Original Article

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Clinical and Microbiological Study of Intertrigo

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Abstract

Background: Intertrigo is a common disorder affecting any age from infancy to old age and is frequently the reason for dermatology consultations.

Methods: A total number of 150 patients with intertrigo attending dermatology outpatient department were included in the study after ethical clearance. A thorough history, regarding occupation, seasonal variation, and any associated disease was recorded. Complete general physical, systemic, cutaneous examination and laboratory investigations were done to identify the etiologic agent.

Results: Maximum number of cases (70%) belonged to 21-60 years of age. Male to female ratio was 1:3.1. Housewives (59.33%), constituted the majority of all occupations. The majority of patients (66.67%) presented with chronic duration. Intertrigo was commonly associated with obesity (18.67%) and diabetes mellitus (10%). The most common site involved was toe web space (76.67%) in particular 4th and 5th toe web space. Of 150 cases, *Candida* constituted majority (51.33%) of cases. Bacterial culture revealed 14.67% cases of *Pseudomonas* followed by *Staphylococcus aureus*, *E. coli, Klebsiella*, *Streptococci*, and *Proteus*. Mixed growth was seen in 8.67% cases. The majority of *Pseudomonas* isolates (93.55%) were sensitive to piperacillin-tazobactam, and resistance was highest to gentamicin (54.84%). All isolates (100%) of *S. aureus* were sensitive to amoxicillin-clavulanic acid and gentamicin and highest resistance was noted for erythromycin (35.71%).

Conclusion: This study concludes that intertrigo is a common chronic condition presenting at any age, affecting both sexes, commonly seen in housewives. Intertrigo can affect various skin folds among which toe web space is the most common region involved. Intertrigo can be caused by a variety of organisms mainly *Candida*, bacteria or both of them.

Key words: *Candida*, Intertrigo, *Pseudomonas*

INTRODUCTION

The word "intertrigo" comes from the Latin word inter=between and terere=to rub and reflects the rubbing together of skin to skin, to create maceration and irritation, hence friction dermatitis or chaffing.[1] Heat, moisture, and the retention of sweat produce maceration and irritation. The moisture initially comes from eccrine sweat that cannot evaporate in the intertriginous areas because of reduced air circulation following which epidermis becomes eroded.[2-5]

Lateral toe webs are the most common sites of infection.[6] Other sites include finger web, submammary, retroauricular, vulval, and labiomental regions.[7-10] Among the pathogens, *Candida*, Gram-negative bacteria such as *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis*, *Morganella morganii*; and Gram-positive bacteria such as *Staphylococcus aureus*, Group A beta-hemolytic streptococci, *Staphylococcus saprophyticus* are implicated.[4,5,11,12]

Differential diagnosis of intertrigo includes diaper dermatitis, nutritional dermatitis, candidiasis, psoriasis, seborrheic dermatitis, congenital syphilis, granuloma gluteale infantum, Letterer-Siwe disease in infants and children and fungal infections, erythrasma, contact

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dermatitis, psoriasis, pemphigus, Hailey-Hailey disease, subcorneal pustular dermatoses, acanthosis nigricans, and acrodermatitis enteropathica in adults.[13]

Treatment includes patient education, correcting precipitants, treating inflammation, and secondary infection. The mainstay of treatment remains topical and systemic antifungals. Most of the broad-spectrum antifungals that are available for the treatment of superficial infections belong to azole class. These include imidazoles, triazoles, and allylamines such as naftifine and terbinafine. Terbinafine exerts a primary fungicidal action against dermatophytes and a number of yeasts and molds.[3,5,14,15] The present study was undertaken to study the clinical spectrum and predisposing factors of intertrigo, to identify the causative fungal or bacterial agent and to know the sensitivity pattern of isolated bacteria to antibiotics.

