

SKIN DISEASE DISORDER

Many people worldwide suffer from dermatologic issues, but there's a global shortage of specialists. While many people's first step involves going to a Google Search bar, it can be difficult to describe what you're seeing on your skin through words alone. So, a Model will try to predict the type of disorder from the following information and will give prediction to commonly skin disorders.

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INSIGHTS OF DATA

A) Classes of Disorder:

1) psoriasis (1): (Count-112)- Psoriasis (soh-rai-uh-suhs) is a skin disease that causes a rash with itchy, scaly patches, most commonly on the knees, elbows, trunk and scalp. Psoriasis is a common, long-term (chronic) disease with no cure. It can be painful, interfere with sleep and make it hard to concentrate.



Fig1: Scalp Psoriasis

2) Seboreic Dermatitis (2): (Count-61) - Seborrheic (seb-o-REE-ik) dermatitis is a common skin condition that mainly affects your scalp. It causes scaly patches, red skin and stubborn dandruff. Seborrheic dermatitis can also affect oily areas of the body, such as the face, sides of the nose, eyebrows, ears, eyelids and chest.



Fig2: Seboreic Dermatitis

3) Lichen Planus (3): (Count- 72) - Lichen planus (LIE-kun PLAY-nus) is a condition that can cause swelling and irritation in the skin, hair, nails and mucous membranes. On the skin, lichen planus usually appears as purplish, itchy, flat bumps that develop over several weeks. Lichen planus is an inflammatory disorder that appears as purplish, flat-topped bumps when it affects the skin. Bumps may appear in clusters or lines.



Fig3: Lichen Planus

4) Pityriasis Rosea (4): (Count- 49) - Pityriasis rosea is a relatively common skin condition that causes a temporary rash of raised red scaly patches on the body. It can affect anyone, but it's more common in older children and young adults (aged 10 to 35).



Fig 4: Pityriasis Rosea

5) Cronic Dermatitis (5): (Count- 52)- Atopic dermatitis is long lasting (chronic) and tends to flare sometimes. It can be irritating but it's not contagious. People with atopic dermatitis are at risk of developing food allergies, hay fever and asthma.



Fig 5: Cronic Dermatitis

6) pityriasis rubra pilaris (6): (Count- 20) - Pityriasis rubra pilaris (PRP) refers to a group of skin conditions that cause constant inflammation and scaling of the skin. People with PRP have reddish, scaly patches that may occur everywhere on the body, or only on certain areas.

- Causes. There are several subtypes of PRP. The cause is unknown, although genetic factors and an abnormal immune response may be involved. One subtype is associated with HIV/AIDS.
- There's no current cure for PRP, but treatment can relieve symptoms.



Fig 6 : Pityriasis Rubra Pilaris

B) General Information:

- **Dermatitis** is a general term that describes a common skin irritation. It has many causes and forms and usually involves itchy, dry skin or a rash. Or it might cause the skin to blister, ooze, crust or flake off.
- **Epidermis** is the outermost layer of skin on your body. It protects your body from harm, keeps your body hydrated, produces new skin cells and contains melanin, which determines the color of your skin.

- **Eczema** is a term for several different types of skin swelling. Eczema is also called dermatitis.
- **Neutrophils**- A type of white blood cell that is an important part of the immune system and helps the body fight infection.
- **Necrosis** is the death of body tissue. It occurs when too little blood flows to the tissue. This can be from injury, radiation, or chemicals. Necrosis cannot be reversed. When large areas of tissue die due to a lack of blood supply, the condition is called gangrene.
- A **pustule** is a bulging patch of skin that's full of a yellowish fluid called pus. It's basically a big pimple.
- **Infiltration**:
 - 1) to cause (as a liquid) to permeate something by penetrating its pores or interstices infiltrate tissue with a local anesthetic.
 - 2) to pass into or through (a substance) by filtering or permeating.
- **Scaling** skin, or scaly skin, occurs when the outer layer of your skin peels away in large pieces that resemble fish scales.
- **Keratinocytes** are the most prominent cell within the epidermis.
- The **stratum corneum** is the outermost layer of the epidermis and marks the final stage of keratinocyte maturation and development. Keratinocytes at the basal layer of the epidermis are proliferative, and as the cells mature up the epidermis, they slowly lose proliferative potential and undergo programmed destruction.
- **Melanin** is a substance in your body that produces hair, eye and skin pigmentation. The more melanin you produce, the darker your eyes, hair and skin will be. The amount of melanin in your body depends on a few different factors, including genetics and how much sun exposure your ancestral population had.
- The **basal layer** is the innermost layer of the epidermis, and contains small round cells called basal cells. The basal cells continually divide, and new cells constantly push older ones up toward the surface of the skin, where they are eventually shed.

