# ALOPECIA AREATA

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## ABSTRACT

*An autoimmune condition known as alopecia areata causes non-scarring bald patches to form on the body parts that have hair. The most frequent site of involvement is the scalp. Any age group might be affected by alopecia areata. Oval or round hair loss patterns are typical. Alopecia areata can evolve from complete alopecia totalis or alopecia universalis with substantial onychodystrophy of all body hair. Although other parts of the head, such as the eyelashes, eyebrows, and beard, may also be affected, it is mostly defined by reversible loss of hair affecting the scalp. The various types of hair loss, that can affect all hair-bearing areas, range from loss in clearly defined patches through diffuse and total hair loss. Around 2% of a general population will experience alopecia areata at some point in their lives. One of the main causes of alopecia areata is believed to be a breakdown in hair follicle privilege.*

*The clinical signs of alopecia areata are typically used to make the diagnosis, however histopathology and dermoscopy may also be useful. Medical treatment for alopecia areata is challenging, but recent developments in understanding its molecular pathways have revealed new medicines and the potential for remission soon. The major goal of treatment is to control disease activity. Topical, intralesional, and systemic therapy are the preferred forms of treatment.*

**Keywords:** *Alopecia, alopecia areata, alopecia totalis, alopecia universalis, hair loss.*

## Introduction:

**General**: In general, autoimmune diseases like alopecia areata cause temporary, non-scarring hair loss while still preserving the hair follicle. The most frequent type of hair loss, patchy alopecia areata, affects the scalp and can range from loss in clearly defined patches or diffuse to total loss of hair, which can impact all hair-bearing areas.

The name "alopecia areata" was originally used in French physician Sauvages de Lacroix (1706-1767) by "Nosologia Methodica," which was published in 1763, and the condition was first described by "Cornelius Census." Around 2% of a general population will experience alopecia areata at some point in their lives.

In the UK and the USA, alopecia areata accounting for 2-3% of new dermatology cases. 0.7% in India and 3.8% in China. The prevalence in the general population was estimated to be 0.1-0.2%, with such a lifetimes risk of 1.7%. Despite some research reporting a male preponderance, both males and females are affected equally. That can happen at any age. The oldest was in his late eighties, while the youngest was 4 months old.

Children made up 20% of instances, and 60% of people with alopecia areata developed its first patch before the age of 20. Ages 31 to 59 had the highest incidence. In 8.7–20% of cases, family members are impacted. Alopecia areata is a kind of alopecia that mostly affects the retinal pigment epithelium, nails, and hair follicles. It is a kind of hair loss that doesn't leave scars and often manifests as rounded patches.

Those who have alopecia areata experience partial or complete hair loss on their heads and, occasionally, other parts of their bodies. The hair follicles are affected by the chronic condition alopecia areata. Although there may be skin irritation and health issues brought on by the loss off eyelashes and eyebrows, it is not unpleasant nor life-threatening.

Alopecia isn't an autoimmune condition that develops as a result of a confluence of genetic or environmental factors, while its origin and subsequent course of development are not entirely known. Alopecia rarely causes

physical injury, but it can have psychological repercussions, such as high levels of anxiety and sadness. The success of medical care for the illness is limited, and the patient may become quite depressed if a cure cannot be found.

Since the specific etiopathogenesis is uncertain, autoreactive T-cells directed to the hair follicle are likely to be the mediating factor. The histological characteristics change depending on the disease's stage. The peribulbar lymphocytic infiltration, which may also affect the epithelium and hair matrix, is the first and most significant hallmark of the acute stage. At later phases, inflammation might be lessened or even gone.

Alopecia areata frequently appears unexpectedly and lasts only a few days. There isn't much proof in the scientific community that stress causes alopecia areata. When only just few patches or hair loss are present, alopecia areata patients frequently spontaneously recover completely with no additional medical intervention.

