AlQalam
Alq J Med App Sci
https://journal.utripoli.edu.ly/index.php/Alqalam/index eISSN 2707-7179

Original article

Microbiological Profile and Antimicrobial Susceptibility Patterns in Patients with Tinea Pedis at Diabetic Center In EL-Beyda City

Souad ALtabouli[1], Salema Qowaider[2], Manal Hamad[1], Marfoua Ali[3*]

[1]*Department of Dermatology, Faculty of Medicine, Omar AL-Mokhtar University, EL-Beyda, Libya*
[2]*Department of Microbiology and Immunology, Faculty of Medicine, Omar AL-Mokhtar University, EL-Beyda, Libya*
[3]*Department of Zoology, Faculty of Science, Omar AL-Mokhtar University, EL-Beyda, Libya*

ARTICLE INFO

Corresponding Email. *marfouas@yahoo.com*

Received*: 04-12-2023*
Accepted*: 09-01-2024*
Published*: 13-01-2024*

Keywords*. Diabetes Mellitus, Tinea Pedis, Bacterial Super Infection, Antibiotic Sensitivity, DFU.*

ABSTRACT

The purpose of this study was to determine the microbiological profile and antimicrobial susceptibility patterns in patients with Tinea Pedis at the Diabetic Center in EL-Beyda City (Libya). Samples were collected from the diabetic patients with intertrigo of foot attending the out-patients' department in the Diabetic Center from December 2020 to February 2021 by using sterile swabs. Samples were inoculated into blood and MacConkey agars for bacterial isolation. The microbiologic isolation and antimicrobial susceptibility tests were performed according to standard microbiological methods. Antibiotic susceptibility patterns of all the isolates to different antibiotics was determined by antimicrobial susceptibility testing. Overall, 50 patients (50% male and 50% female) had a mean age of 58.4 ± 9.4 years and a mean duration of diabetes of 14.6 ± 6.6 years. Most isolates (76.8 %) were Gram-negative bacilli (Escherichia coli, Pseudomonas aeruginosa, Klebsiella Spp and Proteus Spp), followed by Gram-positive cocci (23.2%) (Streptococci Spp and Staphylococcus aureus). Most bacteria were sensitive to Ciprofloxacin (84.0%) and resistant to Erythromycin (42.0%). The majority of isolated bacteria from patients were found to be multi-drug resistant. The results demonstrate the importance of time in the identification of the intertrigo sample collection for the identification of the pathogens and their antibiotic susceptibility pattern before initiating antimicrobial treatment.

Cite this article. *Altabouli S, Qowaider S, Hamad M, Ali M. Microbiological Profile and Antimicrobial Susceptibility Patterns in Patients with Tinea Pedis at Diabetic Center In EL-Beyda City. 2024;7(1):50-55.* *https://doi.org/10.54361/ajmas.2471009*

INTRODUCTION

Diabetes affects persons of all ages and in all socioeconomic segments of the population. World health organization predicts that by the year of 2010 the world`s diabetic population will double to over 200 million people [1,2]. Tinea Pedis is a dermatophyte infection of the feet especially between the toes (interdigital or web space) and the soles of the feet. This disease is estimated to affect 10% of the world`s population [3]. Patients with diabetes appear to be prone to interdigital Tinea Pedis infections at an earlier age than those without diabetes. Previous study found that, the fungal infection is frequent in diabetic patients attending to diabetic center [4]. Diabetic patients are very often prone to fungal infections, because of higher blood glucose levels which help for the growth of fungi. Tinea Pedis

often occurs in the 3rd and 4th interdigital spaces, may extended to the dorsal and plantar aspects [5]. Tinea Pedis especially the interdigital type is often involving of bacterial super infection which causes the treatment to be difficult [6,7]. Although antifungal medications are effective, dermatomycosis remains undertreated [8]. In addition to cause permanent damage to the affected area, dermatomycosis can progress to severe disease in elderly and immunocompromised patients if left untreated [9-11]. Furthermore, untreated Tinea Pedis or improper treatment may lead to secondary infection by bacteria [12]. This infection may be caused by pathogenic bacteria originating from the external environment as well as by bacteria forming physiological micro flora of the skin (e.g. *staphylococcus epidermidis, staphylococcus aureus,* and *propionibacterium acnes*) [13,14]. Neglected acute and chronic Tinea Pedis can become a problem for persons with diabetes. Because of the lower extremities compromise seen in high-risk diabetes, Tinea Pedis presents a significant concern because interdigital web-space Tinea Pedis may lead to cracks and fissures. These can become secondarily infected, resulting in serious deep space infection, then ulcerating and if there is neuropathy or ischemia may lead to amputation which very burden to the patients and to health care system [15]. This study was aimed to determine most common bacterial super infection in Tinea Pedis and antimicrobial susceptibility patterns in patients with this infection at diabetic center in EL-Beyda City.

