INTRODUCTION: Rheumatoid diseases are disorders with inflammation and pain in connective tissues and supporting body structure-ligaments, joints, tendons, and muscles.

There is a pain in joints, swelling and stiffness (particularly morning stiffness) that lead to a myriad of disabilities with underlying autoimmune dysfunction. The term ‘juvenile’ refers to the onset of symptoms before age 16 years.

Idiopathic means a condition which has not any clear etiology and arthritis is the inflammation of a joint. The term Juvenile rheumatoid arthritis (JRA), Juvenile chronic arthritis (JCA), Juvenile arthritis (JA) is now used today as Juvenile idiopathic arthritis (JIA).
The symptoms present in JIA are more comparable with the features of Aamavata Vyadhi mentioned in Ayurvedic classics. Aamavata Vyadhi is not mentioned for Pediatric age but due to its parallel clinical appearance same reference necessitates for Ayurvedic treatment.

In this review article, we will summarize brief description of Juvenile idiopathic arthritis (JIA) in adolescents along with treatment options in Ayurveda, which emphasizing safety as well as the usefulness.

2. Review of Juvenile Idiopathic Arthritis (JIA):
2.1. Definition: JIA is chronic childhood arthritis present with inflammation of joint and stiffness of unknown cause in children and their onset prior to 16 years of age. Common occurrence of this disease is mainly observed from the ages of 7 to 12, but it may also occur in infants. JIA refers to arthritis that remains for over six weeks and involves joint swelling and/or painful joint restricted movements. It has dissimilarity to arthralgia in which there is joint pain with or without inflammation. JIA affects both sexes equally but more common in females than male-like other rheumatological diseases.

2.2. Prevalence: International prevalence ranges of Juvenile idiopathic arthritis (JIA) is 8 to 150 per 100,000. In another scenario, Juvenile rheumatoid arthritis (JIA) affects about one in 1,000 children in any given year and prevalence of severe JIA 1:10,000.

2.3. Causes: The main cause of Juvenile idiopathic arthritis (JIA) is idiopathic it means no defined cause and an area of active research. However, the disorder is autoimmune. The immune system is aggravated by changes in the environment due to mutations in many associated genes.

Types: Rheumatologists identified mainly three types of Juvenile idiopathic arthritis (JIA)-

- Oligoarticular (former: Pauciarticular).
- Polyarticular (Rheumatoid factor-positive and Rheumatoid factor-negative).
- Systemic onset (Still disease).

The international league of association for rheumatology (ILAR) classification for JIA also includes 3 other types like enthesis-related JIA, Juvenile psoriatic arthritis, and differentiated arthritis. The evaluation rules out other causes of arthritis including post-infectious arthritis, Lyme arthritis, Septic arthritis, reactive arthritis, and others. JIA subtypes can be done with respect to clinical, demographic, and genetic features. Systemic JIA is considered an autoinflammatory disease, but other types of JIA are considered autoimmune diseases.

A. Oligoarticular JIA: Children with Oligoarticular JIA are at increased risk of developing uveitis (chronic eye inflammation), which is gradual, insidious, and often only found when especially looked for an eye examination. Sometimes, the adolescents will present with overt eye symptoms such as eye redness, pain, photophobia and change in vision. Children with a positive test for antinuclear antibody (ANA) are at highest risk of developing eye inflammation.

B. Polyarticular JIA: In polyarticular JIA, the joint swelling is found in five or more joints especially small joints of hands along with weight-bearing joint, and disease onset should be six months of age. Polyarticular JIA has two classic age ranges: 1-6 years of age and 6-11 years of age. Polyarthritis can be rheumatoid factor-positive or negative. Rheumatoid factor-positive polyarticular, JIA directly resembles adult rheumatoid arthritis and can be a more severe disease than the RF-negative patients.

C. Systemic JIA: Systemic JIA, there is arthritis in one or more joints that develops or is preceded by high-grade fever with high spikes of two weeks or more duration, which is classically daily for three days or more. Other possible presentation of systemic JIA inflammation of the heart, lungs and enlarged lymph nodes, liver or spleen.

