Introduction

Hair loss, baldness or Khalitya (medically known as alopecia) is a loss of hair from the head.

Hair has a great importance in human being life, like human communication. Its importance in human communication means that abnormalities like excess hair in hirsutism or hair loss in alopecia cause psychological distress.

Khalitya or baldness according to great Aacharya Sushruta is a state of falling hair due to vitiated and increased state of Pitta assorted with Vayu, after that the Kapha mixed with Rakta also joins in this event. [1] Dalhan as well as Videha also says in his commentary in above reference that Khalitya effects only in males not in females [2] so we tried to explore in males only.

The nature of hair falling is Khalitya or Khaulya (baldness). [3] It is morbid baldness. [4]

Baldness (Khalitya) Ayurvedic View

1. **Khalitya as Rasaja diseases**: [5]

Of all diseases Vata, Pitta and Kapha are verily the root; because of having their symptoms, their subsidence and scriptural evidence. As the entire creation existing as universe is never distinct from Sattva, Rajas and Tamas, the entire group of disorders present in different forms does not exist without Vata, Pitta and Kapha. Variations are due to combination of Doshas, Dhatus and Malas; specific sites and etiological factors; to Dhatus, vitiated excessively by Doshas, nomenclature is given Rasaja, Raktaja, etc.

It is only by indirect application that diseases are said to be originated by Dhatuja in fact the diseases caused in Dhatus excessively vitiated by Doshas are known as Rasaja (Produced by/in Rasa) etc; such as in burnt by Ghee, oil, copper or iron, heating is indirectly
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

referred to by Ghee etc. Similarly in diseases caused by Rasa; is Doshas located in Rasa Dhatu etc. indirectly referred to.

2. ‘Khalitya’ as diseases due to vitiated Rasa Dhatu

[6]

Following diseases are caused by the vitiation of Rasa Dhatu, disinclination for food, anorexia, impotency, asthma, emaciation, loose of power of digestion and premature appearance of wrinkles and gray hairs.

3. As indication of death (Aristas) [7]

One whose hair are parted on a boundary line, eye brows are contracted and drooped with eyelashes moving constantly dies soon.

4. As indication of old age [8]

Age is divided into three- 1 Childhood 2. Middle (Adult) 3. Old age; Of them below sixteen years are children, who are subdivided into three- those taking only milk (liquid), those taking milk and food (liquid and solid mixed) and those taking solid food, they are respectively up to the age of one year, two years and thereafter.

Middle age is between sixteen and seventy, its subdivision is – development, youthfulness, fullness and decline; of them the period of development is up to twenty years. Youthfulness is up to thirty years; fullness of all Dhatus, sense organs, strength and power.

Thereafter slight decline till seventy; after seventy one is called old whose Dhatus, sense organs, strength and power and enthusiasm are decreasing and who is, day by day, attended with wrinkles, graying of hair and baldness, afflicted with complications like cough, dysnoea, etc.

5. Sweet test as beneficial for Kesha (Hair) [9]
Sweet taste increases all Dhatus, Ojas, semen and breast milk; is beneficial for eyes, hair, and complexion.

6. Drugs and diets having sweet taste are promoting for healthy skin, hair, voice and strength \[^{10}\]

7. **Tila (sesamum) is as beneficial for Kesha (Hair)** \[^{11}\]

*Tila* is lightly astringent and bitter, sweet, *Madhur* in *Vipaka*, pacifies *Vata* and increases *Pitta*, is checking, *Ushnaveerya*, excellent promoter of strength, unctuous, beneficial for wound as external paste, wholesome for teeth, skin and hair, promotes digestive power and intellect, reduces urine and is heavy.

8. **Fruit of Gambhari is wholesome for Kesha (Hair)** \[^{12}\]

*Kashmarya* (Fruit of Gambhari) is agreeable, diuretic, and useful in intrinsic hemorrhage and *Vata*, wholesome for hair, *Rasayana* and intellect promoting.

9. **Matting of hair as premonitory symptom of Prameha** \[^{13}\]

The premonitory symptoms of *Prameha* are burning sensation in palm and sole; unctuousness, sliminess and heaviness of the body parts; sweet and white urine, throat, tongue and teeth, matting of hair and increase of nails.

10. The three vitiated ‘Doshas’ while initiating the process of manifestation of various types of ‘Prameha’ produce the premonitory symptoms like matting of the hair. \[^{14}\]

11. **Pathogenesis of Khalitya (Baldness)** \[^{15}\]

*Pitta* situated in hair follicles and associated with *Vata* fells hair, thereafter *Kapha* mixed with *Rakta* creates obstruction therein
j) 10 Chapter 7 Review of Literature Khaliya (Baldness)
resulting in non appearance of others. This is known as Indralupta, Khaliya or Rujya.

12. Pathogenesis of dandruff (Darunaka) [16]

When ground of hair becomes hard, itching and rough with cracks it is known as Darunaka caused by aggravation of Kapha and Vata.

13. Pathogenesis of Paliya (Greying of hair) [17]

Body heat caused by anger, grief and exertion along with Pitta located in head subject the hair to serve heating which results in Paliya (grey hair).

Abnormal greying of hair is caused by anger etc. while the normal one takes place by Pitta; otherwise due to identity of body heat and Pitta there might be defect of repetition.

14. Effect of combing during Ritukala [18]

During menstrual period, from the very first day, the women, observing celibacy, should abstain from day sleep, combing etc., why? By day sleep she gives birth to the sleepy like that by combing, he is born bald.

15. Vital Points related to head hair [19]

Above temples and at the end of hair line are Utksepa Marmans, (on injury) the patient lives till splinter is there or if it falls out after suppuration but never after extraction of the foreign body.

16. ‘Sirasah Pratipurana’ and hair [20]

Massage on head eliminates diseases of head, provides softness, length, luxuriance, gloss and blackness in hair, satiety in head, charm on face, saturation in sense organs and filling of vacant head.
17. **Effect of hair cutting** \[^{21}\]

Cutting of hair (on head and other parts) and nails removes inertia provides pleasure, lightness and charm with increases enthusiasm.

18. **Effect of ‘Sareyakadi Tail’ on baldness** \[^{22}\]

It should be used, after purifying the body as snuff and massage keeping on the diet of black gram or ‘Krasara’. After a month hair become dense, curly and bee black with new hair appearing on the bald scalp. Moreover, senility does not attack suddenly, excellent strength comes in sensory and motor organs and face becomes free from wrinkles.

19. **Result of ‘Sompana’ on hair growth** \[^{23}\]

Lord ‘Soma’ is only one but has twenty four different forms according to place, name, shape and potency. ‘Bhrama’ etc. in early age, created ambrosia named ‘Soma’ in order to prevent senility and death. When any subject uses it according to described method applying after a month, subject’s head should be tonsured and anointed with paste of ‘Usira’ and black sesamum or bathed with milk. Thus after a week hair becomes as bee-black, curly, firm and glossy.

20. **Effect of ‘Basti’ on hair** \[^{24}\]

Of all the measures, ‘Bastikarm’ (enemation) is mentioned as the most important because it performs many functions. Such as having combination of various drugs, performs evacuation, pacification and checking of Doshas: acts as aphrodisiac for one whose semen is diminished; promotes development of body in the emaciated; slims the obese, nourishes eyes, removes wrinkles and greying of hair and stabilises youthfulness.

21. **‘Dhoompan’ and hair** \[^{25}\]
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

The person, by the use of smoking, becomes cheerful in sense organs, speech and mind; has firm hair, teeth, beards and moustaches and fragrant and non slimy mouth.

22. ‘Nasya’ and ‘Khalitya’ [26]

The word ‘Nasya’ particularly denotes ‘Sneha’ which is administered to those with vacant head for promoting strength also in neck, shoulder and chest or for improving vision.