METHODS

Study setting

This study was carried out during the period between December 2020 to February 2021, after obtaining informed consent form from the patients or relatives. The study protocol was reviewed and approved by scientific research and ethics committee at University of Tripoli (SREC-UOT) with Ref No: SREC/010/34/2023. Additionally, permission to perform the study was obtained from the center manager.

Samples

Fifty consecutive patients (25 males and 25 females) with more than 5 years diagnosed of diabetes mellitus and having Tinea Pedis resistance to pure antifungal therapy were enrolled in this study. All the patients underwent a detailed demographic profile including: name, age, diabetes duration and dermatological examination.

The samples were obtained from patients who aged above 20 years, diabetic more than 5 years with Tinea Pedis based on clinical examination with positive KOH examination before start antifungal treatment and willing to participate in research by signing informed consent. Exclusion criteria are being treated with oral and topical antibiotics in the past week.

Sampling technique

First, the area is cleaned with normal saline, then awaited dry. For lesions in the form of vesicles or bulla, done by opening the roof of the lesion using a sterile scalpel and then scrape the base of the lesion by sterile cotton swab, then inserted into dry transport system container and labeled with patients' identity. The tubes immediately transported to the microbiology laboratory. The specimens were removed from the dry transport swab, applied to the blood agar and Mac Conkey agar media, incubated at 37^{0} C for 24 hours. The mold species were identified on the basis of their microscopic and macroscopic appearance. Biochemical tests were done to identify and confirm all isolates. Aantibiotics susceptibility patterns of all the isolates to different antibiotics was determined by the disc diffusion methods, as recommended by the Clinical and Laboratory Standard Institute CLSI, using commercial antimicrobial discs (Mast. Co., UK). Antimicrobial sensitivity testing of all isolates was performed on diagnostic sensitivity test plates according to the Kirby-Bauer method [16].

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The comparison between groups with qualitative data was done by using Chi-square test and Fisher's exact test instead of Chi-square test only when the expected count in any cell less than 5. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered P- value ≤ 0.05 was considered significant, P- value > 0.05 was considered insignificant.

RESULTS

This is a cross sectional study to determine bacterial super infection in Tinea Pedis at the Diabetes Center in AL-Jabal AL-Akhdar at EL-Beyda City (Libya). Fifty Libyan patients, 50% (n=25), 50% (n=25) were female and male respectively. Gram negative and positive isolates were recorded in this study; the most isolates (76.8 %) were Gram negative *bacilli* (*Escherichia coli* (22 patients), *Pseudomonas aeruginosa* (13 patients), *Klebsiella Spp* (4 patients), and *Proteus Spp* (3 patients), followed by Gram positive cocci (23.2%) (*Streptococci Spp* (7 patients), and *Staphylococcus aureus* (6 patients), with a significant difference between gram positive and gram negative, as shown in table 1.

Table 1. Gram negative and positive isolates from male and female subjects.

Gram Stain	Sex				Total		Chi-square test	
	Female (n=25)		Male (n=25)					
	No.	%	No.	%	No.	%	x^2	P Value
Gram negative Bacilli	19	38	24	48	43	76.8	4.153	**0.042***
Gram positive cocci	7	14	6	12	13	23.2		

The most common bacterial culture results in this study were gram-negative bacterial infections with no significant difference between genders (96 % and 76% male and female, respectively). However, gram-positive bacterial infections were found with a significant difference between genders (24 % and 28% male and female, respectively). *Candida* found only 1 patient (Table 2).

