Biomedicine and Chemical Sciences 1(4) (2022) 254-258

33-BCS-1065-259

Content lists available at:
https://journals.irapa.org/index.php/BCS/issue/view/15

Biomedicine and Chemical Sciences

Journal homepage: https://journals.irapa.org/index.php/BCS

Human Skin Infection: A Review Study

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ARTICLE INFO

Article history:
Received on: May 26, 2022
Revised on: July 14, 2022
Accepted on: July 14, 2022
Published on: October 01, 2022

Keywords:
Cellulitis
Impetigo
Pyodermas
Staphylococcal folliculitis

ABSTRACT

All across the world, skin diseases are rather frequent. The likelihood of pediculosis capitis (0.2-35 percent, 6.9-35 percent in Sub-Saharan Africa in addition to other parts of South Africa.), pyoderma (prevalence range 0.2-35 percent, 6.9–35% in Sub-Saharan Africa and other parts of South Africa, tinea capitis (1–19.7%), scabies (0.2–24%, 1.3–17% in Sub-Saharan Africa), and viral skin illnesses (0.4–9%, mainly molluscum contagiosum,0-57 percent). A bacterial skin infection is the most frequent kind of skin infection. Numerous bacterial skin infections have been linked to necrotizing fasciitis, scarlet fever, erysipelas, erythrasma, abscesses, folliculitis, furunculosis, and impetigo. Additionally, ecthyma, furunculosis, and mycobacterium skin disorders are covered in this review. Recent studies have revealed modifications in the causes and remedies of bacterial skin infections. In the United States, the prevalence of MRSA (methicillin-resistant *Staphylococcus aureus*) is rising.

1. Introduction

Skin conditions are brought on by bacteria, fungi, viruses, parasites, and rickettsiae. Skin infections come in two varieties: primary and secondary. Primary infections are most frequently detected in healthy skin, have distinct morphologies and histories, and are brought on by solitary organisms. The most frequent causes are coryneform bacteria, *Streptococcus pyogenes*, and *Staphylococcus aureus*. Typical symptoms include impetigo, folliculitis, boils, and erythrasma. Systemic infections may result in skin symptoms. A secondary issue that results from the sick skin is the development of secondary infections. Examples of secondary infections include intertrigo and toe web infections (Mistik, et al., 2015).

2. Clinical Signs and Symptoms

Bacterial infections of the skin differ from one person to another. Erythema, edema, and other indications of inflammation are common in skin illnesses. There may be pus (furuncles) or fluid (vesicles and bullae) accumulations in the lesions, although lesions can also be scaling without evident inflammation (Nucci & Parra-Herran, 2019).

3. Methods for Laboratory Diagnosis

Samples were taken using a blade or by swabbing, the affected skin regions. A sterile surgical blade is used to cut away the ceiling or crust when pustules or vesicles are present. For Gram staining, the pus or exudate is applied as thinly as possible to a transparent glass slide. Using a sterile needle and syringe, pus is sucked from closed lesions in order to test for actinomycetes. Material can be gathered from draining sinuses by holding a sterile test tube at the edge of the lesion and letting the pus and grains trickle into the tube. Granules are composed of aggregates of inflammatory cells, debris, protein-rich material, and fine branching filaments. Pus and other exudates are examined (Mistik, et al., 2015).

Staphylococcal folliculitis is the most superficial type of skin infection and is distinguished by microscopic, erythematous follicular pustules that do not spread to the surrounding skin. favoured areas include the scalp and extremities areas. Granules can be seen under a microscope and are used to diagnose gram-negative folliculitis (Saha et al., 2019).

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How to cite:

AL-kahfaji, M. H. A. M. (2022). Human Skin Infection: A Review Study. *Biomedicine and Chemical Sciences, 1*(4), 254-258.