Many genetic or environmental factors seem to play a role inside the inheritance pattern for alopecia areata. Generally, first-degree relations (including such siblings and children) of affected people are at a higher risk of developing the ailment than the general population. Alopecia areata has no known treatment. Your hair will most likely regrow in a few months if you have just few minor areas or hair loss around your head. In some situations, your doctor might not recommend treatment. Your doctor could advise getting steroid injections below your scalp if you have hair loss in greater places.

## Types of Alopecia Areata

## A.] Based on Extract

**1.] Patchy alopecia-** One, several distinct patches, and conjugated (reticular) patches or hair loss can be seen in patchy alopecia areata. The most noticeable sign for alopecia areata was patchy hair loss, in which hair starts to fall out in coin-sized areas, mostly from the scalp. Each area where hair grows can be impacted, even the beard or eyelashes. Hair loss can occur suddenly, developing over a few days, or gradually, developing over a few weeks.

**2.] Alopecia totalis-** The entire head, including the eyelashes and eyebrows, are affected by this hair loss. It refers to the higher advanced stage with alopecia areata, which in about 1% to 2% of cases proceeds to totalis and universalis. Alopecia areata totalis denotes complete baldness of the head.

**3.] Alopecia universalis-** Hair loss that affects your entire body is known as alopecia areata universalis. This phrase refers to widespread hair loss, which signifies the absence of hair on the entire epidermis. As the most severe type of alopecia areata, it is extremely uncommon, affecting only 1 in 100,000 persons.

**4.] Alopecia incognita**- Diffuse complete hair loss without nail involvement, with a positive pull tests, yellow spots, and short, miniature degrowing hairs.

## B.] Based on pattern

**1.] Reticular alopecia-** Reticular pattern develops when regions of hair loss are more severe and congregate. When hair loss is restricted to a sides and lower back of the head, an ophiasis pattern develops.

**2.] Ophiasis alopecia-** Hair loss that appears as a band around the outside of the head, more notably along the temporal or occipital bone borders Hair loss across the sides or back of your head forms a band due to ophiasis alopecia areata.

**3.] Sisaipho alopecia-** Extensive alopecia areata, with the exception of the scalp's edges. Because of the shape's apparent resemblance to a snake and its pattern of hair loss, it was given the Greek term "ophis snake." The inverse pattern is called "Sisaipho" in mathematics. Nearly the opposite spelling of Ophiasis is Sisaipho. It also goes by the name "Ophiasis inverse."

## C.] Non-scarring alopecias (non-cicatricial alopecias)

Non-cicatricial alopecias, sometimes referred to as non-scarring kinds of alopecia, are hair loss conditions where the hair follicle is preserved but the hair cycles, follicle size, hair breakage, or a combination of these causes, results in hair loss. the following non-scarring alopecia kinds

**1.] Male pattern hair loss-** Alopecia is a genetically defined (polygenic) and androgen-dependent

condition that, by the age of 50, affects 50% of males and is characterised by a receding hairline and generalised hair loss at the crown.

**2.] Female pattern hair loss-** Common and comparable to man pattern hair loss, diffuse hair loss is distinguished by the maintenance of the frontal hair line with a less clear explanation.

**3.] Telogen effluvium-** Profuse hair shedding, which can occur as a chronic condition linked to female pattern hair loss or as an acute self-limiting form brought on by a variety of events (such as delivery, febrile illness, major surgery, and rapid weight loss).

**4.] Trichotillomania-** With broken hairs which are securely attached inside the scalp and irregular patches and tonsural patterns of hair loss, hair-pulling self control disorder is distinguished.

**5.] Traction alopecia-** Chronic mechanical traction during hair style causes hair loss that is initially reversible but may become irreversible because to follicular elimination as a result of continued traction.

**6.] Short anagen syndrome-** usually presents in childhood and is characterized by a normal density and hair strength, but minimal hair growth.

