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AN OVERVIEW OF HERBAL ANALGESICS FROM DIFFERENT GEOGRAPHICAL LOCATIONS.

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Abstract:

Pain is a distressing feeling caused by damage to different tissues. Consequently the person reacts, and tries to remove the painful stimulus. On the other hand, prostaglandins contribute to the emergence of pain. However, there are many side effects associated with the administration of nonsteroidal anti-inflammatory drugs. However, there are medicinal plants with anti-inflammatory therapeutic effects with low or no side effects. It is important to document the ethnobotanical knowledge and applications of anti-inflammatory medicinal plants from selected countries representing different regions. These compounds are formed and secreted by Cyclogenase-2 or COX-2 enzymes. It is through inhibiting these enzymes that most of the analgesic medications act. The present study constitutes an updated review on plants with analgesic and anti-inflammatory activity with special emphasis on those plants found in different geographical locations. Regarding the importance of research about pain and the effort in increasing awareness in this respect and also regarding the problems caused by using opioid medications, it is necessary to find herbal medications.

Keywords: inflammation, inflammatory conditions, Herbal, plant potentials.

Introduction:

Pain emerges when a tissue is damaged. It causes the individual to react and try to get rid of the painful stimulus. It may be stated that pain comprises of three parts: sensory, emotional and affective. Illness, inflammation and damage to the central and the peripheral nervous system leads to significant changes in pain pathways, increase in excitability, and change in gene manifestations, enzymes and receptors.1 Prostaglandins also contribute to the induction of pain. These compounds have important inter-cell effects and may be released under specific physiological and pathological conditions into the blood flow. Prostaglandins are formed by an enzyme called cyclooxygenase 2 (COX-2).This enzyme is secreted by damaged cells and induces the feeling of pain through

connecting to the receptors related to G-proteins and increasing CAMP amount in the cells. As suffering pains causes mental discomfort, humans have always sought a way to remove or decrease pain. 2 Nowadays one of the ways to control pain is using non-steroid anti-inflammatory medications. Although their analgesic effect is induced relatively fast but this side effect is one of their limiting factors in using them. For instance these medications cause stomach dysfunction, dizziness, blurred vision, skin rash, pruritus and liver damage.1 Furthermore, non-steroid anti-inflammatory medications cost a lot of expense. Therefore researchers are looking for less expensive herbal medications and side less side effects; thus the analgesic effects of many medications have been investigated. Using herbal medications has been popular since antiquity. In the past decade, there also has been a significant rise in the usage of these medications among people.

The increase in the resistance of pathogens toward chemical medications and also their side effects are one of the chief reasons for pharmaceutical companies, doctors and the public to adopt herbal medications for treatment. Therefore secondary ingredients in herbs may serve as good replacements for synthetic drugs. Finding and introducing herbs with medicinal properties such as analgesic properties is necessary and may lay the ground for the treatment of various disorders and complications and opens up new horizons for scientists and researchers.3 One of the many analgesic ingredients are flavonoids. Flavonoids are polyphenol ingredients that may cross the blood-brain barrier and modulate pain centrally through different mechanisms, such as affecting opioid GABA, alpha 2 adrenergic and inhibiting the enzymes involved in inflammation.4 Researches also show that flavonoids reduce intercellular calcium through inhibiting the activity of N-methyl-D-aspartate receptors and as a result inhibiting the activity of the enzyme, synthesizing nitric oxide and a2-phosphpolipease related to calcium and manifest its analgesic properties by decreasing NO and prostaglandins. For instance, flavonoids in tarragon decrease pain through their protective properties operating against oxidative stress caused by hyperglycemia and ingredients with similar properties to benzodiazepines.5 Regarding the importance of research about pain and the effort in raising awareness in this respect and also regarding the problems caused by using opioid medications, is necessary to try to find herbal medications. Thus, this study aims to investigate and review some of the scientific findings on analgesic effects and probable active ingredients and possible analgesic effect mechanisms of these herbs.

