A Review on Herbal Plant's Used on Edema Disease

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Abstract- *Edema is a swelling which is caused due to accumulation of fluid due to release of fluid from small blood vessels (capillaries) or interstitial spaces to nearby tissues. It may affect a small area or even entire body. The affected body part is considered to be edematous. Edema is most commonly seen in the legs, feet, ankles and it can even affect other body parts. Edema is a side effect in many medications. The article presents information on the types, symptoms, causes, diagnosis and treatment of edema.*

The management of edema requires a systematic approach to screening, diagnosis, and treatment, with an essential initial assessment to differentiate between generalized and localized edema. The Association of Physicians of India (API) aimed to develop the first Indian Edema Consensus (Edema India), offering tailored recommendations for screening, diagnosing, and managing edema based on the insights from the expert panel.

Keywords: Edema, Fluid Accumulation, Herbal Plant's, Medicinal Plants, Diuretics activity, Antiinflammatory activity

I. INTRODUCTION

Edema is a swelling which is caused due to accumulation of fluid due to release of fluid from small blood vessels (capillaries) or interstitial spaces to nearby tissues. Swelling may be caused due to the reasons such as pressure within the blood vessels, build-up of fluid following removal of the lymph nodes, inflammation, water retention, hydrostatic Pressure, tissue (interstitial) oncotic pressure. The capillary damage or increased pressure either by injury or inflammation leads to the swelling of the body parts. It may affect a small area or even entire body. The affected body part is considered to be edematous. Edema is most commonly seen in the legs, feet, ankles and it can even affect other body parts. Edema is a side effect in many medications (1)

Edema may be localized, as in inflammation, trauma, or venous obstruction, or generalized (anasarca), often seen in systemic conditions like congestive heart failure, chronic kidney disease, liver cirrhosis, and malnutrition. Clinically, it can be categorized as pitting edema, where pressure leaves a depression, or non-pitting edema, commonly associated with lymphedema and myxedema. (2)

Due to its multifactorial etiologyedema plays a significant role as a diagnostic marker in medical practice. Early recognition and management of edema are crucial for preventing complications and improving patient outcomes. (3)

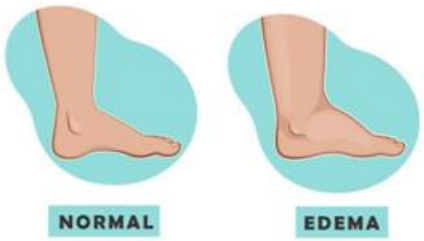

Fig 1:Edema

II. HISTORY

The history should include the timing of the edema, whether it changes with position, and if it is unilateral or bilateral, as well as a medication history and an assessment for systemic diseases. Acute swelling of a limb over a period of less than 72 hours is more characteristic of deep venous thrombosis (DVT), cellulitis, ruptured popliteal cyst, acute compartment syndrome from trauma, or recent initiation of calcium channel blockers. (4)

Dependent edema caused by venous insufficiency is more likely to improve with elevation and worsen with dependency. (5) Edema associated with decreased plasma oncotic pressure (e.g., malabsorption, liver failure, nephrotic syndrome) does not change with dependency.

The mechanism often includes the retention of salt and water with increased capillary hydrostatic pressure. Diuretic use may cause volume depletion and reflex stimulation of the renin angiotensin system.The history should also include questions about cardiac, renal, thyroid, or hepatic disease. Graves' disease can lead to pretibial myxedema, whereas hypothyroidism can cause generalized myxedema. Although considered a diagnosis of exclusion, obstructive sleep apnea has been shown to cause edema. One study evaluated the apnea-hypopnea index in patients with obstructive sleep apnea and found that even when adjusted for age, body mass index, and the presence of hypertension and

diabetes mellitus, the index was higher in patients who had edema. (6)

III. CLASSIFICATION

According to Pathophysiological Mechanism
- Hydrostatic edema
- Oncotic (hypoproteinemic) edema
- Hydrostatic Permeability (inflammatory) edema
- Lymphatic edema (lymphedema)
- Mixed edema

According to Location
- Localized edema
- Generalized edema (Anasarca)