MATERIALS AND METHODS

A total of 150 patients with intertrigo including both sex and all age groups were included in the study. Detailed history, clinical examination, and systemic examination to rule out any systemic diseases were done. Relevant laboratory investigations such as potassium hydroxide (KOH) examination, gram staining, fungal, and bacterial culture along with antibiotic sensitivity for bacteria were done. Scrapings from the lesions were taken with the blunt edge of scalpel blade, and the specimen was used for KOH examination and gram staining.

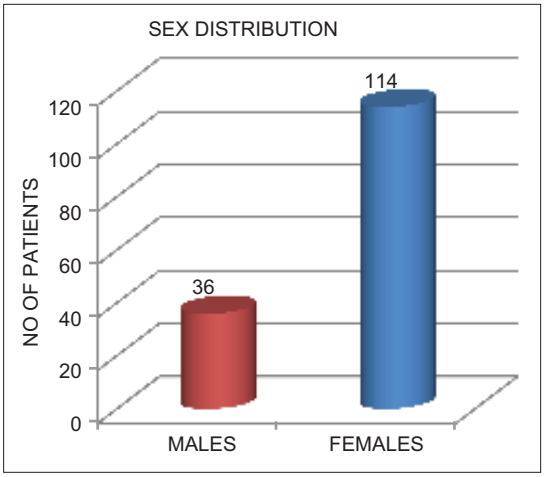
A part of the specimen was planted for culture by furrowing it into the Sabouraud's Dextrose Agar and incubated at 37°C for 4 weeks, and the morphology was studied. A colony of *Candida* from the culture medium was incubated with human serum at 37°C. This was observed after 2-4 h for the germ tube under the microscope. The presence of bacteria, their staining characteristics, and their arrangement was noted by Gram's Method. All the organisms isolated were tested for antibiotic sensitivity by Disc Diffusion Technique.

RESULTS

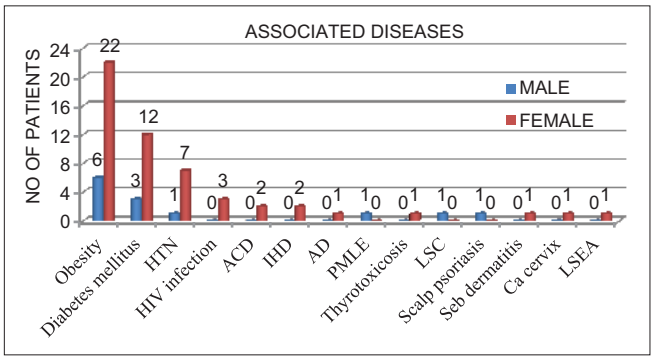
The maximum number of cases, i.e., 105 (70%) cases belonged to the age group of 21-60 years. The youngest case was 17-day-old, and oldest was 83 years. Females constituted about 114 (76%) cases and males 36 (24%) with male to female ratio of 1:3.1 as depicted in Graph 1. Among the occupation, majority of patients were housewives i.e., 89 (59.33%) followed by 17 (11.33%) patients who did not belong to any occupation as they were aged less than 6 years, 16 (10.67%) servants, 12 (8%) agriculturists followed by 6 (4%) students, 4 (2.66%) clerks, 2 (1.33%) officials, and 1 (0.67%) barber, lab technician, police, and tailor.

About 115 (76.67%) cases belonged to lower, 24 (16%) middle and 11 (7.33%) belonged to upper socioeconomic status; whereas 84 (57.33%) belonged to rural areas followed by 64 (42.67%) patients were from urban areas. The majority of cases i.e., 100 (66.67%) presented with duration of more than 60 days, 26 (17.33%) with duration of 16-60 days, and 24 (16%) with duration of 1-15 days. The diseases associated with intertrigo were obesity - 18.67%, diabetes mellitus - 10%, hypertension - 5.33%, immunocompromised status - 2%, allergic contact dermatitis, and ischemic heart disease - 1.33% each. Thyrotoxicosis, atopic dermatitis, polymorphic light eruption, lichen simplex chronicus, scalp psoriasis, seborrheic dermatitis, carcinoma cervix, and lichen sclerosis et atrophicus accounted 0.67% each as shown in Graph 2.