DOI: **https://doi.org/10.48112/bcs.v1i4.259**

3.1. B-Culture

The correct medium must be chosen because most skin-harming germs flourish in artificial media. For general use, blood agar plates (preferably 5 percent defibrinated sheep blood) are advised. In many circumstances, combining a selective media with a general-purpose medium is beneficial. For instance, in blood agar media where both *Staphylococcus aureus* and *Streptococcus pyogenes* are present, *Staphylococcus aureus* may outgrow *Streptococcus pyogenes*. When crystal violet is added to blood agar at a concentration of 1 g/ml, *S pyogenes* is preferred over *S aureus*. Cultures of meningococci, gonorrhea, and brucella must be incubated in a CO_2 environment. If *tuberculosis* or a fungus infection is suspected, specimens are collected on the proper media and incubated aerobically, according to (Del Giudice, 2020).

4. Bacterial Skin Infections

In an effort to organize and categorize various clinical entities, pyodermas (bacterial skin diseases) are categorized. For elementary and secondary schools, this is an arbitrary but helpful classification. According to Mistik et al., (2015), pyoderma affects more than 111 million children worldwide, and many of them also have either tinea or scabies. 7 Bacterial skin infections come in many different forms. Scarlet fever, erysipelas, erythrasma, necrotizing fasciitis, abscesses, cellulitis, folliculitis, furunculosis, and other conditions are among the most prevalent. Additionally common are skin infections such ecthyma, furunculosis, and mycobacterium.

4.1. Primary Infections

Staphylococcus aureus, Streptococcus pyogenes, or a mix of the two can cause impetigo, a skin infection. *S. aureus* infections, which make up 90% of all bacterial causes in northern countries, are more prevalent than *S. pyogenes* infections in developing nations. Children are the main victims of impetigo, which is particularly prevalent in low-income communities (Torrelo, et al., 2020). It can spread by self-inoculation and small-scale family or community outbreaks, and it is contagious. A clinical diagnosis of impetigo is made. A delicate The primary lesion in S. aureus impetigo is a bulla. The bullae break, producing an oozing erosion, and then become inflamed and pustular right away. However, any area of the skin may be affected. In children, the mouth is a typical and common localisation. several things (Del Giudice, 2020).

4.1.1. Cellulitis and Erysipelas

Acute skin infections that are quite common include cellulitis. The bulk of published cellulitis care recommendations are supported by research on cellulitis-related skin and soft tissue infections or by expert opinion. *Streptococcus pyogenes*, which mostly affects subcutaneous tissue, is the most frequent cause of cellulitis. It results in a broad inflammation of loose connective tissue. The infection is helped by tissue edema, and the pathogen typically enters the body through a breach in the skin's surface. Cellulitis can appear on healthy skin. On the other hand, cellulitis is distinguished by erythematous, edematous, painful lesions with ill-defined borders (Galli, et al., 2019). Erysipelas and *streptococcal cellulitis* cannot be distinguished with certainty. Erysipelas is more superficial than erysipelas and has a clear boundary (Karakonstantis, Kritsotakis, & Gikas, 2020).

4.1.2. Staphylococcal Scalded Skin Syndrome

Lyell's disease, commonly known as Staphylococcal scalded skin syndrome (SSSS), is a condition that begins as a small lesion and spreads to cause erythema and peeling of the skin. The staphylococci of phage group II that cause this syndrome release an epidermolytic toxin. Compared to adults, children are more prone to illness. Clinical signs of the illness range from blistering infections affecting specific body areas to more widespread and systemic infections, and exfoliative toxin (ET)-producing *Staphylococcus aureus* strains have been associated to the condition. Although mortality is low, severe exfoliation and infections due to a lack of secondary protection can still occur (Blicharz, et al., 2021). Lyell's illness and toxic epidermal necrolysis ritter disease are other names for Staphylococcal scalded skin syndrome (SSSS), which starts as a localized lesion and worsens over time.