C) General information about Symptoms:

- **Acanthosis** - is a skin condition that causes a dark discoloration in body folds and creases. It typically affects the armpits, groin and neck.
- **Erythema** (from the Greek erythros, meaning red) - is redness of the skin or mucous membranes, caused by hyperemia (increased blood flow) in superficial capillaries. It occurs with any skin injury, infection, or inflammation.
- **Koebner phenomenon** - affects people with certain skin diseases, most often with psoriasis. Sometimes, it can happen to people with warts, vitiligo and lichen planus. An injury, wound or burn can cause new lesions that resemble the primary skin disease.
- **Clubbing of the rete ridges** - This is the microscopic appearance of lentigo senilis, commonly known as an age or "liver" spot. The rete ridges are elongated and appear club-shaped or tortuous. Melanocytes are increased in the basal layer and melanophages appear in the upper dermis.
- **Band like infiltrate** - An infiltrate of lymphocytes affects and obscures the basal epidermis, classically with a band like pattern. Sometimes the infiltrate is patchy. There is associated basal cell degeneration.

- **Fibrosis of papillary dermis** - Fibrosis is often a sequela of epidermal or dermal injury due to chronic chemical exposure or trauma. It is characterized by an increase of fibrous connective tissues in the dermis or subcutis and usually accompanies chronic inflammation.
- **Hypergranulosis** is an increased thickness of the stratum granulosum. It is seen in skin diseases with epidermal hyperplasia and orthokeratotic hyperkeratosis.
- **Parakeratosis** - refers to incomplete maturation of epidermal keratinocytes, resulting in abnormal retention of nuclei in the stratum corneum. It occurs in many diseases of the skin, particularly in psoriasis.
- **Exocytosis** is the last step of the secretory pathway and it involves the fusion of vesicles with the plasma membrane, a process that, in fungi, ensures the delivery of cell wall-synthesizing enzymes, membrane proteins, and lipids in areas of active growth.
- A **papule** is a raised area of skin tissue that's less than 1 centimeter around. A papule can have distinct or indistinct borders.
- **Follicle**- a small secretory cavity, sac, or gland.
- **Follicular Papules**- Follicular contact dermatitis is usually characterized by individual papules that include a central hair follicle.
- **Perifollicular**- The tissues surrounding a follicle.
- **Melanin incontinence (pigmentary incontinence)** is the presence of melanin in the superficial dermis, due to the loss of melanin from damaged cells of the basal layer.
- **Munro's microabscess** is an abscess (collection of neutrophils) in the stratum corneum of the epidermis due to the infiltration of neutrophils from papillary dermis into the epidermal stratum corneum. Munro's microabscesses are a characteristic hallmark of psoriasis pathology.
- **Spongiform pustule** - an epidermal pustule formed by infiltration of neutrophils into necrotic epidermis in which the cell walls persist as a spongelike network.
- **Spongiosis**- is a well-established histologic hallmark of the epidermis in eczema. It is characterized by the diminution and rounding of keratinocytes (condensation), and widening of intercellular spaces resulting in a spongelike appearance of the epidermis that can lead to formation of small intraepidermal vesicles.

D) Major Symptoms for different Skin Disorder:

1. Psoriasis:

- Hyperkeratosis, Disappearance_of_the_granular_layer, clubbing of the rete ridges, elongation of the rete ridges, family history, knee and elbow involvement, munro microabscess, PNL infiltrate, scalp involvement, spongiform pustule, thinning of the suprapapillary epidermis, munro microabscess, itching.

2. Seboreic Dermatitis:

- PNL infiltrate, spongiosis, eosinophils in the infiltrate, erythema, exocytosis, acanthosis, definite borders, inflammatory mononuclear infiltrate, itching.