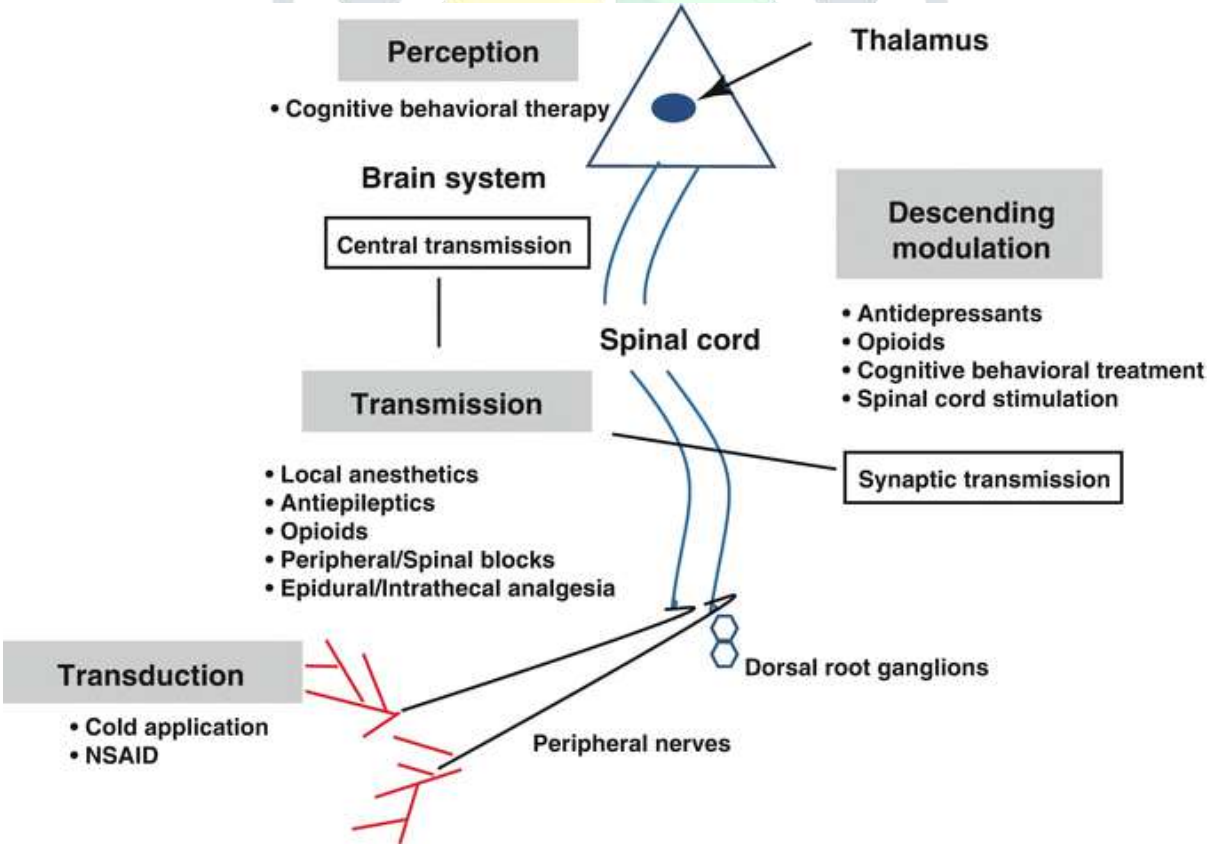

Figure 1: Pain and analgesics pathway

The experience of pain as we currently understand it can be broadly divided into four steps: transduction, transmission, modulation, and perception 1 (Figure 2). Transduction involves the stimulation of nociceptors at tissue sites by various noxious stimuli. Transmission carries the induced action potentials via fast A-delta and slower C fibres to the dorsal horn of the spinal cord, and further on to the thalamus and finally the cerebral cortex. Modulation of nociceptive signals occurs by stimulation of descending inhibitory pathways from the brain and brainstem, thereby altering afferent signals that eventually reach the brain to be interpreted. 3 Perception of nociceptive signals is very complex, and occurs primarily in the somatosensory, prefrontal, insular, and cingulate cortices Pain management can be targeted at any of the above pathways (or combinations thereof) and the most suitable treatment modality will be determined by the type of pain, patient and disease factors, drug characteristics, efficacy, and tolerability. This 3-part series on analgesics will cover different classes of treatments used in pain management, and will discuss the mechanisms of action and place in therapy of the nonsteroidal anti-inflammatory drugs (NSAIDs), paracetamol, and topical analgesics (Part 1), opioids, tramadol, and tapentadol (Part 2), and antidepressants and anticonvulsants (Part 3)