According to Clinical Findings
- Pitting edema
- Non-pitting edema
- Dependent edema
- Inflammatory edema (7)

IV. CAUSES

- Excessive salt intake
- Pregnancy
- Malnutrition/Protein deficiency
- Medications
- Allergic reaction/ Inflammation
- Heart failure
- Liver disease(8)

V. SYMPTOMS

- Skin that retains a dimple when pressure is applied for few seconds
- Stretched and shiny skin
- Increased abdominal size
- Swelling or puffiness in the affected area
- Aching body parts
- Weight gain or weight loss
- Raised pulse rate
- Ascites
- Stretched skin
- Chest pain
- Difficulty in breathing or cough (9)

VI. PATHOPHYSIOLOGY

Edema occurs when an excessive volume of fluid accumulates in the tissues, either within cells (cellular edema) or within the collagen-mucopolysaccharide matrix distributed in the interstitial spaces (interstitial edema) (10, 11). Our focus is on swelling of the extracellular matrix or interstitial edema, which may occur as a result of aberrant changes in the pressures (hydrostatic and oncotic) acting across the microvascular walls, alterations in the molecular structures that comprise the barrier to fluid and solute flux in the endothelial wall that are manifest as changes in hydraulic conductivity and the osmotic reflection coefficient for plasma proteins, or alterations in the lymphatic outflow system, as predicted by examination of the Starling equation.

Excessive accumulation of interstitial fluid is generally viewed as detrimental to tissue function because edema formation increases the diffusion distance for oxygen and other nutrients, which may compromise cellular metabolism in the swollen tissue. For the same reason, edema formation also limits the diffusional removal of potentially toxic by-products of cellular metabolism. These are especially important problems in the lungs, where pulmonary edema can significantly impair gas exchange.

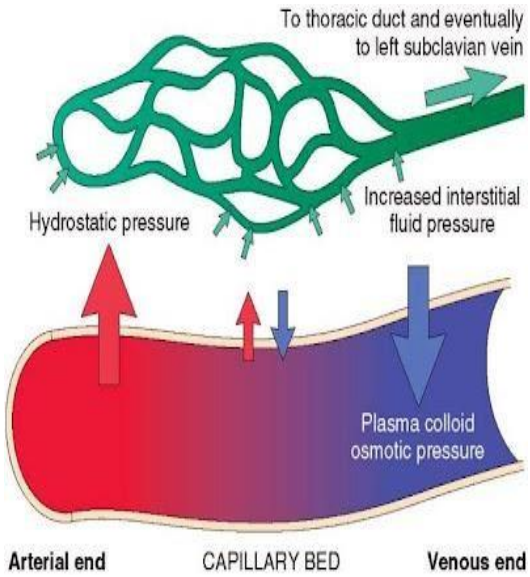

Fig 2: Pathophysiology of edema

In some tissues, certain anatomical structures limit the expansion of the tissue spaces in response to edemagenic stress. For example, the kidneys are enveloped by a tough fibrous capsule, the brain is surrounded by the cranial vault, and skeletal muscles in the volar and anterior tibial compartments are encased in tight facial sheaths. As a consequence of the inability of these tissues to readily expand their interstitial volume, relatively small increments in transcapillary fluid filtration induce large increases in

interstitial fluid pressure. This, in turn, reduces the vascular transmural pressure gradient and physically compresses capillaries, thereby reducing nutritive tissue perfusion (12). In the intestine, unrestrained transcapillary filtration leads to exudation of interstitial fluid into the gut lumen, a phenomenon referred to as filtration-secretion or secretory filtration. Filtration-secretion may compromise the absorptive function of the delicate intestinal mucosa and appears to occur as a result of the formation of large channels between mucosal cells in the villous tips when interstitial fluid pressure increases by greater than 5 mmHg .Ascites, or the pathologic accumulation of fluid in the peritoneal cavity, occurs in cirrhosis and is caused by fluid weeping from congested hepatic sinusoids secondary to elevated portal venous pressure. Ascites can predispose afflicted individuals to peritoneal infections, hepatic hydrothorax, and abdominal wall hernias (13).

