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REVIEW ARTICLE

Exploring the Effectiveness of *Kutaki* as a Preventive and Therapeutic Medicine in Hemiplegia Management: A Review Article

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ABSTRACT

Pakshaghata, as described in *Ayurveda*, is often correlated with Hemiplegia resulting from strokes, categorized under vitiated *Vata Dosha*. The burden of stroke increase in India stroke is now the fourth leading cause of deaths and fifth leading cause of disability. Some conditions like High blood pressure High level of triglyceride and high level of low-density lipoprotein (LDL) Cholesterol, Uncontrolled diabetes, Inflammatory diseases are risk factors for stoke. **Material and Methods**: The review will be done from various Ayurvedic classical texts, modern textbooks, international journals, and online databases like Google Scholar for relevant literature. **Discussion**: Researches indicates that some bioactive compounds in *Kutaki* such as Cucurbitacin, and lupanine hold the possibility of crossing the blood-brain barrier, making them potentially suitable for targeting neurological conditions and recognized for its anti-inflammatory, antioxidant, and neuroprotective properties. Researches indicates that the bioactive compounds in *Kutaki*, such as picrosides, have the capacity to modulate inflammatory pathways and reduce oxidative stress, both of which are critical in managing the secondary damage following a stroke. These properties may aid in preserving neurological function and promoting recovery. **Conclusion:** The highest priority of stroke treatment is the rapid removal of occlusive clots and restoration of tissue perfusion. *Kutaki* is effective medicine for dissolution of blood clots and as a preventive medicine in hemiplegic patients.

Key Words *Pakshaghata*, Hemiplegia, Stroke, *Kutaki*

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INTRODUCTION

In *Ayurveda*, *Pakshaghata* is associated with stroke, particularly hemiplegia in modern medicine, based on signs and symptoms. *Pakshaghata* was referred to by *Acharya Charaka* under *Nanatmaja Vata Vikaras*[1] and by *Acharya Sushruta* under *Ashta Mahagada*[2]. *Ayurveda* states that *Pakshaghata* is mostly caused by vitiation of the *Vata Dosha*, though it can also be linked to *Pitta* or *Kapha Dosha*[3]. Acharya *Vagbhata* states that a vitiated *Vata Dosha* that affects one half of the body results in dryness of *Sira* (veins) and *Snayu* (tendons) which leads to *Pakshaghata.* According to *Acharya Charaka Virechana* is a specific treatment for the condition of *Pakshaghat*[4]. *Bhavprakash Nighntu* and *Kaiyadev Nighantu*

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has mentioned *Kutaki* properties as *Bhedani*[5]. *Kutaki* is very effective medicine for *Virechana.*

Hemiplegia/ hemiparesis is the paralysis of either right or left side of the body with loss of functions. The main cause of hemiplegia is stroke. Stroke is mainly of two types Ischemic and Hemorrhagic. The burden of stoke increase in India stroke has become the fourth leading most common cause of deaths and fifth most common leading cause of disability. Stroke incidence is also increased toward even younger patients due to factors such as irregular work life and infrequent rest, a growing sense of pressure and anxiety, poor eating habits, and many other reasons. Hemiplegia is one of the most common symptoms of stroke and significantly affects the patient's quality of life by reducing their ability to perform activities of daily living. *Ayurveda* is the ancient system of medicine aims at prevention and treatment of various disorders in the body.

Aim & objectives

To evaluate the effect of *Kutaki* as preventive treatment and management of *Pakshaghat.*

Material and methods

Material is collected from classical text books, Articles, journals and other issued works. This is a review article i.e. based on a review of *Ayurvedic* texts and Modern texts. Main *Ayurvedic Samhitas* used in this article are *Charak Samhita*, *Sushrut Samhita* and all relevant book which gives idea to complete this article.

Stroke

The main cause of Hemiplegia is stroke that could be either by ischemic (bloke a artery with embolus or by hemorrhagic (from artery rupture) stroke. Stroke occurs when a blood vessel that caries oxygen and nutrients to the brain either blocked by clots or ruptures. Stroke can be either ischemic or Hemorrhagic.

Causes of stroke

Primarily hypertension, atherosclerosis leading to coronary artery disease, dyslipidemia, heart disease and hyperlipidaemia causes stoke.

Etiopathogenesis

1.Ischemic stroke:

Ischemia usually caused by emboli from a proximal arterial source or the heart. An embolism is an obstruction or blockage in a blood vessel. Most often, it starts as a blood clot from elsewhere that breaks off and travels through your bloodstream. When a blood clot or another substance becomes an obstacle, it’s an embolism. A blockage may be more likely to happen when blood vessels become smaller, like where plaque buildup (atherosclerosis) makes an artery narrow. Atherosclerosis is a hardening of your arteries from plaque building up gradually inside them. Plaque consists of fat, cholesterol and other substances. This plaque buildup limits blood flow. It blocks blood, if blood can’t get through, oxygen can’t either. This lack of oxygen causes an “infarct” and damages the organ that needs oxygen.

factors can increase the risk of harmful blood clots include:

- High blood pressure

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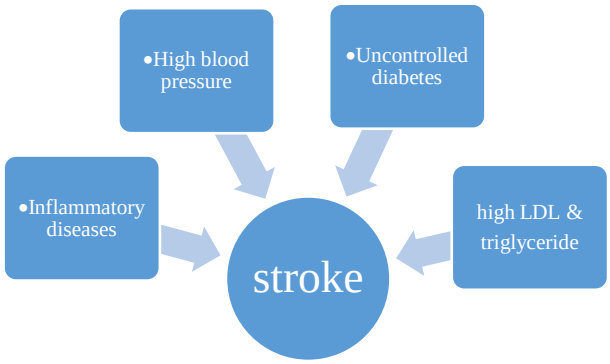
- High level of triglyceride and high level of low-density lipoprotein (LDL) Cholesterol
- Uncontrolled diabetes
- Inflammatory diseases



2.Hemorrhage stroke

Hemorrhagic stroke is due to bleeding into the brain by the rupture of a blood vessel. Hypertension is the most common cause of Hemorrhagic stroke[6].

Ayurvedic view of coagulation:

According to the *Ayurvedic* concept, the imbalance state of *Vata*, *Pitta* and *Kapha* can lead to development of hypercoagulation and hypocoagulation[7]. *Rakta* vitiates with *Kapha* is responsible for hypercoagulation[7].

Ayurvedic view of anticoagulant

Katudravya- Breaking blood clots is one of *Katudravya's* functions (*Shonita sanghatam bhinatti*). *Katu Rasa* is *Vayu* (*Ruksha*) and *Agni* (*Tikshna*) *Mahabhuta Pradhan*[8]. The term *Kutaki* name after the word *Katuka* which indicates its bitter taste so it has the ability to dissolve a blood clot by its *Rasa*.

Properties of *Kutaki*:

- *Rasa: Tikta, Katu*
- *Virya: Sheet*
- *Vipaka: Katu*
- *Karma: Kaphpittaghana*

Chemical constituents of *Kutaki*: Over 61 secondary metabolites from the *Kutaki* have been identified, including iridoid glycosides, flavonoids, cucurbitacins, and phenolic chemicals. The active phytochemical in *Picrorhiza kurroa* is kutkin, which consists of picrosides and kutkosides. The main picrosides found in Kutkin are picrosides I and II that are ideally iridoid glycosides. Other iridoid glycosides include picroside III, picroside IV, picroside V, veminoside, catalpol, veronicoside, specioside, minecoside, picrorhizaoside, 6-feruloylcatalpol and pikuroside. Cucurbitacin.

Effect of *Kutaki* in *Pakshaghata*

In this paper we discuss the properties of *Kutaki* helpful in management of *Pakshaghata* and as preventive treatment of *Pakshaghata*.

A. Role of *Kutaki* in management of *Pakshaghata*

Medication to prevent brain oedema (swelling) and has ability to dissolve blood clot would be given for a stroke. These treatments can help prevent permanent tissue damage as the blood flow is restored. *Kutaki* (Picrorhiza kurroa) is recognized in *Ayurveda* for its potential to dissolve blood clots and improve circulation. The mechanisms by which *Kutaki* aids in blood clot dissolution are multifaceted:

Active ingredients

1. Picroside I and II: These iridoid glycosides are the primary active components in *Kutaki*. They exhibit significant anti-thrombotic properties,

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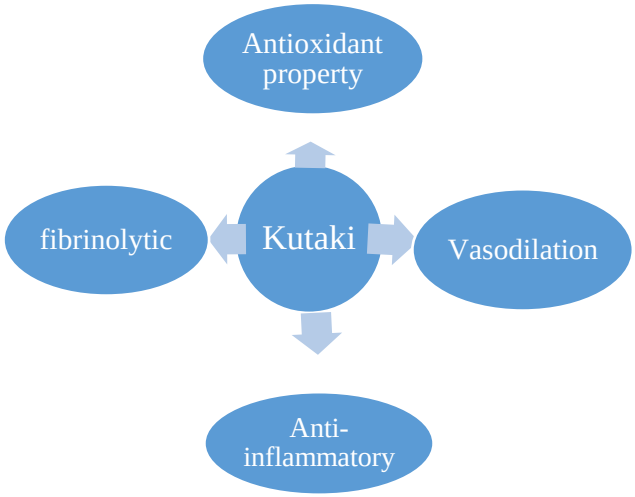
which help prevent the formation of blood clots and promote their dissolution.

2. Kutkin: This term refers to the mixture of picroside I and II, which contributes to kutaki's therapeutic effects, including its ability to enhance blood flow and reduce clot formation.

3. Cucurbitacin, and lupanine: These triterpenoid saponins boast a diverse range of activities, including antitumor and anti-inflammation. These hold the possibility of crossing the blood-brain barrier, making them potentially suitable for targeting neurological conditions[9].

MODE OF ACTION:



1. Inhibition of Platelet Aggregation: Picroside II can inhibit the aggregation of platelets, a critical step in clot formation. By reducing platelet clumping, *Kutaki* helps maintain smoother blood flow.