D. Juvenile Psoriatic Arthritis: Juvenile psoriatic arthritis commonly associated with a skin disorder called psoriasis. Psoriasis may begin many years earlier than arthritis. Juvenile psoriatic arthritis gives symptoms of both arthritis and psoriasis. Arthritis symptoms include pain, swelling in joints, and symptoms of psoriasis include a scaling red rash behind the ears, on the eyelids, elbows, and knees.
E. Enthesitis-related JIA: This is characterized by tenderness where the bone meets a tendon, ligament or other connective tissue. Enthesitis-related arthritis is more common in boys and onset between the ages of 8 and 15. This is genetic and affected children will have a positive test for the HLA-B27 gene.

F. Undifferentiated Arthritis: The term undifferentiated arthritis is used when they give symptoms of two or more subtypes.

2.5. Diagnosis: Diagnosis of JIA based on complete history taking, complete clinical examination and appropriate diagnostic tests.

2.6. Clinical Examination: Main clinical features of JIA is -

- Pain and swelling on single or multiple joints.
- Pyrexia (fever) for at least 10 days and associated with transient erythematous rash.
- Joint warmth.
- Decreased body movement.
- Effusion on joint.

2.7. Diagnostic Test: Important investigation for JIA is -

- Erythrocyte sedimentation rate (ESR) or C reactive protein (CRP).
- CBC (Complete blood count).
- Rh factor.
- ANA (Anti-nuclear antibody).
- HLA (Human leukocyte antigen) B27 and plain radiographs.
- 2D Echo.

ESR and CRP indicate an inflammatory process these markers are frequently raised in JIA but may be normal. Rh factor is positive in only few JIA patients but the level of Rh factor may indicate the poor prognosis of diseases. Complete blood count (CBC) provides detail information for anemia. Plain X-rays have been investigated for erosions of joints and serial X-rays provide information about disease progression or improvement status.

2.8. Assessment of Improvement: Assessment is an improvement can be conducted by using parameters of American College of Rheumatology (formerly the ARA) score. This score is based on grading of pain severity, swelling, tenderness, grip strength and functional score.

2.9. Complication: Possible complication of JIA is inhibition of growth with shorted height, bony overgrowth, contractures, spinal cord compression, cervical spine and chronic eye diseases. Eye complication includes cataract, secondary glaucoma, vision compromise and even death. Macrophage-activation syndrome (MAS) is also a common complication in systemic JIA.

2.10. Treatment: Main approach of JIA treatment is based on minimization of joint pain and inflammation, control of systemic complications and provides quality of life to patients. In Modern sciences non-steroidal anti-inflammatory drugs (NSAIDs) is first-line drug for control pain and inflammation in JIA but it has many side effects in adolescents such as increased sleep disturbance and non-specific abdominal pain. The antiplatelet effect of the NSAIDs predisposes to excessive bruising in particularly active children. Aspirin is not recommended in children because of its common complication in children such as Reye syndrome. Other drugs used in JIA are corticosteroid injections and Methotrexate, disease-modifying antirheumatic drugs (DMARD), which helps hold back joint inflammation in JIA patients with polyarthritis. All modern medicine drugs have high risk of severe side effects such as renal toxicity, gastrointestinal ulcers, cardiovascular complications, hematologic toxicity, pulmonary toxicity, hepatic fibrosis, cirrhosis, diarrhea, immune reactions, and local injection-site reactions.

3. METHODOLOGY: This review work was carried out by using a wide-ranging and organized data mining approach. To achieve significant literature author uses the keywords “Juvenile idiopathic arthritis (JIA)” and “plants, herbal medicine for JIA, Anti-arthritis effect, Ayurveda” were parallel searched in Google Scholar, web of science, Science direct, Scopus, Medline and PubMed Central journal literature.