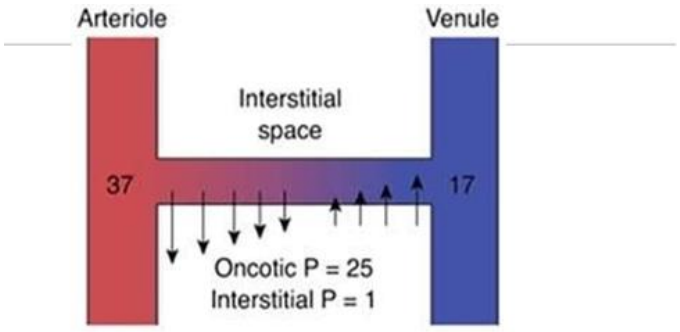

Fig3: Schematic representation of pressures gradients across the wall of a muscle Capillary

VII. PLANTS AS NATURAL ANTI-EDEMIC AGENTS:

Unlike modern allopathic drugs which are single active components that target one specific pathway, herbal medicines work in a way that depends on anorchestral approach. A plant contains a multitude of different molecules that act synergistically ontargeted elements of the complex cellular pathway (14).

Medicinal plants have been source of wide variety of biologically active compounds for many centuries and used extensively as crude material orpure compounds for treating various disease conditions(15).

The use of herbal medicines becoming popular due to toxicity and side-effects of allopathic medicines. Medicinal plants play an important role in the development of potent therapeutic agents. There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications India with its biggest repository of medicinal plants in the world may maintain an important position in the production of raw materials either directly for crude drugs or as the bioactive compounds in the formulation of pharmaceuticals and cosmetics etc.(16).

VIII. HERBAL PLANT'S USED ON EDEMA

Sr.no.	Plant Name	Family	Plant Part	Type of Extract
1.	Achilleamillefolium	Asteraceae	Whole plant	Aqueous,alcohol
2.	AdhatodaVasica	Acanthaceae	Leaves	methanol
3	Aegle marmeloes	Rutacae	Leaves	methanol
4.	Aloe Vera	Asphodelaceae	Leaves	Ethanol
5.	BacopaMonnieri	Scrophulariaceae	Whole plant	Ethanol
6.	Barleriaprionitis	Acanthaceae	Whole plant	Methanol
7.	Citrus aurantium	Rutaceae	Resin	Not indicated
8.	Daphne pontica	Thymelaeacea	Aerial Parts, Roots	Methanol
9.	Elephantophsscaber	Compositae	Leaves	Pet.ether
10.	Garcinia mangostana	Guttiferae	Fruit	Methanol
11.	Hammadaelegans	Chenopodiaceae	Arial part	Ethanol
12.	Iberisamara	Brassicaceae	Whole Plant	Ethanol
13.	Juniperuscommunis	Cupressaceae	Whole Plant	Alcohol
14.	Lantana camera	verbenaceae	Leaves	Pet.ether
15.	Moringaolifera	Moringaceae	Root,Flower	Methanol , Aqueous
16	ZingiberOfficinale	Zingiberaceae	Rhizome	Ethanol

1. Achilleamillefolium

Aqueous and alcoholic extracts of A. millefolium are used in traditional medicine internally in treatment of gastro-intestinal and hepato-biliary disorders and as an antiphlogistic drug. The topical anti-inflammatory activity of sesquiterpenes is caused by inhibition of arachidonic acid metabolism. The three flavnoids present in the crude extract and enriched in flavnoid fraction are rutin, aspigenin-7-O-glucoside and luteolin-7-Oglucoside. The crude plant extract and two fractions enriched in the dicaffeoyquinic acids and the flavnoids inhibit human neutrophil elastase as well as the matrix metalloproteinases, which are associated with anti-inflammatory process in vitro studies (17).

Fig 4:Achilleamillefolium

2. AdhatodaVasica

Adhatodavasica L. is an indigenous herb belonging to family Acanthaceae. The plant has been used in the indigenous system of medicine in worldwide as herbal remedy for treating cold, cough, whooping chronic bronchitis asthma, sedative expectorant, antispasmodic, anthelmintic, rheumatism and rheumatic painful inflammatory swellings. The drug is employed in different forms such as fresh juice, decoction, infusion and powder. It is also given as alcoholic extract and liquid extract or syrup. (18).