That should be given with Sneha processed with drugs pacifying Vata and Pitta when head is overcome by Vata and in falling of teeth, hair, beards, moustaches, dandruff, tinnitus, defects of vision, hoarseness of voice, nasal diseases, dryness of mouth, premature wrinkles and greying of hair, difficult awaking and other disorders of mouth caused by Vata and Pitta.

23. ‘Nasya’ and ‘Khalitya’ [27]

Snuffing pacifies disorders located in supraclavicular region, provides clarity to sense organs, fragrance in mouth and strength in jaw, teeth, head, neck, Trika, arms, chest, prevents appearance of wrinkles, greying of hair, baldness and freckles.

24. ‘Mahakalyanaka Ghritam’ and Hair [28]

This ‘Mahakalyanaka Ghritam’, when used, alleviates all types of fevers; it is auspicious and only by sight and touch removes all diseases. By the regular use of this one becomes invincible to all creatures and lives for three hundred years free from wrinkles and grey hair.

25. Advantages of Nasal Therapy [29]
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

One who practises nasal therapy in time according to the prescribed method, his hair and beard never become white or gray; he never experiences hair fall these rather grow luxuriously.

26. Oiling of head and ‘Khalitya’\textsuperscript{[30]}

One who applies Til oil on his head regularly does not suffer from headache, baldness, greying of hair, nor do his hair fall.

27. ‘Tila’(sesamum) is hot in potency, good for the skin, cold on touch, good for hairs, strengthening, not easily digestible, produces little quantity of urine, pungent at the end of digestion and increases intelligence, digestive function, ‘Kapha’ and ‘Pitta’.

28. Care of hairs and nails\textsuperscript{[32]}

The dressing and cutting of hair, beard and nails adds the corpulence, libido, longevity, cleanliness and beauty.

29. Signs and symptoms of vitiation of Asthi Dhatu & ‘Khalitya’\textsuperscript{[33]}

Signs and symptoms of the diminution of Asthi are falling of hair, nails, hair of the beard including moustaches and teeth, exertion and looseness of joints.

30. Excess using of salt and ‘Khalitya’\textsuperscript{[34A]}

Drugs and diets having saline taste if used excess they cause obstruction of the function of senses and production of premature wrinkling, greying and baldness.

1. Salt is associated with hot and sharp properties. It is neither very heavy nor very unctuous. It is deliquescent and is capable of producing laxative
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

effect. People who are accustomed to the excessive use of salt, suffer from premature baldness, grey hair and wrinkles in the skin. [34B]

2. Addiction to the intake of salt makes the offspring suffer from early onset of wrinkles in the skin, greying of hair and baldness. [34C]

3. Salt used in excess, it causes increase of ‘Asra’ (blood) and ‘Pavana’ (Vata), causes baldness, greying of hair, wrinkles of the skin, thirst, leprosy (skin diseases), poison effect, ‘Visarpa’ and diminution of strength of the body. [34D]

31. Hair diseases due to vitiated Asthi Dhatu [35A]

Following diseases are caused by the vitiation of Asthi Dhatu, hypertrophy of bones and teeth, cracking sensation in the teeth and pain in bone, discoloration and morbidity in hair of the head, small hair of the body, nail as well as beard.

32. Decrease of ‘Asthi Dhatu’ causes pain in joints, falling off of the teeth, hair, nails etc. prematurely. [35B]

33. ‘Khalitya and excess using of Alkalies’ [36A]

Alkali is associated with hot, sharp and light properties. In the beginning it works as a deliquescent and afterwards as a desiccant. It is used for suppuration, cauterisation and penetration. Its excessive use produces injurious effects on hair, eye, heart, and virility. People of villages, towns, cities, and countries where this is continuously used in excess; suffer from blindness, impotency, baldness, grey hair and heart diseases. Therefore alkali should not be used in excess.

34. All (‘Ksaras’) alkalies are very penetrating; very hot in potency, destroys worms, easily digestible, vitiate ‘Pitta’ and ‘asrak’ (blood) help digestion of other
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)
substances, help break up hard masses, not good for
the heart, being pungent and salty in taste are not
good to semen, ‘Ojas’ eyes and hair. [368]

35. Hairs and parasites of the blood [37]

Blood born parasites specifically ‘Kesada’ (Lit. which eat away
hair of the head) and ‘Lomada’ (Lit. which eat away the small hair of
the body) have effects in this manner that destruction of the hair from
the head, face, other parts of the body, eye lashes and nails.

36. ‘Tvak Sara’ and hairs [38]

Individuals having the excellence of ‘Tvak’ or skin are
characterized by unctuous, smooth, soft, clear, fine, less numerous,
deep rooted and tender hair and lustrous skin.

37. ‘Meda Sara’ and hairs [39]

Individuals having the excellence of ‘Meda Dhatu’ are
characterized by the abundance of unctuousness in complexion, voice,
eyes, hair of the head and other parts of the body, nail, teeth, lips, urine
and feces.

38. Enumeration of hair [40]

Hair can be ascertained from inference only. ‘Kesha’ (Hair),
‘Samashru’ (beard & moustaches) and ‘Loman’ (small hair) are
enumerated as 29946(Twenty nine thousands nine hundred forty six).

39. Hair fall as Bad prognosis of incurable type of
Javara [41]

If deep seated and acute fever occurs in a weak and in an
emaciated patient, and continues for several nights, then it is incurable.
In such diseases; the hairs of the head fall apart to produce a straight
line.
40. ‘Kanakarista’ and ‘Khalitya’ [42]

It also cures ‘Vali’ (appearance of wrinkles in the body), ‘Palita’ (appearance of premature dry hair) and ‘Khalitya’ (baldness) caused by the vitiation of ‘Doshas’.

41. ‘Kesha’ is as ‘Mala’ (waste product) [43]

‘Kesha’ (big hair), and ‘Loman’ (small hair) are ‘Mala’ (waste product) of ‘Asthi Dhatu’ a tissue element.

42. Poisoned oil and hair fall [44]

If the oil for application over the head is poisoned, then the patient suffers from hair fall, headache and tumours in the head.

43. Line of treatment of hair diseases [45]

In ‘Khalitya’ (alopecia), ‘Palitya’ (greying of hair), ‘Vali’ (appearance of wrinkles over the face), and ‘Hari-loman’ (tawny hair), the patient should, in the beginning, be given elimination therapies, and thereafter, be given ‘Nasya’ (inhalation therapy) with medicated oil, and application of paste of drugs over the head and face.

44. ‘Anutaila’ and ‘Khalitya’ [46]

Inhalation therapy with medicated oils or with ‘Anu-taila’ cures alopecia and greying of hair.

45. Warm water bath and hairs [47]

Pouring warm water over the body bestows strength, but the same over the head, makes for loss of strength of the hair and eyes.

46. Oil of ‘Aksa’(Vibhitaka) and hairs [48]

‘Aksa’ tail oil obtained from seeds of ‘Vibhitaka’ is sweet, cold in potency good for the hair, hard to digest, mitigates Pitta and Vata.
47. ‘Lasuna’ and hairs

‘Lasuna’ is highly penetrating, hot in potency, pungent in taste, and at the end of digestion, makes the bowels to move, good for the heart and hairs.

48. ‘Sami’ and hairs

‘Samya’ (fruit of ‘Sami’) is not easily digestible, hot in potency, destroys the hairs and causes dryness

49. Application of paste of drugs over the face & hair

If properly done, it cures premature greying of hair, discoloured patches, wrinkles, blindness, and bluish vision.

50. Fatal signs connected with hair beyond particular appearance

He, whose hair on the head and on the body appearing as though smeared with oil, though not actually smeared is fatal sign.

