

RECOGNIZING NEGLECTED TROPICAL DISEASES THROUGH CHANGES ON THE SKIN



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Recognizing neglected tropical diseases through changes on the skin: a training guide for front-line health workers.

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1. INTRODUCTION

The skin of a patient is the first and most visible structure of the body that any health-care worker encounters during the course of an examination. To the patient, it is also highly visible, and any disease that affects it is noticeable and will have an impact on personal and social well-being. The skin is therefore an important entry point for both diagnosis and management. Many diseases of humans are associated with changes to the skin, ranging from symptoms such as itching to changes in colour, feel and appearance. The major neglected tropical diseases (NTDs) frequently produce such changes in the skin, re-enforcing the feelings of isolation and stigmatization experienced by patients affected by these diseases. Indeed, these are often the first signs that patients will notice, even before changes in internal organs or other systems occur. The following NTDs all have prominent skin changes at some stage in their evolution.

Purpose of this guide

This training guide explains how to identify the signs and symptoms of neglected tropical diseases of the skin through their visible characteristics. It also contains information on how to diagnose and manage common skin problems that front-line health workers may encounter.

Target audience

The guide is intended for use by frontline health workers without specialist knowledge of skin diseases. Pathways for more detailed investigation and/or management are described but, often, this will involve referral to a specialist service.

2. NEGLECTED TROPICAL DISEASES OF THE SKIN

This section summarizes the characteristics of the major neglected tropical diseases of the skin, or the so-called skin NTDs.

2.1 Buruli ulcer

Buruli ulcer is an infection mainly affecting the skin caused by *Mycobacterium ulcerans*. The mode of transmission is not known, although in many cases there is associated exposure to rivers, streams or wetlands. The first changes are often raised lumps on the skin that subsequently ulcerate. These ulcers are usually single and large, with a yellowish surface appearance and an underlying red moist base; sometimes 2–3 ulcers may appear. The edges of the ulcer are often undermined, making it is easy to insert a blunt probe for a short distance underneath it. During the early stages of infection, extensive swelling may extend around the emerging ulcerated area; this is characteristic of Buruli ulcers. Most patients living in areas where the disease is endemic are children aged under 15 years. **Fig.1.**

2.2 Cutaneous leishmaniasis

Cutaneous leishmaniasis is an infection of the skin or oral mucosa caused by *Leishmania* protozoa. The infection is spread through biting insects, sandflies of the genera *Phlebotomus*, *Lutzomyia* and *Psychodopygus*. Reservoir hosts are wild animals, domestic animals and humans. It also presents with lumps on the skin that can be rounded or flat and which may ulcerate in the centre – the base of the ulcer is usually red and bleeds easily. Ulcer edges or borders are often raised. Lesions may be single or multiple, usually occurring on exposed sites such as the face or limbs and containing variable numbers of *Leishmania* parasites. Cutaneous leishmaniasis may affect any age group; while infection normally occurs sporadically, large numbers of people may be affected in areas where displaced populations are housed. The visible changes may vary in different parts of the endemic range; for instance, in areas of South America lesions may also occur in the mouth or nasal passages. **Fig.2.**

Fig. 1. Distribution of Buruli ulcer, worldwide, 2016

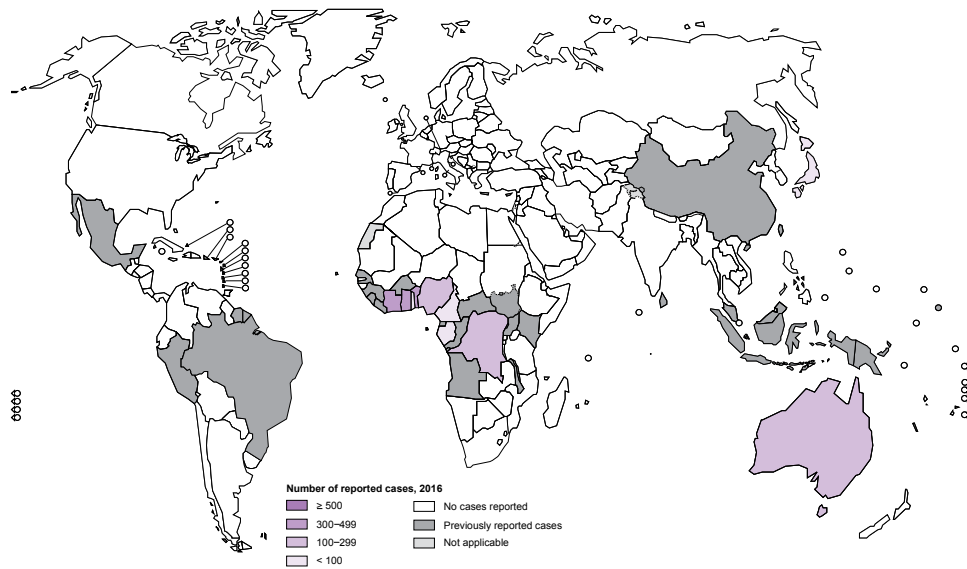
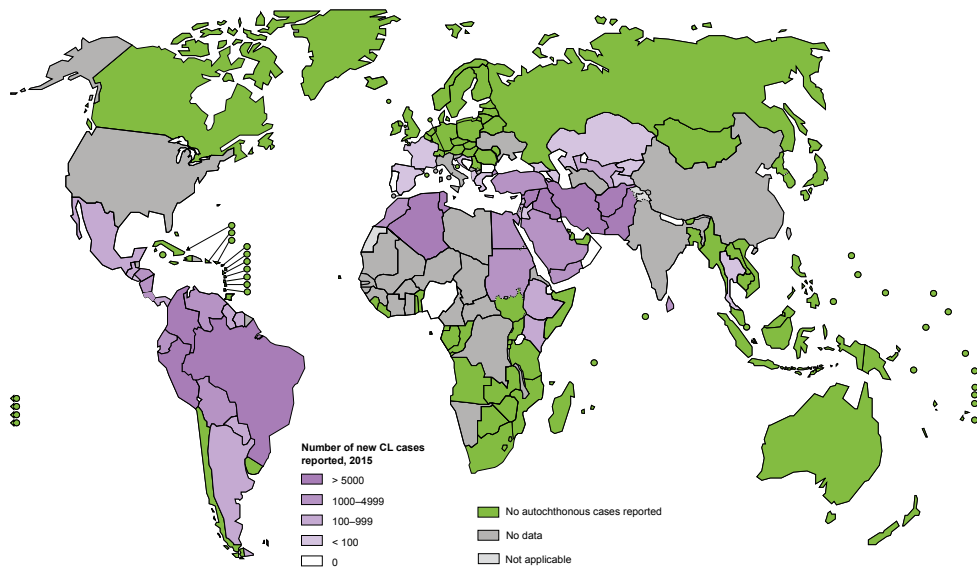


Fig. 2. Distribution of cutaneous leishmaniasis, worldwide, 2016



2.3 Post kala-azar dermal leishmaniasis

Post kala-azar dermal leishmaniasis is a complication of systemic or visceral infection with *Leishmania* that is restricted to a few countries. Some 5–20% of patients who have visceral leishmaniasis develop skin lesions as a late complication of the internal infection. Although it is not completely clear whether these skin lesions are caused by the presence of viable organisms, they do contain a variable number of *Leishmania* parasites and are treated with anti-*Leishmania* medications. These lesions are usually either pale patches, or small or large lumps. This form of leishmaniasis may occur at any age but develops in around 10–30% of patients some 6–12 months after apparent resolution of visceral (internal) leishmaniasis. **Fig.3.**

2.4 Leprosy

Leprosy is a systemic infection caused by the bacterium *Mycobacterium leprae*, which targets the skin and nerves. Although much of the damage caused by leprosy results from destruction of nerves, the skin is affected early in the course of the infection. This disease is transmitted directly through close contact over long periods. Leprosy is transmitted via droplets, from the nose and mouth, during close and frequent contacts with untreated cases. Infection can occur at any age. The first signs are usually skin patches of variable sizes that are usually dry and whose colour may be slightly paler than the rest of the skin. Another presentation of leprosy takes the form of multiple lumps, also in variable sizes. Leprosy destroys nerves, and it is easy to damage the skin because patients cannot feel hot objects or rubbing shoes, and ulcers form at these sites. If untreated, these ulcers (usually on the hands or on the feet), which are known as neuropathic ulcers, can proceed to destroy other structures in the area including bone. **Fig.4.**