**7.] Loose anagen syndrome**- usually presents in childhood and occasionally in adults and is characterized by slightly thinned, unruly, non-growing hair.

**8.] Temporal alopecia triangularis**: A disorder that presents in new born or young children and is characterized by a triangular or lancet-shaped bald spot with normal hair numbers, but very few terminal hairs (most are vellus hairs).

## D.] Scarring alopecias (Cicatricial alopecias)

Scarring alopecias, commonly known as cicatricial alopecias, are kinds of loss of hair in which hair follicles were destroyed by inflammation or, less frequently, malignancy such as cutaneous lymphoma. Although the early stages may mimic alopecia areata, affected skin exhibits absence of follicle ostia (the holes of the hair follicle through which the hair fibre emerges through the skin).

### Following types of scarring alopecia

1.] **Lichen planopilaris**: a long-term inflammatory condition that destroys hair follicles permanently. It is often characterised as patchy hair loss on the scalp with isolated follicular erythema around the edges of bald patches (that is, non-infectious itchy rash).

**2.] Frontal fibrosing alopecia**: kind of lichen planopilaris, usually affecting postmenopausal women, but with a distinctive pattern of loss of hair (in the frontal or frontotemporal hair line or eye brows).

**3.] Chronic cutaneous lupus erythematosus:** a kind of lupus erythematosus which starts as a symptomatic patch and progresses to scaly, indurated papules, ill-defined, irregular plaques, telangiectasia, and depigmentation.

**4.] Central centrifugal cicatricial alopecia**: a syndrome that affects mostly African-American women that causes patchy scarring lesions that spread throughout the scalp in a centrifugal pattern. The condition has hereditary and environmental causes, including African-American hair styling methods.

### Symptoms of alopecia areata:

Patchy hair loss is the main sign of alopecia areata. Little coin-sized hair flakes start to fall out, mostly from the scalp. Yet every place where hair grows might be impacted, even the beard or eyelashes.

A few days or a few weeks may pass before there is a noticeable loss of hair. Before hair loss, there may be burning or itching in the area. So because hair follicles are never destroyed, if the inflammation in the follicles goes down, new hair can form. Individuals who just lose some few patches of hair frequently spontaneously make a full recovery without receiving any kind of treatment.

Alopecia areata affects about 30% of those who have it; for these people, the condition either worsens or turns into an ongoing cycle of loss of hair and regrowth.

Alopecia areata sufferers typically recover in about half the time it takes, but many will have multiple episodes. Alopecia totalis called alopecia universalis affects approximately 10% of people.

The fingernails or toenails can also be affected by alopecia areata, and in some cases, such changes are the earliest indication that the problem is progressing. Nails are subject to a few minor alterations.

## Additional clinical signs include:

Exclamation mark hairs: These are a few brief hairs that sprout at or around the borders of bald spots and get narrower at the bottom.

Other areas of the body including the face, such as the eyebrows, eyelashes, or beard, may also experience hair loss. Some people experience localised hair loss. Others frequently lose their cool.

The first sign of hair may be clumps on you pillow and in the shower. Someone might point out the spots if they are at the back of the head. But, other medical disorders may also contribute to a similar pattern of hair loss. Alopecia areata cannot be diagnosed just based on hair loss.

## Causes of alopecia areata:

White blood cells target the cells within hair follicles, which causes them to contract and significantly reduce hair growth. This condition is the result. It is unclear why the immune system of the body specifically targets hair follicles inside this manner.

Although it is unknown why these changes take place, it appears that genetics may be at play because alopecia areata is much more likely to affect a person who is related to a close relative who also has the condition. One in five individuals who have the condition does have a family member that has alopecia areata.

According to other studies, many individuals with such a family background of alopecia areata additionally have a personal and family background of other autoimmune diseases, such as thyroiditis, vitiligo, and atopy, which is defined by a propensity to be hyperallergic.