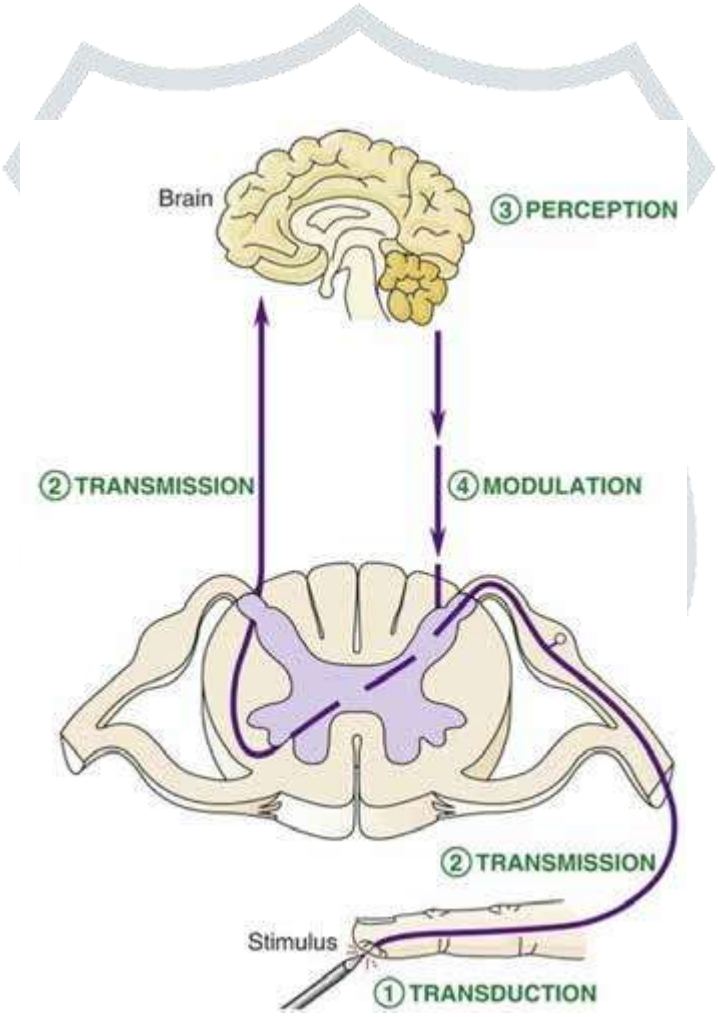

Figure 2: Nociceptive and pain pathways

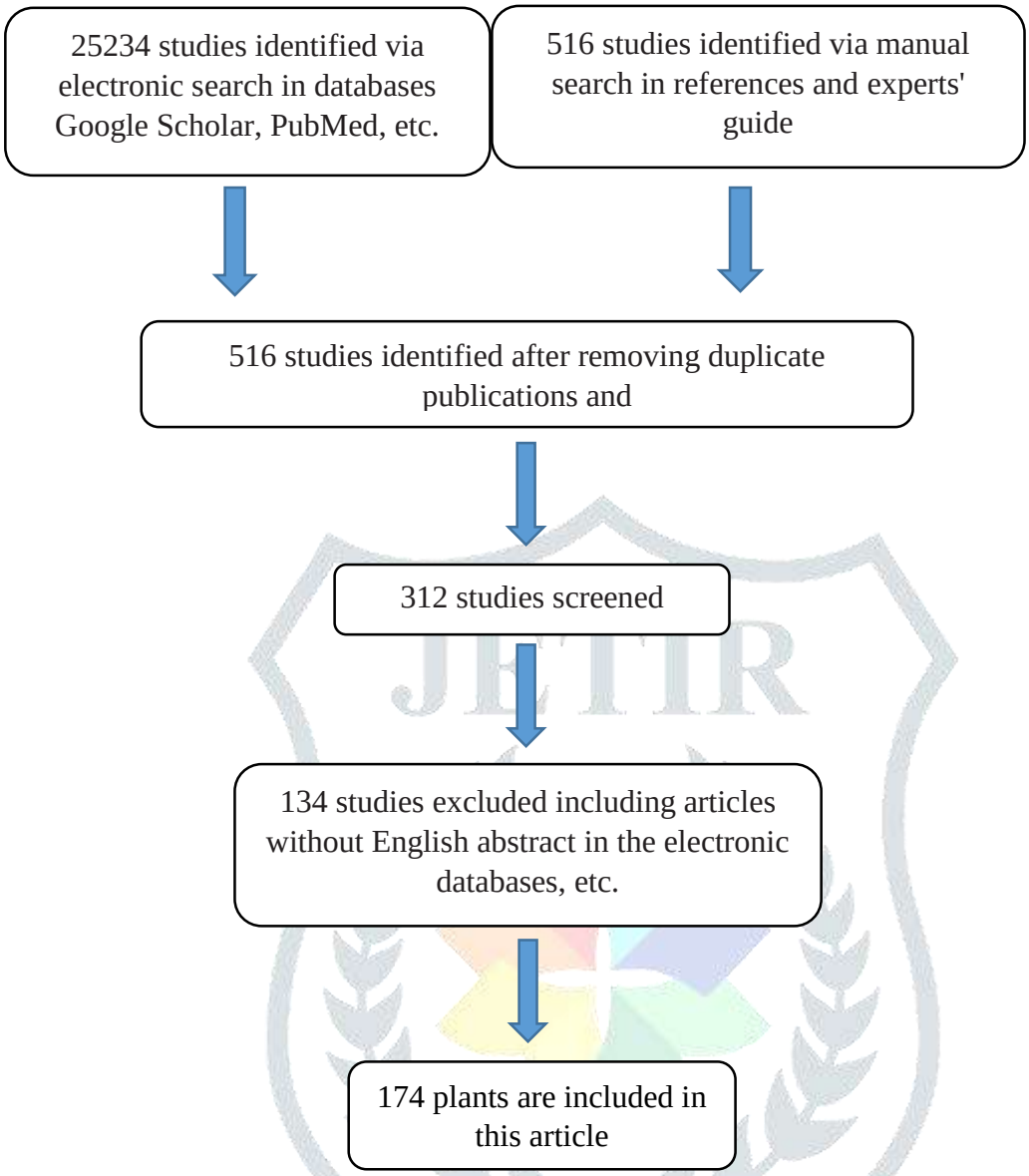

Figure 3: Flow diagram for the study review

Plants with central analgesic activity:

An analgesic is a drug that selectively relieves pain by acting on the CNS or on peripheral pain mechanisms without significantly altering consciousness.

