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Awareness of podological treatment methods and treatment preferences in individuals with ingrown toenails: A cross-sectional study from Turkiye

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ABSTRACT

OBJECTIVE: Ingrown toenail (onychocryptosis) is a common foot disorder that negatively affects quality of life and may lead to chronic inflammation and recurrence. Public awareness regarding podological treatment methods remains limited. This study aimed to evaluate awareness of podological treatment approaches, treatment preferences, and factors associated with ingrown toenails among adults living in Turkiye.

METHODS: This descriptive cross-sectional study included 1,144 individuals aged 18–60 years between June and October 2023. Data were collected using a 15-item questionnaire administered online. Sociodemographic characteristics, occupational factors, footwear habits, diabetes status, genetic predisposition, podology awareness, treatment preferences, and recurrence rates were evaluated. Statistical analyses were performed using Pearson's Chi-square test.

RESULTS: Chronic ingrown toenails were reported by 15.5% of participants, whereas 42.0% experienced occasional episodes. More than half of the participants (51.7%) had never heard of podology or orthonyxia applications, and only 16.2% had previously undergone treatment at a podology center. Chronic ingrown toenails were significantly associated with female sex, physically demanding occupations, inappropriate footwear use, diabetes, and family history ($p<0.05$). Self-management was the most common treatment preference (34.3%). Recurrence rates were significantly higher following surgical treatment compared with podological orthonyxia applications (67.6% vs. 28.7%, $p<0.001$).

CONCLUSION: Awareness of podological treatment methods in Turkiye remains insufficient. Conservative podological approaches were associated with lower recurrence rates than surgical treatment. Increasing public awareness and expanding access to podological care may contribute to improved management and prevention of ingrown toenails.

Keywords: Conservative treatment; ingrown toenail; onychocryptosis; orthonyxia; podology; public awareness.

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Ingrown toenail (onychocryptosis) is a common foot disorder characterized by penetration of the nail plate into the lateral periungual soft tissue, leading to pain, inflammation, tenderness, and infection [1, 2]. The condition most frequently affects the great toe and may significantly impair daily activities, ambulation, and overall quality of life. If left untreated, chronic inflammation, granulation tissue formation, and secondary infection may develop [1, 2].

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The etiology of ingrown toenails is multifactorial. Improper nail trimming habits, inappropriate footwear, genetic predisposition, trauma, hyperhidrosis, obesity, and diabetes are among the major risk factors [2–5]. In particular, the use of narrow-toed shoes and occupations requiring prolonged standing increase mechanical pressure on the nail plate, thereby facilitating disease development [4, 5].

Clinically, ingrown toenails are evaluated according to different stages. Based on the Heifetz classification, stage I is characterized by mild pain and erythema, stage II includes signs of infection, and stage III presents with granulation tissue and marked inflammation [6–8]. While conservative treatment modalities may provide successful outcomes in the early stages of the disease, advanced cases often require surgical intervention [2, 9].

In recent years, developments in podology have brought conservative podological treatment approaches to the forefront. Podology is a multidisciplinary healthcare field aimed at protecting foot health, preventing foot disorders, and managing these conditions using conservative methods. Orthonyxia techniques, packing applications, kinesio taping systems, and brace-wire applications are widely used in the management of ingrown toenails [10–17]. These methods may reduce the need for surgical intervention in early-stage cases and enable patients to return to daily life more rapidly [18–21].

Although podological practices have shown considerable development in Turkiye in recent years, public awareness regarding these approaches is still thought to be insufficient.

Although numerous studies in the literature have focused on the surgical and conservative treatment of ingrown toenails, studies evaluating public awareness of podological treatment modalities remain limited [2, 9]. Therefore, the present study aimed to evaluate the level of knowledge, treatment preferences, and tendencies regarding podological treatment methods among adults living in Turkiye.

Highlight key points

- Public awareness regarding podological treatment methods and orthonyxia applications remains insufficient in Turkiye.
- Female sex, physically demanding occupations, inappropriate footwear use, diabetes mellitus, and family history were significantly associated with chronic ingrown toenails.
- Self-management was the most commonly preferred treatment approach among individuals with ingrown toenails.
- Recurrence rates were considerably lower following conservative podological orthonyxia applications compared with surgical treatment methods.
- Increasing awareness of podology and expanding access to conservative foot care services may improve the management and prevention of ingrown toenails.

MATERIALS AND METHODS

Study Design and Participants

This descriptive cross-sectional study was designed to evaluate awareness of podological treatment methods and treatment preference tendencies among individuals with ingrown toenail. Ingrown toenail is a common foot health disorder influenced by numerous factors, including age, sex, occupation, footwear habits, genetic predisposition, and overall health status. In addition, access to healthcare services, socioeconomic conditions, and educational background may play significant roles in determining treatment preferences. Within this context, the study assessed the level of knowledge regarding podological treatment methods and approaches to ingrown toenail management among individuals aged 18–60 years living in Turkiye.