Fig 6: AdhatodaVasica

3. Aegle Marmeloes

Bael, scientifically known as Aeglemarmelos, is a traditional medicinal plant widely used in Ayurveda and other systems of medicine. The fruit, leaves, bark, and roots are known for their various pharmacological properties. (19)Edema, or fluid retention, is the abnormal accumulation of fluid in certain tissues within the body. It can be a symptom of underlying conditions like heart failure, kidney problems, or inflammation.In traditional medicine, particularly Ayurveda, Bael is believed to have diuretic and anti-inflammatory properties that can help reduce swelling and fluid retention key symptoms of edema. (20)**.**

Fig 7: Aegle Marmeloes

4. Aloe vera

There are more than 300 species of Aloe plants. This plant has yellow flowers. The leaves are arranged in a rosette configuration, they are triangular and spear like and have thorny ridges. The plant reaches maturity when it measures 1.5- 4 feet long and has a base of 3 inches or greater in diameter.The gel or mucilage obtained from the flesh of the leaf contains quite different compounds from the bitter latex extracted from the leaf lining. (21).

Fig 8: Aloe vera

5. Bacopamonnieri

The Bacopamonnieriis a creeping, glabrous, succulent herb, rooting at nodes and habitat of Wetlands and muddfyshores.Earlier, itis used as a brain tonic to enhance memory development, learning and concentration.The plant possesses anti-inflammatory activity on carrageenan-induced rat paw edema and it has shown 82% edema Inhibition when compared to indomethacin. Bacopamonnierialso significantly inhibited 5-Lipoxygenase (5-LOX), 15 (LOX) and cyclooxygenase- 2 (COX-2) activities. BacopaMonnieri possesses significant antiinflammatory activity that may well be relevant to its Effectiveness in the leading of various inflammatory conditions in traditional medicine. (22).

Fig 9: Bacopamonnieri

6. Barleriaprionitis,

The whole plant is small in appearance, about 1-3 feet long and its flowers are equally broad as well as tubular, mainly yellowish or whitish, approximately 3-4 cm in length. Its fruits are ovoid and capsular whereas its seeds are flattened, covered with matted hairs, about 8 mm long and 5 mm wide. Its elliptic leaf containing 5-20 mm long spines is about 3-10 cm long and 1.54 cm broad. Its light tan or grey colour stems are stiff, round, cylindrical and glabrous Paste form is taken daily once for edema (23) .

Fig 10: Barleriaprionitis,

7. Citrus aurantium

The essential oil extracted from the flowers of Citrusaurantium, known as nerolioil, exhibited strong anti-inflammatory and analgesic effects in animal models. It significantly reduced paw edema, granuloma formation, and pain in mice, demonstrating effects comparable to standard anti-inflammatory drugs like diclofenac sodium. (24).

Fig 12: Citrus aurantium

8. Daphne pontica

Daphne species are supposed to have anti-cancer activity since the time of AD 2nd century. Several Daphnespecies have been used against inflammatory disorders. Daphneponticahave been used for the treatment of rheumatic pain and inflammatory ailments. The extracts inhibits the production of PGE2 and IL-1ß28.Daphne pontica L. (Twin flowered Daphne). The extracts of different parts of the D. pontica plant exhibit anti-inflammatory and antinociceptive activity. (25)**.**

Fig 13: Daphne pontica

9. Elephantophsscaber

Elephantopusscaber is a traditional medicinal plant widely used in Asian countries for its antiinflammatory, diuretic, and wound-healing properties. In the context of edema, the plant shows therapeutic relevance because its extracts possess significant diuretic and anti-inflammatory activities, which help in reducing fluid accumulation in tissues. Studies have demonstrated that Elephantopusscaber enhances urinary output and promotes excretion of electrolytes, thereby decreasing edema. (26).

Fig 14: Elephantophsscaber

10. Garcinia mangostana

The fruit rinds of Garciniamangostanahave been used as a traditional medicine for the treatment of trauma and skin infections. The xanthones exhibits their biological effects by blocking inducible nitric oxide synthase (iNOS) and cyclooxygenase-2(COX-2).It was reported that two mangostins decrease prostaglandins (PGE2) levels through inhibition of COX-2 activity and NO production. It is reported that α-mangostin shows a more potent inhibition of PGE2 release than either histamine or serotonin (27).