51. ‘Kalanisa’ and hair

Seeing a women who is black, sinful, not performing, traditional rites (including in misconduct); having long hairs, nails and hanging breasts, wearing, discoloured garlands and dress- is like seeing ‘Kalanisa’ (goddess of death) is a fatal sign.
Baldness Modern View

According to modern the baldness or Khalitya is divided in two types as below:-

A. Male
B. Female

Female androgenic alopecia is known as female pattern baldness, although its characteristics can also occur in males. It more often causes diffuse thinning without hairline recession; and, like its male counterpart, rarely leads to total hair loss. The Ludwig scale grades are used to observe severity of androgenic alopecia in females.

In this study only the male pattern baldness is selected so there baldness is used only for male pattern baldness.

Baldness can refer to general hair loss or androgenic alopecia (male pattern baldness). Some types of baldness can be caused by alopecia areata, an autoimmune disorder. The extreme forms of alopecia areata are alopecia totalis, which involves the loss of all head hair, and alopecia universalis, which involves the loss of all hair from the head and the body.

It is believed that androgens are the main regulator of human hair follicles, changing small vellus follicles producing tiny, virtually invisible hair into larger intermediate and terminal follicles making bigger, pigmented hair. The response to androgens varies with the body site as it is specific to the hair follicle itself. Normally around puberty, androgens stimulate axillary and pubic hair in sexes, plus the beard, etc. in men, while later they may also inhibit scalp hair growth causing androgenetic alopecia. Androgens act within the follicle to alter the mesenchyme-epithelial cell interactions, changing the length of time the hair is growing, the dermal papilla size and dermal papilla cell, keratinocyte and melanocyte activity.
Role of human hair

Human hair growth is very important to our health and well-being. This is despite its growth being so reduced compared to most other mammals. Although often seen as rather irrelevant medically because human hair loss is not life-threatening, hair is highly significant for people in many different cultures around the world.

Human hair’s main functions are protection and communication; it has virtually lost the insulation and hide roles important in mammals, although seasonal variations in growth and our remaining ability to erect our hair when cold or nervous indicate the evolutionary history.

The visible hair produced in childhood are mainly protective; eyebrows and eyelashes stop things from entering the eyes, while scalp hair probably protects the head and neck from sunlight, cold, and physical damage. Head hair is also important for social communication.

Human hair is also involved in sexual communication. The development of visible pubic and axillary hair signals puberty in both sexes, while men exhibit sexual maturity with visible beard, chest, and upper pubic diamond hair. These important communication roles explain why hair disorders have serious psychological consequences and negative impact on the quality of life even among.

Androgenic alopecia, Baldness or Khalitya:-

Androgenic alopecia is hair loss that occurs due to an underlying susceptibility of hair follicles to androgenic thinness. It is the most common cause of hair loss. Men typically present with hairline recession at the temples and vertex balding, while women normally diffusely thin over the top of their scalps. Both genetic and environmental factors play a role, and much etiology remain unknown. Since androgens and androgen receptors (AR) are the initiating cause of androgenic alopecia, hair loss or Khalitya, their genetic corollaries are a subject of much research.
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

Classic androgenic hair loss in males begins above the temples and vertex, of the scalp as we divided the scalp in two regions in this study. As it progresses, a rim of hair at the sides and rear of the head develops. The Hamilton-Norwood scale has been developed to grade androgenic alopecia in males which we used to define the grade of hair loss or Khalitya in this study.

Causes of baldness: - These can be explained as external and internal but regarding our aim and objective internal causes are required. Internal causes are as below.

<table>
<thead>
<tr>
<th>Physiological</th>
<th>Pathological</th>
</tr>
</thead>
</table>

Our study is done under the department of Kriya Sharir which represents physiology in the Ayurveda so there we will discuss only for physiological causes.

Physiological causes for Baldness Or Khalitya

1. Hormonal Role :-

Research indicates that the initial formation of pilosebaceous units begins in uterus. Pilosebaceous units have an important role in hair growing and baldness due to their functions and anatomical positions.

The sebaceous glands are microscopic exocrine glands in the skin that secrete an oily or waxy matter, called sebum, to lubricate and waterproof the skin and hair of mammals. In humans, they are found in the greatest number on the face and scalp, and are also found on all parts of the skin except the palms of the hands and soles of the feet. The type of secretion of the sebaceous glands is referred to as holocrine.
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

There are two types of sebaceous glands concerned to hair loss or Khalitya study, those connected to hair follicles, in pilosebaceous units, and those that exist independently.

Sebaceous glands are found in hair-covered areas, where they are connected to hair follicles. One or more glands may surround each hair follicle, and the glands are surrounded by arrector pili muscles. The glands have an acinar structure (many-lobed berry), in which multiple glands branch off a central duct. The glands deposit sebum on the hair, and bring it to the skin surface along the hair shaft; which has properties like Kapha Dosha. The structure consisting of hair, hair follicle, arrector pili muscles, and sebaceous gland is an epidermal invagination known as a pilosebaceous unit.

Sebaceous glands are also found in hairless areas (glorious skin) of the eyelids, nose, penis, labia minora, the inner mucosal membrane of the cheek, and nipples. Some sebaceous glands have unique names. Sebaceous glands on the lip and mucosa of the cheek are known as Fordyce spots, and glands on the eyelids are known as meibomian glands. Sebaceous glands of the breast are also known as Montgomery's glands.

Function:-

1. Sebaceous glands secrete the oily, waxy substance called sebum (Latin: fat, tallow)
2. Sebum waterproofs and lubricates the skin and hair of mammals
3. Sebaceous secretions in conjunction with apocrine glands also play an important thermoregulatory role.
4. Importance in delaying dehydration, in hot conditions, the secretions emulsify the sweat produced by the eccrine glands and this produces a sheet of sweat that is not readily lost in drops of sweat.
5. In colder conditions, the nature of sebum becomes more lipids and in coating the hair and skin, rain is effectively ward off.

6. Sebum is produced in a holocrine process, in which cells within the sebaceous gland rupture and disintegrate as they release the sebum and the cell remnants are secreted together with the sebum. The cells are constantly replaced by mitosis at the base of the duct.

7. Sebaceous glands are part of the body's integumentary system and serve to protect the body against germs. Sebaceous glands are responsible for the secretion of acids that form the acid mantle. This is a very fine, slightly acidic film on the surface of the skin which acts as a barrier to bacteria, viruses and other potential contaminants that might penetrate the skin.

8. The pH of the skin is between 4.5 and 6.2, and this acidity helps to neutralise the primarily alkaline nature of contaminants.

9. Sebaceous lipids make an important contribution in maintaining the integrity of the skin barrier, and express both pro-inflammatory and anti-inflammatory properties.

10. Additionally, sebaceous gland secretion provides vitamin E to the upper layers of facial skin.

11. Sebaceous glands are involved in skin problems such as acne and keratosis pilaris. In the skin pores, sebum and keratin can create a hyperkeratotic plug called a comedo.
The primarily androgenic physiology is that dihydrotestosterone (DHT) has major contributor at the dermal papillae. Below-normal values of sex hormone-binding globulin, follicle-stimulating hormone, testosterone, and epitestosterone are
present in men with premature androgenic alopecia compared to normal controls.

**Androgen:**

Androgen, (from ‘andro’ Greek word meaning as masculine) also called androgenic hormone or testoid, is the broad term for any natural or synthetic compound, usually a steroid hormone, that stimulates or controls the development and maintenance of male characteristics in vertebrates by binding to androgen receptors. This includes the activity of the accessory male sex organs and development of male secondary sex characteristics. Androgens were first discovered in 1936. Androgens are also the original anabolic steroids and the precursor of all estrogens.