Fig. 3. Distribution of visceral leishmaniasis, worldwide, 2016

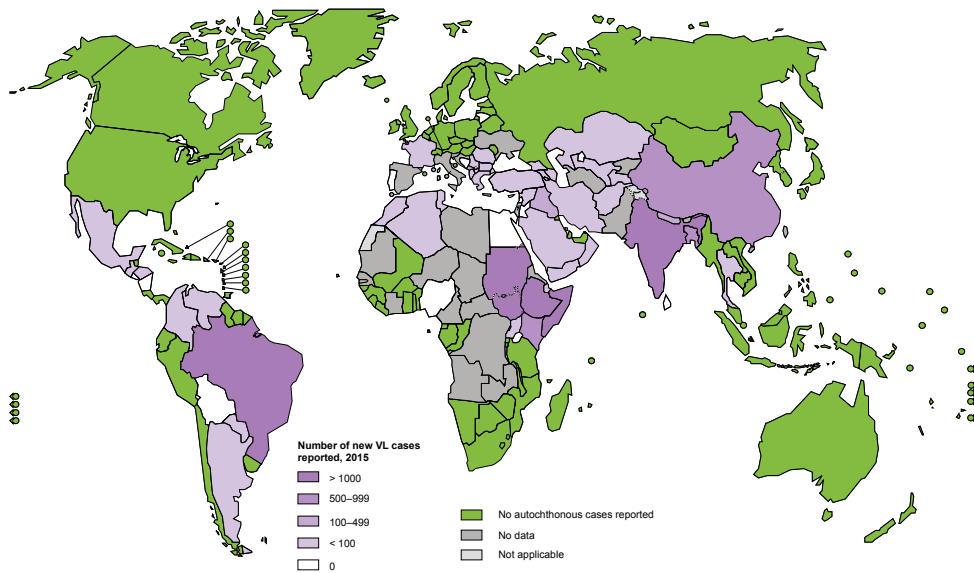
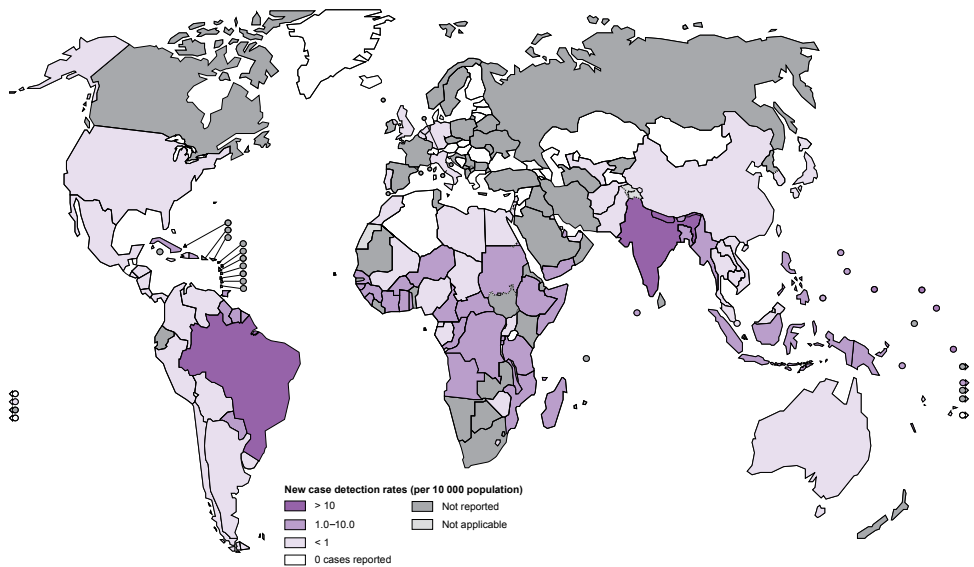


Fig. 4. Leprosy new case detection rates, 2016



2.5 Lymphatic filariasis

Lymphatic filariasis is a systemic infection caused by the filarial nematode worms *Wuchereria bancrofti* and, in limited geographical areas, *Brugia malayi* or *Brugia timori*. It is transmitted by mosquitoes such as *Culex* and *Anopheles*. The filarial worms that cause lymphatic filariasis live in, dilate and obstruct the lymphatic channels, usually in the lower parts of the body such as the groin and genital area and thighs. Adult worms produce immature microfilariae that can be detected in blood at times specific to the periodicity of the parasite. Infections impair lymph flow, leading to progressive swelling or lymphoedema of the lower limbs and, in males, swelling of the scrotum (hydrocele). Other parts of the body can be involved such as the breasts or vulva in females. Although lymphatic filariasis often starts in childhood, it becomes prominent in adults where the results of progressive lymphatic obstruction are apparent. A clinical diagnosis is suggested if one leg becomes swollen and/or if the leg on one side is more swollen than the other. Hygiene and skin care are important to prevent secondary bacterial infections which cause “acute attacks” of acute inflammation of the skin, lymph vessels and lymph glands accompanied by debilitating pain, fever and swelling. Acute attacks, also known as adenolymphangitis or acute dermatolymphangioadenitis, progress the severity of disease. The affected area is warm, reddish and painful. With time the skin may become thickened, covered in small lumps giving a cobbled appearance and susceptible to recurrent infections, **Fig.5**.

2.6 Mycetoma

Mycetoma is an infection of the subcutaneous tissue and bone caused by a variety of different environmental bacteria and fungi. The disease follows implantation of fungi or filamentous bacteria from plant debris or soil through a deep skin injury such as a thorn prick. In mycetoma, there is an infection under the skin that causes the development of a large lump which is usually painless. As this enlarges it becomes covered in smaller lumps, some of which are filled with pus; these discharge yellow or blood-stained fluid that may contain the microcolonies of the infecting organisms seen as tiny black or pale pieces of grit. In advanced mycetoma, the bone in the area is invaded with local destruction and the part of the limb or body affected becomes swollen and deformed. Adults are mainly affected, although rare childhood cases occur. **Fig.6**. Other deep mycoses seen affecting the skin include chromoblastomycosis where there are thick raised patches often with a rough surface like very large warts.

Fig. 5. Countries where lymphatic filariasis is endemic and status of preventive chemotherapy in those countries, 2016

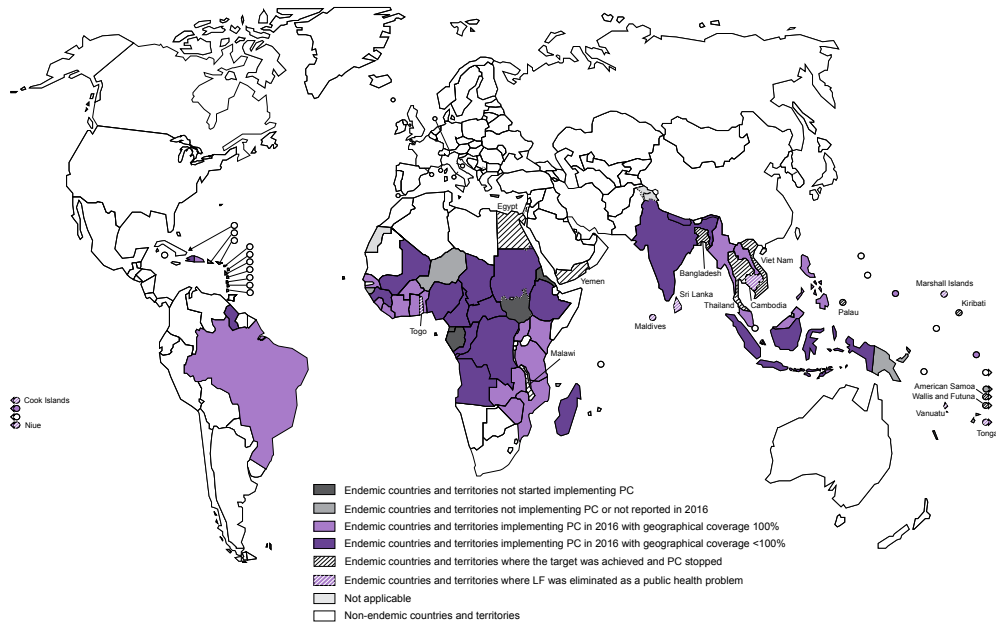


Fig. 6. Prevalence of mycetoma per 100 000 population, latest year available



2.7 Onchocerciasis

Onchocerciasis is a systemic filarial infection caused by *Onchocerca volvulus* that affects the skin and the eye. Infection may lead to blindness or debilitating skin disease. The filarial worm *Onchocerca volvulus* is transmitted by black flies of the genus *Simulium* that breed near fast running streams and rivers. The adult female worms are surrounded by fibrous tissue to form firm subcutaneous or deeper large lumps or nodules, which do not typically cause symptoms. People are most likely to complain of troublesome itch (severe pruritus). Symptomatic skin signs are produced by the inflammatory response to dying microfilaria (an early larval form of the parasite). Similarly, eye diseases such as iritis (inflammation near the pupil of the eye), corneal scarring and retinal damage (retinopathy) result from the inflammatory response to microfilariae. Many patients with onchocerciasis do not have marked skin symptoms, although as the disease progresses the skin becomes wrinkly and skin folds can enlarge and sag, for example in the groin (hanging groin), and visible depigmentation may occur (leopard skin). However, in many endemic areas onchocerciasis is accompanied by small itchy lumps on the skin, often around the shoulders or waist and thighs; constant scratching is common. Sometimes, small itchy lumps appear more densely on one limb than the other and the skin of the affected limb becomes rough, chronically itchy and with thickened patches that are darker in colour than the rest of the skin; these patches are intensely itchy. Onchocerciasis can occur at all ages, although most cases are recognized in older children or adults. **Fig.7.**

2.8 Scabies and other parasitic infections of the skin

Scabies is a very itchy infection caused by the human itch mite *Sarcoptes scabiei*. It is common and endemic in many communities in resource-poor settings and is associated with household overcrowding. The infection is transmitted by human to human contact and although it can affect all age groups, it is particularly common in infants and children. The skin in certain areas is covered with small lumps, some containing pus as well as small squiggly lines where the mites burrow into the skin. Hands, feet, external genitalia, buttocks and shoulders are all commonly affected and usually other members of the household are infected and itch. Secondary bacterial (streptococcal) infection of scabies may cause kidney inflammation or nephritis, an immunological reaction to the bacteria, in children. **Fig.8.**

Tungiasis, an itchy infection caused by a tropical sand flea, *Tunga penetrans*, causes itchy lumps, usually with a central dark or pus-filled plug, most commonly on the feet after contact with contaminated sandy soil, for example in homes or around villages. However, it can occur at almost any site, particularly in areas where there are body folds, and develop at any age.