Table 1: Plants with central analgesic activity

Sr. No	Plant	Family	Part used	Place	Ref.
1	*Caralluma tuberculata*	Asclepiadaceae	Dried entire plant	Pakistan	[25]
2	*Carthamus tinctorius*	Asteraceae	Flowers	Saudi Arabia	[25]
3	*Cedrus deodara*	Pinaceae	Wood essential oil	India	[25]
4	*Celastrus paniculatus*	Celastraceae	Dried flowers	Pakistan	[23]

5	*Centella asiatica*	Apiaceae	Dried entire plant	India	[26]
6	*Chasmanthera dependens*	Menispermaceae	Fresh leaf	Nigeria	[27]
7	*Chelidonium majus*	Papaveraceae	Entire plant	Austria	[27]
8	*Chrozophora verbascifolia*	Euphorbiaceae	Dried aerial parts	Egypt	[27]
9	*Cinnamomum zeylanicum*	Lauraceae	Dried bark	Jordan	[27]
10	*Citrullus colocynthis*	Cucurbitaceae	Aerial parts	Saudi Arabia	[27]
11	*Clematis chinensis*	Ranunculaceae	Dried root	Taiwan	[27]
12	*Cleome viscose*	Capparidaceae	Dried seed	Jamaica	[27]
13	*Clerodendrum infortunatum*	Verbenaceae	Entire plant	India	[27]
14	*Clitoria ternatea*	Fabaceae	Dried aerial parts	India	[27]
15	*Cocculus pendulus*	Menispermaceae	Seed	Saudi Arabia	[28]
16	*Commiphora molmol*	Burseraceae	Gun-resin	Italy	[28]
17	*Cordia francisci*	Boraginaceae	Dried leaf	Italy	[28]
18	*Cordia martinicensis*	Boraginaceae	Freeze-dried leaf	Italy	[28]
19	*Cordia myxa*	Boraginaceae	Leaf	Italy	[28]
20	*Cordia ulmifolia*	Boraginaceae	Freeze-dried leaf	Italy	[28]
21	*Cucumis trigonus*	Cucurbitaceae	Dried fruit	India	[28]
22	*Culcitium canascens*	Asteraceae	Dried aerial parts	Peru	[29]
23	*Curcuma zedoaria*	Zingiberaceae	Dried rhizome	Taiwan	[29]
24	*Cuscuta chinensis*	Convolvulaceae	Dried entire plant	India	[29]
25	*Cyathea nilgirensis*	Cyatheaceae	Aerial parts	India	[29]
26	*Cymbopogon schoenanthus*	Poaceae	Entire plant	Saudi Arabia	[29]
27	*Cystoseira usneoides*	Cystoseiraceae	Dried thallus	Spain	[29]
28	*Datisca cannabina*	Datiscaceae	Dried flowers-seed	India	[29]
29	*Desmodium canadense*	Fabaceae	Dried entire plant	USSR	[30]
30	Dioclea grandiflora	Fabaceae	Dried rootbark	Brazil	[30]
31	*Diodia scandens*	Rubiaceae	Dried entire plant	Nigeria	[30]
32	*Dolichos falcatus*	Fabaceae	Dried root	China	[31]

33	*Ducrosia ismaelis*	Apiaceae	Essential oil	Saudi Arabia	[31]
34	*Egletes viscosa*	Asteraceae	Flower essential oil	Brazil	[32]
35	*Elaeagnus kologa*	Elaeagnaceae	Aerial parts	India	[33]
36	*Elaeocarpus canitrus*	Elaeocarpaceae	Fruit	India	[33]
37	*Eriobotrya bengalensis*	Rosaceae	Aerial parts	India	[33]

Plants with Peripheral analgesic activity.

Diseases, inflammation, and damage to peripheral and central nervous system cause obvious changes in pain pathways such as increase in stimulation and change in expression of genes and new molecules such as neurotransmitters, enzymes, and receptors. Certain pains in long term cause mental and psychological adverse effects. Therefore, human has been always seeking for a solution to remove or relieve pain.

Table 2: Plants with Peripheral analgesic activity.

Sr. No	Plant	Family	Part used	Place	Ref.
1	*Melaleuca elliptica*	Myrtaceae	Fresh aerial part	Egypt	[36]
2	*Melaleuca styphelioides*	Myrtaceae	Dried leaf	Egypt	[36]
3	*Mentha piperita*	Lamiaceae	Dried leaf	Jordan	[36]
4	*Mikania cordata*	Asteraceae	Root	India	[36]
5	*Morinda citrifolia*	Rubiaceae	Decorticated root	France	[36]
6	*Morus alba*	Moraceae	Rootbark	Japan	[36]
7	*Mucuna pruriens*	Fabaceae	Dried fruit	Africa	[37]
8	*Myrica nagi*	Myricaceae	Dried stembark	India	[37]
9	*Myrtus communis*	Myrtaceae	Dried leaf	Iraq	[37]
10	*Nepeta caesarea*	Lamiaceae	Aerial part	Turkey	[37]
11	*Nepeta italica*	Lamiaceae	Leaf essential oil	Turkey	[37]
12	*Neurolaena lobata*	Asteraceae	Dried aerial parts	Brazil	[37]
13	*Nigella sativa*	Ranunculaceae	Seed oil	India	[38]
14	*Nyctanthes arbor-tristis*	Verbenaceae	Shade dried leaf	India	[39]
15	*Ocimum sanctum*	Lamiaceae	Shade dried leaf	India	[40]
16	*Oplopanax elatus*	Araliaceae	Root essential oil	China	[41]
17	*Origanum onites*	Lamiaceae	Essential oil	Turkey	[41]
18	*Paeonia moutan*	Paeoniaceae	Dried root bark	South Korea	[41]
19	*Panax ginseng*	Araliaceae	Leaf	Japan	[41]
20	*Panax ginseng*	Araliaceae	Dried root	India	[41]