Study data were collected between June 15 and October 17, 2023, using an online questionnaire prepared in Google Forms. The survey targeted adults from the general population residing in Turkiye. The survey link was distributed through publicly accessible social media platforms, e-mail, and personal communication networks. Participation was voluntary, and only adults aged 18–60 years residing in Turkiye who were able to read and understand Turkish were eligible to participate. The minimum required sample size for the study was calculated as 1,067 participants, and data collection was terminated after reaching a total of 1,144 participants.

The sample size calculation was based on the 2021 data published by the Turkish Statistical Institute (TURKSTAT). Considering that the population aged 18–60 years in Turkiye was 53,018,176, the sample size was calculated using the formula for known populations. Assuming a 95% confidence interval, a margin of error of 0.03, and p=q=0.50, the minimum sample size was determined to be 1,067 individuals.

Study Variables and Questionnaire

The independent variables in the study included sociodemographic characteristics, occupational features, health

status, and knowledge of podological treatments. Sociodemographic variables included age, sex, educational status, and marital status. Occupational characteristics included physically demanding work, prolonged standing, and the types of footwear used due to occupational conditions. Regarding health status, diabetes and genetic predisposition were evaluated. In addition, participants' awareness of podology practices and podological treatment methods was assessed.

The dependent variables were defined as the presence or absence of a history of ingrown toenail and the health-related behaviors exhibited in cases of ingrown toenail. Participants were asked whether they had experienced ingrown toenails at any point in their lives and whether the condition was chronic or only occasionally recurrent.

Participants' ages were evaluated within the 18–60-year range. Sex was recorded as female or male. Educational status was categorized as primary school, high school or equivalent, associate degree, bachelor's degree, postgraduate degree, and other. Occupational groups were classified as worker, civil servant, self-employed, private sector employee, housewife, retired, student, and unemployed. Marital status was categorized into two groups: Married and single.

Participants were asked separately whether they worked in a physically demanding job and whether they stood for prolonged periods during the day. To evaluate occupational footwear habits, individuals were asked whether they used narrow, tight, or high-heeled shoes that were not suitable for their foot structure. In addition, the use of protective footwear within the scope of occupational health and safety practices was also assessed.

For the evaluation of diabetes status, participants were offered the response options "yes," "no," and "I do not know." The "I do not know" option was included to allow the evaluation of individuals who had not yet been diagnosed but suspected they might have diabetes. To assess genetic predisposition, participants were asked whether any family members or second- or third-degree relatives had a history of ingrown toenails. Response options were arranged as "very common," "rarely," and "none."

To evaluate awareness of podology, participants were asked whether they were familiar with podological practices. To avoid misinterpretation solely due to unfamiliarity with the term "podology," the questionnaire included explanatory examples such as nail brace applications, nail taping methods, tampon applications, and procedures performed using podology devices. In this way, not only terminology recognition but also awareness of practical applications was assessed. Response options were structured as "I have never heard of it before," "I have only heard of it," and "I have previously undergone a procedure at a podology center."

To determine preferred treatment approaches for ingrown toenails, participants were offered the options of self-treatment, pedicure care, application to a podology center, consultation with a physician, or other methods. Thus, the rate of preference for podological practices in society was compared with that for other treatment approaches.

In the final section of the questionnaire, participants were asked to select the statement that best described their ingrown toenail experience. This section included options related to recurrence after surgical intervention, outcomes following podological treatment, successful management using individual methods, or failure to benefit from any treatment approach. In this manner, the outcomes of different treatment approaches were comparatively analyzed.

Statistical Analysis

Statistical analyses of the obtained data were performed using IBM Statistical Package for the Social Sciences Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY, USA). Sociodemographic characteristics, health conditions, and health-related behaviors of the participants were expressed as numbers and percentages for categorical variables and as mean±standard deviation for continuous variables. Associations between ingrown toenails and variables including age, sex, occupation, working conditions, footwear use, diabetes status, genetic predisposition, treatment preferences, and treatment outcomes were analyzed using Pearson's Chi-square test. $p<0.05$ was considered statistically significant.

Ethical Approval

This study was approved by the Institutional Ethics Committee of Marmara University (approval number: 09.2023.815; approval date: June 02, 2023) and was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants before participation in the study.

