nevus type.

General awareness of acral nevi in our study was 73.8%, and awareness was higher in women and for palmar nevi. Awareness rates have only been



investigated in two previous studies. Madankumar *et al.* (11) reported awareness rates of 54% for the palmar region and 43% for the plantar region, while Kogushi-Nishi *et al.* (14) reported that 31% of patients were aware of plantar nevi. Madankumar *et al.* also determined lower awareness of palmar and plantar lesions (44% and 31%, respectively) among patients presenting due to general dermatological disease compared with patients presenting for skin cancer screening or surgery (76% and 62%, respectively) (11). We observed no relationship between awareness of nevi and reasons for presentation.

There were a number of limitations to our study, the most important being its single-center character. Another limitation is that biopsy was not performed, and no clinical-histopathological relationship could therefore be demonstrated. The strengths of our study were that it was performed in an extensive sample, the low number of previous studies of acral nevus prevalence and awareness, and the absence of any previous studies with broad participation assessing the prevalence in Turkey.

We found that acral lesions were prevalent, particularly among patients with darker skin colors, female sex and younger age. The majority of lesions exhibited benign dermoscopic patterns.

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**Ethics approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Scientific Researches Ethics Committee of the Medical University of Karadeniz Technical (No:2016 / 147).

**Consent to participate:** Informed consent was obtained from all individual participants included in the study.

**Consent for publication:** Patients signed informed consent regarding publishing their data and photographs.

**Availability of data and material:** The data that support the findings of this study are available from the corresponding author upon reasonable request

**Code availability:** Not applicable.

**Authors' contributions:** All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Zeynep Karaca and Leyla Baykal Selçuk. The first draft of the manuscript was written by Zeynep Karaca, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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