21	*Panax pseudoginseng*	Araliaceae	Dried leaf	China	[41]
22	*Pancratium maritimum*	Amaryllidaceae	Dried bulb	Turkey	[41]
23	*Paullinia cupana*	Sapindaceae	Dried seed	Brazil	[42]
24	*Peganum harmala*	Zygophyllaceae	Dried entire plant	Iraq	[43]
25	*Persea americana*	Lauraceae	Dried seed	Brazil	[44]
26	*Photinia serrulata*	Rosaceae	Dried branches	Taiwan	[45]
27	*Phyla nodiflora*	Verbenaceae	Dried leaf	Africa	[46]
28	*Phyllanthus niruri*	Euphorbiaceae	Dried entire plant	Brazil	[47]
29	*Phyllanthus sellowianus*	Euphorbiaceae	Dried entire plant	Brazil	[47]
30	*Phyllanthus tenellus*	Euphorbiaceae	Dried entire plant	Brazil	[47]
31	*Phyllanthus urinaria*	Euphorbiaceae	Dried entire plant	Brazil	[47]

Analgesic Activity of some Indian medicinal plants

Table 3: Analgesic Activity of some Indian medicinal plants

S. No	**Botanical Name (Common Name)**	**Family**	**Region**	**Chemical Constituent**	**Activity**	**Ref**
1	*Acacia catechu (Katha)*	Leguminosae	India	Tannins catechin, quercetin, catechuic acid.	Anti-inflammatory	[16]
2	*Clerodendrum phlomidis (Arni)*	Verbanaceae	India	Alkaloids, glycosides, saponins, tannins.	Analgesic	[17]
3	*Phyllanthus niruri (Gulf-leaf flower)*	Phyllanthaceae	India	Flavonoids, sterols, alkaloids, phyllanthin, hypophyllanthin.	Antiinflammatory, analgesic.	[19]
4	*Sterculia foetida (Jangli badam)*	Sterculiaceae	India	Fat, cycloprenoid fatty acids.	Antiinflammatory, analgesic.	[20]
5	*Amaranthus spinosus (Prickly amaranth)*	Amaranthaceae	India	α-spinasterols octacosanoate and saponin.	Antiinflammatory	[21]
6	*Hibiscus tiliaceus (Beach Hibiscus)*	Malvaceae	India	Vanillic acid, syringic acid, β-sitosterol, Quercitin etc.	Anti-inflammatory	[22]
7	*Pletranthus amboinicus (Maxican mint)*	Lamiaceae	India	terpinene, myrcene, limonene, eugenol, carvacrol.	Anti-inflammatory	[23]

8	*Calotropis gigantea s (Crown flower)*	Asclepiadaceae	India	Calotropnaphthalene, terpenes.	Anti-inflammatory	[24]
9	*Leucas cephalotes (dronpushpi)*	Labiatae	India	Alkaloides, terpenes, stigmasterol ,sterols.	Anti-inflammatory	[25]
10	*Celosia argentia (Lalmurga)*	Amaranthaceae	India	Stigmasterol, sitosterol, celosin A and B, fatty acids.	Anti-inflammatory	[26]
11	*Holarrhena antidysenterica (Indrajao)*	Apoynaceae	India	Alkaloid, Tannins & Flavanoids	Antiinflammatory, Analgesics	[27]
12	*Tridex procumbens (Ghamra)*	Asteraceae	India	flavonoids, procumbentin and quercetin,β-sitosterol	Antiinflammatory, Analgesics	[28]
13	*Oxalis corniculata (Creeping oxalis)*	Oxalidaceae	India	alkaloids, steroid, triterpenoids, tannins, flavonoids	Anti-inflammatory	[29]
14	*Cassia sophera (Kasunda)*	Caesalpiniaceae	India	flavonoids, glycosides	Anti-inflammatory	[30]
15	*Cissus rependa (Pani bel)*	Vitaceae	India	Alkaloids, glycosides, saponins, tannins.	Antiinflammatory, Analgesics	[31]
16	*Kaempferia galangal (Aromatic ginger)*	(Zingiberaceae)	India	ethyl-p-methoxycinnamate, methylcinnamate, Carvone etc	Antiinflammatory, Analgesics	[32]
17	*Tanacetum artemisioides (Paloyo Zoon)*	Asteraceae	India	Flavonoids	Antiinflammatory, Analgesics	[33]
18	*Hedyotis puberula (Surbuli)*	Rubiaceae	India	Iridoid glycosides	Antiinflammatory, Analgesics	[34]
19	*Eucalyptus citriodora (lemon eucalyptus)*	Myrtaceae	India	Terpenes, alkaloids, flavonoids, tannins, eucalyptol.	Antiinflammatory, Analgesics	[35]
20	*Chococca brachiata*	Rubiaceae	India	Steroids, phenolic compounds, ligans	Antiinflammatory, Analgesics	[35]
21	*Cynara scolymus (Globe artichoke)*	Asteraceae	India	Sesquiterpenes, flavone glycosides,	Antiinflammatory, Analgesics	[35]