The primary and most well-known androgen is testosterone. Dihydrotestosterone and androstenedione are less known generally, but are equal importance in male development. DHT in the embryo life causes differentiation of penis, scrotum and prostate. Later in life DHT contributes to male balding, prostate growth and sebaceous gland activity.

Below-normal values of sex hormone-binding globulin, follicle-stimulating hormone, testosterone, and epitestosterone are present in men with premature androgenic alopecia compared to normal controls.\(^{[55]}\)

Although follicles were previously thought that permanently gone in areas of complete hair loss, they are more likely dormant, as recent studies have shown the scalp contains the stem cell progenitors from which the follicles arose.\(^{[56]}\)

Studies have shown that growth and dormancy of hair follicles are related to the activity of insulin-like growth factor at the dermal papillae, which is affected by DHT.
DHT, which stands for Dihydrotestosterone (5α-Dihydrotestosterone), is a male sex hormone, an androgen. 5α-reductase, an enzyme, synthesizes DHT in the adrenal glands, hair follicles, testes and prostate.

Male and female adults can lose hair as a consequence of changes in the metabolism of androgen in the body, men more commonly than women. DHT plays a major role in hair loss. Male pattern baldness, also known as androgenic alopecia or androgenetic alopecia, is caused by the hair follicle's sensitivity to DHT. The follicles shrink, resulting in a shorter lifespan and the abnormal production of hair. It is demonstrated in study that *Igf-I* affects follicular proliferation, tissue remodelling, and the hair growth cycle, as well as follicular differentiation.\(^{[57]}\)

The most important part of the hair follicle is the dermal papilla (papilla of hair), which is responsible for the growth of hair. The dermal papilla cells divide and differentiate to form new hair follicles. The papilla is in direct contact with the skin's blood capillaries, from which it gets its essential nutrients for proper hair follicle growth. The dermal papilla has a large number of androgen receptors (more in males than females). When DHT gets to the dermal papilla, it undermines the absorption of vital nutrients required for healthy hair follicles.

Hair follicles have resting and growing phases. Without proper nutrition, their resting stages get longer while their growing phases get shorter.

Miniaturization in this thesis refers to the progressive shrinking of the hair follicle. Miniaturization occurs because of DHT. Most of cases of male pattern baldness occur because of the effects of DHT on the hair follicles. How much DHT people produce depends almost entirely on their genetic make-up - the more that is produced, the greater and more widespread miniaturization is, resulting in greater
hair loss. Hair grows for shorter periods, becomes lighter, finer and smaller, until it eventually reaches the vellus stage. Vellus hair is light-colour, short, thin and very fine hair - it is barely noticeable and grows on most of the human body, except for on the lips, palms of the hands, soles of the feet, etc.

Dihydrotestosterone (commonly abbreviated to DHT), or 5α-dihydrotestosterone (5α-DHT), also known as androstanolone (5α-androstan-17β-ol-3-one) as well as 17β-hydroxy-5α-androstan-3-one, is a sex steroid and androgen hormone. The enzyme 5α-reductase synthesizes DHT in the prostate, testes, hair follicles, and adrenal glands.

In men, approximately 5% of testosterone undergoes 5α-reduction to form the more potent androgen, dihydrotestosterone (DHT). DHT has two to three times greater androgen receptor affinity than testosterone and has 15-30 times greater affinity than adrenal androgens.  

During embryogenesis DHT has an essential role in the formation of the male external genitalia, while in the adult DHT acts as the primary androgen in the prostate and in hair follicles.

DHT is the primary contributing factor in male pattern baldness that results from hair follicle miniaturisation. However, female hair loss is more complex.

Androgens are important in male sexual development around birth and at puberty. They regulate sebaceous glands, apocrine hair growth, and libido. With increasing age androgens stimulate hair growth on the face, but suppress it at the temples and scalp vertex, a condition that has been referred to as the androgen paradox.
5-alpha reductase:-

Types 1 and 2-5α reductase enzymes are present at pilosebaceous units in papillae of individual hair follicles. They catalyze formation of the androgens testosterone and DHT, which in turn regulate hair growth. [62]

5α-reductases, also known as 3-oxo-5α-steroid 4-dehydrogenases, are enzymes involved in steroid metabolism. They participate in 3 metabolic pathways:-

1. Bile acid biosynthesis
2. Androgen and estrogens metabolism
3. Prostate cancer.

There are three isoenzymes of 5-alpha reductase, which vary in different tissues with age. The enzyme is produced in many tissues in both males and females, in the reproductive tract, testes and ovaries, skin, seminal vesicles, prostate, epididymis and many organs, including the Nervous System. There are three isoenzymes of 5-alpha reductase: steroid 5α-reductase 1, 2, and 3 (SRD5A1, SRD5A2 and SRD5A3). [63]

Distribution with age of 5-alpha reductase:-

1. Fetal life: - 5α-R1 is expressed in fetal scalp and nongenital skin of the back anywhere from 5 to 50 times less than in the adult.

α-R2 is expressed in fetal prostates similar to adults. 5α-R1 is expressed mainly in the epithelium and 5α-R2 the stroma of the fetal prostate. Scientists looked for 5α-R2 expression in fetal liver, adrenal, testis, ovary, brain, scalp, chest, and genital skin, using immunoblotting, and were only able to find it in genital skin. [64]
2. **After birth**: - the 5α-R1 is expressed in more locations, including the liver, skin, scalp and prostate. 5α-R2 is expressed in prostate, seminal vesicles, epididymis, liver, and to a lesser extent the scalp and skin. Hepatic expression of both 5α-R1 and 2 is immediate, but disappears in the skin and scalp at month 18. Then, at puberty, only 5α-R1 is reexpressed in the skin and scalp.

3. **Male fetuses and throughout postnatal life**: - 5α-R1 and 5α-R2 appear to be expressed in the prostate in male fetuses and throughout postnatal life. In adulthood, 5α-R1-3 is ubiquitously expressed. 5α-R1 and 5α-R2 are also expressed, although to different degrees in liver, genital and nongenital skin, prostate, epididymis, seminal vesicle, testis, ovary, uterus, kidney, exocrine pancreas, and the brain. [65]

Androgens have different effects at different follicles: they stimulate IGF-1 at facial hair, leading to growth, but stimulate TGF β1, TGF β2, and IL-6 at the scalp, leading to catagenic miniaturization. [66]

Studies of serum levels of IGF-1 show it to be increased with vertex balding [67] and DHT inhibits IGF-1 at the dermal papillae. [68]

IGF-1 is modulated by IGF binding protein, which is produced in the dermal papilla [69] and DHT inhibits IGF-1 at the dermal papillae. [70] Extracellular histones inhibit hair shaft elongation and promote regression of hair follicles by decreasing IGF and alkaline phosphatase in transgenic mice.

Also, crosstalk occurs between androgens and the Wnt-beta-catenin signaling pathway that leads to hair loss. At the level of the somatic stem cell, androgens promote differentiation of facial hair dermal papillae, but inhibit it at the scalp. [71]

Latest serological studies says that men with androgenic alopecia typically have higher 5-alpha-reductase, lower total testosterone,
Hair growth and development are influenced by androgens, a blinded, case-control study was undertaken to determine if hair patterning is associated specific hormonal profiles. The study accrued 315 male subjects who were stratified with regard to age, race, and case-control status. Hair-patterning classification and serum levels of total and free testosterone (T), sex hormone binding globulin, and dihydrotestosterone (DHT) were performed. Several strong associations also were found between hormone levels and hair patterning. Men with vertex and frontal baldness had higher levels of free T, when compared to men with either little or no hair loss.  

