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Skin infection risk factors and its management

Bibi Sazain Aman[1], Muhammad Kamran Taj[*1], Zohra Samreen[3], Ashiq Hussain[3], Imran Taj[1], Saima Azam[1], Syeda Ayesha Ali[1], Sakina Khan[1], Lalbibi[1], Saqiba Jogezai[2], Bilal Javed[2]

[1]*Center for Advanced Studies in Vaccinology and Biotechnology, University of Balochistan, Quetta, Balochistan, Pakistan*

[2]*Department of Microbiology, University of Balochistan, Quetta, Balochistan, Pakistan*

[3]*Bolan University of Medical and Health Sciences, Quetta, Balochistan, Pakistan*

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Abstract

Skin and soft-tissue infections (SSTIs) involve microbial invasion and SSTIs have variable presentations and severities. The challenge of SSTIs is to efficiently differentiate those cases that require immediate attention and intervention, whether medical or surgical, from those that are less severe. SSTIs are among the most severe health problems, particularly in individuals who inject drugs. The skin has an extremely diverse ecology of organisms that may produce infection, and majorities of SSTIs are caused by bacteria, referred as acute bacterial skin and skin structure infections (ABSSSIs). Annually, more than 4 million patients are seen in the emergency department for skin and soft-tissue infections, increased by nearly 1 million from 2007. The factors commonly believed to reveal the high prevalence and incidence of common skin infections in developing countries are poverty related including a low level of hygiene, difficulties accessing water; climatic factors; and overcrowding living conditions. Environmental and lifestyle factors negatively affect skin health and facilitate the spread of contagious skin infections such as furuncles, carbuncles, and impetigo. Poor personal hygiene in rural areas children can lead to various skin infections, and can be transmitted to other close persons. Skin diseases are a common cause of hospital visits worldwide, occurring in both rural and urban populations, affecting both young and old. Reduced functional capacity and increased susceptibility of skin with development of dermatoses, as well as benign and malignant tumors are the most common skin conditions in aged populations worldwide. The diagnosis of skin and soft-tissue infection is difficult because they may commonly trick as other clinical syndromes. The selection of antimicrobial therapy is predicated on knowledge of the potential pathogens, the instrument of entry, disease severity and clinical complications.

***Corresponding Author:** Muhammad Kamran Taj ✉ kamrancasvab@yahoo.com

Introduction

The skin is one of the body's largest organs and it is exposed to a wide-ranging diversity of peripheral stimuli comprising microorganisms. One of the vital functions of the skin is to defend the host from harmful environmental stimuli including invasion by pathogenic microorganisms (Proksch *et al.,* 2008). Skin assists numerous essential functions, including forming the boundary between the inside and outside, providing protection against mechanical and chemical threats, defending the body against trauma, providing innate and adaptive immune defenses, regulating body temperature, maintaining water and electrolyte balance, detecting painful and pleasant stimuli contributing in vitamin D synthesis (Chuong *et al.,* 2002), shielding from ultraviolet (UV) radiations, acting as the sensory organ of touch, and providing outward physical appearance (Sandby-Moller *et al.,* 2003).

The skin consists of 3 layers of tissue: (1) the epidermis, an outermost layer containing the primary protective structure called the stratum corneum, that provides a physical barrier between the individual and the external environment, providing protection from infection (both as a physical barrier and via immune cells) (Fuchs, 2009); (2) the dermis, a fibrous layer and is composed largely of a complex extracellular matrix (ECM) that supports and toughens the epidermis (Lavker *et al*., 1987); and (3) the subcutis, a subcutaneous layer of fat below the dermis that provides nutrients to the other two layers and that cushions and shields the body (Mihm *et al.,* 1976).

Microbial infections of the epidermis, dermis, and subcutaneous tissues are known as skin and soft tissue infections (SSTIs). Such complications are typically related with local pain and may lead to significant health problems including sepsis, endocarditis, and osteomyelitis (Dahlman *et al.,* 2017). Skin and soft-tissue infections are caused by microbial invasion of the layers of skin and underlying soft tissues. Skin and soft-tissue infections have variable clinical presentations, aetiology and severity. Infections might arise at locations wherever the skin barrier has been broken, for example a wound or surgical site infection. Though, infections might also seem devoid of superficial break of the skin barrier, for example folliculitis arising at hair follicles, or furuncles and carbuncles developing at pores. The contribution of deeper layers such as the dermis and/or subcutaneous tissues leads to cellulitis (Ki and Rotstein, 2008), with the involvement of yet deeper tissues, such as underlying muscle leading to fasciitis (Otto, 2010) and even myositis (Nauta, 1990).