Contrary to popular belief, there is virtually little scientific proof that stress contributes to alopecia areata. Intense stress may be able to set off the illness, but most current research points to a hereditary basis.

That is an autoimmune disorder called alopecia areata. Whenever the immune system misidentifies healthy cells as alien objects, an autoimmune disease results. Your immune system typically protects your body from invaders like viruses and germs.

## Dermatological condition in alopecia areata

## Dermoscopy:

Dermoscopy is a simple and effective method for observing hair loss. Because it contains a blocking filter for light reflection from of the skin surface and can be performed without the use of gel, dry dermoscopy, also known as trichoscopy, is the best option. Yellow dots, black dots, broken hairs, tapering hair (exclamation marks), and small vellus hairs are distinctive dermoscopic symptoms of alopecia areata. reported trichoscopy codability hairs and hypothesised that they could serve as valuable indicators of Alopecia areata disease activity. Black spots, broken hair, and tapered hair all indicate an active disease. Tapering hair does not correlate with the severity of alopecia areata; instead, the proportion of black dots and yellow dots does. Although there are fewer yellow spots in androgenetic alopecia than there are in alopecia areata, but are still visible. Alopecia areata may not be diagnosed by a single sign on a dermoscopy, but a mix of traits can assist identify challenging instances such Alopecia areata incognito.

## Nail Changes:

In 29% for adults & 50% of kids with AA, nail alterations are visible. They affect more men and people with

severe AA. Nail alterations could occur before or after hair loss, or they might just affect some or all of the nails. Geometric pitting (many, tiny, superficial pits evenly spaced along transverse and longitudinal lines) and geometric punctate leukonychia are nail changes that are indicative with AA (multiple white spots in a grill pattern), and trachyonychia (sandpaper nails). The other changes include Beau′s lines, onychomadesis, red lunula, and red lunula indicate acute and severe disease.

## Hair loss:

Alopecia is another name for hair loss. Alopecia may leave scars or may not. It is crucial that a dermatologist perform a clinical evaluation of the affected area. To classify alopecia definitively and determine the appropriate course of treatment, a biopsy may occasionally be necessary.

## Hair Disorder:

Many hair diseases are diagnosed and treated by dermatologists. Certain hair conditions are congenital and present at birth, whereas others appear later in life. The reasons for hair loss are numerous. Each of these factors calls for a particular therapeutic strategy.

## Formulation of Hair Tonic:

## Formulation of Hair Tonic of Meniran

**Material & Methods-** A rotary evaporation (Buchi R II), calliper (tricle Brand), pH metre (Hanna), GF254 TLC plate (E Merck), digital scales (Ohaus Type PA 2012), and glassware were utilised in this investigation. The herbs were from Natural herbal Herbal Natural Grace, Yogyakarta. Additional substances utilised consist of simp, quercetin (Sigma Aldrich), and the tools utilised in this study includes a rotary evaporator (Buchi R II), calliper (tricle Brand), pH metre (Hanna), GF254 TLC plate (E Merck), scales digital (Ohaus Type PA 2012) and glassware. / Herbs Herbal Natural Grace, Yogyakarta. Quercetin (Sigma Aldrich), herbs from Supplier & Distributor of Materials Herbal, cream depilatories (Veet), minoxidil (Regrou), ethanol 96%, propylene glycol, sodium metabisulfite, menthol, DMDM hydantoin, TEA, & water are some of the other components employed. Male Wistar rats weighing 150–250 grammes at 2-3 months of age were the test animals. The population of lab animals comes in Bantul.

**Extraction-**Using the maceration process and a 70% ethanol solution, the extraction is carried out. With occasional stirring, 1.128 kg or P. niruri powder were introduced together with ethanol 70%. 24 hours later, the residue was filtered, and 16.5 L of complete ethanol was used to macerate the leftover material until a clear filtrate was achieved. The resultant filtrate is collected, the solvent is then evaporated in a rotary vacuum evaporator at the a temperature of 40 oC to produce a thick extract, and the extract yield is estimated.