5-alpha-reductase converts free testosterone into DHT, and is highest in the scalp and prostate. DHT is most commonly formed at the tissue level by 5α-reduction of testosterone.

**Prolactin:**

Prolactin has also been suggested to have different effects on the hair follicle across gender. Prolactin (PRL), also known as luteotrophic hormone or luteotropin, is a protein that in humans is best known for its role in enabling female mammals to produce milk. Prolactin is secreted from the pituitary gland in response to eating, mating, estrogen treatment, ovulation, and nursing. Prolactin is secreted in a pulsatile fashion in between these events. Prolactin also plays an essential role in metabolism, regulation of the immune system, and pancreatic development pituitary prolactin secretion is regulated by endocrine neurons in the hypothalamus, the most important ones being the neurosecretory tuberoinfundibulum (TIDA) neurons of the arcuate nucleus, which secrete dopamine (aka Prolactin Inhibitory Hormone) to act on the D₂ receptors of lactotrophs, causing inhibition of prolactin secretion. The pleiotropic, cytokine-like polypeptide neurohormone prolactin (PRL), primarily produced by the pituitary gland, is most
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

widely appreciated for its central role in the regulation of lactation and reproduction.

*In vitro* models show it inhibits hair follicle growth. \[^{75}\] PRL receptors, expressed in hair follicles (HFs), are functional and that human skin and human scalp HFs are both direct targets and sources of PRL. Latest study data suggest that PRL acts as an autocrine hair growth modulator with catagen-promoting functions and that the hair growth-inhibitory effects of PRL demonstrated here may underlie the as yet ill-understood hair loss in patients with hyper-prolactinemia. In vivo it can inhibit facial hair growth in humans. \[^{76}\]

**Sex hormone-binding globulin:-**

Sex hormone-binding globulin (SHBG) or sex steroid-binding globulin (SSBG) is a glycoprotein that binds to the sex hormones, androgen and estrogen. Other steroid hormones such as progesterone, cortisol, and other corticosteroids are bound by transcortin. SHBG is found in all vertebrates apart from birds.

2. **Age:-**

Androgens stimulate growth of facial hair, but can suppress scalp hair, a condition that has been called the 'androgen paradox. American Academy of Dermatology reports that in adult men, the incidence of androgenic alopecia is roughly equivalent to chronological age, with half of men experiencing hair loss by age 50.

A number of hormonal changes occur with aging:-

1. Decrease in testosterone
2. Decrease in serum DHT and 5-alpha reductase
3. Decrease 3AAG, a peripheral marker of DHT metabolism
4. Increase in SHBG (Sex Hormone Binding Globulin)
5. Decrease in androgen receptors, 5-alpha reductase type I and II activity, and aromatase in the scalp
The diathesis–stress model is a psychological theory that attempts to explain behavior as predisposition vulnerability together with stress from life experiences. The term diathesis derives from the Greek term for disposition, or vulnerability and it can take the form of genetic, psychological, biological, or situational factors. The diathesis–stress model asserts that if the combination of the predisposition and the stress exceeds a threshold, the person will develop a disorder. Stress can be conceptualized as a life event that disrupts the equilibrium of a person’s life. It has been long recognized that stress plays a significant role in understanding how psychopathology develops in individuals.

Supplementing eunuchs with testosterone during their second decade, for example, causes slow progression of androgenic alopecia over many years, while testosterone late in life causes rapid hair loss within a month. An example of premature age effect is Werner's syndrome, a condition of accelerated aging from low-fidelity copying of mRNA. Affected children display premature androgenic alopecia. Werner Syndrome patients exhibit growth retardation, short stature, premature graying of hair, alopecia (hair loss), wrinkling, prematurely aged faces with beaked noses, skin atrophy etc. but in this study above type of individuals are excluded.

3. **Metabolic syndrome**

(IR- insulin resistance, MS- metabolic syndrome, AGA- androgenic alopecia)

Multiple cross-sectional studies have found associations between early androgenic alopecia, insulin resistance, and metabolic syndrome, with low HDL being the component of metabolic syndrome with highest association. A study in above reference is evaluated 80 patients with early AGA and 48 healthy participants. The serum level of insulin was higher in patients with early AGA compared to the healthy participants, although not significantly. IR was detected in 25 patients with early AGA and in six healthy participants. The difference between the groups was statistically significant. Although 20 patients
with AGA were diagnosed with MS, it was only diagnosed in five healthy participants. The occurrence of MS was significantly higher in the AGA group than in the control group. The results, with the prevalence of IR and MS were observed to have increased in early AGA patients. Hence, patients with early AGA should be followed up for CAD in the long term.

Similar another study in reference of association of androgenic alopecia with metabolic syndrome in men survey was done. [78] A total of 740 subjects aged 40-91 years participated in the survey between April and June 2005. The Norwood classification was used to assess the degree of hair loss. Information on components of metabolic syndrome together with other possible risk factors was collected. Population-based study found a significant association between AGA and metabolic syndrome; among the components of metabolic syndrome, HDL-C was found to be of particular importance. This finding may have significant implications for the identification of metabolic syndrome in patients with moderate or severe AGA. Early intervention for metabolic syndrome is critical to reduce the risk and complications of cardiovascular disease and type 2 diabetes mellitus later in life.

Metabolic syndrome is a disorder of energy utilization and storage, diagnosed by a co-occurrence of three out of five of the following medical conditions which also increases the risk of developing cardiovascular diseases and diabetes:-

1. Abdominal (central) obesity,
2. Elevated blood pressure
3. Elevated fasting plasma glucose
4. High serum triglycerides
5. Low high-density cholesterol (HDL) levels

Essential fatty acids, or EFAs, are fatty acids that humans and other animals must ingest because the body requires them for good health
but cannot synthesize them. The term "essential fatty acid" refers to fatty acids required for biological processes but does not include the fats that only act as fuel. Only two fatty acids are known to be essential for humans:

1. alpha-linolenic acid (an omega-3 fatty acid)
2. linoleic acid (an omega-6 fatty acid)

When the two EFAs were discovered in 1923, they were designated "vitamin F", but in 1929, research on rats showed that the two EFAs are better classified as fats rather than vitamins.

Human or rat microsomal 5 alpha-reductase activity, as measured by enzyme conversion of testosterone into 5 alpha-dihydrotestosterone, is inhibited by low concentrations (less than 10 microM) of certain polyunsaturated fatty acids like linolenic acid linoleic acid. This results suggest that unsaturated fatty acids may play an important role in regulating androgen action in target cells. [79]

According to Davidson the term alopecia (Khalitya) means nothing more than loss of hair and is a sign rather than a diagnosis. There are many causes and patterns of alopecia. [80A]

1. Non-scaring
2. Scaring

**Non-Scaring** [80B]

i. Tinea capitis
ii. Alopecia areata
iii. Androgenetic alopecia
iv. Traumatic (trichotillomania, traction, cosmetic)
v. Syphilis
vi. Androgenetic alopecia
vii. Telogen effluvium
viii. Metabolic
j) 10 Chapter 7 Review of Literature *Khalitya* (Baldness)

ix. Hypothyroidism  
x. Hyperthyroidism  
xi. Hypopituitarism  
xi. Diabetes mellitus  
xxiii. HIV disease  
xiv. Nutritional deficiency  
xxv. Liver disease  
xxvi. Post-partum  
xxvii. Alopecia areata  
xxviii. Syphilis

**Scaring**[^80C]

i. Discoid lupus erythematosus  
ii. Radiotherapy  
iii. Folliculitis Decalvans  
iv. Lichen Planus Pilaris

Some types of alopecia related to this study:-

**Tinea Captis:** [^80D]

Fungal scalp infection is becoming increasingly common in urban areas. The clinical features can be variable but it usually affects children, causing patchy hair loss with some scaling. Any individual who develops an area of hair loss and scaling in the scalp should have the area scraped and affected hair plucked for mycological microscopy and culture. Associated inflammation accounts for the variable presentation. Anthropophilic fungal infections (spread from child to child) account for the majority of cases in urban areas. Endothrix (within the hair shaft) infections, e.g. *Trichophyton tonsurans*, cause relatively uninflamed patchy baldness with breakage of the hair at the skin surface ('black dot').
Hirsutism: - [80E]

Hirsutism is the growth of terminal hair in a male pattern in a female. It should be distinguished from hypertrichosis, which describes the excessive growth of terminal hair in either sex in a non-androgenic distribution. The amount of terminal hair varies in people with different genetic ancestries and therefore the definition of what might be considered excessive needs to take clinical context into account.