The development of a skin and soft-tissue infection is influenced by three steps i.e. bacterial adherence to cells of host, invasion of tissue with evasion of host defences and expansion of toxins (McAdam and Sharpe, 2005). Skin and soft-tissue infections comprise a wide range of clinical presentations, depending on the anatomical site of infection (Dryden, 2010). They vary in severity from slight superficial form of infections to severe lethal infections that breach the deep subcutaneous tissues and oblige hospitalization (Stevens *et al.,* 2014).

Bacterial skin and soft-tissue infections are categorized as primary and secondary skin infections (Del-Giudice *et al.,* 2006). Primary skin and soft tissue infections occur when microorganisms invade otherwise healthy skin, mainly comprised impetigo, ecthyma, erysipelas, erythrasma, folliculitis, furuncles, carbuncles, cellulitis, sycosis barbae, abscesses, wound infections and acute paronychia. The types of organisms that cause primary skin and soft-tissue infections are diverse, and include bacterial, viral and fungal pathogens as well as parasites (Laube, 2004). Whereas secondary skin and soft-tissue infections occur when, because of underlying damaged skin or chronic skin diseases or trauma (e.g. eczema or atopic dermatitis, traumatized skin or a pre-existing skin disease), microorganisms infect already damaged skin, producing further more symptomatic complications (Simou *et al.,* 2005). These underlying diseases act as portals of entry for virulent bacteria (Lipsky, 2002). In both cases, pathogenic microorganisms cause damage to the

surrounding tissues which leads to an inflammatory response characterized by warmth, erythema, and pain. Such damage is more complicated in patients with diabetes because long-term hyperglycemia leads to motor and autonomic neuropathy, cellular and humoral immunopathy, and angiopathy (Herman *et al.,* 2008). Some of these skin infections involve deep layers of skin and supporting structures, leading to substantial morbidity and mortality (Martinez *et al.,* 2009). Most invasive and even life-threatening type of skin infection is necrotizing fasciitis (FustesMorales *et al.,* 2002).

Erysipelas, cellulitis, impetigo, folliculitis and major cutaneous abscesses (furuncles and carbuncles) are the most common types of bacterial skin infections (Stulberg *et al.,* 2002). Skin and soft-tissue infections are among the most widely recognized infections, and may lead to severe local and systemic complications. These infections can be potentially life-threatening and may develop quickly; thus, their initial recognition and proper medical and surgical administration are significant. One of the common causes of skin and soft-tissue infections is the existence of secondary bacterial infection that complicates skin lesions. The skin lesions that can be secondarily infected with bacteria are scabies (Brook, 1995), atopic dermatitis (Brook *et al.,* 1996), psoriasis (Brook *et al.,* 1999), eczema herpeticum (Brook *et al.,* 1998), poison ivy (Brook *et al.,* 2000), and kerion (Brook *et al.,* 1995).

Risk factors of Skin Infection

Skin and soft-tissue infections are common and can affect all age groups; however, certain (co-morbid) conditions such as immunosuppression, trauma; certain pre-existing skin conditions such as ambient skin fever, pre-existing inflammatory dermatoses, and certain other skin conditions such as reactions to insect's bites and scabies; and drug use may influence an individual to skin and soft-tissue infections (Mancini, 2000; Oumeish *et al.,* 2000) or increase the risk of erysipelas and cellulitis (Chahine and Sucher, 2015). Skin and soft-tissue infections are among the most severe health problems in individuals who inject drugs (Noroozi *et al.,* 2019). Individuals who inject drugs are extremely predisposed to various health complications including viral and bacterial infections (Hillgren *et al.,* 2012). Acute bacterial skin and skin structure infections occur when skin integrity is compromised as a result of high bacterial load on the skin, the availability of bacterial nutrients, excessive skin moisture, inadequate blood supply, immunosuppression, and damage to the corneal layer. Poor hygiene, sharing of personal items, physical contact, and crowded living conditions facilitate the spread of contagious skin infections such as furuncles, carbuncles, and impetigo. Poorly controlled diabetes often leads to diabetic foot infection (DFI). Traumatic events such as cuts, bites, and injection drug-use result in wounds that increase the risk of skin and skin structure infections. The risk of surgical site infection (SSI) depends on the category of operation, with clean and low-risk operations having the smallest risk of infections, and contaminated and high-risk operations having the highest risk (Herman *et al.,* 2008).