Fig. 7. Status of preventive chemotherapy for onchocerciasis, worldwide, 2016

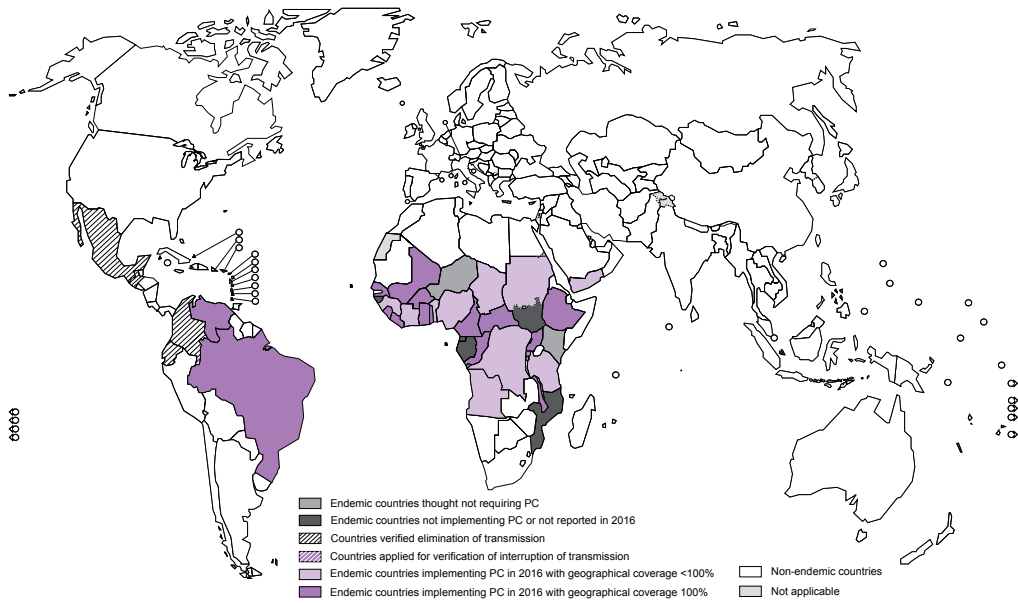
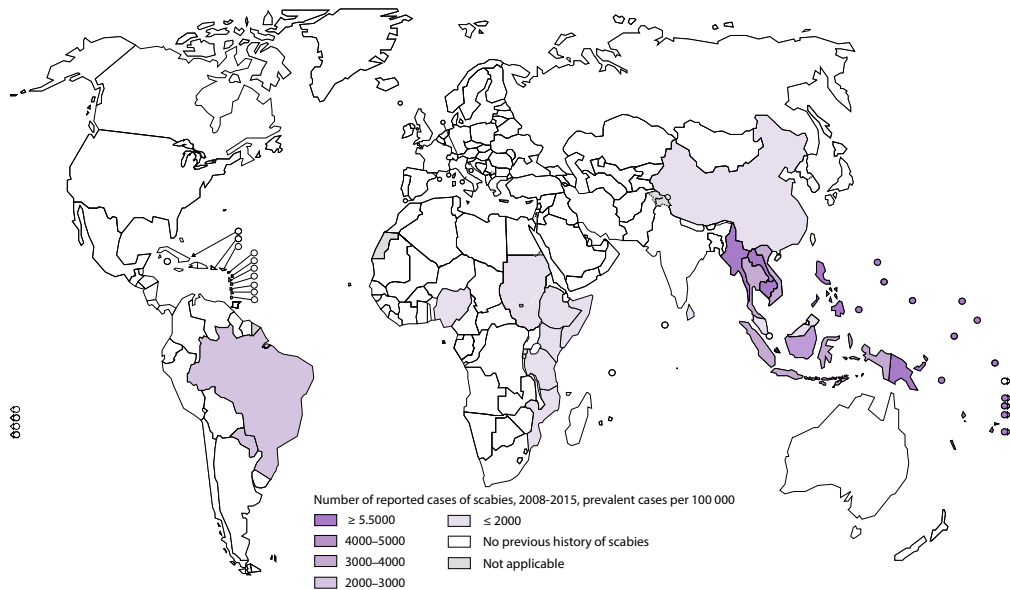


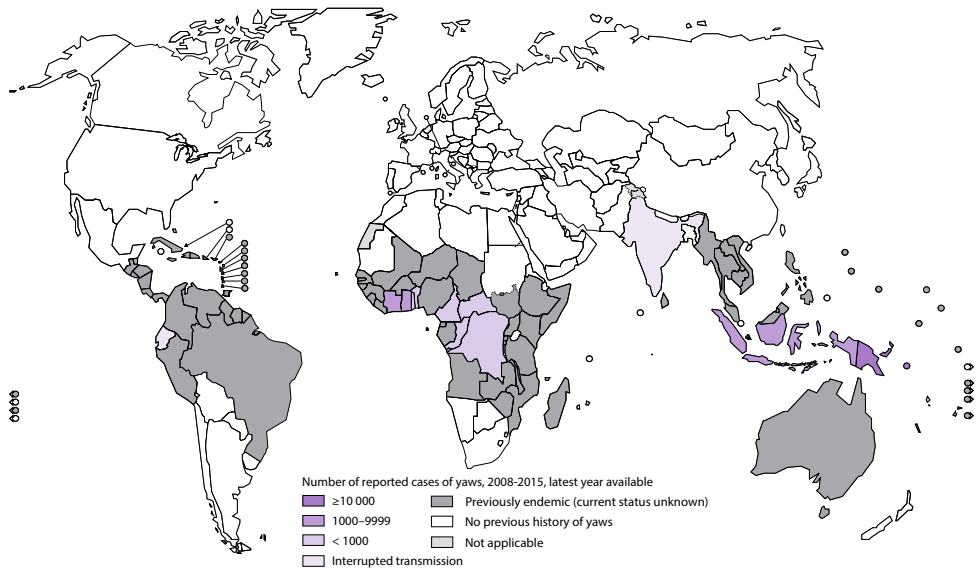
Fig. 8. Distribution of scabies, worldwide, 2016



2.9 Yaws (endemic treponematosi)

Yaws, a systemic infection affecting the skin and, more rarely, bone, is caused by the bacterium *Treponema pertense*, a subspecies of *T. pallidum* which causes syphilis. However, yaws is not sexually transmitted. The disease is often first recognized in children but may affect all ages; it is spread by direct contact between individuals. Yaws presents with one or multiple skin lesions, which appear as small lumps or nodules. These may have a red or yellow surface colour and often feel soft, pebbled or bumpy. These lumps may break down to leave an area of ulceration in the centre of the nodule or appear in the shape of a small volcano. **Fig.9.**

Fig. 9. Distribution of yaws, worldwide, 2008–2016



2.10 Other common non-NTD skin diseases

Skin disease is one of the most common of all human afflictions, affecting about 900 million people in the world at any time. By using changes to the skin as a means of detecting NTDs at their earliest stage, other diseases causing skin changes will be seen. Yet, in most communities, five common conditions account for over 80% of skin disease. It is possible to identify the most common of these other skin diseases and, where feasible, to start treatment as their management is simple and they often respond to medications that are widely available.

The commonest of these diseases are bacterial skin infections or pyodermas such as boils or impetigo (an infection of the skin surface) and fungal skin infections. Other common skin diseases such as eczema are non-infective. These diseases are included in the diagnostic charts and a brief description of their treatments is provided (**Section 5**).

Bacterial skin infections caused by *Staphylococci* (such as impetigo or boils) or *Streptococci* (impetigo) can be transmitted from human to human in homes or schools. They are commonest in children but can affect adults.

Superficial fungal skin infection or tinea is caused by fungi that infect the outer layers of the skin to cause scaly, itchy patches on the body, legs or scalp; in the head there is also loss of hair. They are often transmitted from human to human in homes or schools and can affect all ages.

Eczema, often called dermatitis, is a common non-infectious skin problem causing scattered itchy dry patches with scaling on the skin of the arms (such as the inner surface of the elbows), legs (behind the knees), face and body. Where it is scratched and constantly rubbed the skin becomes darker and thicker. Eczema is common in children. Other common causes of itching are insect bites, which are scattered itchy lumps on exposed sites; these may become infected (see above).

Ulceration or loss of the surface skin is also a common sign of skin or internal disease and important in the differential diagnosis; it is discussed in the next section.

Note

Not every patient affected by a neglected tropical disease will have skin changes, but they are sufficiently common to be a very useful aid to diagnosis and a starting point for using more specialist diagnostic methods such as antigen detection card tests or serology.

3. COMMON CHANGES IN THE SKIN

In order to make a diagnosis by looking at the skin, it is important to recognize that there are a limited number of possible changes in the appearances of the skin due to any disease. A more detailed summary of these changes is provided in the **Annex**, but for the purposes of this guide the descriptions are restricted to the four major changes in the skin, namely: (i) lumps, (ii) ulcers, (iii) swollen limbs and (iv) patches. These changes may occur with or without itch, change in colour or loss of sensation. For the skin NTDs, these are described below.

3.1 Lumps

A lump is a **small** or **large** raised bump that can occur at any site on the skin. Sometimes lumps are hard but they may be soft to touch, which generally indicates that they contain fluid or pus. They can also have a smooth surface or appear rough and wart-like. Lumps may also be painful or itch.

