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An open labelled single group experimental study of Jaloukavacharana (Leech Therapy) as intervention and reduction in inflammatory markers with joint inflammation as outcome in patients of Aamvata(Rhematoid Arthritis).

Asutkar S,[1] Varshney S.C.[2]

1. Professor &Head, Dept of Shalyatantra, Datta Meghe Ayurvcda College,Hospital and Research Centre, Wanadongri, Nagpur
2. Professor Emeritus, Datta Meghe Institute of Medical Sciences, Sawangi , Wardha.

Abstract: Aamvata is a disease characterized by pain and inflammation in joints,which is called as a disease with inflammatory type of arthritis The patients suffer with vruschikadanshawata vedana ie severe unbearable cutting type of pain. Aamvata can be correlated to rheumatoid arthritis according to the signs and symptoms. Ayurveda offers drugless healing art in the form of jaloukavacharan also known as leech therapy which is known for the anti-inflammatory and analgesic, anesthetic actions of leech salivary gland secretions. Hence, a protocol was designed for the doctoral research on 'Study of inflammatory markers in patients of Rheumatoid Arthritis treated by leech therapy", for the assessment of subjective parameters of pain, swelling, redness, tenderness, loss of function of joints assessed by standard criterian, and objective parameters like CRP and ESR before and after jaloukavacharan for 10 sittings on alternate days. Observations were taken on day 0 and day 21..Statistical tests were applied which revealed significant results of anti-inflammatory effect of leech therapy on CRP(mean 5,sd 2.11)at p value ,0.0001, ESR(mean 5.25, sd 2.98,). Jaloukavacharan (Leech therapy) was found to be having highly significant effect on pain score (mean43.65,sd16.45),and subsequent decrease in swelling on knee joint((mean3.83,sd0.97) and ankle(mean3.85,sd1.90)followed by significant increase in walking effect (mean11.71.sd20.06).which was statistically significant and improvement in other subjective parameters of assessment like redness, tenderness and rise in local temperature with highly significant p value by Mcnemars chi square test.and co-relatable clinical improvement. These outcomes are encouraging enough for an RCT to be undertaken on the given area of research on a large scale which were the implications of this study.

Keywords: Aamvata, Jaloukavacharan, Leech Therapy, Inflammatory markers, Aamvata, Rheumatoid arthritis, analgesic, anesthetic

Corresponding Author:
Dr.Sheetal Asutkar, MD,Ph.D.
Professor &Head, Dept of Shalyatantra,
Datta Meghe Ayurveda College, Hospital and Research Centre, Wanadongri, Nagpur
Email-sheetalasutkar16@gmail.com Mobile no.-9766811974

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Introduction:

Aamavata is one of the gruesome illnesses, claiming the maximum loss of human power. It is not only a disorder of locomotor system but is a systemic disease and is named after its chief pathogenic constituents i.e., Ama and Vata. Sandhishoola, Sandhishotha, Stabdhata and Sparshasahatva are salient features of the disease. The disease Amavata run a chronic course and Jadya, Sankocha, Anga vaikalya etc. are responsible for crippling of the patients in the long run1.[1]This disease can be correlated to Rheumatoid Arthritis which accounts for taxation of patients globally on the parameters of pain, joint inflammation and deformity in later life. This accounts for the loss of productivity of a person affecting the skills and hampering the economy of a society owing to the high prevalence and crippling nature of the disease[2]. RA is a chronic inflammatory arthropathy, which most commonly affects middle aged women. The diagnosis is made mostly on the basis of a person's signs and symptoms like polyarticular non- suppurative arthritis affecting small and large joints. X-rays and laboratory testing may support a diagnosis or exclude other diseases with similar symptoms.[3]