The factors commonly believed to elucidate the high prevalence and incidence of common skin infections in developing countries are poverty related and include: a low level of hygiene, including difficulties accessing water; climatic factors; and overcrowding living conditions (WHO, 2005). Precocity of diagnosis is one of the main prognosis factors. However, the early stages of the disease are often misdiagnosed due to the absence of specific clinical features. In addition, several other factors have been shown to influence mortality, including underlying pre-existing condition, advanced age, or bacterial virulence, such as invasive group A *Streptococcus* (Baroux *et al.,* 2014).

Epidemiology of Skin Infection

Regardless of their high frequency, there are limited data on the incidence and fluctuations of common bacterial skin infections such as impetigo, erysipelas or non-necrotizing cellulitis (Koning *et al.,* 2006). The incidence of skin and soft-tissue infections in the general population has been increasing in recent

years, resulting in a larger number of patients being seen and treated in the emergency department (ED), as well as admitted to the hospital (Edelsberg *et al.,* 2009). Annually, more than 4 million patients are seen in the ED for skin and soft-tissue infections, increased by nearly 1 million from 2007 (Prusakowski and Kuehl, 2015). To a large degree, this trend appears to correlate with the greater prevalence of community-associated methicillin-resistant *Staphylococcus aureus* (CAMRSA) (Pallin *et al.,* 2008). According to the Healthcare Cost and Utilization Project Statistical Briefs, there were 656,000 hospitalizations due to skin and soft-tissue infections in 2010, which was an increase of 75% from 1997 (Pfuntner *et al.,* 2006). Nonetheless, SSTIs are encountered often in both the outpatient and inpatient settings. According to the 2011 National Statistics of the Healthcare Cost and Utilization Project, SSTIs accounted for 3.4 million emergency department visits, or 2.6% of all emergency department visits, with 13.9% of visits resulting in hospitalization (Merritt *et al.,* 2013). Data from the European Centre for Disease Prevention and Control (ECDC) evaluated that 4% of all healthcare-acquired infections (HAIs) reported between 2011 and 2012 were skin and soft-tissue infections, with surgical site infections being the second most frequently reported HAI (19.6%)(Suetens *et al.,* 2013). Infections from methicillin-resistant *S. aureus* more than doubled during a 5-year period in patients who presented with purulent acute bacterial skin and soft-tissue infection to a Los Angeles ED, increasing from 29% in 2001 to 64% in 2005 (Moran *et al.,* 2005). Data from the SENTRY Antimicrobial Surveillance Program estimating causes of various types of skin and soft tissue infections between 1998 and 2004 presented that *S. aureus* was a principal pathogen globally and accounted for 44.6% of isolates in North America; 35.9% of the isolates were methicillin resistant (Moet *et al.,* 2007). The worldwide epidemiology of community-acquired methicillin-resistant *S. aureus* is heterogenous, with various clones in some areas (Talan *et al.,* 2011; Chua *et al.,* 2011).

Symptoms of Skin Infection

The basic signs of skin infections include the inflammatory reaction types, with additional signs, for example, fever, speedy development of wounds and bullae (Ki and Rotstein, 2008). Bacterial skin infections usually can be recognized by common presenting symptoms such as erythema (warmth), edema (swelling), tenderness (pain), induration, crusting, and drainage (Wilson, 1998). Depending on the range and site of infection, dysfunction of the infected area (e.g., hand or foot) may also be present. The symptom that greatly increases the doubt of a skin and soft-tissue infection is fever. Additional signs and symptoms, including crepitus, bullae, anesthesia and hemorrhage; amplify the doubt and approve the diagnosis (Hook *et al.,* 1986). Systemic manifestations of fever (lower than 35°C or higher than 40°C), tachycardia (heart rate faster than 100 beats/min), hypotension, or altered mental status indicate systemic toxicity, and protend deeper penetration and invasion of the infection. If permitted to progress, patients with these clinical signs might continue to cultivate severe sepsis or shock, which bring high morbidity and mortality rates (Stevens *et al.,* 2005; Vinh and Embil, 2005).