Fig. 3.1.1. Bacterial skin infection – Bullous impetigo with soft fluid-filled lumps



Fig. 3.1.2. Buruli ulcer – Lump in early nodule



Fig. 3.1.3. Cutaneous leishmaniasis – Smooth glazed lump



Fig. 3.1.4. Post kala-azar dermal leishmaniasis – Multiple smooth lumps



Fig. 3.1.5. Lepromatous Leprosy – Small hard lumps around ear lobe



Fig. 3.1.6. Lymphatic filariasis – Swollen leg to show cobbled change seen with chronic lymph obstruction



Fig. 3.1.7. Mycetoma – Lumps, openings of draining sinuses discharging pus and blood



Fig. 3.1.8. Acute papular onchodermatitis – Multiple small itchy lumps



Fig. 3.1.9. Chronic papular onchodermatitis – Flat-topped lumps

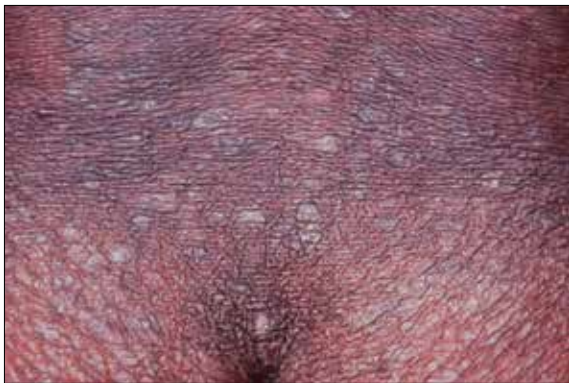


Fig. 3.1.10. Onchocercal nodule – Large hard lump



Fig. 3.1.11. Podoconiosis – Warty lumps on swollen legs



Fig. 3.1.12. Scabies – Small itchy lumps and burrows



Fig. 3.1.13. Tungiasis – Itchy lumps with black centres around toes



Fig. 3.1.14. Yaws – Large lump with raspberry-like surface (papilloma)



Fig. 3.1.15. Yaws – Large lump with raspberry-like surface (papilloma)



Fig. 3.1.16. Buruli ulcer – Lump, an early nodule



Fig. 3.1.17. Cutaneous leishmaniasis – Multiple crusted lumps



Fig. 3.1.18. Tungiasis – Multiple lumps along margin of foot



3.2 Ulcers

An ulcer occurs where there is a break in the surface of the skin. Ulcers are usually round or oval in shape, but they may become irregular and are usually more than 0.5 cm deep. On inspection, the base is often red and raw-looking or it may be covered by dead tissue or a yellow surface crust. Ulceration is an important feature of many skin NTDs.

Other common causes of ulceration include venous or varicose (stasis) ulcers caused by poor drainage through the lower leg veins and arterial ulcers, which develop because of a faulty arterial blood supply. With venous ulceration prominent dilated veins on the leg (varicose veins) are seen and, with arterial ulceration, arterial pulses on the legs cannot be felt. Common infective ulcers caused by bacteria such as *Fusobacterium* and *Haemophilus* occur in areas where yaws is endemic. Clues to the diagnosis of these conditions is included in the diagnostic charts (see **Section 5**).

Fig. 3.2.1. Buruli ulcer – Showing undermined edge



Fig. 3.2.2. Cutaneous leishmaniasis – Ulcer forming on a lump



Fig. 3.2.3. Tuberculoid leprosy – Ulcer in an area with sensory loss



Fig. 3.2.4. Yaws – Ulcerated lesion



Fig. 3.2.5. Ulcers (tropical) – Tropical ulcer caused by *Fusobacterium ulcerans*, this appears over a few days



Fig. 3.2.6. Ulcers (tropical) – Tropical ulcer caused by *Haemophilus ducreyi*, this develops slowly



3.3 Swollen limbs, face or body

Swelling of the skin often occurs when it contains too much fluid.

This change is easiest to see on the limbs as it is possible to compare the size of one limb such as a leg with the other, but large swellings on the face or head as well as the body can also follow inflammation and accumulation of fluid in these areas.

Any swelling that appears as an increase in the circumference of an arm or leg is often best seen when comparing one side with the other. Swollen limbs may be hard to touch or soft, leading to a dent on the skin surface where pressed gently but firmly with a finger, and they can be painful (tender) and warm to the touch – so it is important to ask the patient about pain before touching the limb. Patients will often say that the limb is more swollen by the end of the day and it may reduce when they lie down. It may also be difficult to put on clothes and shoes as these feel tight. In lymphatic filariasis male patients may also present with a swollen scrotum; in females the breast is sometimes affected.

In some areas endemic for NTDs such as the highland areas of Ethiopia and Rwanda, podoconiosis is an important cause of foot or leg swelling (lymphoedema) in children and adults. Podoconiosis is a genetically determined inflammatory reaction to certain soils and often affects both legs.

Leg swelling can occur in other conditions such as heart failure where the presence of other symptoms such as breathlessness, weakness and palpitations may be found.

Fig. 3.3.1. Buruli ulcer – Extensive swelling of the left arm



Fig. 3.3.2. Lymphatic filariasis – Limb oedema



Fig. 3.3.3. Mycetoma – Swelling of the foot and ankle

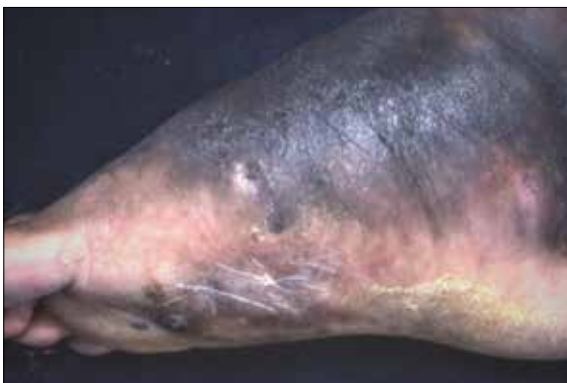


Fig. 3.3.4. Podoconiosis – Bilateral foot swelling



Fig. 3.3.5. Lymphatic filariasis – Swollen arm for more than 5 years



Fig. 3.3.6. Lymphatic filariasis – Scrotal swellings



3.4 Patches

A patch is a distinctive area of skin that is either raised above the skin surface or is different in colour or to feel (texture) compared with the surrounding skin; for example, it may feel rough to the touch. Patches may also itch. Raised patches vary in height above the skin surface from a few millimetres to one centimetre or more.

The ability to recognize changes in skin colour associated with skin lesions largely depends on whether the skin is naturally dark. Darkening or lightening of skin colour is more noticeable in darker skin types. Increases in skin pigmentation associated with skin inflammation may persist for months. Increased redness or erythema may be more difficult to distinguish in darker skin.

Fig. 3.4.1. Buruli ulcer – Patch



Fig. 3.4.2. Cutaneous leishmaniasis – Patch (pebbly) around ear



Fig. 3.4.3. Eczema – Itchy patch (lichenified)



Fig. 3.4.4. Borderline tuberculoid leprosy – Multiple pale patches with loss of sensation



Fig. 3.4.5. Onchocerciasis – Hypopigmented onchodermatitis (leopard skin)



Fig. 3.4.6. Lichenified onchodermatitis – Thickened very itchy patches; worse on one side than the other



Fig. 3.4.7. Post kala-azar dermal leishmaniasis – Pigmented flat patch



Fig. 3.4.8. Fungal infection – Ring shaped patch of *Tinea corporis*; a superficial fungal infection



Fig. 3.4.9. Scalp ringworm or fungal infection – Patch of hair loss and scaling in a child with *Tinea capitis*



Fig. 3.4.10. Yaws – Pale patch (rough surface)



Fig. 3.4.11. Buruli ulcer – Patch over area where ulcer will form (hard to the touch)



Fig. 3.4.12. Fungal infection – Pale scaly patches of pityriasis versicolor



3.5 Other important signs and symptoms of skin involvement

3.5.1 Itchy skin

Itch is the commonest symptom associated with any skin disease and is most often seen where there is active inflammation. Itching may vary in its severity but, in many patients, it is not trivial and may disrupt their daily lives and sleep. Although there are no specific signs of itchy skin, there may be scratch marks or patients may be observed scratching while waiting to be seen.

3.5.2 Loss of sensation

Loss of sensation in an area of skin is a key feature of leprosy and forms a very important part of the examination. Sensory loss of the skin, particularly the feet, can also occur in diabetes.

3.5.3 Changes in skin pigmentation

One of the features of any disease that causes inflammation of the skin is either an increase in skin colour (hyperpigmentation) or a loss of skin colour (hypo- or de-pigmentation). As these are general signs and seldom specific to one disease they will be used as additional changes seen in skin affected by NTDs.

Note

Any of the above signs and symptoms can occur in combination. For instance, lumps on the skin may ulcerate. This is also true of symptoms and signs that accompany inflammation, such as itching and pigment change, both of which may be experienced by patients with ulcers, patches, lumps or swollen limbs.

4. HISTORY TAKING ASKING PATIENTS ABOUT THEIR CONDITION AND EXAMINING THE SKIN

This section describes how to take a medical history from and examine a patient who has problems of the skin.

4.1 Talking to patients with skin problems

Talking to people about their skin condition can reveal much about the disease, how it started and how it has developed further. But what may be obvious to you may not be to the patient. The presence of symptoms such as itching or pain often draws the patient's attention to an area, but the back and backs of the legs or arms are not visible without a mirror and changes, particularly if they do not itch and are not raised, may not be noticed.

Greet the patient and introduce yourself.

Try to use simple terms that are used locally to describe the changes that you (and they) see. The following are points to concentrate on:

- Where is the location of the skin problem/lesion(s)?
- When did you first notice this?
- How did the condition change over time?
- Does it itch or is it painful or warm?
- Where were you living when this first occurred?

- Do you swim or wash in a lake or river?
- Has this been treated with any medicines or home remedies? (Both can be easy to obtain without seeing a health worker in many countries and their use or misuse can alter the appearances of skin lesions.)
- Does anyone else in the family or among your friends have a similar problem?

Remember to ask about reduced sensation in the limbs or in the vicinity of the lesion.

4.2 Examining the skin

Remember these points when conducting an examination of the skin, taking care to avoid any discomfort to the patient:

- Examine the skin, where possible, in good light. Using a poorly lit house or room does not provide the best environment to see the changes.
- Observe the general condition of the patient. Is the patient comfortable or appear weak, in pain, or having difficulty breathing or walking?
- Look at as much of the skin surface as possible and not just the area pointed out by the patient. Step back and examine from a distance. Are there colour changes (e.g. dark brown, pale)? Are most of the skin lesions located in one area of the body or do they affect many parts of the skin?
- Look closely at the following characteristics of skin lesions:
 - What types of skin lesions do you see? Lumps, patches, ulcers, or swelling?
 - What is their colour? Flesh-coloured, red, white, brown, black, yellow?
 - What is the size of most of the lesions? Are they tiny or large? If possible, measure the size of ulcers.
 - Are there any scratch marks?
- Feel the texture of the lesions. Remember to ask if the lesions are painful before touching them. Are they hard or soft? Is the surface rough? Wear gloves to examine broken skin such as ulcers.
- It may be necessary to ask the patient to remove clothes. Bear in mind that examining the skin should also be subject to the normal standards of consent and behaviour. Most patients are modest and shy about exposing themselves, even to health workers, and so providing them with suitable privacy to carry out the examination is important.
- For female patients, examination is often best carried out by female staff. Equally, local traditions of social behaviour have to be respected as it may be difficult to view intimate areas such as genitalia and breasts even where the presence of lesions may help with the diagnosis.