Table 2. Characteristics of different isolations among 50 subjects

Pathogen	Isolates		Female (n=25)		Male (n=25)		x^2	P Value
	No.	%	No.	%	No.	%		
Gram negative Bacilli (n=43)								
Escherichia coli	22	51.1	13	26	9	18	1.273	**0.259**
Pseudomonas aeruginosa	14	32.6	7	14	7	14	0.00	**1.00**
Klebsiella Spp	4	9.3	1	2	3	6	1.065	**0.302**
Proteus Spp	3	7	3	6	0	0	3.128	**0.077**
***Gram positive cocci* (n=13)**								
Streptococci Spp	7	53.8	2	4	5	10	4.052	**0.044***
Staphylococcus aureus	6	46.2	0	0	6	12	6.682	**0.010***
Candida	1	100	0	0	1	2	1	**0.317**

In terms of different sensitivity patterns to antibiotics, the most isolated bacteria were sensitive to Ciprofloxacin (Cip) 42 patients (84.0%), followed by Gentamicin (Gn) 4 patients (8.0%), and then Augmentin (AMC) in 2 patients (4.0%). Less sensitive were found with Augmentin (AMC) 16 patients (32.0%), followed by Erythromycin (E) 11 patients (22.0%), then Doxycycline (DO) 8 patients (16.0%), Nalidixic acid (NA) 6 patients (12.0%), and Gentamicin (Gn) 4 patients (8.0%). Most bacteria were sensitive to Ciprofloxacin (88.0%) and resistant to Erythromycin (42.0%), as shown in table 3.

The same table shows statistically significant differences between males and females in terms of being less sensitive to antibiotics. Which was higher with Augmentin (AMC) in the female group compared to the male group. While Nalidixic acid (NA) was high in male group compared to the female group, Similar significant differences were obtained according to resistance between male and female patients. Which was higher with Nalidixic acid (NA) and Nitrofurantoin (F) in the female group compared to the male group.

Table 3. Different sensitivity patterns to antibiotics among 50 patients

Antibiotics	All patients (n=50)		Female (n=25)		Male (n=25)		Chi-square test	
	No.	%	No.	%	No.	%	x2	P Value
Sensitive (+++)								
Ciprofloxacin 5 mg (Cip)	42	84	22	88	20	80	0.583	**0.445**
Gentamicin 10 mg (Gn)	4	8	2	8	2	8	0.00	**1.00**
Augmentin 10 mg (Aug)	2	4	1	4	1	4	0.00	**1.00**
Nitrofurantine 20 mg (F)	1	2	0	0	1	4	1	**0.317**
Nystatin 100 mg (NY)	1	2	0	0	1	4	1	**0.317**
Sensitive (+)								
Augmentin 10 mg (Aug)	16	32	13	52	3	12	9.007	**0.003***
Erythromycin 15 mg (Ery)	11	22	6	24	5	20	0.114	**0.735**
Doxycycline 30 mg (Dox)	8	16	4	16	4	16	0	**1**
Nalidixic acid 30 mg (NA)	6	12	0	0	6	24	6.682	**0.010***
Gentamicin 10 mg (Gn)	4	8	2	8	2	8	0.00	**1.00**
Ciprofloxacin 5 mg (Cip)	1	2	0	0	1	4	1	**0.317**
Cloxacillin 10 mg (CX)	1	2	0	0	1	4	1	**0.317**
Miconazole 10 mg (MCL)	1	2	0	0	1	4	1	**0.317**
Nitrofurantine 20 mg (F)	1	2	0	0	1	4	1	**0.317**
Tetracycline 30 mg (TE)	1	2	0	0	1	4	1	**0.317**
Resistant								
Erythromycine 15 mg (Ery)	21	42	9	36	12	48	0.724	**0.395**
Nalidixic acid 30 mg (NA)	11	22	9	36	2	8	5.597	**0.018***
Nitrofurantine 20 mg (F)	5	10	5	20	0	0	5.444	**0.020***
Vancomycin 5 mg (VA)	4	8	0	0	4	16	1	**0.317**
Augmantine 10 mg (Aug)	3	6	1	4	2	8	0.348	**0.556**
Doxacycline 30 mg (Dox)	3	6	0	0	3	12	3.128	**0.077**
Cephalexin 10 mg (CL)	1	2	0	0	1	4	1	**0.317**
Clotrimazole 50 mg (clo)	1	2	0	0	1	4	1	**0.317**
Gentamicine 10 mg (Gn)	1	2	0	0	1	4	1	**0.317**