				volatile oil.		
22	*Elephantopus scaber (Elephant foot)*	Asteraceae	India	Glycosides, stigmasterol, deoxyelephantopin	Antiinflammatory, Analgesics	[35]
23	*Mikania glomerata (sprengel)*	Asteraceae	India	Coumarins.	Antiinflammatory, Analgesics	[35]
24	*Trianosperma tayaya (Mart)*	Curcurbitacea e	India	Essential oil, diterpenoids, sesquiterpens	Antiinflammatory, Analgesics	[35]
25	*Casearia sylvestris Swartz. (wild coffee)*	Flacurteaceae	India	Alkaloids	Antiinflammatory, Analgesics	[35]
26	*Marsypianthes chanaedrys (Konmonmi mawon)*	Lamiaceae	India	Essential oil, germacrene D, beta caryophyllene	Antiinflammatory, Analgesics	[35]
27	*Apuleia Leiocarpa (Grapia)*	Leg-ceae	India	Flavons, phytosterols, flavonoids	Antiinflammatory, Analgesics	[35]
28	*Dorstonia brasiliensis (Carapia)*	Moraceae	India	Monoterpenoid susbstituted furocoumarin, phytosterol.	Antiinflammatory, Analgesics	[35]
29	*Brunfelsia uniflora (Manaca)*	Solanaceae	India	Alkaloids-franciscain, manain, scopoletin.	Antiinflammatory, Analgesics	[35]
30	*Bauhinia racemosa (Kachnal)*	Caesalpiniace ae	India	Flavonoids, saponins, glycosides, tannins.	Analgesic	[35]

Analgesic Activity of some Chinese medicinal plants:

Table 4: Analgesic Activity of some Chinese medicinal plants

Sr. No	Plant name	Family	Region	Activity	Ref.
1	*Ligusticum chuanxiong* Hort.	Umbelliferae	Chinese	Anti-inflammatory, Analgesics	[48]
2	*Lonicera japonica* Thunb.	Honeysuckle	Chinese	Anti-inflammatory, Analgesics	[48]
3	*Magnolia biondii* Pamp.	Magnoliaceae	Chinese	Anti-inflammatory, Analgesics	[48]
4	*Morus alba* L.	Moraceae	Chinese	Anti-inflammatory, Analgesics	[48]

5	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	Chinese	Anti-inflammatory, Analgesics	[48]
6	*Nigella glandulifera* Freyn et Sint.	Ranunculaceae	Chinese	Anti-inflammatory, Analgesics	[48]
7	*Oldenlandia diffusa* (Willd.) Roxb.	Rubiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
8	*Ophiopogon japonicus* (L.f.) Ker-Gawl.	Asparagaceae	Chinese	Anti-inflammatory, Analgesics	[48]
9	*Paeonia veitchii* Lynch	Paeoniaceae	Chinese	Anti-inflammatory, Analgesics	[48]
10	*Paeonia lactiflora* Pall.	Paeoniaceae	Chinese	Anti-inflammatory, Analgesics	[48]
11	*Paeonia suffruticosa* Andr.	Paeoniaceae	Chinese	Anti-inflammatory, Analgesics	[48]
12	*Panax ginseng* C. A. Mey.	Araliaceae	Chinese	Anti-inflammatory, Analgesics	[48]
13	*Perilla frutescens* (L.) Britt.	Lamiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
14	*Peucedanum praeruptorum* Dunn	Apiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
15	*Polygonatum odoratum* (Mill.) Druce	Asparagaceae	Chinese	Anti-inflammatory, Analgesics	[48]
16	*Polygonum multiflorum* Thunb.	Polygonaceae	Chinese	Anti-inflammatory, Analgesics	[48]
17	*Poria cocos* (Schw.) Wolf	Polyporaceae	Chinese	Anti-inflammatory, Analgesics	[48]
18	*Psoralea corylifolia* L.	Leguminosae	Chinese	Anti-inflammatory, Analgesics	[48]
19	*Pueraria lobata* (Willd.) Ohwi	Fabaceae	Chinese	Anti-inflammatory, Analgesics	[48]
20	*Pyrola calliantha* H. Andres.	Ericaceae	Chinese	Anti-inflammatory, Analgesics	[48]
21	*Rehmannia glutinosa* Libosch.	Orobanchaceae	Chinese	Anti-inflammatory, Analgesics	[48]
22	*Rosa laevigata* Michx.	Rosaceae	Chinese	Anti-inflammatory, Analgesics	[48]
23	*Rubia cordifolia* L.	Rubiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
24	*Salvia miltiorrhiza* Bge.	Labiatae	Chinese	Anti-inflammatory, Analgesics	[48]