As you will read later, it is often important to add specific additional steps to your questions or examination.

For instance, if you suspect leprosy it will be important to test the lesion or the hands and feet for sensory loss as well as feeling for (palpating) enlarged peripheral nerves. If you suspect that scabies may be important, look for tiny tracks (short scaly lines) or burrows in the skin – these are best seen between the fingers, on the wrists and around the ankles.

In interpreting your findings, remember the natural geography and distribution of NTDs. Many only occur or are more common in certain countries. Statistics on disease prevalence may not be accurate, and even in areas where individual diseases have been reduced to a low level, it is important to be vigilant for the odd case that has evaded detection, as recognizing these patients will prevent re-emergence of the disease.

Table 1. Distribution of targeted skin NTDs by region

Diseases	Region					
	Africa	Asia	Americas	Europe	Eastern Mediterranean	Pacific
Buruli ulcer	++	+	+	–	–	+
Cutaneous leishmaniasis	+	+	++	+	++	–
Post kala-azar dermal leishmaniasis	+	+	–	–	+	–
Leprosy	+	+	+	–	+	+
Lymphatic filariasis	++	++	+	–	+	++
Mycetoma	+	+	+	–	+	–
Onchocerciasis ¹	+	–	+	–	+	–
Scabies	++	++	++	+	+	++
Yaws	+	+	+	–	–	+

++ = Common; + = Present but not common; – = Absent

¹ = Common in endemic areas

5. USING KEY SKIN SIGNS TO MAKE THE DIAGNOSIS

This section is subdivided for each of the main clinical signs in the skin: lumps, ulcers, swollen limbs, patches and itching. Diagnostic charts are included and should be used in conjunction with the NTD distribution maps (Figs 1–9).

Table 2. Summary of skin NTDs and the four main clinical signs and one symptom in the skin; itch may accompany any of these signs

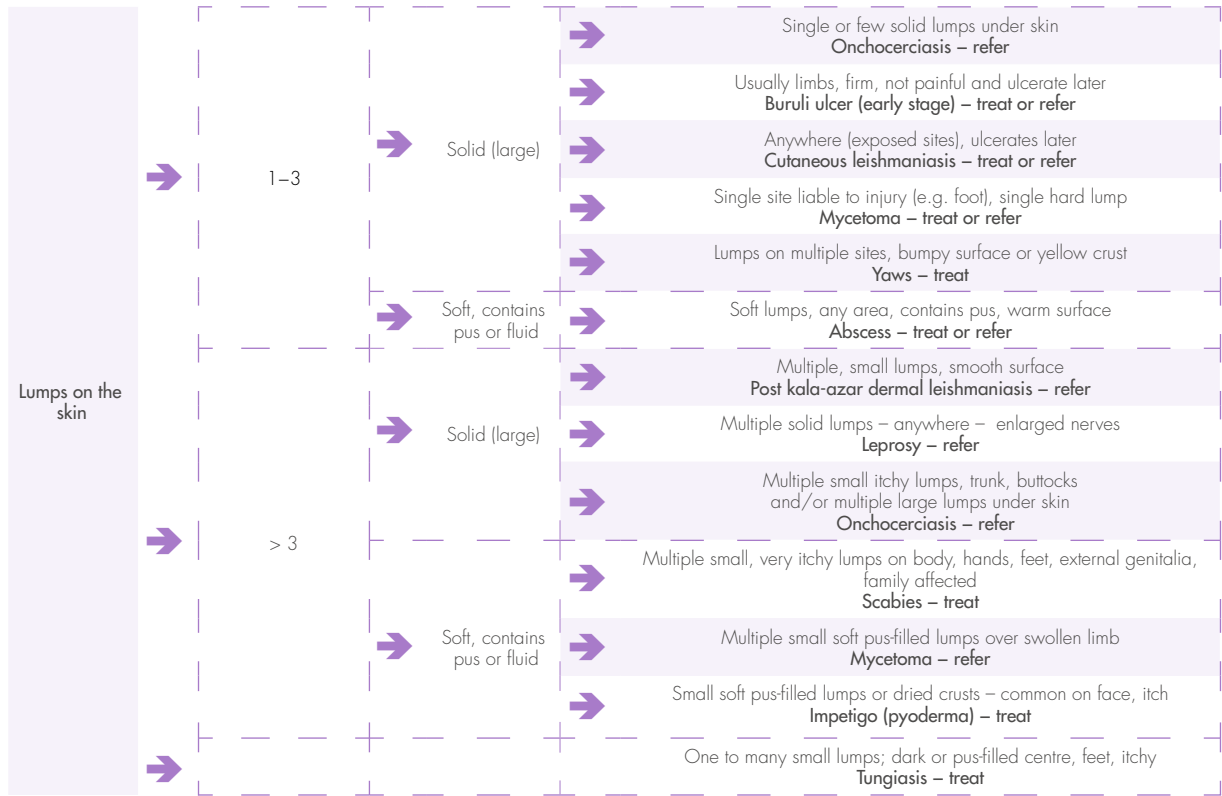
Diseases	Lumps	Ulcers	Swollen limbs	Patches	Itchy skin
Buruli ulcer	+	+	+	+	–
Cutaneous leishmaniasis	+	+	–	+	–
Post kala-azar dermal leishmaniasis	+	–	–	+	–
Leprosy	+	+	–	+	–
Lymphatic filariasis	+	+	++	+	– ¹
Mycetoma	+	+	+	–	–
Onchocerciasis ²	+	–	–	+	+
Scabies	+	–	–	–	+
Yaws	+	+	–	+	–

++ = Common; + = Present but not common; – = Absent

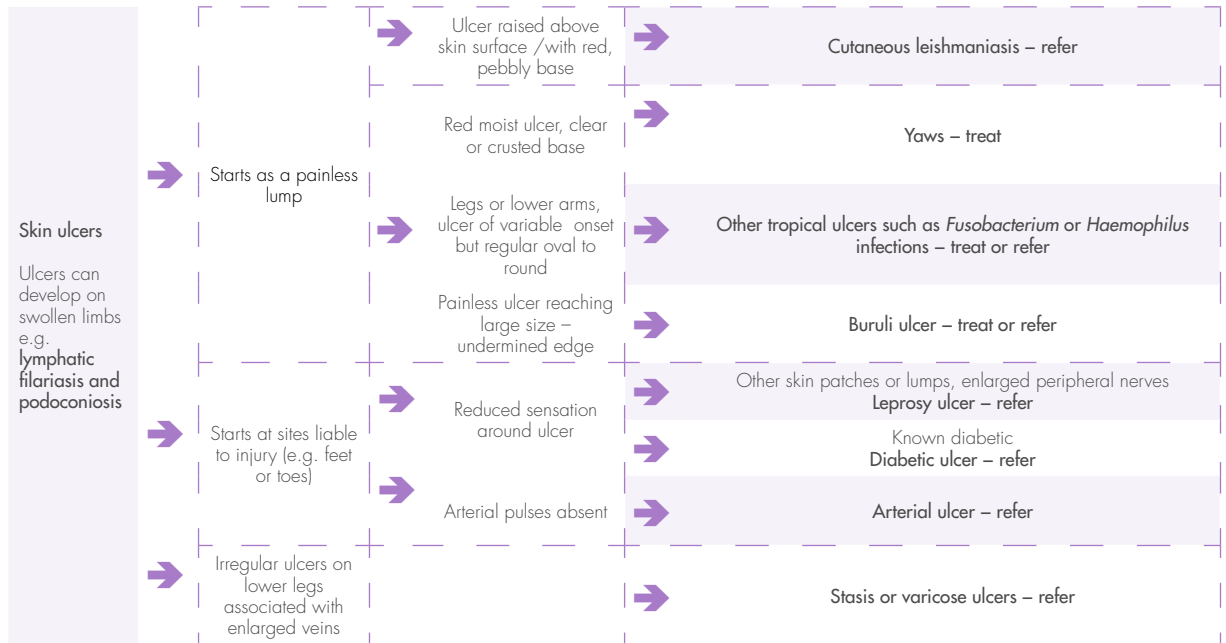
¹ = Occasionally, itch in lymphatic filariasis if inflamed.

² = In some areas, patients with onchocerciasis have few skin changes.