Role of Microorganisms in Skin Infection

The microbiology of skin and soft-tissue infections also may vary with the means of entrance (Eron *et al.,* 2003). Thus, the skin and soft-tissue infections might be normal host flora transferred from the instrument of entry or transferred from the environment (Rennie *et al.,* 2003). The majorities of skin and soft-tissue infections are caused by bacteria and are referred to as acute bacterial skin and skin structure infections (ABSSSIs). Some cases are caused by viruses, most notably, varicella zoster virus (VZV), which is the causative organism of chickenpox and shingles (Merritt *et al.,* 2013). The vast majority of colonizing normal host flora consists of bacteria (Todar, 2008). *S. aureus* and group A-hemolytic *Streptococci* (*S. pyogenes*) remained the most widespread Gram positive cocci and were isolated from all sites of body. In contrast, organisms that exist in the mucous membranes adjacent to the lesions prevailed in

infections following to these membranes. In this manner, enteric Gram-negative bacilli and *Bacteroides* spp. were most often found in buttock and limb lesions. The possible foundations of these organisms are vagina and the rectum, where they exist in normally. Group A-haemolytic *Streptococci*, *Fusobacterium* spp., *Prevotella* spp., and *Porphyromonas* spp. were most normally found in lesions of the face, head, fingers and neck. These microorganisms in all probability had reached these sites from the oral cavity, where they are portion of the normal flora (Brook, 2002).

The most recurrent agents in acute bacterial skin and soft-tissue infections (ABSSSIs) are aerobic Gram positive cocci pathogens; *Staphylococcus aureus* including methicillin-resistant *S. aureus* (MRSA) and methicillin-susceptible *S. aureus* (MSSA); and βhaemolytic *Streptococci* (Garau *et al.,* 2013). Earlier the year 2000, methicillin resistant *S. aureus* (MRSA) was an uncommon pathogen in community-acquired (CA) infections and was more common in hospital-acquired infections (Naimi *et al.,* 2001). Conversely, the prevalence of community-acquired methicillin-resistant *S. aureus* (CA-MRSA) has critically increased in the past years, and community-acquired methicillin-resistant *S. aureus* is now a predominant cause of purulent acute bacterial skin and soft-tissue infections in the US (Talan *et al.,* 2011). In skin infections that have a more complex aetiology, such as those resulting from necrotizing fasciitis, diabetic foot infection and ecthyma gangrenosum, the range of pathogens is abundant and is dependent on the clinical setting (US FDA, 2013).

Anaerobic Gram-positive bacilli containing *Clostridium* spp. and *Enterobacteriaceae* (Yong *et al.,* 1994) are also involved in skin infections. Furthermore, certain anaerobic Gram-negative bacteria, mostly with polymicrobial infections are involved in acute bacterial skin and soft-tissue infections (Gunderson, 2011) like *Peptostreptococcus* spp., *Bacteriodes* spp., *Prevotella* spp., *Porphyromonas* spp. and *Fusobacterium* spp. (Brook, 2002). Other organisms, such as *Staphylococcus epidermidis*, group B *Streptococci*, *Escherichia coli*, *Pseudomonas aeruginosa* and some Gram-negative bacteria, are rarely involved in skin infections (Darmstadt, 1998).

Effects of Hygienic Condition on Skin Infection

For over a century skin hygiene particularly of the hands is considered to be one of the primary mechanisms to reduce risk of transmission of infectious agents by both the contact and fecal-oral routes (Liss and Sussman, 1999). Basic hygiene measures to reduce infection are important such as washing hands, and keeping fingernails trimmed to avoid scratching and covering sores. Inadequate hygiene practices can in turn promote the spread of infectious diseases including skin infections and ultimately result in chronic sequelae (Foster *et al.,* 2017).

Frequent Hands Washing Effect on Skin Infection

Each time the skin is washed, it undergoes profound changes. Most of these changes are transient, but among persons in occupations such as health-care, for whom frequent hand washing is required, long-term changes in the skin can result in chronic damage, irritant contact dermatitis and eczema, and concomitant changes in flora (Aly and Maibach, 1981). Irritant contact dermatitis, which is associated with frequent handwashing, is an occupational risk for health-care professionals, with a prevalence of 10% to 45% (Larson *et al.,* 1997).