The Erythrocyte sedimentation Rate (ESR) and C-reactive Protein (CRP) are blood tests that are markers to detect Inflammation. These are certainly useful blood tests to help diagnose and monitor the inflammatory activity and response to treatment in diseases like Rheumatoid Arthritis, diabetes, Alzheimer's disease, Osteoarthritis, Cellulitis, SLE, etc. The "new" classification criteria, jointly published by the American College of Rheumatology (ACR) and the European League against Rheumatism (EULAR) in 2012 and 2019 establish a point value scale between 0 and 10 to diagnose RA based on the levels of ESR and CRP.In these, 1 point is attributed to elevated ESR and or elevated CRP value.[4] Jaloukavacharan can be synonymously called as Leech Therapy which is defined as the use of leeches in medical treatment. This therapy helps in letting out impure blood from given area with the help of leech bite. The whole world is looking towards the biotherapy with the soft slimy parasite known as leech which is gifted by nature with a handful of bioactive enzymes in its saliva having medicinal properties. Researchers worldwide are working to on this medical marvel for its miraculous actions on human body in various entities like plastic and reconstructive surgeries, neurosurgery, bones and musculoskeletal disorders, skin and soft tissue diseases and many more[5].An altogether different area of research is open to clinicians based on pain management by leech therapy in various disorders. The Leech sucks blood from the site as well as transmits some enzymes in its saliva having anesthetic, anti-inflammatory, anticoagulant, vasodilatation effect etc thereby giving prolonged oozing effect from the site of bite. Studies suggest that leech SGS(Salivary gland secretions) contains more than 100 bioactive substances and has anti-inflammatory, bacterio-static, pain resolving actions[6]. It eliminates microcirculation disorders, restores damaged vascular permeability of tissues and organs, eliminates hypoxia, improves bio-energetic status of the organism through rejuvenation. Hence Leech Therapy has been established as one of the most efficacious therapies in Ayurveda which is labeled as anushastra vistravana by Sushruta, and used for the patients who are afraid of surgical tools.[7] Considering the pain resolving ,anesthetic, anti clotting, anti inflammatory and other multifold actions of leech Salivary gland Secretions(SGS), and indication of Raktavisravana[jaloukavacharan] in Vranashopha treatment advocated by Sushruta, with a moto of evaluation of leech therapy on reduction of inflammatory markers in patients of Aamvata[RA\], a doctoral research had been

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proposed and completed under the aegis of Mahatma Gandhi Ayurveda College, Wardha .Very remarkable outcomes had been found at the end of the first of its kind study which was done after analyzing the research Gap and results are stated in the observations and justification provided in the discussion part.

Research gap analysis- All the studies done till now on Aamvata were with some ayurvedic pharmacological intervention and Leech therapy and based on subjective parameters like Pain , Swelling etc and no emphasis was given on the laboratory parameters like Inflammatory Markers (CRP and ESR)

Research question-Can the study of inflammatory markers in patients of Rheumatoid Arthritis may be of utility to ascertain effectiveness of Leech Therapy with reference to pain, inflammation and swelling?

Aim- To assess the effectiveness of Leech Therapy in the patients of Aamvata (Rheumatoid Arthritis) by evaluation of reduction in Inflammatory Markers(CRP and ESR)

Objectives-

1. Pre and Post treatment evaluation of markers of inflammation, CRP and ESR in RA patients.
2. To compare the anti- inflammatory effect(Pain and Swelling) of Leech Therapy Post treatment in patients of Rheumatoid Arthritis (wsr, Aamvata)
3. To compare the levels of CRP and ESR after leech therapy in RA patients

Anticipated translatory component:

1.A handy, easily available, natural mode of management of RA (Aamvata) in the form of leech Therapy may be introduced in routine practises.

2. If the hypothesis was proved and Leech therapy was found to be effective in the reduction of levels of CRP and ESR,a non-pharmacological method which is used as Biotherapy may be introduced in reducing the markers of inflammation in patients of RA.

3. Similarly. leech therapy is a known para-surgical tool in the treatment of some peculiar features of arthritis like joint pain and restricted movement, hence, can be validated in this study on RA, for re-establishment.

Research Design:

Nature of study: Experimental Study.

Study type: Open label single group experimental study

Sample Size: Total 61 patients were selected, allocated into a single group by convenience sampling method.

IEC approval - taken on dated 11/07/2016 vide letter no DMIMS(DU)/IEC/2016-17/3022

Variables –CRP (evaluated by quantitative method),ESR (evaluated by quantitative method,Pain (VAS scale),Swelling (Metric method),Redness (present /Absent),Tenderness (Dr. Frank Painter's scale),Rise in local temperature (Present/absent) were the variables and criteria of assessment in the patients of RA.