Androgenic Alopecia: - [80F]

Male-pattern baldness is physiological in men over 20 years old, (In the above reference and Samhita reference we grouped the volunteers starting age from 20 years) although rarely it may be extensive and develop at an alarming pace in the late teens. It also occurs in females, most obviously after the menopause. The well-known distribution (bitemporal recession and then crown involvement) is described as 'male-pattern' but this type of hair loss in females is often diffuse.

References

1. रोमक्षुपासांशृ वातन सहसूचितिः। प्रज्ञावर्तिरोमाणि तत्त: श्रामारोणिः।
   / वैध जयदेवरी विक्रमजी आचार्य/ मु.नि.13/33/322/ सुब्रह्म संहिता-दल्हण
   टीका/ वाराणसी/ चौखम्बा सुभार्ती प्रकाशन/2008/

2. विवेध:- खालित्वं पुसामेव न तु योधितां। वैध जयदेवरी विक्रमजी
   आचार्य/मु.नि. 13/33-34/322/ सुब्रह्म संहिता-दल्हण टीका/ वाराणसी /
   चौखम्बा सुभार्ती प्रकाशन/2008
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

3. खालत-न३ खलेत्माल्व: व्यरु तर्क वाचकपन्य त्री तरानाम तर्कवाचकपति भुट्टेनार्थ/ वाचकपत्यम/2476/ तृतीय भाग/ चौथे मास मात्र तीर्थ ओपिन वारणार्थी/1970/

English dictionary/ second edition/Munshiram Manharlal Publication/ 1981/

5. तत्र
अलापध्वराविचारिकार्यकरधारहल्लासत्सिंगाबहुतपाणेवार्गांगूरो
धकाथवैस्मादकालजवलीपितवर्तनप्रभुत्रो रसदेशज्वा विकारा: / वैद्य जयदेवजी त्रिकमजी आचार्य/ म.सू. 24/9/116/ सुधुत संहिता-डल्हण टीका / वारणार्थी/ चौथे मास मात्र प्रकाशन/2008/

6. नाथो-प्रेमधाकालं वन्य: पलिताऽग च।
रसप्रेमोजजा रोगा,..............................॥/ वैद्य जयदेवजी त्रिकमजी
आचार्य/ च. सू. 28/10/11/179/ चरक संहिता-आयुर्वेद दीपिका- चरकाणि
टीका/ वारणार्थी/ चौथे मास मात्र प्रकाशन/2009/

7. केशा: सीमान्तिं यस्त संक्षिप्ते विनमते भुवी॥
तुन्डन्ति चारकाशिकां मोंगिनारायणति मुख्ये /वैद्य जयदेवजी त्रिकमजी
आचार्य/ म.सू. 31/10/139/सुधुत संहिता-डल्हण टीका /
वारणार्थी/चौथे मास मात्र प्रकाशन/2008/

8. समस्तार्थं त्रिकमणाणातत्विन्द्रवंसवीयसाहमहत्यहि
बलीपितवर्तनल्युंहुं.......वृद्धाचरकं॥/ वैद्य जयदेवजी त्रिकमजी
आचार्य/ म.सू. 35/29/155/ सुधुत संहिता-डल्हण टीका / वारणार्थी
/चौथे मास मात्र प्रकाशन/2008/

9. रसगुणावत ऊंचवि वक्त्याशः- तत्र मधुरो
रसो...............शुक्स्यवर्धनश्चकुः: केशो वणिं........॥/ बैद्य
जयदेवजी त्रिकमजी आचार्य/ म.सू. 42/ 9/ 185/ सुधुत संहिता-डल्हण
टीका/ वारणार्थी/ चौथे मास मात्र प्रकाशन/2008/

10. तत्र, मधुरो रस:...........................केश्य: कण्ठो वल्य:...........।/ बैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू. 26/42/143-144/चरक संहिता-
11. The above mentioned literature review indicates the following:

- Chapter 7: Review of Literature

12. The references mentioned in the literature review include:
- 2009:
  - Chapter 7: Review of Literature
- 2008:
  - Chapter 7: Review of Literature
j) 10 Chapter 7 Review of Literature Khaliya (Baldness)

पिं च केशान् पचति पतितः तेन जायते॥/ वैच्छ जयदेवजी त्रिकमजी
आचार्ये/ सु.चि 13/37/322/ सुभूत संहिता-इल्लण टिका / वाराणसी /
चौधर्म्मा सुभार्ती प्रकाशन/2008/

18. अवलेखनात् खलतिः: / वैच्छ जयदेवजी त्रिकमजी आचार्ये/ सु.शा.
2/25/346/ सुभूत संहिता-इल्लण टिका / वाराणसी /चौधर्म्मा सुभार्ती
प्रकाशन/2008/

19. शहीकृण्णपरिक शेषान्तं उदेश्ये, तत्र सृष्टिये जीवेत् पाकान् पतितश्चत्वाश्च
वा नोदृष्टश्चत्.; / वैच्छ जयदेवजी त्रिकमजी आचार्ये/ सु.शा.6/27/3474/
सुभूत संहिता-इल्लण टिका / वाराणसी /चौधर्म्मा सुभार्ती
प्रकाशन/2008/

20. श्रीरोपात्तया रोगान्ध्रोपायुपकर्षति।
केशान्तं मार्दवं दैव्यं भुक्तं भिज्ञकृण्णार्यां॥
करोति शिरस्तूमिः सुव्यक्तमे चाननम्।
सन्तपयं चेन्द्रशाम्याम्य शिरस्; प्रतिपुराणम् ॥/ वैच्छ जयदेवजी त्रिकमजी
आचार्ये/ सु.चि. 24/25-26/488/सुभूत संहिता-इल्लण टिका / वाराणसी /
चौधर्म्मा सुभार्ती प्रकाशन/2008/

21. पामपोशमं केशान्तरोमापाय्ये
हर्षलोकवसीभाग्यक्रमसुभार्तीप्रकाशनम् ॥/ वैच्छ जयदेवजी त्रिकमजी
आचार्ये/ सु.चि. 24/73-74/490/सुभूत संहिता-इल्लण टिका / चौधर्म्मा सुभार्ती
प्रकाशन/2008/

22. केशा भवलिः भ्रमङ्गानाः॥
केशात्मानायें खल्ता भवेसुर्जङ्गः न चैन सहस्त्रयुपेति ॥ / वैच्छ
जयदेवजी त्रिकमजी आचार्ये/ सु.चि. 26/36/496 / सुभूत संहिता-इल्लण
टिका / वाराणसी / चौधर्म्मा सुभार्ती प्रकाशन/2008/