25	*Santalum album* L.	Santalaceae	Chinese	Anti-inflammatory, Analgesics	[48]
26	*Saposhnikovia divaricata* (Turcz.) Schischk.	Apiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
27	*Scutellaria baicalensis* Georgi	Lamiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
28	*Scutellaria barbata* D. Don	Lamiaceae	Chinese	Anti-inflammatory, Analgesics	[48]
29	*Satsstrea japonica* (Thunb.) De.	Menispermaceae	Chinese	Anti-inflammatory, Analgesics	[48]
30	*Spatholobus suberectus* Dunn.	Leguminosae	Chinese	Anti-inflammatory, Analgesics	[48]
31	*Stephania tetrandra* S. Moore	Menispermaceae	Chinese	Anti-inflammatory, Analgesics	[48]
32	*Tribulus terrestris* L.	Zygophyllaceae	Chinese	Anti-inflammatory, Analgesics	[48]
33	*Trichosanthes kirilowii* Maxim.	Cucurbitaceae	Chinese	Anti-inflammatory, Analgesics	[48]
34	*Typha angustifolia* L.	Typhaceae	Chinese	Anti-inflammatory, Analgesics	[48]
35	*Typhonium giganteum* Engl.	Araceae	Chinese	Anti-inflammatory, Analgesics	[48]
36	*Xanthium sibiricum* Patr.	Asteraceae	Chinese	Anti-inflammatory, Analgesics	[48]
37	*Zingiber officinale* Rosc.	Zingiberaceae	Chinese	Anti-inflammatory, Analgesics	[48]

Table 5: Analgesic Activity of some Iranian medicinal plants

No	**Plant name**	**Scientific name**	**Mechanism**	**Family**	**Ref.**
1	Ben sorkh	*Allium jesdanum*	Central analgesic activities and effect on opioid receptors	Lilaceae	[49]
2	Karafs	*Apium graveolens*	Inhibition of cyclo-oxygenase	Umbelliferae	[49]
3	Tarkhoun	*Artemisia dracunculus*	Presence of flavonoids and substances with benzodiazepines property	Asteraceae	[49]
4	Dermaneh	*Artemisia herba alba*	Stimulation of GABA A receptors	Artemisia	[49]
5	Artemisia	*Artemisia siberi Besser*	Inhibition of calcium release, blocking of receptor, TRPA1, inhibition of	Dermaneh dashti	[49]

			synthesis of NO, cytokines, and prostaglandin E2		
6	Zereshk	*Berberis vulgaris L.*	Opioid system	Berberidaceae	[49]
7	Zenyan	*Carum copticum*	Effect of essential fatty acids	Umbelliferae	[49]
8	Lauraceae	*Cinnamomum zeylanicum*	Inhibition of NO synthesis, inhibition of TNF and COX2, inhibition of prostaglandins, and stimulation of opioids receptors	Darchin	[49]
9	Gole hasrate-barfi	*Colchicum szovitsii Fisch& C.A.Mey*	Anti-inflammatory effects and opioid pathways	Colchicaceae	[49]
10	Geshniz	*Coriandrium sativum*	-	Verbenaceae	[49]
11	Zaefaran	*Crocus sativus*	Potential inhibition of NMDA receptors and NO synthesis	Iridaceae	[49]
12	Zireh sabz	*Cuminum cyminum L.*	-	Apiaceae	[49]
13	Tatoureh	*Datura stramonium L.*	Strengthening of opioid system and decrease of peripheral and central pain-causing mediators	Solanaceae	[49]
14	Bilhar	*Dorema aucheri*	Inhibition of synthesis of NO and NMDA receptors and stimulation of opioid and adrenergic system	Umbelliferae	[49]
15	Shabnam khorshid	*Drosera spatulata*	Activity of **nucleus paragigantocellularis**	Droseraceae	[49]
16	senjed	*Elaeagnus angustifolia*	Inhibition of proinflammatory mediators and NMDA receptors	Elaeagnacea	[49]
17	Shirmal	*Euphorbia helioscopia*	Effect of flavonoids and steroids	Euphorbiaceae	[49]
18	Razianeh	*Foeniculum vulgare*	Serotonergic and histaminergic receptors	Apiaceae	[49]
19	Glosium	*Glaucium grandiflorum*	Alkaloids	Papaveraceae	[49]
20	Shirin bayan	*Glycyrrhiza glabra*	Inhibition of white blood cells migration and production of inflammatory mediators in neutrophils	Fabaceae	[49]

21	Kangar	*Gundelia tournefortii L.*	Serotonergic, gabanergic, and adrenergic and inflammatory processes	Asteraceae	[49]
22	Razak	*Humulus lupulus L.*	Opioid receptors	Cannabaceae	[49]
23	Nang dane	*Hyoscyamus niger*	Cholinergic and opioid mechanisms	Solanaceae	[49]
24	Alafe chay	*Hypericum perforatum*	Inhibition of COX1 and 5-LO enzymes	Hypericaceae	[49]
25	Gerdou	*Juglans regia*	Inhibition of COX1 enzyme, inhibition of calcium release, cholinergic,	Juglandaceae	[49]