Skin Infection in Prison Population

In a crowded, institutionalized setting such as a prison, the interplay of such factors is more pronounced. As a result, many outbreaks have occurred in such settings (CDC, 2003). In a prison setting, poor personal hygiene practices were significantly associated with an increased risk for skin infection (MRSA) (Kazakova *et al.,* 2005).

Skin Infection in Rural Area

People of rural areas have developed various unhygienic health practices and undesirable health

attitudes because of poverty, illiteracy, ignorance, misconception and superstition. Rural areas children have suffered various skin infections due to poor hygienic practices (Walvekar *et al.,* 2006). Poor hygiene can impact a person's life negatively in many ways. Poor personal hygiene can lead to skin infections with bacteria and fungi and parasitic infestations of the skin and hair, this can be transmitted to others in close contact with the person. The consequences are not isolated to the outside of the body (Simpkins, 2019).

Antiseptic-Use Effects on Skin Infection

In fact, the current debate surrounding the increased use of antiseptic products, not only in health care settings but also for more general bathing and washing, has increased focus on the potential for the emergence of antiseptic-resistant strains of skin flora (McMurry *et al.,* 1998). During the 1960s, one group of investigators (Mortimer *et al.,* 1966) was among the first to demonstrate that although *S. aureus* is normal flora generally residing in the anterior nares, it is rarely airborne, it is almost always transmitted by direct touch, and handwashing reduces its transmission several fold. They found that *S. aureus* was spread by the airborne route only 6%–10% of the time, but 54% of babies in a new-born nursery handled by a "carrier" nurse with unwashed hands subsequently became colonized with her strain of *S. aureus* (Mortimer *et al.,* 1962).

Overcrowding Effects on Skin Infection

Many households and communities are considered overcrowded, a situation that can lead to a wide range of health problems including chronic skin conditions (e.g. necrotizing fasciitis) (Liotta, 2018). Large numbers of people per household and sharing of contaminated bed linen and towels increases the likelihood of transmission of bacteria from person to person (DSNZ, 2010). Living in overcrowded accommodation or housing with shared facilities puts children (Brown *et al.,* 2004) at greater risk of contracting viral or bacterial infections, (Baker *et al.,* 2000) especially skin disorders (Amery *et al.,* 1995).

In developing countries, one of the main risk factors associated with skin disease appears to be household overcrowding. In primary schools in western Ethiopia, more than 80% of randomly examined schoolchildren had at least one skin disease, which was usually caused by one of four conditions: scabies, pediculosis capitis, tinea capitis, or pyoderma (Figueroa *et al.,* 1996). Those figures mirror work carried out elsewhere. For example, in Tanzania, in a survey of two village communities, Gibbs (1996) found that 27% of patients had a treatable skin disease, and once again, infections were the most common diseases. Overcrowding was a major risk factor in that survey. A similar community-based survey in Sumatra, Indonesia, showed a 28% prevalence of skin disease (Saw *et al.,* 2001). What seems to influence the overall prevalence and pattern of skin conditions in certain areas is the existence of a number of common contagious diseases, notably, scabies and tinea capitis (Mahe *et al.,* 2003).

Role of Injuries and Insect bites in Skin Infection

Broken skin as a result of grazes, cuts, bites, stings, infestations, burns, accidental falls or sports injuries increases the risk of cellulitis and other skin infections. Eczema has been identified as a significant contributor to skin infections. The dryness, cracking, itching and scratching that eczema causes, increases the risk of bacteria entering through the skin (Hunt, 2004).

UV Light Effects on Skin Infection

Lifelong and repeated exposure to UV rays damages the skin leading to benign and to malignant skin changes. Indeed, the incidence of skin cancers and associated morbidity and mortality is increasing worldwide and explicitly with age. Skin cancers are the most frequent cancers overall (Boyers *et al.,* 2014; Mayer *et al.,* 2014).

Climatic Effects on Skin Infection

The climatic conditions and a variety of other environmental factors affect several skin characteristics facilitating or conditioning the outbreak of a series of dermatoses.