DISCUSSION

Diabetic patients are more susceptible for foot intertrigo infections, especially fungal infection correlates with previous study. fungal infection (Tinea Pedis, interdigital type) was seen in 52% of patients [12]. Multiple risk factors had been reported for Tinea Pedis and tinea unguium. These include age, male sex, climate (high temperature and humidity), footwear, exercise, use of public facilities, home infections, and incidence of certain diseases such as obesity, diabetes, and vascular disorders [17-19]. The majority of patients in current study belong to the age group of 35-65 years old which correlates with the previous studies that foot intertrigo was common in age group of 36-81 years [12,17,20,21]. These finding suggest that interdigital infection common disorder that can affect any stage of life. In diabetic patients interdigital Tinea Pedis must be treated, clear, and prevent recurrence because Tinea Pedis is potential risk for diabetic foot ulcers (DFU). If neglected this minor infection or not treated well would cause small fissures and breaks in the skin causing a portal of entry for bacteria which called complex dermatophytosis (as in current study all cases n=50 interdigital Tinea Pedis have secondary bacterial infection), the condition of Tinea Pedis without bacterial infection was called simplex dermatophytosis [22,23].

The most common bacterial culture results in this study were gram- negative bacterial infections were with 76.8 % of patients as compared with gram- positive bacterial infections which found with 23.2%. Gram-negative *Bacillus* is the predominant pathogen in diabetic infections. *Eschrichia coli* among gram- negative bacilli and *Staphylococcus aureus* among gram- positive cocci and these results correlates to other studies in India [24, 25], in Ethiopia [26], in China [27], in Lebanon [28] and in Saudi Arabia [17]. However, in Another study was against to current result, it found the most common infections were gram-positive *Staphylococcus* (41.1%) and gram- negative *Bacillus* (*Eschrichia coli* **(**12.8%)) [23]. In addition, another study also found secondary bacterial infection in dermatophytosis with *Staphylococcus* followed by *Eschrichia coli* [29].

Increased resistance of pathogenic bacteria is an important problem in the treatment of diabetic foot infection. Another finding of this study was culture sensitivity test recorded that in all cases found. highly resistance to Erythromycin in 42% of cases and highly sensitivity to ciprofloxacin 84% of cases. It also found that the most prescribed antibiotic Augmentin was less sensitive and less effective in 32% of cases.
Long-term (more than 6 months) antibiotics, long foot wound duration, high blood pressure, anemia, chronic osteomyelitis, and history of infection have been recognized as the predictive risk factors [30]. This study provides a reference for the local bacterial distribution, antimicrobial sensitivity and resistant. In order to improve the clinical outcomes of diabetic foot infection patients, a timely microbiology examination and the appropriate selection of antibiotics based on the severity of ulcers and infections, drug-resistant bacteria risk factors, and antimicrobial susceptibility are necessary.

CONCLUSION

Patients who don't respond to topical and/or systemic antifungal therapy should undergo screening for bacterial infection to prevent deeper bacterial infection. For all Tinea Pedis (diagnosis clinically and KOH or culture) patients, especially diabetic patients, if they have not responded to antifungal therapy, it is mandatory to do culture sensitivity for bacterial infection to prevent serious complications.

Acknowledgments
We are heartily thankful to the diabetic center director Abdalhaleem AL-jayash for his encouragement and support. Our thanks are conveyed to the patients who accepted to participate in our research, as well as to all staff and nurses of the Diabetic Center in Al-Jabal Al-Akhdar in El-Beyda City (Libya) for their great assistance and cooperation during collecting samples.

Conflict of interest
There are no financial, personal, or professional conflicts of interest to declare.