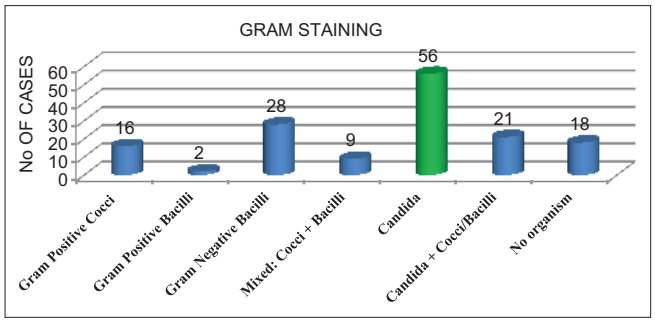
In the present study, out of 150 cases, 115 (76.67%) cases were of toe web intertrigo (Figure 1) followed by 12 (8%) perianal (Figure 2), 8 (5.33%) vulval, 6 (4%) finger web, 5 (3.33%) groin, 3 (2%) retroauricular, and 1 (0.67%) submammary intertrigo. Of 150 cases, 56 (37.33%) cases showed *Candida* (Figure 3) followed by 28 (18.67%) gram-



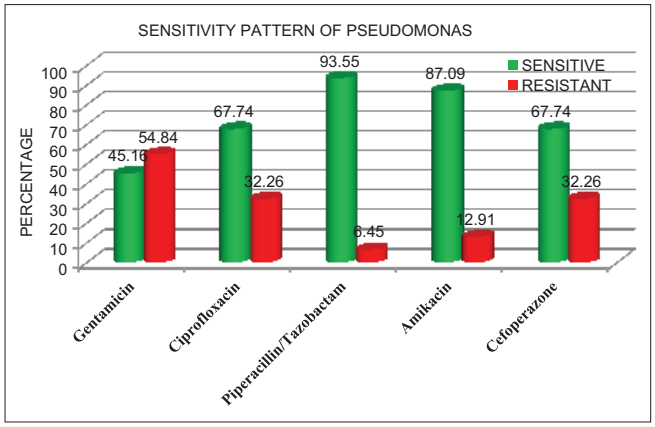
Graph 1: Age distribution



Graph 2: Associated diseases



Graph 3: Gram staining



Graph 4: Sensitivity pattern of *Pseudomonas*

Figure 1: Toe web intertrigo

negative bacilli, 21 (14%) *Candida* and cocci or bacilli, 16 (10.67%) gram-positive cocci, 9 (6%) mixed cocci and bacilli, and 2 (1.33%) gram-positive bacilli; whereas in 18 (12%) cases no organisms were detected as shown in Graph 3. Bacterial culture revealed 22 (14.67%) cases of *Pseudomonas* followed by 16 (10.67%) *Staphylococci*, 9 (6%) *E. coli*, 6 (4%) *Klebsiella*, 2 (1.33%) *Streptococci*, and 1 (0.66%) *Proteus*. Mixed growth was seen in 13 (8.67%) cases, whereas normal skin commensals were found in 7 (4.67%) cases. No growth was seen in 74 (49.33%) cases.