2. Fibrinolytic Activity: The active compounds in *Kutaki* can enhance the activity of plasmin, an enzyme responsible for breaking down fibrin, the protein that forms the structural framework of blood clots. This promotes the dissolution of existing clots.

3. Vasodilation: *Kutaki* is known to dilate blood vessels, which can help lower blood pressure and improve overall blood circulation. Enhanced circulation reduces the likelihood of clot formation.

4. Anti-inflammatory Effects: The production of clots might be made worse by inflammation. *Kutaki's* capacity to avoid and dissolve clots is further enhanced by its anti-inflammatory qualities, which assist reduce this danger. The anti-inflammatory properties of kurroa alcohol extract and the chemicals kutkin, picroside-1, and kutkoside have been documented[10]. Studies shows that apocynin is very power-full anti-inflammatory agent[11].

5. Antioxidant Properties: By reducing oxidative stress, *Kutaki* protects blood vessels from damage, which can otherwise lead to clot formation. The antioxidant activities of the aqueous and methanolic PKRE (P. kurroa rhizome) extracts were used to examine the ferric-reducing antioxidant activity, radical scavenging assay, and thiobarbituric acid assay to test the suppression of lipid peroxidation. Both extracts exhibited good antioxidant properties[12].

B. **Role of *Kutaki* as Preventive treatment of *Pakshaghata*:**

Atherosclerosis, hypertension, heart diseases, diabetes, inflammatory disorders are causative factor for stroke. Among them atherosclerosis is main cause of ischemic and hypertension for hemorrhagic stroke. Some studies show the

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Kutaki is potent to lower the blood pressure, LDL level, triglyceride level, and effective in management of diabetes that lowers the risk of stroke.

Hypotensive action: *Kutaki* is a *Virechaniya* Drug by balancing the *Pitta Dosha*, ultimately lower high blood pressure. Some clinical evaluations suggest that *Virechan* can help reduce both systolic and diastolic blood pressure levels.

Hypolilidemic action: The presence of high levels of cholesterol in the blood is one of the most critical risk factors for the development of plague which limits blood flow and further can cause ischemic stroke and eventully develop hemiplasia. The study outcomes showed that *Picrorhhiza Kurroa* water extracts had a reasonably excellent and beneficial impact on high-fat diet-induced hyperlipidemic mice with good hepatoprotective properties[13]. The hepatoprotective properties of the water extract were also found to have a preventive hypolipemic effect in another study of PR in mice that had developed hyperlipemia by poloxamer (PX)-407. The effectiveness of PX-407 was compared with that of 10 mg/kg simvastatin. Serum TGs, LDL, and total cholesterol levels were reduced dose-dependent in the PR extract and simvastatin dosing groups compared to the vehicle control group. These findings suggest that the PR water extract has a comparatively excellent positive preventative effect on PX-407-induced hyperlipidemia and a favorable hepatoprotective impact[14].

Anti-diabetic action: - *Kutaki* helps in production of insulin from the beta pancreatic cells, and helps in reduction of conversion of glucose from starch, thus leading to low blood glucose level. Study has demonstrated that its administration increased insulin production in rats which had Streptozotocin Evoked β-Cell Damage[15]. In vivo studies in rats suggested that its extract played potential role in type-2 diabetes induced by streptozotocin-nicotinamide[16]. An alcoholic extract of Picrorrhiza kurroa was found to lower blood glucose in basal conditions and after a heavy glucose load in normal rats. Maximum reduction in serum glucose was observed after 2 hours at a dose level of 75 mg extract/kg of body weight. P. kurroa extract was also found to reduce the increase of blood sugar in alloxan-induced diabetic rats (43% at 75 mg/kg body weight and 60% at 150 mg/kg body weight). Chronic administration of the extract significantly reduced the blood sugar in alloxan-induced diabetic rats for several days (10 days). The extract was also found to reduce the increased blood urea nitrogen and serum lipid peroxides in alloxan-induced diabetic animals and to inhibit the body weight reduction and leukopenia induced by alloxan administration. These results indicate that P. kurroa extracts are able to ameliorate biochemical damages induced by alloxan in diabetic rats[11].

Anti-inflammatory activity: Picroliv is also known for anti-inflammatory responses. Rhizome extracts was reported to be effective in a dose dependent manner in rats against carrageenan

induced paw oedema and cotton pellet-induced granuloma formation[15]. Picroliv role was also studied for anti-inflammatory response in ulcerative colitis (UC) mice model which suggested that its administration could be a therapeutic approach.

Conclusion:

Kutaki (Picrorhiza kurroa) emerges as a significant herbal medicine in *Ayurveda* for the management and prevention of *Pakshaghata*. *Kutaki* reduces the chances having stroke by working on high LDL, Hypertension, DM, and inflammation. Its multifaceted action on blood coagulation, anti-inflammatory processes, and metabolic regulation highlights its therapeutic potential in addressing stroke-related complications. Further research is essential to fully elucidate its efficacy and to integrate traditional practices with modern medical approaches for enhanced patient outcomes.

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