4.1.3. Folliculitis

Based on histologic location, foliculitis can be categorized into two categories: superficial and deep. *Staphylococcal folliculitis* is is the mildest kind of skin infection and is distinguished by tiny, erythematous follicular pustules. that do not affect the surrounding skin (Al Bayati, 2018). Popular targets include the scalp and extremities. Patients with acne vulgaris who have been using systemic antibiotics for a long time are more likely to develop gram-negative folliculitis as a super infection. These pustules frequently cluster around the nose in a ring. The bacteria are present in pustules and nasal passages. It has been thought that *staphylococcal folliculitis* is synonymous with *protonibacterium acnes* folliculitis. A flat or rounded white to yellow follicular pustule serves as the primary lesion. Gram staining of pus reveals (Adya & Inamadar, 2015).

4.1.4. Erysipeloid

Fishermen and people who work with meat are susceptible to the infection known as erysipeloid. It results in skin that is red for several days, usually on the back of the hand or a finger. The infection is brought on by *Erysipelothrix rhusiopathiae* (Altibi, et al., 2019).

4.1.5. Pitted Keratolysis

A superficial infection of the plantar surface called pitted keratolysis gives the foot a punched-out appearance**.** It is possible that the pits will coalesce into zones of shallow erosion with irregular shapes. A lytic process that spreads outward causes pits to form. The most frequently affected areas are the toes, volar pads, heels, and ball of foot. High heat and humidity are two typical irritants. Gram-positive coryneform bacteria were discovered to be present in the lesions (L*aw, et al., 2019).*

4.1.6. Erythrasma

Erythrasma, a skin condition, ultimately impacts the pubis, toe web, groin, axilla, and inframammary folds. Despite the fact that the majority of lesions are asymptomatic, they might occasionally produce mild burning and itching. The patches are uneven, dry, scaly, and first pinkish before turning brown. In warmer climates, the common, generic variety is more common. The cause is *Corynebacterium minutissimum.* The organism is difficult to see in KOH preparations of infected scales because of its small size, but it is quite obvious when the stratum corneum

is stained with Gram's method. Under Wood's light, the sick scales gleam coral red, which is suggestive (Janeczek, et al., 2020).

4.1.7. Trichomycosis

Trichomycosis is a fungus that affects the pubic and axillary hair, producing nodules that vary in firmness and color. Usually asymptomatic, the sickness does not spread. Under the surface, the skin is healthy. Infected hairs are placed on a slide with a drop of 10% KOH beneath a coverslip for microscopic analysis. Short bacillary forms make up the hair nodules. Three different coryneform species—one that trichomycosis is brought on by three different organisms: one that resembles *C. minutissimum,* another that is lipolytic, and a third that is *C. tenuis* (Bonifaz, et al., 2013).

4.2. Secondary Infections

4.2.1. Intertrigo

Obese children and adults are most frequently affected by intertrigo. Erythema, maceration, and even erosions in the skin fold are brought on by heat, moisture, and friction. Overgrowth of permanent or passing flora may be the root of this problem (Metin, Dilek & Bilgili, 2018).

4.2.2. Acute Infectious Eczematoid Dermatitis

False folliculitis of initial lesion that produces infectious exudate, that is a boil or **a** runny nose or ear, leads to the development of acute infectious eczematoid dermatitis. One distinguishing characteristic due to illness is a dermatitis stripe along the path of discharge material flow. The most frequently isolated organisms are coagulase-positive staphylococci (Eichenfield, et al., 2019).

Pseudofolliculitis of the beard can occur in black men who shave their beards. Erythematous papules and pustules with concealed hairs are the most frequent lesions. An ingrown hair develops when a hair from bent hair follicles reenters the skin. Gram-positive bacteria from the local flora are linked to this circumstance, emphasizing how nonpathogenic bacteria can take advantage of weakened human defenses (Ogunbiyi, 2019).