REFERENCES

1. Harris M. Descriptive epidemiology of diabetes mellitus. Diabetes in America. 1995:46-47.
2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes care. 2004;27(5):1047-1053.
3. Schieke SM, Garg A. Superficial fungal infection. Fitzpatrick's dermatology in General Medicine. 2012;8:2277-2296.
4. Altubouli SS, Ali MS. Skin Manifestation of Diabetes Mellitus in El-Beida City. Journal of Dental and Medical Sciences. 2019;18(10):68-71.
5. Kates S, Nordstrom K, McGinley K, Leyden J. Microbial ecology of interdigital infections of toe web spaces. Journal of the American Academy of Dermatology. 1990;22(4):578-582.
6. Friedrich M. Inflammatory Tinea Pedis with bacterial superinfection effectively treated with isoconazole nitrate and diflucortolone valerate combination therapy. Mycoses. 2013;56:23-25.
7. Guttman C. Secondary bacterial infection often accompanies interdigital tinea pedis. Dermatol Times [internet]. 1999;20(4):1.
8. Lipner S, Joseph W, Vlahovic T, Scher R, Rich P, Ghannoum M, Daniel, R. Elewski, B. Therapeutic Recommendations for the Treatment of Toenail Onychomycosis in the US. SKIN The Journal of Cutaneous Medicine. 2022;6(2):s31-s.
9. Achterman RR, White TC. A foot in the door for dermatophyte research. PLoS pathogens. 2012;8(3):e1002564.
10. Wang R, Huang C, Zhang Y, Li R. Invasive dermatophyte infection: a systematic review. Mycoses. 2021;64(4):340-348.
11. Weiss J. Molecular diagnostics for sensitive detection of dermatomycosis species. Medical Laboratory Observer. 2023;55(9):14-17.
12. Ilkit M, Durdu M. Tinea pedis: the etiology and global epidemiology of a common fungal infection. Critical reviews in microbiology. 2015;41(3):374-88.
13. Citron DM, Goldstein EJ, Merriam CV, Lipsky BA, Abramson MA. Bacteriology of moderate-to-severe diabetic foot infections and in vitro activity of antimicrobial agents. Journal of clinical Microbiology. 2007;45(9):2819-2828.
14. Wada FW, Mekonnen MF, Sawiso ED, Kolato S, Woldegiorgis L, Kera GK, El-Khatib, Z., Ashuro, AA, Biru, M. Boltena, MT. Bacterial profile and antimicrobial resistance patterns of infected diabetic foot ulcers in sub-Saharan Africa: a systematic review and meta-analysis. Scientific Reports. 2023;13(1):14655.
15. Rich P. Onychomycosis and Tinea Pedis in patients with diabetes. Journal of the American Academy of Dermatology. 2000;43(5):S130-S134.

16. Humphries R, Bobenchik AM, Hindler JA. Schuetz AN. Overview of changes to the clinical and laboratory standards institute performance standards for antimicrobial susceptibility testing, M100. J Clin Micro. 2021;m59(12):1010-1128.
17. Khalifa A, Alreshidi IG, Alaradi LA, Alrashidi YM, Alrashidi Y. Tinea Unguium and Tinea Pedis and Their Correlation with Diabetes Mellitus in the General Population in the Hail Region, Saudi Arabia: A Cross-Sectional Study. Cureus. 2023;15(6). e40116.
18. Roseeuw D. Achilles foot screening project: preliminary results of patients screened by dermatologists. J Euro Acad Derma Venereology. 1999;12:S6-S9.
19. Watanabe S, Harada T, Hiruma M, Iozumi K, Katoh T, Mochizuki, Naka, W Group, JFW. Epidemiological survey of foot diseases in Japan: Results of 30 000-foot checks by dermatologists. J Dermatology. 2010;37(5):397-406.
20. Ahmad S, Aman S, Hussain I, Haroon TS. A clinico-etiological study of toe web fungal infection. J Pakistan Association of Dermatologists. 2003;13(2):62-66.
21. Aste N, Atzori L, Zucca M, Pau M, Biggio P. Gram-negative bacterial toe web infection: a survey of 123 cases from the district of Cagliari, Italy. J American Acad Derma. 2001;45(4):537-541.
22. Leyden JJ. Progression of interdigital infections from simplex to complex. Journal of the American Academy of Dermatology. 1993;28(5):S7-S11.
23. Sitepu EH, Muis K, Putra IB. Dermatophytes and bacterial superinfections in Tinea Pedis patients at Haji Adam Malik Central Hospital, Medan-Indonesia. Bali Med J. 2018;7(2):425-456.
24. Bansal E, Garg A, Bhatia S, Attri A, Chander J. Spectrum of microbial flora in diabetic foot ulcers. Indian journal of pathology and microbiology. 2008;51(2):204.
25. Gadepalli R, Dhawan B, Sreenivas V, Kapil A, Ammini A, Chaudhry R. A clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes care. 2006;29(8):1727-1732.
26. Atlaw A, Kebede HB, Abdela AA, Woldeamanuel Y. Bacterial isolates from diabetic foot ulcers and their antimicrobial resistance profile from selected hospitals in Addis Ababa, Ethiopia. Frontiers in Endocrinology. 2022; 13:987487.
27. Li X, Qi X, Yuan G, Ju S, Yu Z, Deng W, et al. Microbiological profile and clinical characteristics of diabetic foot infection in northern China: a retrospective multicentre survey in the Beijing area. J Med Micro. 2018;67(2):160-168.
28. Jouhar L, Jaafar RF, Nasreddine R, Itani O, Haddad F, Rizk N, Hoballah J. Microbiological profile and antimicrobial resistance among diabetic foot infections in Lebanon. Inter Wound J. 2020;17(6):1764-1773.
29. Rehman WM. Clinical patterns of bacterial and fungal infections in diabetic patients. Pak J Surg. 2019;35(4):275-277.
30. Feng S-H, Chu Y-J, Wang P-H, Jun X, Min D, Li X-M. Risk factors and gene type for infections of MRSA in diabetic foot patients in Tianjin, China. Inter J Lower Extremity Wounds. 2013;12(2):106-112.