Review of literature- The disease Amavata can be correlated with rheumatoid arthritis owing to similarity of clinical presentation. On the basis of the findings in the Egyptian Mummy's, the antiquity of the disease rheumatoid arthritis has been traced in the very beginning of civilization. It is believed that the description of the disease was initiated by Hippocrate (600 B.C.) in the realm of medical science. But in the right perspective the first clinical description was given by Arteus (100 A.D.). Rheumatism word was coined by Galen (199 A.D.) W.H.O. has also referred the word Arthritis to indicate the joint disorders.

Rheumatoid Arthritis is a chronic multisystem disease of unknown cause. Characteristic features is persistent inflammatory synovitis usually involving peripheral joints in a symmetric distribution (Harrison's 1998).The affected joints

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are frequently tender, swollen and warm and there may be limitation of both active and passive movements. Joint swelling results from accumulation of synovial fluid, hypertrophy of the synovium, and thickening of the joint capsule[8.] Laboratory Findings in Amavata (Rheumatoid Arthritis) show that, Haematological findings that are characterized by normochromic, normocytic anaemia with rise in WBC count and Eosinophillia. The erythrocytic sedimentation rate is increased in nearly all the patients with active rheumatoid arthritis. The levels of ceruloplasmin and C-reactive protein are also elevated and Rheumatoid factor which are antibodies reactive with the Fc portion of IgG are found in more than two third of the adults with the disease. The inflammed joints are usually held in flexion to maximize joint volume and minimise distention of the capsule. In this stage, where fibrosis has not yet started, and warmth is evident on examination especially of large joints such as the knee joint,where erythema is infrequent[9]..This is the particular time where, patient should be offered with an option to take care of the joint inflammation as well as pain relief. Raktamokshana is such a modality which occupies third place in the treatment of Vranashopha[10] and ninth modality of karma in the shashti upakramas mentioned in the treatment of Vrana[11].Raktavisravana by jalouka is the treatment offering bloodletting with the help of leeches, which have got anti inflammatory, analgesic anti coagulant, anti histaminic, fibrolytic enzymes in the salivary gland secretions. This causes unblocking of capillaries and lymphatics, thinning of blood and reversal of local stasis of blood due to inflammation[12]. “That’s the ideal medicine, which relieves from all kinds of miseries,” says Charaka.[13] There are multifold routes of drug administration in Ayurveda like oral,local, systemic,anal,nasal and many others.All of these serve the purpose of curing disease with specific actions. Raktamokshana is a technical term employed to denote the para-surgical procedures to expel out the vitiated blood from selected areas of the body, by specific methods.[14]

New classification criteria overruled the "old" ACR {American College of Rheumatology) criteria of 1987 and are adapted for early RA diagnosis. The "new" classification criteria, jointly published by the American College of Rheumatology (ACR) and the European League against Rheumatism (EULAR) establish a point value between 0 and 10. In these, of the 10 points, 1 point is attributed to elevated ESR (erythrocyte sedimentation rate), and or elevated CRP value (C-reactive protein).[15]
Parent article-Aetna Journal considers medicinal leech therapy experimental and investigational for treating cancer pain, epidermoid cysts, knee osteoarthritis, inadequate arterial supply or tissue ischemia, priaprism, rheumatoid arthritis and other musculoskeletal diseases, and for all other indications because of insufficient evidence of its effectiveness.[16]

Materials-Leeches and Leech Lab and other procurements elaborated in fig.Group A(pic 1,2) as per the SOPs of Jaloukavacharana[12]and tablets of Paracetamol.

Leeches and leech lab

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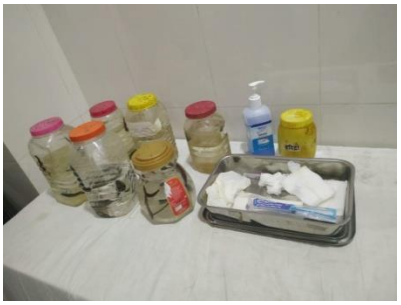
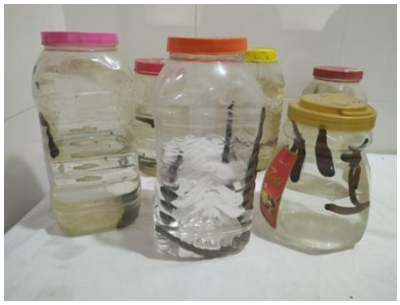

Group A(Pic no-1,2), Leech lab, labeled containers for patients and tray shows procurements for Leech therapy



Group B(Pics no 3,4,5) showing jaloukavacharan on knee joints in patients of Aamvata.