4.3. Toe Web Infection

It was once believed that athlete's foot was just a fungal illness. This notion, however,. has been contested due to the fact that fungi frequently fail to heal lesions over the course of the disease. The earliest invaders, dermatophytes, are now believed to induce skin injury that promotes the growth of bacteria, which in turn promotes maceration and hyperkeratosis. The fungus then produces antibiotics to establish an environment that encourages the development of certain coryneform bacteria and Brevibacterium. Some of these bacteria release proteolytic enzymes, which can exacerbate the situation. The toe webs suffer severe damage if the feet get too damp because local Gram-negative rods take over as the dominant flora. Once thought to be purely a fungal condition, the athlete's foot is then eradicated either by bacterial activity or antifungal therapy. However, because fungi usually fail to heal from lesions as the disease progresses, this idea has come under scrutiny. Dermatophytes, the first invaders, are now thought to harm skin, which promotes bacterial growth, which promotes maceration and hyperkeratosis. The fungus then produces antibiotics that help certain coryneform bacteria and Brevibacterium grow in a favourable environment. The release of proteolytic enzymes by certain of these microorganisms could (Solomon, et al., 2021).

4.4. Other Bacterial Skin Diseases

4.4.1. Skin Tuberculosis (Localized Form)

After injecting *Mycobacterium tuberculosis* into a wound, people who have never had any immunologic encounter with tuberculosis may develop localized cutaneous tuberculosis. Regional lymphangitis and lymphadenitis first occur, then an inflammatory nodule (chancre). The prognosis of the condition is impacted by both the patient's resistance to treatment and its efficacy. a host with partial or full can distinguish between TB verrucosa and lupus vulgaris, two important groups of skin diseases (Mann, et al., 2018).

4.4.2. Mycobacterium *marinum* skin disease

Clidren and teenagers who have previously used swimming pools or cleaned fish tanks are frequently affected by the *M marinum* skin condition. Although lesions frequently develop in the areas most vulnerable to injury even when there is no history of trauma, there is frequently a history of trauma. The most frequent kind of lesions are *tuberculoid granulomata*, which are often solitary and acid-fast organisms are infrequently seen. The results of a skin test for tuberculin were positive (Holden, et al., 2018).

4.4.3. *Mycobacterium ulcerans* Skin Disease

The skin condition's lesions *M ulcerans* can develop on the hands or soles, but not on the arms, legs, or other parts of the body. One cutaneous ulcer that is painless and has clearly eroded boundaries is present in the majority of cases. In various places of the world, marshes and waterways have been connected to the sickness. In certain tropical environments, this bacteria frequently causes chronic ulcers. In the condition known as Tuberculosis of the lymph nodes or bones can migrate to the skin and cause ulcers, a condition known as scrofuloderma (Gloster, et *al*, 2016). In patients with fulminating cutaneous tuberculosis, bacteria spread through the bloodstream., leading to a disseminated form of the illness. Uninfected tuberculous skin lesions, including lichen scrofillosis are produced by hematogenously disseminated antigen (Bernando, 2017).

4.4.4. Actinomycetoma

Numerous species can cause actinomycetoma. Fungi are responsible for the other half of the cases, which are caused by actinomycetes (actinomycetoma) (eumycetoma). In the United States, *Pseudallescheria (Petriel lithium) boydii* are the two most frequent causes of mycetoma (a bacterium). The clinical picture is the same irrespective of the organism.. Causing bacteria enter the skin as a result of trauma. A sign of the disorder is edematous skin that gradually gets softer and enlarges. In the deeper tissues, sinus tracts that resemble tunnels grow. most frequently in the foot, where they cause swelling and distortion. The draining material has grains that vary in size and color depending on the agent (Ankad, Beergoudar & Nikam, 2019).