3. Lichen Planus:

- Focal Hypergranulosis, melanin incontinence, polygonal papules, oral mucosal involvement has only for lichen Planus and others like vacuolisation and damage of basal layer, band like infiltrate, saw tooth appearance of rete, spongiosis, itching.

4. Pityriasis Rosea:

- Acanthosis, definite borders, erythema, exocytosis, inflammatory mononuclear infiltrate, koebner phenomenon.

5. Chronic Dermatitis:

- Elongation of the rete ridges, fibrosis of the papillary dermis, follicular papules, spongiosis, itching.

6. Pityriasis Rubra Pilaris:

- Perifollicular parakeratosis, follicular horn plug, follicular papules, spongiosis.

E) Some more Insights:

- Elongation of the rete ridges has mostly in PSORIASIS and then followed by Chronic dermatitis.
- Family History mostly in Psoriasis and then followed by Pityriasis Rubra Pilaris.
- Follicular horn plug mostly in Pityriasis Rubra Pilaris, and same level for Seboreic Dermatitis, Lichen Planus, Chronic dermatitis.
- Follicular papule has mostly in Pityriasis Rubra Pilaris followed by Chronic dermatitis.
- Knee and elbow involvement in Psoriasis followed by Pityriasis Rubra Pilaris.
- PNL infiltrate mostly in Psoriasis and then followed by Seboreic Dermatitis.
- spongiosis is seen all the classes except for class 1 (Psoriasis) but mostly in Seboreic Dermatitis.
- As Follicular Papulas increase there is a chance of Follicular Horn Plug and at that time pityriasis rosea is present.
- Definite borders are present in all the skin disorder whereas mostly definite borders are present in Psoriasis followed by Lichen Planus.
- Eosinophils in the infiltrate is also present in all classes of disorder but mostly present in Seboreic Dermatitis.
- Erythema is also present in all classes of disorder but mostly present in Psoriasis, followed by Lichen Planus and Seboreic Dermatitis.
- Exocytosis present in all disorder but mostly in Lichen Planus and then in Seboreic Dermatitis, Pityriasis Rosea.
- Hyperkeratosis is also present in all but mostly in Psoriasis.

A condition marked by thickening of the outer layer of the skin, which is made of keratin (a tough, protective protein). It can result from normal use (corns, calluses), chronic inflammation (eczema), or genetic disorders (X-linked ichthyosis, ichthyosis vulgaris).

Q) What is hyperkeratosis with focal parakeratosis? - Orthokeratotic hyperkeratosis refers to the thickening of the keratin layer with preserved keratinocyte maturation, while parakeratotic hyperkeratosis shows retained nuclei as a sign of delayed maturation of keratinocytes. Hyperkeratosis can be associated with dyskeratosis.

At 274, range 0 had the highest parakeratosis and was 2,944.44% higher than range 3, which had the lowest parakeratosis at 9.

Range 0 accounted for 58.05% of parakeratosis.

- Inflammatory mononuclear infiltrate all present in all classes of disorder, mostly in Psoriasis and Lichen Planus and almost have same level for all other disorders.
- Itching present in all but least is in Pityriasis Rosea, Pityriasis Rubra Pilaris.
- Acanthosis present in all, but mostly in Psoriasis and least in Pityriasis Rubra Pilaris. Band like infiltrate: 2 had the highest band like infiltrate at 123, followed by 3, 1, and 0. 2 accounted for 60.59% of band like infiltrate. 3 had the highest total band like infiltrate at 196, followed by 1 and 2 and 3 had the highest average band like infiltrate at 49, followed by 1 and 2. 4 had the lowest total band like infiltrate at 0. 2 in class 3 made up 58.62% of band like infiltrate.

Family History - doesn't matter for Acanthosis during band like infiltrate.

Age – Range 2 in class Psoriasis made up 19.13% of Count of Age.

- When Itching is considered, itching is there for every class with respect to age.
- Koebner phenomenon present in Lichen Planus, Psoriasis, Pityriasis Rosea and least present in Seborrheic Dermatitis and not at all present in Chronic dermatitis, Pityriasis Rubra Pilaris.
- Parakeratosis is present mostly in Psoriasis and present in same level for all other classes of disorder.