Group C(Pics no 6,7,8) showing jaloukavacharan on ankle joints in patients of Aamvata.. Inclusion Criteria-Patients in the age group 20 to 70 yrs. with special features of RA were selected for study like two or more swollen joints and with elevated erythrocyte sedimentation rate (ESR), and or elevated CRP value (C-reactive protein) were selected for the research protocol. **Exclusion Criteria-**All infective types of Arthritis, pregnant ladies, lactating mothers,HIV and Hbsag positive patients,patients on treatment of IHD,patients with bleeding disorders.

Methods-The patients suffering from Aamvata (RA) in whom knee joints and ankle joints were involved was the target population Patients of Aamvata, whether sero positive or sero negative,in whom CRP and ESR were raised were chosen for leech therapy. Painful Knee joint and ankle joint (were preferred for Leech therapy).Leech Therapy was done on alternate day as elaborated in fig. group B(pic 3,4,5) and fig. Group C(pics 6,7,8). Such 10 sittings were done. On every instance, 2 or 3 leeches (small to moderate size were applied which were found to suck 5 to 15 ml of blood as average.

This wais a single group interventional Study in which before and after treatment assessment was done on certain objective parameters like markers of inflammation ie CRP and ESR and subjective parameters like pain, swelling, redness, tenderness, rise in local temperature,

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restricted movements of joints. Blood investigations like CBC, CRP, ESR, RA factor, Bleeding time and Clotting time, HIV and Hbsag were performed before leech therapy. CRP, ESR, BT and CT were repeated after leech therapy.

The observations were taken on day 0 and day 21 of leech therapy. Leech Therapy was performed on alternate day on affected joint according to the standard operating procedures of Raktamokshana by Jalouka, on preferably the knee and ankle. The observations were compared before and after therapy and statistical data drawn quantitatively

Results and Discussion-

On completion of the protocol of leech therapy in 61 patients of Rheumatoid Arthritis (Aamvata), results were drawn after application of certain statistical tests and illustrated in the tables given followed by the discussion of the result.

Statistical Analysis- Data was entered in MS excel worksheet coded and analysed in a statistical software, STATA ,version 10.1, 2011

Descriptive statistics was used to summarize quantitative variables with measures like mean and standard deviation, while frequency percentage were used to summarize categorical variables(qualitative)Inferential statistics involves application of test of significance. Paired t test was used for comparison of before and after mean values of quantitative parameters. Mcnemar's chi square test was used for comparing before and after difference in proportion for qualitative parameters. Mean differences in two subgroups before and after treatment in two subgroups were compared with two independent variables and independent with chi square values. Analysis of Variance was proposed to compare mean of ESR by various important parameters like age ,gender and RA factor using F test. Significance of p value<0.05 was set at alpha 0.05 level.

Observations and Results-

1. **Pain score**- This was calculated on Visual analogue scale before and after leech therapy in RA patients.

Table no 1**.–**Comparison of Pain score before and after treatment

Mean score	Mean	SD
Before	75.77	10.73
After	32.11	16.48
Difference	-43.65	16.45
p value = 0.0001, HS		

Results-Table no 1 shows Percentage of mean pain score difference which was found to be 43.65,when before and after leech therapy pain scores were compared in patients of *Aamvata*. The initial pain score is found to be 75.77 and final pain score is found to be 32.11% respectively.

Hence the difference is highly significant found by Mcnemar's chi square test.

Discussion-This difference is suggestive of the significant effect of leech therapy on pain owing to the anti-inflammatory and anesthetic effect of salivary gland secretions such as bdellins, eglins, tryptase inhibitors, and Factor Xa inhibitors etc which are injected in the site of leech bite at the time of blood suction.[17]The significant pain relief is also due to continuous oozing of sero

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sanguineous bloody fluid, which lasts from 4 to 8 hrs after leech therapy.