Figure 2: Perianal intertrigo

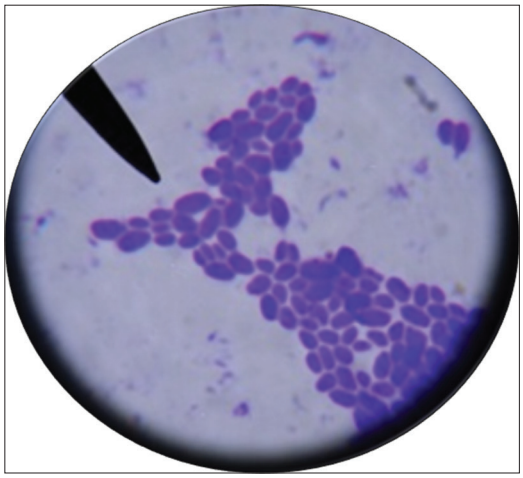


Figure 3: Gram staining shows gram-positive budding yeast cells

Of 31 isolates of *Pseudomonas*, 29 (93.55%) were sensitive to piperacilin-tazobactam followed by 27 (87.09%) to amikacin, and 21 (67.74%) each to ciprofloxacin and cefoperazone. Resistance was highest to gentamicin, i.e., 17 (54.84%) isolates as depicted in Graph 4. In the present study, amoxicillin-clavulanic acid and gentamicin sensitivity were seen in all 28 (100%) isolates of *Staphylococci*, and no resistance was observed. With respect to cefotaxime, ciprofloxacin, and cotrimoxazole; 24 (85.71%), 22 (78.57%), 21 (75%) isolates were sensitive, and 4 (14.29%), 6 (21.43%), 7 (25%) isolates were resistant, respectively. The highest resistance was noted for erythromycin (35.71%) followed by clindamycin (32.14%).

DISCUSSION

The Majority (70%) of patients belonged to the age group of 21-60 years in the present study, which correlates with the study of Ahmad *et al.*, (21-50 years).[6] Whereas Lin *et al.*,

Aste *et al.*, and Keita *et al.*, found that foot intertrigo was common in the age group of 36-81 years, 19-74 years, and 12-48 years, respectively.[3,16,17] The age variations signifies that intertrigo is a common disorder that can affect any individual from infancy to old age. Female preponderance was seen which is consistent with the study of Keita *et al.*, (1:2.1) which can be attributed to housewives (59.33%), who constituted majority group.[16]

Lower socioeconomic class patients comprised 76.67% of the total. The low income, poor nutritional status, poor hygiene, overcrowding could be factors that contribute to intertrigo. The majority of patients, i.e., 89 (59.33%) were housewives. This is on par with the study of Ahmad *et al.*, which showed 33.3% housewives, who engaged themselves in household activities resulting in maceration of toe webs followed by servants and agriculturists.[6] About 66.67% cases of intertrigo cases had a duration of more than 60 days which is in accordance with other studies which makes it a chronic recurrent condition.

Obesity was seen in 18.67% cases in the present study, which is not consistent with the study of Keita *et al.*, which showed 68.8% cases, which can be attributed to racial and geographical differences.[16] Association with obesity in the present study is due to more numerous and deeper skin folds in obese patients. Diabetes was seen in 10%, which is consistent with the studies of Ahmad *et al.*, (6.66%) and Keita *et al.*, (8.88%).[6,16] Increased incidence in diabetics may be due to increased glucose levels in urine, tissue fluids, and sweat, which make them more prone to candidiasis.

There are no studies available in the literature for the comparison of region wise distribution of intertrigo. Toe web space was involved in 76.67% of the cases, in the present study. This is due to the reason that the majority of the study population in the present study constituted females (76%) who engaged in household work, which is an important predisposing factor for toe web intertrigo. In the present study, 4th and 5th toe web space were involved bilaterally in the majority (40.87%) of patients. This is in accordance with the study of Ahmad *et al.* in which bilateral 4th and 5th toe web space were involved in majority (41.76%) of patients.[6]

In the present study, the predominant organism isolated was *Candida,* which accounted for 51.33%. This is consistent with the studies of Lestringant *et al.*, Ahmad *et al.*, Goto *et al.*, and Soghair *et al.*, which showed 57.7%, 60%, 60%, 88.9% cases of *Candida*, respectively.[6,18-20] The predominance of *Candida* in the present study can be attributed to retention of moisture as seen in housewives, increased temperature and maceration in body folds particularly during the summer and monsoon, along with other predisposing factors.