4. OBSERVATION: A total of nine publications were included in the final selection after systematic analysis for treatment of JIA by different Ayurvedic modalities.
4.1. Treatment of JIA by Ayurveda: Treatment algorithms in Ayurveda are based on non-linear dynamics of biological systems. Ayurveda treats diseases by using two different methods:-

A. Shodhana therapy (Purificatory)
B. Shaman therapy (Pacificatory)

Shodhana therapy means detoxification of the body by expelling the deranged Doshas (morbid materials inside the body causing various diseases) and this is done by Panchkarma therapy. Shaman therapy is appeasement of symptoms without eliminating the morbid doshas and this is done by herbal or herbo-mineral drugs.

Typically, all treatment protocols begin with shodhana therapy, followed by shaman therapy for better results. 28

<table>
<thead>
<tr>
<th>Shodhana therapy</th>
<th>Ayurvedic Compound</th>
<th>Single Herbal Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarvanga Abhyanga</td>
<td>Kaishora Guggulu</td>
<td>Shallaki</td>
</tr>
<tr>
<td>Nadi Swedana</td>
<td>Chitrakadi Vati</td>
<td>Nirgundi</td>
</tr>
<tr>
<td>Valuka Swedana</td>
<td>Rasnasaptak</td>
<td>Turmeric</td>
</tr>
<tr>
<td>Vaitarana Basti</td>
<td>Kwatha</td>
<td>(Curcuma longa Linn)</td>
</tr>
</tbody>
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TABLE 1: TREATMENT OF JIA IN AYURVEDA

Role of Shodhana Therapy in Juvenile Idiopathic Arthritis (JIA): In Shodhana therapy mainly 4 procedures are very effective in the treatment of Juvenile idiopathic arthritis (JIA) -

- Sarvanga Snehana or Abhyanga (Full body massage with medicated oil).
- Nadi Swedana (Steam bath).
- Valuka Swedana (fomentation by sand pack).
- Vaitarana Basti (a type of medicated enema).

Sarvanga Abhyanga (Full Body Massage with Medicated Oil): The application of oil to the skin followed by massage in specific directions and postures is called Abhyanga. The importance of Abhyanga and its benefits are clearly described in Ayurveda classics.

Material Required: Sarvanga Abhyanga (massage) of the body including limbs, is done by:

- Mahanarayana oil.
- Bala oil.

A. Mahanarayana Oil: Ayurveda is the plant-based native system of medicine practiced in India since ancient times. Now there is need for scientific evidence for the effectiveness of various Ayurvedic formulations. Mahanarayana oil is a classical formulation which has been used for hypertonic condition, relieving joint and muscular pains. Kesar (Crocus sativus Linn), Halr (Curcuma longa) Bhingraj (Eclipta alba Hassk), Kantakari (Solantum xanthocarpum), etc. are key ingredients and well-reported anti-inflammatory and anti-arthritis properties.

B. Bala Taila: Bala Taila is indicated especially for the treatment of Vata vyadhi in Gada Nigraha. Bala Taila is best in all types of Vatavyadhi, Shosha, Apasmara, etc. It gives longevity, luster, and fertility.

Medicated oil can be select according to Prakriti of the child:

<table>
<thead>
<tr>
<th>Prakriti of Child</th>
<th>Medicated oil</th>
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</thead>
<tbody>
<tr>
<td>Vata Prakriti</td>
<td>Ksheerabala Taila</td>
</tr>
<tr>
<td>Pitta Prakriti</td>
<td>Balaguduchyadi Taila</td>
</tr>
<tr>
<td>Kapha Prakriti</td>
<td>Finish in a classical formulation which has been used for hypertonic condition, relieving joint and muscular pains. Kesar (Crocus sativus Linn), Haldi (Curcuma longa) Bhingraj (Eclipta alba Hassk), Kantakari (Solantum xanthocarpum), etc. are key ingredients and well-reported anti-inflammatory and anti-arthritis properties.</td>
</tr>
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</table>

Method of Procedure: Sarvanga Abhyanga (massage) of the body mainly upper and lower limb is done by Anuloma method i.e. massage should be done in direction of hairs (Anuloma) starting from the origin end of hairs towards the free ends of hairs.