Table 6: Analgesic Activity of some Turkish medicinal plants

Sr. No	Plant name	Collected parts	Collection sites	Use/Mechanism	Ref.
1	*Anchusa azurea* Miller var. *azurea*	Herb	Ankara, Kurtbogazi po	Anti-inflammatory, Analgesics	[50]
2	*Arceuthobium oxycedri* (DC.) Bieb.	Whole	Kastamonu, Kuzey mahallesi	Anti-inflammatory, Analgesics	[50]
4	*Calluna vulgaris* L.	Herb	Trabzon, Su¨ rmene, C¸ amburnu vicinity	Anti-inflammatory, Analgesics	[50]
5	*Daphne oleoides* Schreber	Herb	C¸ ankırı, Ilgaz, Rock tombs	Anti-inflammatory, Analgesics	[50]
6	*Isatis glauca* Aucherx	Herb	Ankara, Go¨ lbasi	Anti-inflammatory, Analgesics	[50]
7	Boiss. subsp. *glauca*	Herb	C¸ ankırı, Ilgaz, Rock tombs	Anti-inflammatory, Analgesics	[50]
8	*Laurus nobilis* L.	leaf	Antalya, Lara	Anti-inflammatory, Analgesics	[50]
9	*Daphne oleoides Schreber*	Seed	Ezenteri, ezanteri	Anti-inflammatory, Analgesics	[50]
10	*Prunella vulgaris* L.	Herb	Ankara, Kurtbogazi pond	Anti-inflammatory, Analgesics	[50]
11	*Ranunculus tricophyllus*	Herb	Ankara, Sariyer dam	Anti-inflammatory, Analgesics	[50]
12	*Rumex crispus* L.	Herb	Ankara, Kizilcahamam, Gu¨ vem village	Anti-inflammatory, Analgesics	[50]
13	*Scabiosa rotata* Bieb.	Herb	Ankara, Kurtbogazi pond	Anti-inflammatory, Analgesics	[50]

14	*Tamus communis* L.	Root	Aydin, Kusadasi, Davutlar village	Anti-inflammatory, Analgesics	[50]

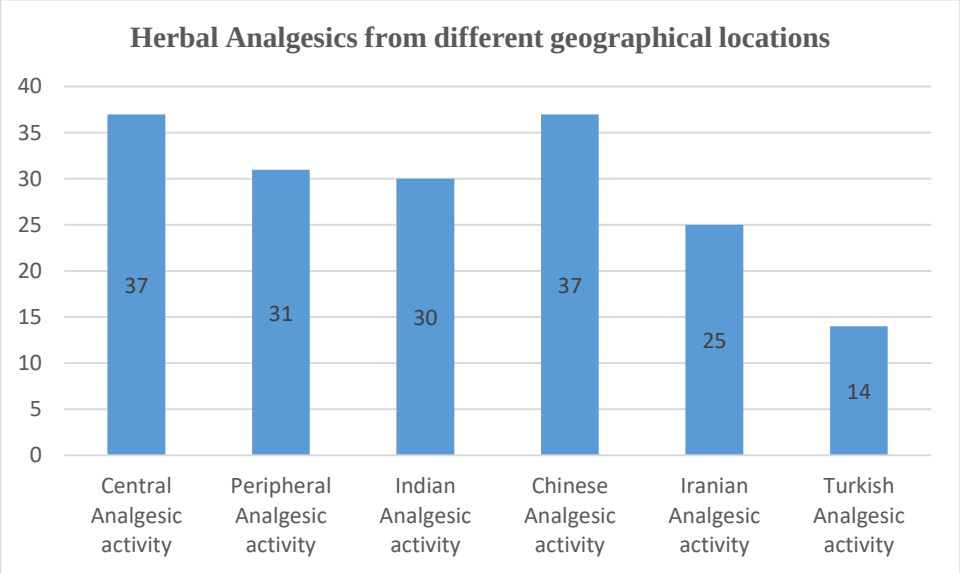

Figure 1: plants from different region

The data of this review article indicated that 174 medicinal plants from India, Chinese, Iran, and Turkish are used as analgesic, 37 plants are screened for showing analgesic activity, 31 plant are show peripheral analgesic activity, 30 plants from India, 37 plants from Chinese, 25 plants from Iranian, 14 plants from Turkish.

Conclusion:

The aim of this review was to examine scientific studies on anti-inflammatory activities of selected medicinal plants in use in different regions of Africa. In this review, different plants from selected countries in the various geographical region (India, Chinese, Iran, and Turkish) were identified. It can be seen that African countries are repository of medicinal plants that are readily available and used in the treatment and management of various disease conditions, including inflammatory conditions affecting the teaming population. Several drugs are available both in developed and developing countries, for treatment and management of inflammatory conditions; however, many of these drugs are associated with adverse effects. Africans who majorly depend on medicinal plants to meet their health needs believe that orthodox drugs are associated with severe side effects, hence many people in mentioned countries, especially those living in poor-resource setting, use medicinal plants in the treatment of inflammation and pain. Many studies have been performed in different (India, Chinese, Iran, and Turkish) countries to evaluate the analgesic activities of medicinal plants and to validate their use in traditional medicine. Plants have the capability to synthesize various forms of phytochemical compounds as secondary metabolites, many of which have been identified and continue to be relevant in the treatment of disease conditions. Further research on plants with analgesic activities is needed since a great percentage of traditional healers across India, Chinese, Iran, and Turkish may have important information of plants that have not been researched.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Author biography

I graduated with a degree in B. pharmacy from Savitribai phule Pune University in 2020 and have a keen interest in Pharmacognosy and their applications to healthcare dilemmas. I am currently a M. Pharmacy student at Savitribai phule Pune University looking at novel drug delivery system which gives targeted drug delivery.

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