## Hair Tonic Preparation Formulations-

In this investigation, two formulations of hair tonic preparations were created using the identical base composition and an extract concentration of 5% (w/w). One of the formulations also included the penetrant booster menthol. Tonic formulations with 2% minoxidil are utilised as a positive control.

## Making the Tonic Preparations-

P. niruri ethanol extraction tonic formulations created by weighing the necessary ingredients. Before adding ethanol, the extract is first diluted in warm water while the menthol is well dissolved in ethanol. TEA, DMDM hydantoin, and sodium metabisulfite were all dissolved in water. Mix parts of ethanol and water gently, propylene glycol is added little to little and the remains of a water continuously stirring until homogeneous.

**Evaluation of Tonic Preparations-** Organoleptic evaluation and a pH test were performed on tonic formulations. On the preparation's colour and scent, organoleptic testing was done. Meanwhile, preparatory pH test is done with a pH metre. To use a stock solution with such a pH of 9, the pH metre was calibrated in advance. After calibrating, the pH metre is dipped into the mixture and left over several minutes to get a pH of tonic solution.

**Hair Tonic of P. niruri Ethanol Extract and Evaluation Preparations-** Because they are simpler to administer, less sticky, and do not leave a thin film on the skin like other semisolid dosages, tonic formulations were created. Tonic preparations are made by combining the extract with 96% ethanol after a warm water solution has been added. Furthermore, menthol is also dissolved in ethanol as a solvent. In order to

fully dissolve the extract and the chemicals employed in the formulation, propylene glycol is added as a cosolvent. Because water can be a microbiological growth medium in large volumes, DMDM hydantoin is utilised as a preservative. To stop the oxidizing of the P. niruri extract, sodium metabisulfite is utilised as an antioxidant. The use of menthol and penetration enhancers to a skin gives the scalp a cool and fresh scent. Organoleptic and ph evaluations of tonic formulations were conducted. In Table 3, the evaluation findings are displayed. The tonic formula's organoleptic observations demonstrate that now the preparations are opaque. This is due to the fact that P. niruri extracts are utilised in the form of a dark, viscous extract, which makes the finished preparation dark and black in colour. Tonic preparations must meet the quality standards of BSN 16-4955-1998, which states that they must have a pH in the range of 3 to 7, and have a pH of a skin that is 4 to 7.

## Conclusion:

The formula 2 dose tonic containing P. niruri ethanol extract with penetrant enhancer menthol 1percent has a better activity as a hair grower than formula 1, according to this study, even if statistically, this formula does not demonstrate any significant difference in terms of length and hair weight.

## Formulation and Evaluation of Minoxidil Gel Using Acrylamide/Sodium Acryloyldimethyl taurate copolymer for Alopecia areata

Antihypertensive medication minoxidil (MXD) appears to be helpful in the management of AA by extending the anagen stage and enlarging smaller hair follicles. MXD is presently offered as a topical solution in concentrations of 2% and 5% w/v. Commercial MXD formulations, however, have significant levels of ethanol & propylene glycol, and using them frequently can have serious negative consequences like redness, irritation, burning, and allergic contact dermatitis. Little time spent in touch with the application region and high systemic drug absorption, which can have negative cardiovascular effects, are other downsides of topical MXD solutions. Hence, a novel formulation inside the form of gel that can offer adequate contact time and be capable of sustained drug administration was needed to address these shortcomings. The production of gels, a transparent or translucent semi - solid dosage form used for topical medication delivery, involves trapping huge volumes of aqueous and hydro-alcoholic liquids inside a three-dimensional colloidal network. A new copolymer called Sepineo P 600 has garnered a lot of attention recently for its potential use in the production of gels.