For instance, low environmental relative humidity (RH) is able to increase skin permeability (Denda *et al.,* 1998), to thicken the epidermal layers, and to stimulate the production of inflammatory mediators (Singh and Maibach, 2013). These changes are particularly observed in patients with chronic inflammatory dermatoses such as psoriasis, atopic dermatitis, and senile xerosis. In which pruritus is usually more severe in cold dry climates (Pierard *et al.,* 2014; Pierard-Franchimont *et al.,* 2014). Hot and humid climatic conditions may also predispose populations to pyoderma, thereby affecting the distribution of disease (Mahe *et al.,* 2003).

As skin is the most exposed organ to a variety of environmental conditions, especially exposed to increased heat and humidity, influencing factors for bacterial skin infections and inflammatory diseases of skin (Due and Australia, 2017). Warmer climatic conditions lead to a greater prevalence of skin infections including bacterial skin infections such as impetigo, cellulitis, and boils; skin conditions due to fungal infections such as pityriasis versicolor and tinea pedis; and viral skin conditions.

Some inflammatory skin diseases due to climatic change include: contact dermatitis which is more common and more severe in high ambient temperature; asteatotic eczema which is less common in hot, humid climates; atopic dermatitis, prevalence of which may be affected by changes in aeroallergens (such as the dust mite, *Dermatophagoides pteronyssinus*); higher temperatures cause more intertrigo (intertriginous dermatitis is a skin rash in large skin folds) especially when associated with obesity and diabetes; hyperhidrosis leads to miliaria and transient acantholytic dermatosis (Grover disease); and a hot environment may also cause flares of rosacea, cholinergic urticaria (skin rash), and heat urticaria (Due and Australia, 2017).

Several studies have shown that between 30 and 50% of young people suffering from acne complained an aggravation of their cutaneous disease during summer principally due to increased sweating (Sardana *et al.,* 2002). Pyoderma is more prevalent in warmer areas, especially when there is high relative humidity (Krashchenko, 1989; Kapil and Sood, 1989). Thus, it was reported that in black population in the southern USA, the incidence of bacterial skin infection in the warm, humid months is reported to be as high as 50% in children aged from 2 to 6 years, but it decreases to 4% in winter (NELSON *et al.,* 1976).

Flood Effects on Skin Infection

Skin diseases, along with respiratory and diarrheal illnesses, are the most likely diseases seen after natural disasters associated with flooding (CDC, 2005). Melioidosis is typically sporadic but several recent clusters of disease are clearly associated with unusually high precipitation and hurricanes, floods, and tornados may allow for outbreaks (Inglis *et al.,* 2011).

Gender Effects on Skin Infection

Based on clinical observations and epidemiological studies (Lasithiotakis *et al.,* 2008), gender differences have been observed in diversifying spectra of skin diseases. With respect to skin disorders, males are generally more commonly afflicted with infectious diseases and pre-cancerous/malignant skin diseases while women are more susceptible to psychosomatic problems, pigmentary disorders, certain hair diseases, and particularly autoimmune dermatoses as well as allergic diseases. In addition to pregnancy dermatoses, there are significantly more female-predominant than male-predominant skin diseases. Dermatoses in the genital area differ between men and women. The mechanisms underlying gender differences in skin diseases remain largely unknown. Differences in the skin structure and physiology, effect of sex hormones, ethnic background, sociocultural behaviour and environmental factors may interact to exert the influences (Chen *et al.,* 2010).

Sex steroids modulate epidermal and dermal thickness as well as immune system function, and changes in these hormonal levels with aging and/or

disease processes alter skin surface pH, quality of wound healing, and propensity to develop autoimmune disease, thereby significantly influencing potential for infection and other disease states. Gender differences in alopecia, acne, and skin cancers also distinguish hormonal interactions as a major target for which more research is needed to translate current findings to clinically significant diagnostic and therapeutic applications (Dao and Kazin, 2007).

Men and women differ in the metabolism of and response to androgens and estrogens (Chen *et al.,* 2002). Estrogens are known to accelerate wound healing, improve inflammatory disorders, increase epidermal thickness, and protect against photo-aging of the skin (Thornton, 2002). Men are also more prone to skin cancer; this increased risk may be partly explained by their heightened susceptibility to ultraviolet-induced immunosuppression compared with women (Dao Jr and Kazin, 2007).