23. स्थिरा शिष्मा लक्षणार्यं: केशाण्ड सुभाम् जायन्ते, तवक च
नीलोक्पाणंतैमीपुष्पवैयुःप्रकाशाः; उधर्वाच मासात् केशान्
वापयहे,वापिव्या चौधीशचन्दनकृणणितित्वतः: शिरे; प्रदिवान् पवमा
वा वापयेत्; ततोस्यान्तरं समरातास् केशा जायन्ते भ्रमङ्गानाः.
j) 10 Chapter 7 Review of Literature *Khalitya* (Baldness)

.........1 / बैठ जयदेवजी त्रिकमजी आचार्य/ सू.चि. 29/12/503/ सुधुत संहिता-दल्हण दीका / बाराणसी / चौखम्बा सुभाषती प्रकाशन/2008/

24. तत्र बेहदीनां कर्मण्य वस्तिकर्म प्रधानतमाहाराचार्यः

.................वनीपिलितपहल्लि वष: स्थापयति 1/ बैठ जयदेवजी त्रिकमजी आचार्य/ सू.चि. 35/3/525/ सुधुत संहिता-दल्हण दीका/ बाराणसी / / चौखम्बा सुभाषती प्रकाशन/2008/

25. नरो धूमोपतोज्ज्ञ प्रस्तुतिध्रियवाच्यः

दुःकेश्रिजश्चमु: सुगतिधिविशदानम्: ॥/ बैठ जयदेवजी त्रिकमजी आचार्य/ सू.चि. 40/15/554/ सुधुत संहिता-दल्हण दीका / बाराणसी / चौखम्बा सुभाषती प्रकाशन/2008/

26. तत्र य: बेहदनां गृह्यशिरसां ग्रीवास्तेषोरसां च बलजननार्थ दुःखितसाधननार्थ ओ बेहो विधीयते तस्मिन् वैशेषिको नस्तश्च:। ततु देवं वाताभिषूते शिरसि दल्हकशेषमुप्रजातात्/ बैठ जयदेवजी त्रिकमजी आचार्य/ सू.चि. 40/22/555/ सुधुत संहिता-दल्हण दीका / बाराणसी / चौखम्बा सुभाषती प्रकाशन/2008/

27. नस्येन रोगः: शास्तिनि नराणामुन्धवज्रुजः

इन्द्रियाण्य च बैमल्ष्य कृयादायं सुगतिं च ॥
हनुदतशिरोग्रीवासित्वाहरसां वल्मु।
वनीपिलितवाचारिवश्चास्त्राणां चाययासंथबद्धम् ॥/ बैठ जयदेवजी त्रिकमजी आचार्य/ सू.चि. 40/54-55/557/सुधुत संहिता-दल्हण दीका / बाराणसी / चौखम्बा सुभाषती प्रकाशन/2008/

28. अध्यपः: सर्वभूतानां वनीपिलितवर्णितः

अन्यायासाद्वूतस्येष जीवंदर्पतत्त्वयं ॥ / बैठ जयदेवजी त्रिकमजी आचार्य/ सू.उ. 39/239-240/689/सुधुत संहिता-दल्हण दीका / बाराणसी / चौखम्बा सुभाषती प्रकाशन/2008/

29. नस्यकर्मः यथाकां यो यथोत्तरं निषेधते ॥

न तस्म चक्षुर्म प्राणं न थोरमुक्तन्ययते ।
न स्यु: श्रेष्ठा न कपिला: केशा: शमयुणि वा पुडः॥

118
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

10. Chapter 7 Review of Literature Khalitya (Baldness)

1) 10 Chapter 7 Review of Literature Khalitya (Baldness)

11. Chapter 7 Review of Literature Khalitya (Baldness)

30. निर्मित क्रेडिटिसिटिस: शिर्षतृत न्र जायते।

न खलील्य न पालिक्य न केशा: प्रपतितल च ||/ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू.5/57-59/41/ चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका / बाराणसी / चौखंडा सुभारती प्रकाशन/2009/

30. निर्मित क्रेडिटिसिटिस: शिर्षतृत न्र जायते।

न खलील्य न पालिक्य न केशा: प्रपतितल च ||/ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू.5/81/42/चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका/ बाराणसी / चौखंडा सुभारती प्रकाशन/2009/

31. उश्चस्त्वच्चै हिम: स्मर्ष केशयो बल्यस्तिनो मृतुः।

अत्युक्ति: कुद: पाके मेधाशिकपिङ्कृत् ||/प्र. के. आर. श्रीकांत मूर्ति / अ. हु. श्रा. / 366/23/78/ अ. हु./ प्रथम बौल्युम / बाराणसी / चौखंडा कृपणदास प्रकाशन / 2013 /

32. पौष्टिक वृद्धि युवयं शुचि रूपविराजनम्।

केशशकुन्तलादीनां कल्पनं संप्रभाषनम् ||/ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू. 5/99/43/ चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका / बाराणसी / चौखंडा सुभारती प्रकाशन/2009/

33. केशलोकनिःशकुन्तलिण्यपतनं धर्म:।

जयमथिज्ञसे लिङ्गं सनिशैलिथयमे च ||/ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू. 17/67/103/ चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका / बाराणसी / चौखंडा सुभारती प्रकाशन/2009/

34. A लवणे रस:.........................वलिपिलिवालित्वमापादयति, अपि

च................./ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. सू.26/42(3)144/ चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका / बाराणसी / चौखंडा सुभारती प्रकाशन/2009/

34. B ये हृदिल्यांमार्य: पुरुषस्तेपायं स्थिलिवासित्वमानि

बल्ययासंनाले भववित ि/ वैद्य जयदेवजी त्रिकमजी आचार्य/ च. वि. 1/18/234/ चरक संहिता-आयुर्वेद दीपिका- चक्रपाणि टीका / बाराणसी / चौखंडा सुभारती प्रकाशन/2009/
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

34. C नब्जनिव्या शीघ्रप्रवर्तित-खालियरोगणिणं वा।/वैध जयदेवजी विक्रमजी आचार्य/च.शा.8/21/344/चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा/बाराणसी/चौबम्बा सुभारती प्रकाशन/2009/

34. D. सोजितुस्त्रधारण्यं खलित्य पूर्वतं वलिमु।/प्रो. के. आर. श्रीकान्त मूर्ति/अ.हु.शा./10/13/145/अ.हु./प्रथम भोलुम/बाराणसी/चौबम्बा कृष्णदास प्रकाशन/2013 /

35. A. अथवस्थिदंती दन्तस्कन्धमेघूर्वं विवर्णाः।
केशनीसनखमुद्राहरूस्त्रस्क्ष्णप्रदोषजाः।/वैध जयदेवजी विक्रमजी आचार्य/च.सु.28/16/179/चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा/बाराणसी/चौबम्बा सुभारती प्रकाशन/2009/

35. B. अस्थ्यपश्चिमोद: शदं दन्तकंशनवादिपते।/प्रो. के. आर. श्रीकान्त मूर्ति/अ.हु.शा./11/19/159/अ.हु./प्रथम भोलुम/बाराणसी/चौबम्बा कृष्णदास प्रकाशन/2013 /

36. A. धार: पुनरोण्यन्तुस्वम्याध्यापक्ष्यमं: क्लेदर्यादी पक्षार्थ्योपयति, स नाननदन्तमेधनाथप्यायुयचर्। सोजितप्रस्त्यमान: केशाधिकरियुपस्त्रीयवाहावर्ताकर: संपत्यते। ये होतं ग्रामनगरतिमनम्यायपदादि: सद्यपुयुञ्जते त आल्यपाण्याँखालित्यपालित्यभावो हस्यापकतिनिधभवन्ति, तथाऽ प्राण्याक्रियांत्र: तस्मानु धारं नायुपुञ्जित।/वैध जयदेवजी विक्रमजी आचार्य/च.वि.17/234/चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा/बाराणसी/चौबम्बा सुभारती प्रकाशन/2009/