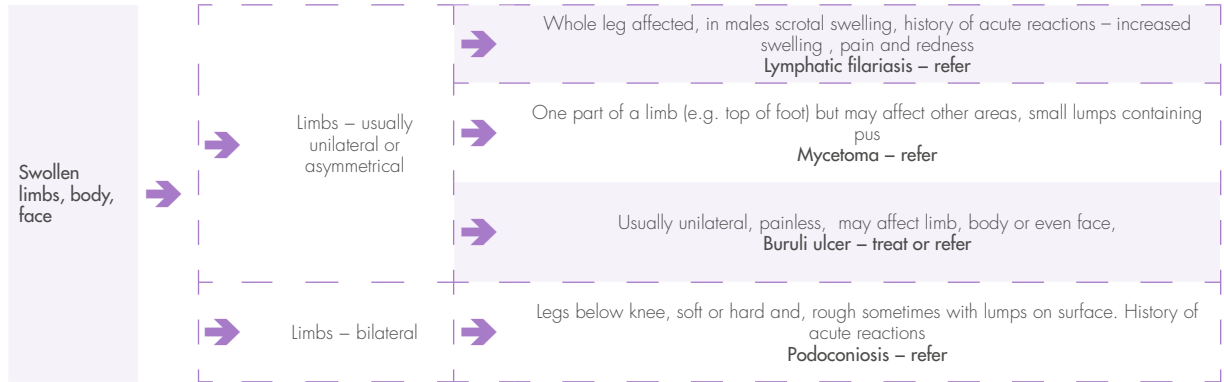
Lumps on or under the skin



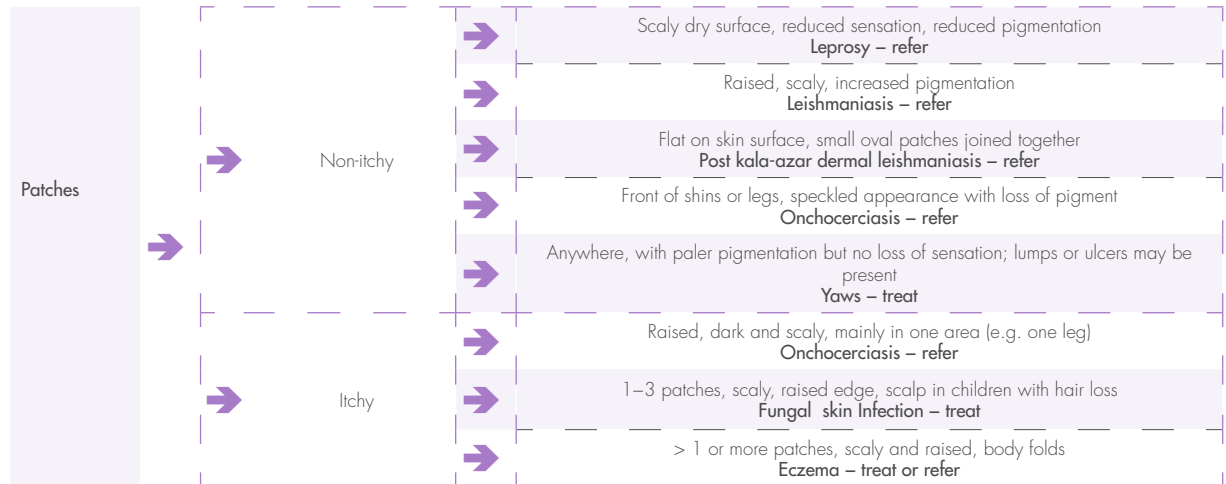
Skin ulcers



Swollen limbs, bodies and faces



Patches on the skin



5.1 Lumps

There is a logical approach to the diagnosis using this feature. In examining the patient ask yourself these questions:

1. If the patient has a lump on the skin surface, is it small or large? (Small lesions measure under 0.5 cm in diameter, e.g. the diameter of a pencil.)
2. How many lumps are there? Group them into (i) 1 and up to 3 or (ii) more than 3.
3. Where are the lumps? On the arms or legs or are they more widely scattered over the body?
4. Do they feel soft or firm/hard?
5. If soft, do they contain fluid or pus?
6. Are they painful or warm when they are touched? .
7. Are they itchy?
8. Is the surface smooth or bumpy?
9. Are there multiple lumps on swollen limbs?

Most NTDs are associated with lumps on the skin. Their descriptions are as follows:

- A. **Yaws.** Usually single or up to three; scattered; yellow crusts may cover a soft, red bumpy (like a raspberry) surface. But there may be more lesions in some cases
- B. **Onchocerciasis.** Onchocercal nodules – single/few; overlying bony prominences, for example iliac crest of pelvic girdle. Nodules may also be seen on other sites including the shoulders, side of the chest or even head; firm, smooth surface. Onchocerciasis may also present with multiple small very itchy lumps on the trunk and limbs. Often the tops of these small lumps have been scratched
- C. **Buruli ulcer (early stage).** Single/few; any part of the body; usually, firm, smooth surface, slightly mobile, painless
- D. **Leishmaniasis.** Single/few, if more than 1, in groups anywhere on the skin surface; hard, bumpy or smooth surface. The surface may be covered by a crust or may ulcerate
- E. **Leprosy.** (less common as cause of lumps) – multiple; anywhere on the skin, hard, smooth. Ear lobes, eye brows may be affected. Check for enlarged nerves and peripheral sensory loss. Test for sensory loss using a pointed object such as a pen. Explain to the patient what you are going to do
- F. **Mycetoma.** Single and large; anywhere on the body but feet are most commonly affected; often warm to touch; surface covered with small bumps (pus-filled or oozing)
- G. **Post kala-azar dermal leishmaniasis.** Single/few. Smooth surface; any site but may also present with multiple smooth small lumps

- H. **Scabies.** Multiple small itchy lumps; anywhere on the body apart from the head except in babies – common sites are wrists, fingers, ankles, shoulders, buttocks, external genitalia (males); soft, often containing pus, small curved or squiggly lines (tunnels) may be seen that correspond to the burrows where the mites reside in the skin; very itchy – other household members often affected
- I. **Tungiasis.** Single or multiple small lumps; commonest on the feet – soles or on or between the toes – but also may occur in other sites such as body folds e.g. groin. These are itchy and may be filled with pus or have a central dark spot

Common skin diseases that also present with lumps:

- J. **Abscesses.** Single or few; large, anywhere; soft and containing pus; painful, red and warm to touch
- K. **Multiple small pebbly lumps or warty growths** may occur on long standing lymphoedema of lower limbs caused by other conditions including lymphatic filariasis. These are firm with a rough warty surface resembling the skin of elephants. It is called elephantiasis).

5.2 Ulcers

Ulcers can occur anywhere on the skin although they are commoner in areas of the body that are subject to trauma. A number of different NTDs cause skin ulceration such as Buruli ulcer, cutaneous leishmaniasis, dracunculiasis (guinea-worm disease) and yaws. In some cases, ulceration starts from a pre-existing lump on the skin. Additionally, a number of common infections also cause skin ulcers and can occur in areas where NTDs are endemic; these include other tropical ulcers caused by *Haemophilus* (slow onset) or *Fusobacterium* (rapid onset), *Corynebacteria* (diphtheria) and tuberculosis of the skin. Also if the sensation of the skin is damaged because of nerve damage (neuropathy) ulceration can occur, usually following unnoticed trauma. Neuropathic ulceration can occur in leprosy, but also follows nerve damage due to other diseases such as diabetes.

In examining patients with skin ulcers, it is important to ask for information about the presence or absence of pain and the speed of development – has the ulcer appeared suddenly, for example within 1–2 days? The overall appearance is also important. For instance, is the shape of the ulcer edge regular or irregular? Look closely at the edges. Are these undermined? In other words, is it possible to insert a sterile probe under the edge of the ulcer?

Questions to ask in reaching a diagnosis

1. Are the ulcers single or multiple? Group them into (i) 1 and up to 3 or (ii) more than 3
2. Are they localized to one body region such as the lower leg or arm or are they scattered across different body sites?
3. Was there any preceding trauma?
4. Have they appeared slowly or rapidly, i.e. within a few days?

5. Are the edges undermined, i.e. can you insert a probe under the edge of the ulcer?
6. Is there any swelling around the ulcer?
7. Is the base red and clean or covered with a coloured crust, e.g. yellow?
8. Was there a preceding lump at the same site?
9. Are they painful?

Specific NTDs

- A. **Buruli ulcer.** Usually 1 but up to 3; mainly limbs; slow development from lump; deep, undermined edges, red base often covered by dead-looking tissue (in the beginning); painless; sometimes associated with swelling
- B. **Cutaneous leishmaniasis.** 1–3; scattered – exposed parts of the body; slow development from a lump; edges are raised above the skin surface; clean or crusted base; not usually painful
- C. **Yaws.** Usually single (sometimes more); development from a lump (ulcers occasionally co-exist with existing lumps); edges are raised above the skin surface; clean or yellow crusted base
- D. **Leprosy.** 1–3 lesions; often on feet and hands; irregular edge and crusted base; painless; loss of sensation in area; often associated with injury (trauma, burns, ill-fitting shoes, etc) but the patient does not notice. Look for other signs of leprosy: lumps, patches and enlarged nerves.
- E. **Lymphatic filariasis ulcers.** This follows trauma such as rubbing. Usually one lesion on swollen limb. Ulcers may also develop with other NTDs that present with limb swelling.

Other causes (differential diagnosis) of ulceration include other tropical infective ulcers e.g. *Haemophilus*, *Fusobacterium*, diabetes, arterial and stasis/venous ulcers as follows:

- F. **Other tropical infective ulcers, e.g. those caused by *Fusobacterium* or *Haemophilus*.** 1–3 lesions; legs or hands; variable onset; sometimes painful; clean red base
- G. **Diabetic ulcers.** Usually 1–3 on feet at sites of rubbing from shoes; painless; irregular with crusted base; there is diminished sensation indicating nerve damage in the area around the ulcer. Feel for arterial pulses. Ask about history of diabetes.
- H. **Arterial ulcers.** Similar in appearance to diabetic ulcers although they may also be painful. A key feature is the reduction or absence of arterial pulses on the foot. It is important to feel for these pulses in all ulcer patients as tight bandaging is contraindicated where there is arterial damage.
- I. **Stasis ulcers.** 1–2; may be bilateral at ankles; irregular shape, ulcer base covered with crust; may be painful. Presence of varicose (enlarged and visible) veins higher up on leg.