Table 1. Sociodemographic characteristics of the participants (n=1144)

Variables	Percentage
Sex	
Female	56.1
Male	43.9
Age groups	
18–25 years	10.9
26–33 years	17.4
34–42 years	27.6
43–51 years	26.6
52–60 years	17.5
Educational status	
Primary school	16.5
High school or equivalent	22.1
Associate degree	18.1
Bachelor's degree	35.1
Postgraduate degree	8.2

RESULTS

A total of 1,144 individuals aged 18–60 years were included in the study. Among the participants, 15.5% reported chronic ingrown toenails, 42.0% reported occasional ingrown toenails, and 42.3% reported no history of ingrown toenails.

Sociodemographic Characteristics

The mean age of the participants was 40.6±10.97 years. Of the participants, 56.1% were female, and 43.9% were male. Regarding educational status, 16.5% had a primary school education, 22.1% had graduated from high school or equivalent institutions, 18.1% held an associate degree, 35.1% had a bachelor's degree, and 8.2% had postgraduate education. In terms of marital status, 60.1% were married, and 39.9% were single. Workers, civil servants, and self-employed individuals constituted the majority of the occupational groups (Table 1).

Factors Associated with Ingrown Toenails

A statistically significant association was found between age groups and the presence of ingrown toenails ($p<0.001$). Chronic ingrown toenails were more common among individuals aged 52–60 years. The prevalence of chronic ingrown toenails was also significantly higher among women compared with men ($p=0.003$).

Table 2. Prevalence of ingrown toenails and associated factors

Variables	Chronic ITN (%)	Occasional ITN (%)	p
Female sex	17.3	37.8	0.003
Male sex	13.3	47.6	
Physically demanding work	17.3	47.8	0.002
Inappropriate footwear use	14.3	46.9	0.002
Presence of diabetes	24.8	45.9	<0.001
Family history	28.5	54.5	<0.001

ITN: Ingrown toenail. Percentages are calculated within groups. Pearson's Chi-square test was applied.

In addition, individuals engaged in physically demanding occupations, those using inappropriate footwear, participants diagnosed with diabetes mellitus, and individuals with a family history of ingrown toenails demonstrated significantly higher frequencies of chronic ingrown toenails ($p<0.05$) (Table 2).

Awareness of Podology

Among the participants, 51.7% reported that they had never previously heard of podology or orthonyxia applications. While 32.1% stated that they had only heard of these approaches, only 16.2% reported having previously undergone a procedure at a podology center.

Awareness of podology was significantly higher among individuals with chronic ingrown toenails. Among participants with chronic ingrown toenails, 44.4% had previously received treatment at a podology center. In contrast, most individuals without a history of ingrown toenails stated that they had never heard of podological applications ($p<0.001$) (Table 3).

Female participants demonstrated significantly higher awareness levels regarding podological applications compared with male participants ($p=0.022$).

Treatment Preferences

Self-management was the most commonly preferred treatment approach among participants with ingrown toenails (34.3%). Physician consultation was preferred by 29.5% of participants, while 21.6% preferred pedicure treatment and 14.7% reported that they would apply to a podology center (Table 4).

Table 3. Awareness of podology and orthonyxia

Podology awareness	n	Percentage
Never heard of it	591	51.7
Only heard of it	367	32.1
Previously underwent podology treatment	186	16.2
Podology awareness according to ITN history		
ITN status	Previously underwent podology treatment (%)	
Chronic ITN	44.4	
Occasional ITN	17.5	
No history of ITN	4.8	

P<0.001. Pearson's Chi-square test was applied. ITN: Ingrown toenail.

Table 4. Preferred treatment methods for ingrown toenails (n=1144)

Treatment preference	Percentage
Self-management	34.3
Physician consultation	29.5
Pedicure treatment	21.6
Application to a podology center	14.7

Table 5. Recurrence rates according to treatment methods

Treatment method	No recurrence n (%)	Recurrence n (%)
Surgical treatment	67 (32.4)	140 (67.6)
Orthonyxia/podological treatment	97 (71.3)	39 (28.7)

P<0.001. Pearson's Chi-square test was applied.

Treatment Outcomes and Recurrence Rates

Recurrence rates were significantly higher among individuals who underwent surgical treatment compared with those treated using podological orthonyxia applications. Recurrence was reported in 67.6% of surgically treated participants, whereas the recurrence rate following orthonyxia applications was 28.7%.

The absence of recurrence after podological treatment was observed in 71.3% of participants. In diabetic individuals, recurrence rates after surgical procedures were higher, whereas conservative podological applications were associated with lower recurrence rates ($p<0.001$) (Table 5).