1. Swelling**-** Swelling was calculated in centimetres by metre tape before and after leech therapy on joints**.**

Table no 2: Comparison of Mean Swelling score (on knee) with difference

Mean Score Swelling	Mean	SD
Before	37.21	1.22
After	33.38	1.17
Difference	-3.83	0.97

Table no 3-Comparison of mean swelling score (on ankle) with difference

Mean score	**Mean**	**SD**
Before	32.82	3.05
After	28.97	2.48
Difference	-3.85	1.50
p value = 0.0001, HS		

Results**-**Table no 2 shows mean score of difference in swelling in centimeters on knee joints which .was found to be 37.21 initially and 33.38 in cms finally after leech therapy. The mean difference is 3.83 and p value is p= 0.0001 which is highly significant.

Table no 3 is another comparison reveals mean difference in score of swelling in ankle joint in patients of *Aamvata*, before and after leech therapy. Initial score was found to be 32.82 and final pain score to be 28.97 in cms. Mean difference was found to be 3.87 and p value is p=0.0001, which is highly significant.

Discussion-This finding suggests that leech therapy has got a major role to play in reducing the swelling over inflamed joint in *Aamvata*. Kumar et al say that the saliva of the medicinal leech also contains proteinase inhibitors, such as bdellins, eglin, inhibitors of α-chymotrypsin, subtilisin, and the granulocytic neutral proteases-elastase and cathepsin G23, responsible for the anti-inflammatory effect of leeching.Similarly, Leeches also secrete a vasodilative, histamine-like substance, which increases the inflow of blood after a leech bite and encourages the bleeding and oozing for 6 to 24 hours of session and reduces local swelling[18]

2. Redness-.Redness on joints was calculated as present and absent.

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Table no 4- Comparison in score of Redness

Redness	Before		After	
	No. of pts	%	No. of pts	%
Present	50	81.67	34	56.67
Absent	26	43.33	11	18.33
P value by Mc nemar's chi square test is p=0.0079,HS				

Results-Table no 4 indicates that 81.67 % of patients had redness before leech therapy which was found to reduce to 56.67% after the leech therapy .18.33% of patients had absent redness of skin over affected joints initially, which was found to improve to 43.33% of patients after leech therapy. P value by Mc nemar's chi square test is found to be p=0.0079 which is highly significant.

Discussion-This finding is in favour of the anti-inflammatory action of leech as per Fort et al by the virtue of which leech reduces pain and swelling on the joints thereby reducing redness which is due to soft tissue inflammation in the joint periphery.[19]

4. Tenderness – Tenderness on joints was calculated by Dr Frank Painters scale

Table no. 5- Comparison of Tenderness on joints before and after treatment.(Dr Frank painters scale)

Tenderness	Before		After	
	No.of pts	%	No.	%
+	1	1.67	36	60
++	32	53.33	4	6.67
+++	27	45	0	0
Normal	0	0	20	33.33
Mc Nemar's Chi^2, P=0.0001, HS				

Results-Table no 5 shows that 32 patients had class II tenderness before treatment, which was 53.33 % in quantity, and which was found to be in 4 patients ie 6.67 % after treatment. In 20 patients, the tenderness was reduced to normal score after treatment. The graph indicates that all the 61 patients had tenderness ie 100% occurrence which was found to reduce to just 40 patients ie 66.67% after therapy.

Discussion- This finding is again suggestive of leech saliva having potent anti-inflammatory and analgesic action. Michaelson et al state that the leech bite injects a cocktail of salivary enzymes like hirudin, hirustasin, bdellins, gelins, eglins, Xa inhibitors and 100 of bioactive constituents which render the potent anti-inflammatory effect reducing the pain, swelling and redness thereby reducing the tenderness over the joints.[20]

3. Rise in local temperature-This character was calculated as presence and absence on joints.

Table No 6: Comparison of rise in local temperature on joints

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Rise in local temperature	Before		After	
	No.	%	No.	%
Yes	55	91.67	21	35
No	5	8.33	39	65
Mc Nemar's Chi^2 P= 0.0001, HS				

Results-Table no 6 reveals that 55 patients had rise in local temperature which was 91.6% before treatment and was found to reduce to 39 patients ie 35%, and 5 patients didn't have redness, the percentage of patients who didn't have redness on joints was found to increase to 55% after treatment.