Pseudomonas was isolated in 14.67% of cases, which correlates with the studies of Ahmad *et al.,* and Karaca *et al.,* who isolated in 10% and 16.7% of cases; but is lesser compared to Lin *et al.,* and Aste *et al.,* who isolated in 55% and 46.4% cases.[3,6,17,21] *Klebseilla* isolated (6%) is on par with the studies of Aste *et al.,* (6.2%) and Lin *et al.,* (3.44%).[3,17] Predominance of gram-negative bacteria in the above studies include hot weather, tight-fitting shoes, as well as previous prolonged antibiotic or antifungal therapy. *Staphylococci* were seen in 10.67% cases followed by 1.33% cases of beta hemolytic streptococci. This is consistent with the study conducted by Karaca *et al.,* in which the isolated pathogens were *S. aureus* in 11.9% cases followed by beta hemolytic streptococci in 2.4% of cases.[21] Culture negative cases were 10% in the present study, which can be explained by the fact that intertrigo is mainly of mechanical origin and infection is a secondary phenomenon, which may have not settled yet. Mixed growth can be explained on the basis of the development of complex with time.[22]

In the present study, all isolates of *Staphylococci* (100%) were sensitive to amoxicillin-clavulanic acid and gentamicin, which correlates with the study of Niebuhr *et al.*, which showed 97% and 84% sensitivity, respectively.[23] Least sensitivity (64.29%) was seen for erythromycin, which correlates with Ghadage *et al.*,[24] (41%). The high proportion of strains showing resistance to antibiotics may be explained by the practice of self-medication by patients. All three isolates (100%) of *Streptococci* were sensitive to ampicillin/amoxicillin and ciprofloxacin, which is in accordance with the studies of Malhotra *et al.*, and Ghadage *et al.*[24,25] *Pseudomonas* was the predominant bacteria isolated in present study, most of them (93.55%) were sensitive to piperacillin/tazobactam, which is consistent with studies of Sharma VK *et al.*, (100%) and Asati DP *et al.*, (77.5%).[26,27] With respect to amikacin sensitivity, the present study was not correlating with the studies of Sharma *et al.*, and Asati *et al.*, who reported less sensitivity to amikacin.[26,27] These variations can be attributed to variations in the study populations.

CONCLUSION

Intertrigo is more common in the age group of 21-60 years, with a female preponderance. Among all occupations, housewives are more commonly affected by intertrigo. The majority of patients present with duration of illness of more than 60 days suggesting its chronicity. Predisposing factors contributing are patients with obesity, diabetes, and patients belonging to lower socioeconomic status, rural areas with seasonal aggravation in the rainy season. Toe web space is the most common region involved with

4th and 5th toe web space being more common. Common organisms causing intertrigo are *Candida*, *Pseudomonas*, and *S. aureus*. The majority isolates of *Pseudomonas* are sensitive to piperacillin-tazobactam and amikacin. All isolates of *S. aureus* are sensitive to amoxicillin-clavulanic acid and gentamicin.