36. B. धार: संबद्ध परमं तीर्थऽयः: कृष्णमिज्जल्लईः।
पितामृत्यूष्यण: पाको चैषाप्रहर्वी विद्वारण: ||
अपथ्य: तुलावर्गदुर्गुण जोः केशचतुरामु।/प्रो. के. आर. श्रीकान्त मूर्ति/अ.हु.शा./151-152/प्रथम भोलुम/बाराणसी/चौबम्बा कृष्णदास प्रकाशन/2013 /

37. श्रीकान्तजानान्तु तु घनु तु हुः: समानं समुद्धानः;--------------------------------------------प्रभावः केशमुद्राबलोक्ष्यमानव्रेमः: त्रिधेतानां च...........II/वैध जयदेवजी विक्रमजी आचार्य/च.वि.7/11/258/चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा/बाराणसी/चौबम्बा सुभारती प्रकाशन/2009/
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

38. Մարդու մարմինի գույանք, բացառություն այլ հանգույցներ տրամադրելը և դասավանդ գրանցավագանք

39. Բոլոր շրջանների մարմանական պատասխան պատճառներ շարունակ են նախարարել ու ուսումնասիրել հանգույցները

40. Հիմնարկություն: Պարտեզի և հանդիպման և...

41. Նշում: Այս դրությունը փոխարինվել է կենսասարքավորներով

42. Կամ գրանցավագանքը բացառվում է և կարողանալով պատասխաններ կարողանալով

43. Կարճատեսակ բանավանում, բացառություն է կարողանալով երկու կապակցության
44. शिरोरूप्याच्या संबंध रीतीने शिरोरूप्यांचे / बैद्य जयदेवजी तिकमजी आचार्य / च. चि. 23/116/576/ चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा / वाराणसी / चौबम्बा सुभारती प्रकाशन/2009/ 
45. बालिये पतले बल्यां हरियानिक च शोधितम्।
नस्येतेत्रे: शिरोबच्चव्यक्त्रे आयुर्वेद नामस्य / बैद्य जयदेवजी तिकमजी आचार्य / च. चि. 26/262-263/611/ चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा / वाराणसी / चौबम्बा सुभारती प्रकाशन/2009/
46. नस्यं स्यायद्वृत्तं वा बालित्यपतितापम्। / बैद्य जयदेवजी तिकमजी आचार्य / च. चि. 26/264/611/ चरक संहिता-आयुर्वेद दीपिका-चक्रपाणि दीक्षा / वाराणसी / चौबम्बा सुभारती प्रकाशन/2009/
47. उपायमध्ये: काश्यप परिवेक्षके बलाकहः।
	तेनैव तुत्तरमाइङ्गस्य बलहृक्षेत्रवधुः। / प्रो. के. आर. श्रीकान्त मूर्ति / अ. हु./सु./2/17/26/अ. हु./ प्रथम बोल्युम / वाराणसी / चौबम्बा कृष्णदास प्रकाशन / 2013/
48. आयं त्वादु हिंमं केष्यं गृहु पिठानिलापम्। / प्रो. के. आर. श्रीकान्त मूर्ति / अ. हु./सु./5/60/67 अ. हु./ प्रथम बोल्युम / वाराणसी / चौबम्बा कृष्णदास प्रकाशन / 2013/
49. नाथुवं भृजानिनिमोिण: कङ्गारकसं: सर:।
हु./केष्यो गृहुवृण्य: भिंश्धो रोचनदीपनः। / प्रो. के. आर. श्रीकान्त मूर्ति / अ. हु./सु./6/109-110/95 / अ. हु./ प्रथम बोल्युम / वाराणसी / चौबम्बा कृष्णदास प्रकाशन / 2013/
50. शाम्यं गृहुत्वं केष्यं रुक्मं पीतु तु पिटालम्। / प्रो. के. आर. श्रीकान्त मूर्ति /अ. हु./सु./6/130/100/ अ. हु./ प्रथम बोल्युम / वाराणसी / चौबम्बा कृष्णदास प्रकाशन / 2013/
51. .................स तु हंसि सुमोजित:।
अकालपतितव्यक्तविनिमित्तमनिका:। / प्रो. के. आर. श्रीकान्त मूर्ति / अ. हु./सु./22/18/274/ अ. हु./ प्रथम बोल्युम / वाराणसी / चौबम्बा कृष्णदास प्रकाशन / 2013/
52. केशरोमनिमयव्यं यस्याभ्यक्तभिवेद्यते।
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

53. Stárka L, Cermáková I, Dusková M, Hill M, Dolezal M, Polácek V. Hormonal Profile of Men with Premature Balding. 112(1)/Experimental and Clinical Endocrinology & Diabetes/03February 2004/

54. Luis A. Garza, Chao-Chun Yang, Tailun Zhao, Hanz B. Blatt, Michelle Lee, Helen He, David C. Stanton, Lee Carrasco, Jeffrey H. Spiegel, John W. Tobias, and George Cotsarelis / Bald scalp in men with androgenetic alopecia retains hair follicle stem cells but lacks CD200-rich and CD34-positive hair follicle progenitor cells/ The Journal of Clinical Investigation/ Published online 2011/


57. Johan K Amory / The Effect of 5α-Reductase Inhibition With Dutasteride and Finasteride on Bone Mineral Density, Serum Lipoproteins, Hemoglobin, Prostate Specific Antigen and Sexual Function in Healthy Young Men/ The Journal Of Urology/ Volume 179/ Issue 6/ Pages 2333–2338/ June 2008/
j) 10 Chapter 7 Review of Literature Khalitya (Baldness)

60. Male Pattern Baldness Causes/ WebMD Medical Reference from the American Hair Loss Association/ Published on March 1, 2010


62. Shigeki Inui and Satoshi Itami / Androgen actions on the human hair follicle: Perspectives/ Pages-168-171 / Experimental Dermatology/ Volume 22/ issue 3/ March 2013/

63. Alejandro Godoy / 5α-reductase type 3 expression in human benign and malignant tissues: A comparative analysis during prostate cancer progression/ Pages-1033-1046/The Prostate/ Volume-71/Issue-10/ July 2011/

64. Faris Azzouni, Alejandro Godoy, Yun Li / the 5 Alpha-Reductase Isozyme Family: A Review of Basic Biology and Their Role in Human Diseases/ Advance in Urology/ Published 25 Dec 2011/PMCID- PMC3253436/

65. Roberto C, Agis Balboa / Characterization of brain neurons that express enzymes mediating neuro steroid biosynthesis/ Volume-103 no. 39/ PNAS/ 26 September 2006/

66. Shigeki Inui and Satoshi Itami / Androgen actions on the human hair follicle: / Pages-168-171 / Experimental Dermatology/ Volume 22/ issue 3/ March 2013/


74. Ramot, Y. / V. Griffiths, Mind the (Gender) Gap: Does Prolactin Exert Gender and/or Site-Specific Effects on the Human Hair Follicle/886–891/ the Journal of Investigative Dermatology 130 (3) /PMID19890346/2009/

75. Foitzik, K. Krause / Human Scalp Hair Follicles Are Both a Target and a Source of Prolactin, which Serves as an Autocrine and/or Paracrine Promoter of Apoptosis-Driven Hair Follicle Regression/ American Journal of Pathology 168 (3): 748–756/ PMC 1606541 2006/
76. Steinhoff, M. Rochlitz / Reduced growth of beard as the only diagnostic sign in a patient with macroprolactinoma / Journal of the European Academy of Dermatology and Venereology 21 (1) 124–126/2006/


80. A, B, C, D, E, F- Alopecia/Davidson’s principles and Practice of Medicine/ 20th Ed. /Chaptor-27- Skin diseases/1278/-1279