Male gender and body mass index (BMI) were found to be statistically significant risk factors of skin diseases with an odd ratio 1.79 (CI 1.08-2.96) and an odd ratio 1.08 (CI 1.02-1.16) respectively (Yeung *et al.,* 2018). The high prevalence of skin infections might be accountable for this since male was more commonly affected by skin infections when compared with female (Chen *et al.,* 2010). An underlying complicated mechanism between sex hormones and epidermal and dermal thickness, immune system function, skin surface pH, etc., was implicated (Dao and Kazin, 2007).

Although women have a greater incidence of dermatological disorders (Kong *et al.,* 2016), they also demonstrate accelerated wound healing compared with men (Emmerson *et al.,* 2013). Yet despite these differences, very few studies have directly addressed sex-dependent effects on skin disease (Kong *et al.,* 2016).

Age Effects on Skin Infection

The International League of Dermatological Societies (ILDS) has identified consequences of skin aging as one of the most important grand challenges in global skin health (Blume-Peytavi *et al.,* 2016). Skin diseases are a common cause of hospital visits worldwide, occurring in both rural and urban populations, affecting both young and old (Sharma *et al.,* 2012). Skin aging is associated with a reduction in functional capacity that itself increases the susceptibility to skin problems and the subsequent development of dermatoses such as dry skin, itching, ulcers, dyspigmentation, wrinkles, fungal infections and skin cancers. As well as changes in skin structure and function, its appearance is the key observable marker of the overall aging process (Gupta, 2010). Skin epidermal alterations with increasing age; increase the susceptibility to a wide range of skin problems: colonization by pathogenic bacteria; reduced stratum corneum cohesion and hydration, leading to dry skin and pruritus, conditions highly prevalent in aged individuals leading to a substantial negative impact on quality of life (Chang *et al.,* 2013; Garibyan *et al.,* 2013).

The commonest age for presentation was between 1-5 years (Sardana *et al.,* 2009). At this age, children are intermingling with their infectious contacts and are constantly exposed to new infections in their neighbourhood due to their lack of awareness. The next common age group was after five years. These children are exposed to a wider variety of infectious aetiologies as they are entering into schools at about this time. Infants were seen to be least affected, most probably because they are confined to their homes and are less in contact with infections in the community (Shrestha *et al.,* 2012).

Skin and soft-tissue infections are quite common in elderly people. Epidemiological figures about the most prevalent age-associated skin infections are summarized to indicate the burden of skin infections in the elderly worldwide (Hodin, 2014). Cellulitis and infected ulcers are the most commonly encountered skin infections in the elderly (Laube and Farrell, 2002). Elderly individuals have an increased susceptibility to skin infections due to age-related anatomical, physiological and environmental factors (Laube, 2004).

Skin Infection in School-going Population

Skin infections are common during school-going age due to constant exposure to subclinical infectious cases by intermingling with each other (Sharma, 1999).

Diagnosis of Skin Infection

Most skin and soft-tissue infections diagnosis depends on clinical impression. Research laboratory examinations help to approve the diagnosis and explain physical characteristics of particular aetiologies. Bacterial investigations may possibly include tissue swab with culture, blood cultures, needle aspiration, ultrasound, x-ray, and computed tomography (CT) scan or magnetic resonance imaging (MRI) screen, depending on the clinical expressions (Hook *et al.,* 1986).

The diagnosis of skin infection is problematical in light of the fact that they may commonly adopt the appearance of other clinical diseases (Ki and Rotstein, 2008). In diagnosing the condition, it is important to describe if the infection has the potential to grow into a serious or life threatening disorder. The clinician must explain whether the infection is superficial or deep, localized or spreading; plus whether it has purple discoloration, skin necrosis, or blistering (Wilson, 1998). If the infection is diagnosed early and treated properly, these infections are practically always treatable, but if diagnosis is late and/or treatment is insufficient, some infections have the potential to cause severe complications for example septicemia, nephritis, arthritis, and carditis. In particular, cellulitis needs rapid intermediation (Hedrick, 2003).