5.3 Swollen limbs, face or body

Swelling of the limbs or appendages such as the scrotum or elsewhere on the body is usually a sign of the accumulation of fluid in the tissue. Where there is a lot of fluid the swelling is soft and when pressed firmly with a finger the imprint of the finger remains on the skin surface. Even with fluid accumulation, with time the swelling becomes hard due to fibrosis or scarring and the skin surface may become irregular and covered with small lumps, a condition often known as “mossy foot”. This is simply a sign of chronic fluid accumulation in the skin, hyperkeratosis or skin thickening that has become secondarily infected with bacteria. The surface may appear bumpy and fluid may ooze from between the bumps. Inflammation in the skin can also cause swelling, although usually the area is warm to the touch and often tender when pressed – this usually indicates infection. Chronically swollen limbs may become secondarily infected as an “acute event” on top of the existing swelling which becomes red and sore and may be associated with systemic illness such as fever.

Useful discriminating questions include noting whether the swelling affects both sides such as both legs and, in males, whether there is scrotal swelling.

Questions to ask in reaching a diagnosis

1. Does the swelling affect one side e.g. one leg or arm but not, or less, on the other?
2. Is the swelling hard or soft?
3. How long has it been present?
4. Does it change (reduce) after lying down overnight?
5. Is the swelling irregular with one or more lumps and to patients is the limb heavy and difficult to lift, e.g. while walking?
6. Is the swelling uniform, with a smooth surface and soft to the touch?
7. Is it tender (painful) to touch?
8. Are there small lumps which may contain pus in the swollen area?
9. Is there any discharge from the surface of the swollen area?

Specific NTDs

- A. **Lymphatic filariasis.** Unilateral or bilateral swelling on legs – in males scrotal swelling or hydrocele and in women vulval swelling may occur; non-tender unless seen during an acute attack; swelling soft and reducible in early cases, but hard (firm to touch) and irreversible in older lesions. There may be a discharge which is often foul smelling
- B. **Mycetoma.** Unilateral and localized swelling to a single site; feet commonly affected but may occur elsewhere e.g. chest wall or head; not painful; surface of swelling may be studded with small soft pus-containing lumps
- C. **Buruli ulcer.** Before ulceration occurs on a limb, the surface of the skin is usually swollen. Also, once an ulcer has formed there is usually a lot of swelling around the ulcer.

The differential diagnosis of limb swelling includes podoconiosis.

D. Podoconiosis. Usually bilateral on legs – usually limited to below the knee. It is generally non-tender unless seen during an acute episode. The swelling is soft and reducible in some cases, but hard, stiff and not compressible in other lesions. There is usually no discharge apart from leaking lymphatic fluid. Later, hard nodules may develop on the surface.

NB. Swelling of both legs may occur in heart failure but the patient usually has additional symptoms such as breathlessness, tiredness and palpitations.

5.4 Patches on the skin

Patches on the skin are flat areas where the appearance and texture of the skin, and sometimes the colour, has altered. Patches may be slightly raised above the rest of the skin surface or distinctive in other ways from surrounding skin, because the surface is rough or the colour different. The surface is sometimes smooth but it may be rough or scaly. The pigmentation is also important as in some patients the patch is lighter in colour than the surrounding skin. It is always important to test the sensation of patches (see above Lumps – leprosy). If they indicate that the sensation has altered, more detailed testing of sensation is indicated along with a search for enlarged peripheral nerves. Another important discriminating sign is the presence of itching, dryness and hair loss.

NTDs associated with patches include leprosy, onchocerciasis, yaws, and cutaneous leishmaniasis and post kala-azar dermal leishmaniasis.

Use as discriminators: Itch, sensory loss, colour change.

Questions to ask in reaching a diagnosis

1. Are the patches single or multiple?
2. Is the surface raised?
3. Does the patch itch?
4. Is there any change in sensation on the lesions?
5. Is there any loss of pigmentation?
6. Is there any increase in pigmentation?
7. Is the surface scaly?

Specific NTDs

A. Leprosy. Single or multiple patches. These may be raised or flat on the skin surface, surface dry with reduced pigmentation (paler), non-itchy. Sometimes the patches may be difficult to see so also look at the patient from several steps away. Test for loss of sensation and look for enlarged peripheral nerves.

- Touch the skin lightly with the pen and ask the person to point to where they felt the pen. Then ask them to close their eyes so that they cannot see what you are doing. Lightly touch the centre of the most prominent skin patch and ask them to point to where they felt the pen. Repeat the procedure on normal skin and on the same patch again. If the person feels nothing on the skin patch, it suggests leprosy.
- B. **Onchocerciasis.** Raised very itchy patches involving large parts of a single limb, darker than surrounding skin. Surface rough and dry. Examine for large lumps in the area (onchocercal nodules – see Lumps – Onchocerciasis).
- C. **Leishmaniasis.** The development is similar to that seen with lumps (see above); edges are raised above the skin surface; often ulcerate; not usually painful
- D. **Post kala-azar dermal leishmaniasis.** Multiple small flat patches which are pale in colour and may join together are also a presenting feature.
- E. **Yaws.** Multiple flat patches which may be lighter in colour than surrounding skin. This usually occurs in the presence of typical forms of the disease such as lumps or ulcers.

Some common skin disease also present with patches on the skin. These include fungal infections and eczema. It is also very common for patients to present with discolouration – increased pigmentation of the skin following any form of skin inflammation.

- F. **Fungal skin infection.** Usually 1–3 patches. Dry scaly and itchy. The edge of the patch is more prominent, ie it sticks out and is more scaly, than the central areas like a ring. In children there may be single or multiple patches with loss of hair in the scalp – these patches may also be scaly.
- G. **Eczema.** Single or multiple very itchy patches. Scaling across the entire surface; may involve the hand or feet or the flexures of the skin – the creases behind the knees, elbows or around the neck – common in children.

5.5 Itchy skin

Itching of the skin is an important feature which is helpful in making a diagnosis. It may affect all the body surface (generalized) and the patients' first description of the condition is often that it is very itchy. In other cases, the itching is confined to a specific lesion such as a patch or a lump. Patients who itch usually scratch the affected area and leave visible scratch marks where the broken skin has been bleeding. In very persistent itchy lesions, the skin becomes thickened and may form a raised patch with darkened skin colour. This is the direct result of persistent scratching and rubbing and is known as lichenification (this process is listed under "patches" in this guide). This form of thickened skin is seen on one limb in some forms of onchocerciasis.

Another important point is to examine patients with itchy skin for any visible skin changes. If there are none, also ask if there was a lumpy rash (“wheals”) that comes and goes within a short time; this is a change known as urticaria and it may occur with certain parasitic infections such as in the early stages of schistosomiasis. A further key question is to ask if any other members of the household are itching, as this indicates that the condition can be passed from one person to another. This is typical of scabies.

Useful questions to include:

- Is the itching confined to one area or does it affect many parts of the body?
- Are other members of the household itching?
- Are there patches or lumps or wheals?

A. Onchocerciasis. Itching is associated with multiple small lumps on the trunk and limbs or patches affecting one limb only. Examine for large lumps under the skin – onchocercal nodules.

Common skin diseases associated with itching include **scabies**, **fungal infections** and **eczema**. Their features are described above. Remember that itching in the other household members is associated with scabies.

5.6 When to consider underlying HIV infection

HIV/AIDS is prevalent in some regions of the world. Skin presentations in HIV-positive patients are common although most of the NTDs discussed above are not often associated with HIV. However, HIV can be associated with changes in the severity of infections such as cutaneous leishmaniasis and in their presentation, which is usually more widespread. Some simple clues that might alert the health worker to investigate for the possible presence of HIV are:

- Sore mouth – white patches on the tongue and sides and roof of the mouth – oral candidiasis
- Persistent genital ulcerations – these may occur with sexually-transmitted infections including syphilis and herpes simplex
- Widespread and sudden appearance of red patches with scaly surfaces – psoriasis (often itchy) or secondary syphilis (non-itchy)
- Scaly patches on the face – such as around the nose, ears and in the eyebrows – seborrhoeic dermatitis. But may spread to affect large areas of the body.
- Red/purple patches or lumps on the trunk or limbs that appear like bruises and do not have a scaling surface, although some are wart-like. Examine the inside of the mouth and see if there are similar bruises on the roof of the mouth – Kaposi sarcoma.

- Multiple non-symptomatic small lumps on the face or body. Many of these have a small depression on the surface which reveals a soft centre. These may be caused by the virus infection – molluscum contagiosum – but they may also be the presenting sign of a systemic fungal infection such as cryptococcosis.
- Itchy skin – small lumps with extensive itchiness, can be localized or generalized – pruritic papular eruption or eosinophilic folliculitis.

More information is available from:

http://www.who.int/maternal_child_adolescent/documents/skin-mucosal-and-hiv/en/

<http://hivinsite.ucsf.edu/InSite?page=kb-04-01-0>

6. NEXT STEPS

The diagnostic charts shown in **Section 5** are intended to allow health-care workers to reach the next phase of diagnosis. It is helpful to use these in combination with the distribution maps. The common skin diseases such as scabies, fungal infections, pyoderma and eczema are seen in all regions. In the case of NTDs, further investigation or management often involves referral to a specialist centre or trained team. Generally, this will apply to all patients who present with either ulcers or swollen limbs or bodies. The diagnostic charts indicate which of those patients presenting with lumps or patches should be referred to a specialist service which, depending on local organization, may be the nearest health centre/hospital or a tertiary referral centre. In most of these patients, arriving at the diagnosis depends on the use of specialist tests (blood tests, direct microscopic examination, histopathology, culture). Tests currently in use are listed in **Table 4**.

For the common skin infections, it is usually not necessary to carry out any diagnostic tests, although they are available in some centres. These diseases are indicated in the diagnostic flow charts (Treat). The conditions respond well to treatments (**Table 5**). If the disease is not responding to treatment, seek advice on the next steps.