DISCUSSION

Ingrown toenails are a common foot health problem that may occur in all age groups and in both sexes [1–3]. In the present study, health-related behaviors, treatment preferences, and awareness levels regarding podological applications among adults living in Turkiye were evaluated. The findings demonstrated that the level of public knowledge regarding podology and orthonyxia applications remains limited. The fact that more than half of the participants had never previously heard of podological applications suggests that podological services are still insufficiently recognized at the community level.

Conservative treatment methods are known to be effective, particularly in the early stages of ingrown toenails [2, 10, 13, 18, 22]. In stage I and stage II cases, conservative approaches such as orthonyxia applications, education on proper nail trimming, packing techniques, and appropriate footwear selection may reduce the need for surgical intervention [10–17]. Surgical treatment methods become more prominent in advanced-stage disease [23–27]. In our study, the lower recurrence rates observed in podological orthonyxia applications compared with surgical methods support the effectiveness of early conservative treatment approaches.

Only 16.2% of participants in the present study reported having previously undergone treatment at a podology center. Nevertheless, the relatively high preference for orthonyxia treatment among individuals

familiar with podological applications is noteworthy. This finding suggests that increasing awareness of podology may also increase the preference for conservative treatment methods.

Previous studies have generally reported that ingrown toenails are more common among young adults and males [4, 28]. Increased physical activity, excessive sweating, and greater susceptibility to trauma have been proposed as major contributing factors [3, 4]. However, in our study, the prevalence of chronic ingrown toenails was found to be higher among women. This difference may be associated with the use of narrow or inappropriate footwear, cosmetic practices, and lifestyle-related factors. Furthermore, the higher frequency of ingrown toenails observed in the middle-aged population in our study differs from some findings reported in the literature.

Improper footwear use is a well-established risk factor for the development of ingrown toenails [2, 4, 5]. Narrow-toed and unsuitable shoes may exert mechanical pressure on the nail plate, causing the lateral nail fold to become embedded into the surrounding soft tissue [4, 5]. In our study, the significantly higher prevalence of ingrown toenails among individuals wearing inappropriate footwear was consistent with previous literature [4, 5, 28]. Therefore, proper footwear selection appears to play an important role among preventive approaches.

One of the major findings of our study was the relationship between diabetes mellitus and ingrown toenails. Individuals diagnosed with diabetes demonstrated significantly higher rates of chronic ingrown toenails. Foot disorders are more common among diabetic individuals due to circulatory impairment, neuropathy, susceptibility to infection, and delayed wound healing [29–31]. Accordingly, early podological assessment and regular foot care are of considerable importance in diabetic patients.

A strong association was also identified between genetic predisposition and ingrown toenails. The significantly higher prevalence of chronic ingrown toenails among participants with a family history of the condition suggests the contribution of hereditary factors [4]. Since only a limited number of studies in the literature have investigated this relationship, the findings of the present study may provide valuable data for future research.

One of the most important challenges in the treatment of ingrown toenails is recurrence. High recurrence rates have frequently been reported following surgical treatment [23–27]. In our study, the recurrence rate was 67.6% among surgically treated individuals, whereas this rate was 28.7% among individuals treated with orthonyxia applications. These findings indicate that conservative podological applications may represent an effective option, particularly in early-stage cases. In addition, the podological approach contributes not only to treatment itself but also to preventive education regarding proper nail trimming, appropriate footwear selection, and foot hygiene.

This study has several strengths. To the best of our knowledge, it is one of the first studies to evaluate public awareness of podological treatment methods and treatment preferences for ingrown toenails in Turkiye using a large community-based sample. Nevertheless, several limitations should be acknowledged. First, the cross-sectional design precludes causal inferences. Second, the study relied on self-reported data collected through an online questionnaire, which may have introduced recall and selection bias. Third, clinical diagnoses of ingrown toenails were not confirmed by physical examination. Despite these limitations, the large sample size and inclusion of participants from different regions of Turkiye enhance the generalizability of the findings.

Conclusion

This study demonstrated that awareness of podological treatment methods among adults in Turkiye remains insufficient. Although ingrown toenails represent a common health problem, the rate of admission to podology centers was found to be low. The lower recurrence rates observed with conservative orthonyxia applications compared with surgical methods support the effectiveness of podological approaches.

Improper footwear use, diabetes, physically demanding working conditions, and genetic predisposition were identified as important risk factors for ingrown toenails. Expanding podological care services and ensuring early intervention, particularly for diabetic individuals, may play a critical role in preventing serious foot complications.

Increasing public awareness of podology, promoting conservative treatment approaches, and improving multidisciplinary foot health services are recommended. Furthermore, greater integration and visibility of podological applications within the healthcare system, along with support for further research in this field, appear necessary.

Ethics Committee Approval: This study was approved by The Clinical Research Ethics Committee of Marmara University (Approval number: 09.2023.815; Date: 02.06.2023).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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