Time Duration: This procedure should carry out at-least for 20 min; 10 min in supine position and rest of the 10 min given for the massage in prone position. Time duration can be increase or decrease according to capacity of children. Use all standard seven positions were not possible in children.
because of inability of the patients to maintain the specified other positions as well as their noncooperation during the Abhyanga process. Thus, two positions i.e. supine and prone positions can be for this purpose.

**Post-Procedure:** After Abhyanga (massage) of the body mainly upper and lower limb Patient should allow taking rest at the place where having no direct air contact and then to take bath with warm water.

**Mode of Action:** Abhyanga provides nourishment due to its snigdha (unctuous), mridu (soft) and picchila (sticky) qualities. Vayu resides in sparsanendriya (skin) and massage is said to be good for the skin. Abhyanga (Massage) directly works on vata to bring it back to normalcy. Abhyanga along with Swedana and Vasti removes Aavarana and Srotorodha (obstruction of channels). Abhyanga and swedana together divert the dosha’s from shakha to koshta. Then dosha’s can be managed by Vasti or other panchakarma procedures. Abhyanga reduces hypertonic conditions, improves muscle bulk and power in CP cases. Abhyanga, along with Swedana might work directly on Vata dosha to bring it back to normalcy, which relief in pain. Abhyanga (massage) of the body by Vishagarbha Taila, Mahanarayana Taila and Bala Taila is very effective in JIA. Massage should be done in direction of hairs (Anuloma) starting from the origin end of hairs towards the free ends of hairs. Daily 30 min of whole-body massage is very effective and it provides strong and smooth skin. The regular application of Abhyanga comes under Trans-dermal purification. Abhyanga restores the balance of the Doshas and enhances well-being and longevity. Results of many studies show that massage by medicated oil could relax the tight junctions between endothelial cells in the CNS vessels and facilitate the entry of solutes and other components into the CNS. Abhyanga (massage) is associated with release of melatonin causes calming effects in brain and drained out by the exertion of physical pressure on peripheral nerve ending.

**C. Nadi Swedana (Steam Bath):** Sweating is induced by means of steam coming from the fluid which may contain many Vata shamak herbs.

The Swedana (sudation) karma is considered as the main treatment of Vata roga; due to its Ushna guna overcomes the sheeta guna of Vata. Swedana (sudation) karma relieved in Sheeta (cold), Shoola (pain), and Sthamba (stiffness) in JIA. Nadi Swedana with Abhyanga facilitates in removal of Aavarana and Srotorodha. Nadi Swedana is very helpful in JIA by relieves spasticity, improves joint mobility or range of motion (ROM).

**D. Valuka Swedana:** This is typical Ruksha Swedana in which bolus of sand is used. In Valuka Swedana sand can be fried in dhanyamula along with Saindhava lavana. Valuka Swedana is very effective in relieving the signs and symptoms of Amavata. Sukshma and Tikshna properties of Saindhava lavana helps to pass the drug molecule in systemic circulation through the mucosa. Valuka Swedana helps the Vasti Dravya to reach up to the molecular level. Much care should be focus mainly on heat of the bolus, mainly moderate heat should be taken.

**E. Vaitarana Basti (Type of Medicated Enema):** Vaitarana Basti is a specific type of Basti that is manily indicated in the treatment of Amavata. Vaitarana Basti has very dominant cleansing action. Vaitarana Basti done cleansing therapy which can cleanse the closed channels and renovate its normal function. It is a kind of Niruha basti and it got its name due to the specific ability to cure disease.

According to modern sciences, the rectum has a rich supply of blood and lymph vessels. Drugs can cross the rectal mucosa like other lipid membranes and entering in general blood circulation so effect of Basti seen on whole body.

**4.2 Shaman Therapy (Pacificatory):** Kaishora Guggulu, Chitrakadi Vati, Rasnasaptaka Kwatha and some single herbal drugs like Shallaki (Boswellia serrate), Nirgundi (Vitex Negundo), Turmeric (Curcuma longa Linn), Haratak (Terminalia chebula Retz.), Methi (Trigonella foenum-graecum Linn.) and Pippali (Piper longum Linn.) etc. are main drug which are used in Shaman therapy of JIA. The mainline of treatment for Juvenile idiopathic arthritis (JIA) to bring Agni (digestive power) in normal state to digest Ama and do away with vitiated Vata and Ama.
Because Ama is precursor to inflammation which further changes in Juvenile idiopathic arthritis (JIA).