REFERENCES

1. Wolf R, Oumeish OY, Parish LC. Intertriginous eruption. Clin Dermatol 2011;29:173-9.
2. Janniger CK, Schwartz RA, Szepietowski JC, Reich A. Intertrigo and common secondary skin infections. Am Fam Physician 2005;72:833-8.
3. 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 Am Acad Dermatol 2001;45:537-41.
4. Bray GA. Health hazards of obesity. Endocrinol Metab Clin North Am 1996;25:907-19.
5. Holdiness MR. Management of cutaneous erythrasma. Drugs 2002;62:1131-41.
6. Ahmad S, Aman S, Hussain I, Haroon TS. A clinico-etiological study of toe web fungal infection. J Pak Ass Dermatol 2003;13:62-6.
7. McMahon R, Buckeldee J. Skin problems beneath the breasts of in-patients: The knowledge, opinions and practice of nurses. J Adv Nurs 1992;17:1243-50.
8. Smith MA, Waterworth PM. The bacteriology of some cases of intertrigo. Br J Dermatol 1962;74:323-5.
9. Lynch PJ. Vulvar dermatoses: The eczematous diseases. In: Black M, Ambros-Rudolph CM, Edwards L, Lynch PJ, editors. Obstetric and Gynecologic Dermatology. 3rd ed. Philadelphia, PA: Mosby Elsevier; 2008.
10. Dohvoma C, Hutchison I, Calvert M. Labiomental intertrigo. An indication for orthognathic surgery. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;79:551-3.
11. Kanwar AJ, De D. Superficial fungal infections. In: Valia RG, Valia AR, editors. IADVL Textbook of Dermatology. 3rd ed. Mumbai: Bhalani Publishing House; 2010.
12. Silvestre JF, Betlloch MI. Cutaneous manifestations due to *Pseudomonas* infection. Int J Dermatol 1999;38:419-31.
13. Richard AF, Terrence C, Hopkins T. The other eczemas. In: Moschella SL, Hurley HJ, editors. Moschella and Hurley Dermatology. 3rd ed. Philadelphia: Saunders; 1992.
14. Epstein NN, Epstein WL, Epstein JH. Atrophic striae in patients with intertrigo. Arch Dermatol 1963;87:450.
15. Chapman MS, Brown JM, Linowski GJ. 0.1% tacrolimus ointment for the treatment of intertrigo. Arch Dermatol 2005;141:787.
16. Keita S, Faye O, Traoré A, Dicko A, Berthe S, Traore P, *et al.* Dermatitis of the folds in black Africans in Bamako, Mali. Int J Dermatol 2012;51 Suppl 1:37-40, 41.
17. Lin JY, Shih YL, Ho HC. Foot bacterial intertrigo mimicking interdigital tinea pedis. Chang Gung Med J 2011;34:44-9.
18. Lestringant GG, Saarinen KA, Frossard PM, Bener A, Ameen AM. Etiology of toe-web disease in Al-Ain, United Arab Emirates: Bacteriological and mycological studies. East Mediterr Health J 2001;7:38-45.
19. Goto M. Ecological study of interdigital athlete's foot. Jap J Dermatol 1970;80:130-8.
20. al-Sogair SM, Moawad MK, al-Humaidan YM. Fungal infection as a cause of skin disease in the eastern province of Saudi Arabia: Tinea pedis and tinea manuum. Mycoses 1991;34:339-44.
21. Karaca S, Kulac M, Cetinkaya Z, Demirel R. Etiology of foot intertrigo in the District of Afyonkarahisar, Turkey: A bacteriologic and mycologic study. J Am Podiatr Med Assoc 2008;98:42-4.
22. Kates SG, Nordstrom KM, McGinley KJ, Leyden JJ. Microbial ecology of interdigital infections of toe web spaces. J Am Acad Dermatol 1990;22:578-82.
23. Niebuhr M, Mai U, Kapp A, Werfel T. Antibiotic treatment of cutaneous infections with *Staphylococcus aureus* in patients with atopic dermatitis: Current antimicrobial resistances and susceptibilities. Exp Dermatol 2008;17:953-7.
24. Ghadage DP, Sali YA. Bacteriological study of pyoderma with special reference to antibiotic susceptibility to newer antibiotics. Indian J Dermatol Venereol Leprol 1999;65:177-81.
25. Malhotra SK, Malhotra S, Dhaliwal GS, Thakur A. Bacteriological study of pyodermas in a tertiary care dermatological center. Indian J Dermatol 2012;57:358-61.
26. Sharma VK, Asati DP, Khandpur S, Khilnani GC, Kapil A. Study of sepsis in dermatology ward: A preliminary report. Indian J Dermatol Venereol Leprol 2007;73:378-82.
27. Asati DP, Sharma VK, Khandpur S, Khilnani GC, Kapil A. Clinical and bacteriological profile and outcome of sepsis in dermatology ward in tertiary care center in New Delhi. Indian J Dermatol Venereol Leprol 2011;77:141-7.

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