Fig 15: Garcinia mangostana

11. Hammadaelegans

Hammadaelegans (Beg.) Botsch. Belonging to the family Chenopodiaceae (Amaranthaceae), Traditionally, it is used in folk medicine to treat inflammation and diabetes.Studies on Hammadaelegans revealed the presence of several bioactive secondary metabolites, including saponins, alkaloids, flavonoids, tannins, sterols, triterpenes, cardiac glycosides, coumarins, and anthracenes. These compounds are believed to contribute to its strong antioxidant and therapeutic potential. (28).

Fig 16: Hammadaelegans

12. Iberisamara

Iberisamara L. (Brassicaceae), commonly known as bitter candytuft, has been reported to have been used in folk medicine as an anti-inflammatory agent. The anti-inflammatory properties were shown to be attributed to its content of curbitacins, flavonoglycosides, kaempferol, sinapic acid, and mustard oil glycosides. In addition, curcurbitacins have a potent antiinflammatory activity in various acute and chronic experimental inflammatory models. (29).

Fig 17: Iberisamara

13. Juniperuscommunis

Anti-Inflammatory Activity. Anti-inflammatory activity of J. communis fruit has determined using isolated cells and enzymatic test. The plant showed varying degree of activity at 0.2 mg/mL in prostaglandin test and 0.25 mg/mL in platelet activating factor (PAF) test (aqueous extract). J.communis showed 55% prostaglandin inhibition and 78% PAF-exocytosis inhibition. The PAF activity was measured by inducing exocytosis of elastase.All plantextracts were studied

on thin layer chromatography eluted with ethyl acetate/methanol/water (30).

Fig 18: Juniperuscommunis

14. Lantana camera

The aerial parts of many species of Lantana are widely used in folk remedies like cancer andtumours.The other uses of plant shows antimalarial, anti-bacterial and anti-diarrhoeal activities. From the studies it has been reported that aqueous extract of Lantana camara leaves is highly effective and safe for the treatment of hemorrhoids. It has been reported that aqueous extract of Lantanacamaraleaves has promising analgesic, anti-inflammatory and antihemorrhoidal activities (31).

Fig 19: Lantana camera

15. Moringaolifera

A significant anti-inflammatory effect was observed in different parts of M. oleifera (leaf, pods, flowers, and roots). It was observed that the isolated compound [2-o-Acetyl-alpha-lrahamnoslyloxy) benzyl] thiocynate from Moringa possessed nitric oxide inhibitory activityand was subsequently found to be effective in Raw264.7 cell linesActive compounds such as tannins, phenols, alkaloids, flavonoids,carotenoids _-sitosterol, vanillin, and moringin have anti-inflammatory properties(32).

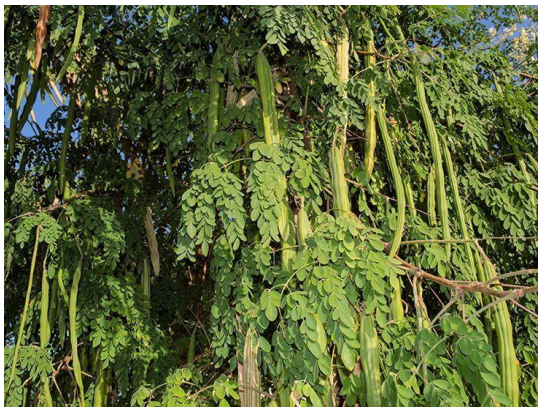

Fig 20: Moringaolifera

16.Zingiber officinalae

Ginger, is one of the most widely used species of the ginger family (Zingiberaceae), botanically known as Zingiberofficinale. It is commonly used for various foods and beverages. Since 2,500 years it has been medicinally used in China and India, specifically for colds, headaches, nausea and rheumatism. Ginger is native to South Asia but is now widely grown in Jamaica, Nigeria,

China, India, Fiji, Sierra Leone and Australia(33) .

Fig 21: Zingiberofficinalae

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