A. Kaishora Guggulu: It has a function to reduce joint pain and swelling. Kaishora Guggulu has antioxidant, immune-modulator and analgesic property which can help to reduce inflammation and to restore joint. The main ingredients of Kaishora Guggulu are Guggulu (Commiphora mukul), Triphala (Haritaki-Terminalia chebula Retz, Bibhitaki - Terminalia bellerica, Amalaki- Emblica officinalis) and Guduchi (Tinospora cordifolia). Guggulu have Sroto Shuddhikaraka and Rasayanas actions. Triphala is recognized for its Rookshana and Kapha Medo Hara effects. Kaishora guggulu is very effective in managing the edema and improvement in the walking ability in JIA. Kaishora Guggulu has antioxidant, hepatoprotective, immuno-modulatory, digestive stimulant, carminative and analgesic property which helps to subside the inflammation in JIA and help to restore joint healthy.

B. Chitrakadi vati: Chitrakadi Vati is given in 2nd line of treatment to improve digestive power because decreased Agni or metabolic fire is most important in the pathogenesis of JIA/Aamavata of adolescents. Due to lack of Agni, alteration of bacterial flora of the gut occurs that result in dysfunction of the macro and microchannels of transport or Srotash. Chitrakadi Vati increases the digestive and metabolic fires (Agni) in JIA patients by its Deepan, Pachan (enhance proper digestion) property. Chitrakadi Vati also helps to avoid indigestion during course of Panchakarma procedure. Main Ingredients of Chitrakadi Vati is Chitraka (Plumbago zeylanica), Pippali Mool (Piper longum), Sarjikakshar (Sodium carbonate), Yavakshar (Potassium carbonate) and Pancha lavana (Five salts), etc. Agnitundi vati can also be given for increases the digestive and metabolic fires (Agni) in JIA patients.

C: Rasnasaptak Kwatha: Rasnasaptak Kwatha is Ayurvedic polyherbal decoction prescribed as Vata Shamak property and can be used for pain relief in Juvenile idiopathic arthritis (JIA). Main Ingredients of Rasnasaptak Kwatha is Rasna (Pluchea lanceolata), Erandamoola (Ricinus cumminis), Gokshura (Tribulus terrestris), Punarnava (Boerhaavia diffusa), Amrita (Tinospora cordifolia), Aragwadha (Cassia fistula), etc. Rasnasaptak Kwatha responds on all cardinal symptoms of arthritis such as inflammation, pain, stiffness etc. it works as an immunosuppressive and antioxidants action for the management of JIA symptoms by countering at cellular and biomolecular level.

4.3 Single Herbal Drugs: According to the world health organization (WHO) 80% of world’s population depends on herbal drugs for their primary health care. Various of the herbal drugs have potent anti-arthritis activity without any side effects.

A. Shallaki (Boswellia serrate): Shallaki has an anti-inflammatory, analgesics, immune-modulatory, osteoarthritides, and hypoglycemic activities. The anti-arthritis activity is mainly done by decreasing the activity of membrane marker enzymes and prevention of leucocytes migration in the inflamed area. Shallaki possesses a considerable anti-arthritis activity on male albino rats.

B. Nirgundi (Vitex negundo): Nirgundi has different pharmacological actions including anti-inflammatory, analgesic, immune-modulatory, antioxidative and anti-rheumatic. Nirgundi decreased the elevated levels of ESR, and subside many inflammatory mediators hence, it can be concluded that the Nirgundi have an anti-arthritis activity.

C. Turmeric (Curcuma longa Linn): Turmeric has a significant role in reduction of disability and pain. The turmeric plant is reported to be highly anti-inflammatory value and antibacterial activity. Turmeric essential oil also has activities of anti-inflammatory and anti-arthritis activities.