Table 3. Common epidemiological and clinical diagnostic clues

Diseases	Age	Gender	Pain	Fever	Lesion location	Transmission
Buruli ulcer	Child/Adult	Both	No	No	Mainly limbs	Unknown ? water
Cutaneous leishmaniasis	Child/Adult	Both	No	No	Exposed sites	Sandfly bite
Post kala-azar dermal leishmaniasis	Mainly Adult	Both	No	No	Anywhere	Sandfly bite
Leprosy	Child/Adult	Both	Loss of sensation	No – apart from reactions	Anywhere – ulcers on hands or feet	Close contact over time
Lymphatic filariasis	Mainly Adult	Both	Only in acute attacks	Only during acute attacks	Swelling in lower limbs, scrotum	Mosquito Patients often no longer infected
Mycetoma	Child/Adult	Both	No	No	Limbs or site of trauma	Trauma e.g. thorn injury
Onchocerciasis	Child/Adult	Both	No but may be itchy	No	Anywhere – but limbs are commonly affected	Blackfly bite
Scabies	Child/Adult	Both	No but itchy	No	Anywhere – hands, external genitalia, feet, buttocks	Other household members who also itch
Yaws	Child/Adult	Both	No	No	Anywhere, but often on the limbs	Contact

Table 4. Summary diagnosis and treatment

Diseases	Investigation	Laboratory tests	Medical treatment	Supportive care
Buruli ulcer	Swab	fTLC and PCR of skin swab/FNA samples	Oral rifampicin + oral clarithromycin for 8 weeks	Wound dressing, physiotherapy as needed depending on site and size
Cutaneous leishmaniasis	Swab/biopsy	Microscopy and PCR of skin swab	Stibogluconate, paromomycin, miltefosine, amphotericin B	No
Post kala-azar dermal leishmaniasis	Slit skin smear or biopsy	Microscopy, PCR	Miltefosine, amphotericin B	
Leprosy	Slit skin smear or skin biopsy	Direct microscopy or histology	Multidrug antibiotic therapy for 6 or 12 months. e.g. rifampicin, dapsone, clofazimine	Care of insensitive areas (loss of feeling) plus regular wound inspection appropriate footwear, contact survey
Lymphatic filariasis ¹	Blood test	Rapid diagnostic tests ² , thick blood film (collected during hours of peak mf circulation)	Oral diethylcarbamazine for 12 days ± doxycycline for 4–6 weeks ³	Limb cleaning, exercise, wound care, anti-bacterial/anti-fungal creams when needed. Oral antibiotics and antipyretics during acute attacks
Mycetoma	Biopsy	Microscopy histology and culture of grains/biopsy	Depends on species. Long term antibiotic or antifungal ± surgery	Walking support
Onchocerciasis	Skin snip biopsy	Microscopy, PCR	Oral ivermectin, doxycycline in areas with Loiasis unless known to be low risk for adverse events	Emollients
Scabies	Clinical diagnosis, dermoscopy, videomicroscopy	Presence of mites scraping	Permethrin cream, sulphur (4%), ointment 15%, benzyl benzoate, oral ivermectin	Treat family and contacts
Yaws	Swabs	DPP test and PCR of skin swab	Single oral dose of azithromycin (2nd line: injectable benzathine penicillin)	Wound dressing, Treat family and contacts

BRT, *Brugia* rapid test; DPP, dual path platform; FNA, fine needle aspiration; fTLC, fluorescent thin layer chromatography; FTS, filarial test strip; PCR, polymerase chain reaction.

¹ For lymphoedema and hydrocele patients, diagnosis of infection is not required for case management.

² Alere Filariasis Test Strip for *W. bancrofti* (Abbot Scarborough (MN), USA); *Brugia* Rapid Test for *Brugia* spp. (Reszon Diagnostics International, Malaysia).

³ This regimen is altered in those regions where there is onchocerciasis or *Loa loa*. Single dose with regimen used in mass drug administration also acceptable.

Many skin lesions, from eczema to ulcers, can be secondarily infected by bacteria and this may be the reason for failure to respond to therapy. Bacterial entry points (BEP) should be treated in all lymphoedema patients. An important complication of lymphoedema is an acute episode of fever and redness of the leg (cellulitis). This is caused by the entry of bacteria through breaks in the skin such as athletes foot (cracking between the toes), wounds or cuts. Patients should be asked to check these entry points regularly to minimize the risk of infection. Eliminating cracking of the skin in the toe web spaces is the most difficult part of entry point care. Where there is athletes foot (a fungal infection between the toe) an antifungal cream can be used. Many patients have associated eczema of the legs (stasis eczema). (see below). Skin wounds, including ulcers, may also be entry points for more serious infections such as tetanus, and it is important therefore to ask about the patient's current immunization status.

Although treating skin disease is often simple be careful not too use powerful corticosteroid creams without being certain that the disease is not caused by an infection. Also patients can often obtain strong corticosteroid creams without prescription and their use will alter the appearance of infections. So it is important to ask patients if they have already treated their skin with any medication.

Table 5. Investigations and treatment of common non-NTD skin diseases and scabies

Diseases	Investigation*	Medical treatment	Supportive care
Bacterial skin infection – abscess	Swab for culture	Drain abscess. Oral cloxacillin, trimethoprim	Wound care
Bacterial skin infection – impetigo	Swab for culture	Topical creams (mupirocin) or antiseptics (povidone)	Treat contacts
Eczema		Emollients and medium strength steroid cream for 2–4 weeks	Avoid irritants. May relapse
Fungal infection	Scraping for mycology microscopy culture	Topical azole (clotrimazole, miconazole) creams. In severe cases, oral terbinafine or griseofulvin itraconazole	If in scalp do not share caps or hats
Scabies	Skin smear/demoscopy	Permethrin cream, sulphur (4%) ointment. 1.5% benzyl benzoate. Oral ivermectin	Treat family and contacts
Tropical ulcers caused by <i>Fusobacteria</i> or <i>Haemophilus</i>	Smear for PCR	Depends on cause. Penicillin for 5 days or azithromycin	Wound dressing/grafting

*Often only available in specialist centres.

PCR, polymerase chain reaction

If, after going through the various tables and algorithms, there is still doubt about the diagnosis of the skin lesion, refer to a specialist service.

ANNEX. DESCRIPTIVE TERMS FOR SKIN LESIONS

The descriptive terms below adapted from the 2016 International League of Dermatological Societies' revised glossary for the description of cutaneous lesions <http://dx.doi.org/10.1111/bjd.14419>.

Included under lumps

Nodule. An elevated, solid, palpable lesion > 1 cm usually located primarily in the dermis and/or subcutis. The greatest portion of the lesion may be exophytic or beneath the skin surface

Papule. An elevated, solid, palpable lesion that is \leq 1 cm in diameter

Included under patches

Plaque. A circumscribed, palpable lesion > 1 cm in diameter; most plaques are elevated. But plaques may result from a coalescence of papules

Macule. A flat, circumscribed, nonpalpable lesion that differs in colour from the surrounding skin. It can be any colour or shape

Included under ulcers

Ulcer. Full-thickness loss of the epidermis plus at least a portion of the dermis; it may extend into the subcutaneous tissue

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Additional links and resources

Neglected Tropical Diseases

http://www.who.int/neglected_diseases/en

International Foundation for Dermatology

<http://www.ifd.org/>

International League of Dermatology Societies

<http://web.ilds.org/>

Skin App

<http://thespindle.org/project/skin-app/>

Dermatología comunitaria (Mexican web site)

<http://www.dermatologiacomunitaria.org.mx/>

Africa Teledermatology project

<http://africa.telederm.org/>

Regional Dermatology Training Centre (Tanzania)

<http://rdtc.go.tz/>



The skin of a patient is the first and most visible structure of the body that any health-care worker encounters during the course of an examination. To the patient, it is also highly visible, and any disease that affects it is noticeable and will have an impact on personal and social well-being. The skin is therefore an important entry point for both diagnosis and management. Many diseases of humans are associated with changes to the skin, ranging from symptoms such as itching to changes in colour, feel and appearance. The major neglected tropical diseases (NTDs) frequently produce such changes in the skin, re-enforcing the feelings of isolation and stigmatization experienced by patients affected by these diseases. Indeed, these are often the first signs that patients will notice, even before changes in internal organs or other systems occur. The following NTDs all have prominent skin changes at some stage in their evolution.

BURULI ULCER CUTANEOUS LEISHMANIASIS POST KALA-AZAR DERMAL LEISHMANIASIS LEPROSY LYMPHATIC FILARIASIS MYCETOMA ONCHOCERCIASIS PODOCONIOSIS SCABIES YAWS (ENDEMIC TREPONEMATOSIS) BURULI ULCER CUTANEOUS LEISHMANIASIS POST KALA-AZAR DERMAL LEISHMANIASIS LEPROSY LYMPHATIC FILARIASIS MYCETOMA ONCHOCERCIASIS PODOCONIOSIS SCABIES YAWS (ENDEMIC TREPONEMATOSIS) BURULI ULCER CUTANEOUS LEISHMANIASIS POST KALA-AZAR DERMAL LEISHMANIASIS LEPROSY LYMPHATIC FILARIASIS MYCETOMA ONCHOCERCIASIS PODOCONIOSIS SCABIES YAWS (ENDEMIC TREPONEMATOSIS) BURULI ULCER CUTANEOUS LEISHMANIASIS POST KALA-AZAR DERMAL LEISHMANIASIS LEPROSY LYMPHATIC FILARIASIS MYCETOMA ONCHOCERCIASIS PODOCONIOSIS SCABIES YAWS (ENDEMIC TREPONEMATOSIS)

This training guide explains how to identify the signs and symptoms of neglected tropical diseases of the skin through their visible characteristics. It also contains information on how to diagnose and manage common skin problems that front-line health workers may encounter.

The guide is intended for use by front-line health workers without specialist knowledge of skin diseases. Pathways for more detailed investigation and/or management are described but, often, this will involve referral to a specialist service.

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