4.4.5. Actinomycosis

Actinomyces israelii is typically the culprit for actinomycosis, with *Arachnia propionica (Actinomyces*

propinicus) coming in second. The lesion looks like a regular swelling—firm, red, and steadily growing. Over time, the stiff masses soften and expel, leaving behind chronic sinus passages that rarely heal. The sinuses exude purulent fluid that contains "sulfur" particles. Cervicofacial lesions that affect the earliest tissues are those of the face, neck, tongue, and mandible. Lesions in roughly half of all cases. In around 20% of patients, thoracic actinomycosis is present. It can result through oral aspiration of the organism as a primary infection or from the disease's direct spread from the neck or abdomen. The major lesion of abdominal actinomycosis (Sadeghi, Azaïs & Ghannoum, 2019).

5. Treatment of the Pyodermas

5.1. General Considerations

By periodically applying topical antiseptics like chlorhexidine to the exposed lesions and debriding superficial pyoderma, the source of infection is eliminated and prevented from spreading to different skin areas or patients. Several secondary skin conditions, including web infections,will go away with simple twice-daily cleaning. If a patient has an infection on their feet, they should wear sandals or open-toed shoes that allow air to flow. Drying agent aluminum chloride stops opportunistic bacteria from overgrowing in the axillary, perineal, and foot regions. The removal of hyperkeratotic lesions that harbor infections by keratinolytic medications (such as topical salicylates) enables other topical treatments to reach the damaged skin surface (Boateng & Catanzano, 2015).

5.1.1. Topical Treatment

Topical antibiotics commonly use neomycin, bacitracin, and polymyxin. Mupirocin, gramicidin, or erythromycin are some of the more recent additions, while other formulations mix these antibiotics with steroids. Topical antibiotics are frequently preferred over oral antibiotics for a patient with a mild illness because of the hazards of systemic therapy. (Shekhawat, et al., 2017).

Itraconazole and terbinafine are the two most often used oral and/or topically applied azole or allylamine formulations in the treatment of dermatophyte infection. Tinea pedis/manuum and tinea corporis/cruris are primarily treated with topical medicines used once or twice daily. When applying a topical medication is impractical or when the tinea involvement is substantial or chronic, using oral antifungals may be a viable option.

5.1.2. Systemic Therapy

Systemic antibiotic therapy is required for extensive pyoderma. Systemic antibiotics can be administered intravenously or orally. Parenteral therapy is recommended for severe infections, although oral medication works well for the majority of widespread cutaneous infections (Sunderkötter & Becker, 2015). There is a variety of antibiotics available for pyoderma systemic treatment. For the systemic therapy of pyoderma, a range of antibiotics is available. The pathogen's isolation and identification, as well as the intensity and scope of the illness, should be taken into consideration when choosing an antibiotic. Efficacy must be related to consumer cost in the cost-conscious economy of today. There are numerous less expensive antibiotics that work against a particular bacteria just as well as more expensive medications with broader spectrum coverage treatment (Tresch, et al., 2019).

Multiple site involvement, severe tinea corporis, recurring or chronic dermatophytosis, tinea pedis, tinea capitis, tinea unguium, localized infection resistant to topical AFAs, and immunocompromised conditions are the usual indications for systemic treatment of dermatophytosis. Systemic AFAs, with terbinafine being the only fungicidal medication, have been known to be effective against dermatophytes, including griseofulvin, ketoconazole, fluconazole, and itraconazole. It is likely because the latter require a longer course of treatment that itraconazole and terbinafine are prescribed more frequently than griseofulvin and fluconazole among these medications. The classic textbooks list a number of therapeutic options for the treatment of tinea corporis, tinea cruris, and tinea pedis.

6. Conclusion

Over 111 million children suffer from pyoderma, and many of them also have scabies, tinea, or both. There are numerous variations of bacterial skin infections. Impetigo, folliculitis, furunculosis, abscesses, cellulitis, scarlet fever, erysipelas, erythrasma, necrotizing fasciitis, and other conditions are among the most prevalent. 8 Additionally common are skin infections such mycobacterium, furunculosis, and ecthyma.

Competing Interests

The authors have declared that no competing interests exist.

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