D. Harataki (Terminalia chebula Retz.): Harataki extract have role in significant reduction in the inflammatory mediators and have potent anti-arthritis activity.

E. Methi (Trigonella foenum-graecum Linn.): Methi extract has anti-inflammatory and anti-rheumatic activities. Methi seeds have role in anti-arthritis activity by decreasing the oxidative stress, cell influx and release of mediators associated with arthritis.
F. Pippali (*Piper longum* Linn.): Major constituents of Pippali are piperine, piperlongumine and piperlonguminine, it has anti-inflammatory along with immune-modulatory activities. The aqueous extracts of Pippali possess anti-arthritic activity by inhibiting inflammatory mediators.

G. Sunthi (*Zingiber officinale*): Sunthi has active Constituents such as phenolic compounds and essential oils. It has anti-inflammatory activity, analgesic activity and antioxidant activity.

H. Gokhsura (*Tribulus terrestris*): The main active constituents of Gokshura are phytosterol, saponins, steroidal, flavonoids, and alkaloids. In preclinical studies, methanolic extract of *Tribulus terrestris* fruit has anti-arthritic and analgesic activity.

I. Guduchi (*Tinospora cardifolia*): Guduchi is also known as “Amrita” which means “divine nectar” and it is used in detoxifying and cleansing the whole system of the human body. Mechanism of action of Guduchi on basis of preclinical studies is immune-modulatory activity, anti-inflammatory activity (aqueous extract) and antioxidant activity.

J. Punarnava (*Boerhavia diffusa*): Literally meaning of Punarnava is “drug which renews the old body”. On the basis of preclinical studies, its aqueous extract shows anti-arthritic, analgesic and antioxidant activity.

Pathya Ahara: The diet used in Juvenile idiopathic arthritis (JIA) should be Laghu (easily digestible) and Agni vardhaka. High Agni is manifested by more appetite and low Agni by loss of appetite and heaviness feeling in the abdomen. Agni is high around noon time due to Pitta dominance so morning diet and evening diet should be light, and lunch should be heavy in Juvenile idiopathic arthritis (JIA).

CONCLUSION: JIA is the umbrella term for a group of chronic childhood arthritis present with inflammation of joint and stiffness of unknown cause in children and their onset prior to 16 years of age. The symptoms present in JIA are more comparable with features of Aamavata Vyadhi mentioned in Ayurvedic classics. In Juvenile idiopathic arthritis (JIA) mainly vitiated Vata associated with Ama (undigested toxic substance) and produce particular symptoms affecting the bony joints and systemic system. In contemporary treatment of JIA many drugs are used, which associate with major side effects such as hepatic, pulmonary, renal and bone marrow abnormalities; and minor effects such as malaise, nausea, and diarrhea.

The selected Ayurvedic treatment is very effective in relieving the symptoms of JIA patients and no side effect on any systems. In Ayurveda, Shodhana therapy, such as Sarvaanga Snehana (Full body massage with medicated oil), Nadi swedana (Steam bath), Valuka Swedana (fomentation by sand pack) and Vaitarana Basti (type of medicated enema) is very effective in management of JIA.

In Shaman therapy mainly Kaishora Guggulu, Chitrakadi Vati, and Rasnasaptak Kwatha is effective in relieving pain and swelling of joints. Some herbal drugs also have very potent consideration as anti-arthritic activity such as Shallaki (*Boswellia serrata*), Nirgundi (*Vitex negundo*), Turmeric (*Curcuma longa* Linn), Harataki (*Terminalia chebula* Retz.), Methi (*Trigonella foenum-graecum* Linn.) and Pippali (*Piper longum* Linn.). This option is effective in improves quality of life (QOL), swelling, pain, and restriction of movement (ROM) in JIA patients. It has positive and hopeful effect; it is revolution in treatment by Ayurveda.

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REFERENCES:

68. Annonymus, Indian Medicinal Plant. Vol.4, Medicinal Plants unit: Indian Council of Medical Research, New Delhi, 2008; 617-30.

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