**Materials And Methods-** Material Minoxidil Sepineo P 600 is a concentrated hexadecane dispersion of the copolymer acrylamide/sodium acryloyldimethyl taurate. Dialysis membrane made of propylene glycol (Molecular weight cut off 14000 Da) The analytical grade comprised all other compounds.

**Preparation of drug loaded gel-** In order to create gel (MXD-Gel), the medication was first dissolved in an adequate amount of propylene glycol, followed by the addition of Sepineo P 600 (1%, 2%, and 3% w/v), all while stirring continuously for five minutes. Similar to that, blank gel was created without the use of any drugs. To create the ideal viscosity gel, three different gelling agent concentrations were applied. To release trapped air, the produced gel was allowed to equilibrate for 24 hours at room temperatures (25 1oC). The medication was dissolved in a solvent mixture to create MXD-Lotion (ethanol: propylene glycol: water in the ratio of 50:30:20).

**Drug content and pH-** 500 mg of MXD-Gel were dissolved into 50 ml of phosphatase buffer (pH 7.4) inside a volumetric flask with a volume of 100 ml with constant shaking to determine how much medication was present in the formulation. Lastly, it was examined on UV- visible after the proper dilution. max. 231 nm visual spectrophotometer (Varian Cary-5000, Netherlands). The pH of the gel was determined using a digital pH metre (pH Tutor Bench Meter, EUTECH Instruments, Singapore).

**Spreadability study-**The region to which the formulation spreads readily after direct application to skin was measured using the gel's spreadability. Weighed cellulose acetate filtrate (W1) was placed at the centre of a aluminium foil sheet to measure spreading ability. Using a 5 ml syringe, 20 drops of the test mixture were applied over the cellulose acetic filter paper's designated area (Becton Dickinson & Co., USA). The saturated portion of a filter paper was separated from the saturated portion after 10 minutes.

**Skin adhesion test-** The bio adhesion strength of produced gel to excised pig ear tissue was measured using a modified version of Patel et al(2007) .'s approach. With a two-arm balance, the left arm was attached to one glass slide that had skin on it, while the second glass slide to skin was linked to a wooden block. By putting

more weight on the right pan, the left and right pans were brought into equilibrium. By applying light pressure to eliminate air bubbles, 1 g of the produced gel was placed between the two slides and left for 5 minutes. Weight was gradually added to a right pan at a rate of 50 mg per minute until the patch came away from the skin. Using the formula, the weight (gramme force) necessary to separate the gel from of the skin surface was computed as a measure of the bio adhesive strength.

**Result:** Minoxidil-Gel containing 1.0% w/v of Sepineo P 600 form a very thin gel that liquefies within 6 h of preparation, while at 3.0% w/v gel formulation was very thick and sticky that could not be properly spread out. Gel containing 2.0% w/v of Sepineo P 600 formed uniformand smooth gel that does not liquefy upon keeping. Thus, 2.0% w/v concentration of gellingagent was selected as the optimized concentration.

## Conclusion:

The most prevalent type of hair loss, alopecia areata, negatively impacts many patients' quality of life. The signs of alopecia areata include nail abnormalities, hair loss, and hair disorders. The immune system targets your hair follicles when you have alopecia areata. There is no known reason for alopecia areata, hence it cannot be prevented. Alopecia areata has no known cure or effective treatment. The mainstay of AA treatment is corticosteroids. Minoxidil, immunotherapy, injectable, and oral medication are additional therapies that have been tried with some degree of effectiveness. The prognosis of the complex multifactorial condition alopecia areata varies. Controlled research examining efficient Alopecia areata therapies are scarce. The effects of alopecia areata on a person's appearance and mental health are significant. Moreover, there is no widely accepted reliable treatment. The prognosis of the complex multifactorial condition alopecia areata is uncertain. While many individuals recover on their own, some may have a persistent illness. Although corticosteroids are thought of as the first line of defence, there are no FDA-approved therapies. Alopecia areata patients with topical minoxidil solution may have hair regrowth.

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