Treatment & Management of Skin Infection

Empiric antimicrobial therapy for bacterial skin and skin structure infections is usually initiated (before a microbiological diagnosis is available) with an agent that has excellent antimicrobial activity against the likely pathogen(s). Therefore, the antibiotic choice initially depends on the type and severity of infection and the suspected pathogens (Swartz, 2004). Management of skin and soft-tissue infections is dependent on the clinical presentation and the severity of the infection (Stevens *et al.,* 2014). Management of skin infections rely on rapid surgical debridement and broad-spectrum antibiotic therapy (Wang and Lim, 2014). In general, a combination of surgical debridement or drainage and antibiotic treatment is used to treat the infection (Dryden, 2010), although incision and drainage, without the need for antibiotics, is usually sufficient for treating simple abscesses or boils (Sartelli *et al.,* 2014). Determining the level of disease severity is an important first step in the clinical management of skin and soft-tissue infections in order to determine the type of care and empirical therapy (Ki and Rotstein, 2008). Failure to do this can lead to inappropriate prescribing, with overtreatment of mild skin and soft-tissue infections and undertreatment of severe skin and soft-tissue infections having been reported previously (Marwick *et al.,* 2012). Three therapeutic approaches are favoured in treating skin infections: (a) surgical drainage and debridement, (b) wound culture with susceptibility testing, and (c) early and appropriate empiric antibiotic therapy (van Hal and Paterson, 2011). Therapeutic indications were stratified on the basis of clinical manifestations, classified as mild, moderate and severe (Falcone *et al.,* 2013). Guidelines for the diagnosis and management of skin and soft-tissue infections (SSTIs): 2014 update by the Infectious Diseases Society of America (Stevens *et al.,* 2014) has clearly suggested that, for mild purulent SSTI, I&D alone is indicated; for moderate purulent SSTI, it should be treated with I&D plus TMP-SMX or doxycycline as empiric antimicrobial therapy but remain or switch to TMP-SMX if MRSA is isolated. As for severe purulent SSTI, in addition to I & D, either Vancomycin or daptomycin or linezolid or Televancin or Ceftaroline is recommended as empiric antimicrobial therapy and should remain unchanged when MRSA is suspected or confirmed (Chuang and Huang, 2013).

For non-necrotizing skin and soft-tissue infections, including those caused by methicillin-susceptible *S. aureus*, commonly used antibiotics include Penicillin G, Cloxacillin, Ceftriaxone and Clindamycin (Montravers *et al.,* 2016).

Antibiotics are used empirically with consideration for resistance patterns. Current antibiotic recommendations include penicillinase-resistant penicillins, first-generation Cephalosporins, Azithromycin, Clarithromycin, Amoxicillin-clavulanic acid, or a second-generation fluoroquinolone in the skeletally mature patient (Stulberg *et al.,* 2002). For suspected polymicrobial acute bacterial skin and soft-tissue infection, treatment include coverage of Gram-negative and anaerobic pathogens (Chua *et al.,* 2011) with a second-, third-, or fourth-generation Cephalosporin; and is usually indicated in children under three years and in patients with diabetes or who are immunocompromised (Stulberg *et al.,* 2002).

The mechanisms of injury for wound infections vary from animal bites to gunshot wounds, and in most cases, empiric antibiotic therapy must be initiated before culture and susceptibility results are available (Gunderson, 2011). Although the rate of treatment failures for acute bacterial skin and soft-tissue infection remains relatively low in the emergency department (ED), failures are more likely to occur with *S. aureus* infections (Mistry *et al.,* 2011). No clinical or epidemiologic risk factors reliably distinguish community-acquired methicillin-resistant *S. aureus* (CA-MRSA) from other pathogens, and CA-MRSA skin infections range from simple cutaneous abscesses to fulminant necrotizing fasciitis (Stryjewski and Chambers, 2008; Abrahamian *et al.,* 2008).

Conclusion

Skin and soft-tissue infections are among the most common infections, which can be potentially mortal and may progress rapidly; therefore, their early recognition and appropriate medical and surgical management are important. Necrotizing fasciitis is the most invasive and even mortal type of skin infection. The factors commonly elucidate the high prevalence and incidence of common skin infections in developing countries are poverty related factors including poor hygiene practices, difficulties accessing water, climatic factors, sharing personnel items, excessive use of antiseptic products, inadequate drug-use and overcrowding living conditions. In the face of their high frequency, there are inadequate data on the fluctuations and incidence of common bacterial skin infections as impetigo, erysipelas or non-necrotizing cellulitis. On the basis of clinical manifestations and severity of skin infection, treatments of skin infections include surgical debridement; early and appropriate empirical antibiotic therapy; and wound culture with susceptibility testing. For uncomplicated mild to moderate infections, the oral route suffices, whereas for complicated severe infections, intravenous administration of antibiotics is warranted.

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