الصورة الميكروبيولوجية وأنماط الحساسية للمضادات الميكروبية لدى مرضى سعفة القدم بمركز السكر بمدينة البيضاء

سعاد الطبولي[1]، سالمة قويدر[2]، منال حمد[1]، مرفوع علي[3]*

[1]قسم الأمراض الجلدية، كلية الطب، جامعة عمر المختار، البيضاء، ليبيا
[2]قسم الميكروبيولوجي والمناعة، كلية الطب، جامعة عمر المختار، البيضاء، ليبيا
[3]قسم علم الحيوان، كلية العلوم، جامعة عمر المختار، البيضاء، ليبيا

المستخلص

الغرض من هذه الدراسة هو تحديد المظهر الميكروبيولوجي وأنماط الحساسية المضادة للميكروبات لدى المرضى الذين يعانون من سعفة القدم في مركز مرض السكري في مدينة البيضاء (ليبيا). تم جمع العينات من مرضى السكري الذين يعانون من ثنية القدم المترددين على قسم العيادات الخارجية بمركز السكري في الفترة من ديسمبر 2020 إلى فبراير 2021 باستخدام مسحات معقمة. تم تنمية العينات في الاوساط الغذائية التالية الدم وأجار ماكونكي لعزل البكتيريا. تم إجراء اختبارات العزلة الميكروبيولوجية واختبارات الحساسية المضادة للميكروبات وفقا للطرق الميكروبيولوجية القياسية. تم تحديد أنماط الحساسية للمضادات الحيوية لجميع العزلات للمضادات الحيوية المختلفة عن طريق اختبار الحساسية للمضادات الحيوية. بشكل عام، كان متوسط عمر 50 مريضًا (50% ذكور و50% إناث) 58.4 ± 9.4 سنة ومتوسط مدة الإصابة بالسكري 14.6 ± 6.6 سنة. معظم العزلات (76.8%) كانت عصيات سلبية الجرام (*Escherichia coli, Pseudomonas aeruginosa, Klebsiella Spp and Proteus Spp*) تليها المكورات موجبة الجرام بنسبة (23.2 %) (*Streptococci Spp and Staphylococcus aureus*) كانت معظم البكتيريا حساسة للسيبروفلوكساسين بنسبة (84.0%) ومقاومة للإريثرومايسين بنسبة (42.0%). وتبين أن غالبية البكتيريا المعزولة من المرضى مقاومة لمضادات متعددة. توضح النتائج أهمية الوقت في تحديد جمع عينات لتحديد مسببات الأمراض ونمط حساسيتها للمضادات الحيوية قبل البدء في العلاج المضاد للميكروبات في الحالات المصابة.

الكلمات الدالة. داء السكري، سعفة القدم، العدوى البكتيرية ، حساسية المضادات الحيوية.