Hence it was found that there is a remarkable decrease in the percentage of patients with rise in local temperature on joints particularly after leech therapy on joints.

Discussion-As RA is a disease characterized by inflammatory condition of joints and joints which are swollen and warm and painful is a typical finding with other peculiar characters. Ganpati et al say that leech saliva has many properties like anti-inflammatory, analgesic, anesthetic, decongestant action, anti-ischemic properties and anti-coagulant action which allow the blood to flow freely even after the leech is removed. This allows the local toxins to flow freely, releases the local stagnant pool of inflammatory secretions thereby reducing rubor, calor, dolor, tumor and local warmth in the tissue[21]

6. Restricted movements- These were restricted movements of knee joints calculated on goniometer and noted as degree of flexion.

Table no 7-Comparison of Mean score of restricted movements and difference -

Mean score	Mean	SD
Before	45.64	19.13
After	88.61	23.21
Difference	42.96	20.06
p value = 0.0001		

Results-Table no 7shows the mean score difference in restricted movements before and after leech therapy in joints which was found to be 45.64 and 88.61 respectively ,the mean difference being 42.96 and p value is p=0.0001 which is highly significant. This shows a statistically significant improvement in restricted movement of joint.

Discussion-The combined effect of the multiple bioactive salivary secretions like pain killer action, analgesic anti-inflammatory action, anesthetic properties, thrombolytic effect, tissue rejuvenation effect, anti-ischemic effect, renders the improvement in the pain, swelling, stiffness of the joint and improvement in the restricted movement of joint.This finding goes hand in hand with the facts stated by Enocsson et al.[22]

7. Walking Effect-This was calculated as mean distance of walking by patient of RA in 15 m9ns.

Table no.8: Mean distance walked in meters in 15 minutes –before and after Leech therapy.

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Distance (meters) walked in 15 minutes	Mean	SD
Before	16.25	5.77
After	27.96	6.5
Difference (Effect)	11.71	5.77
p value = 0.0001, HS		

Results-

Table no 8 reveals mean distance walked by patients in 15 mins time before and after leech Therapy which was found to be 16.25 and 27.96 in meters respectively. The mean difference is 11.71 which is found as highly significant with p value = 0.0001. This finding suggests that the mean increased score in observed walking by the patients of RA for 15 mins is 11.71 meters, which is significant.

As Leech therapy is effective in giving pain relief, reducing swelling, redness, tenderness and local warmth is also reduced improving the restricted movement of joints of lower limb. Singh et al state that all the improved characters play a combined role on the walking effect of the patient thereby improving the quality of life of the patient.[23]

8. CRP(C reactive protiens)-This is an acute phase reactant, marker of inflammation in the RA patients. This pathological parameter is the inflammatory marker calculated by quantitative method

Table no 9-Comparison of mean CRP before and after treatment

CRP	Mean	SD
Before	21.24	5.08
After	16.24	4.65
Difference	5.00	2.11
p value = 0.0001, HS		

Results-Table no 9 shows mean difference in CRP in 61 patients of Aamvata before and after leech therapy, which was found to be 5, with p value p=0.0001 that is highly significant.

Discussion-This indicates that leech therapy is effective in reducing the CRP in patients of Aamvata to a level which is statistically significant in a population of RA patients with sample of n= 61 The reduction in CRP is due to the systemic effect of anti-inflammatory and analgesic effect of leech salivary gland secretions which are injected in every leech bite, along with the vasodilation and anti-edematous effects and other potent effects such as immune-modulating effect, tissue rejuvenation effect and improvement in microcirculation effect etc.[24]

9.ESR (Erythrocyte sedimentation rate)-This is the marker of inflammation calculated as the rate which the erythrocytes sediment at the end of 1 hour,which is very high in RA.

Table no 10 -Comparison of ESR in; distribution in total and according to Sex

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ESR	Mean	SD
Before	50.95	7.74
After	45.7	7.6
Mean difference	5.25	2.98
p value = 0.0001, HS		

Results-Table no 10 reveals the Mean of ESR in both genders, mean difference which is 5.25 in mm/hr, SD being 2.98, p value is 0.0001 which is highly significant.

Table 11.-Comparison of Mean change from baseline in ESR by gender

Table : Mean ESR in male subjects (n=26)			Mean ESR in female subjects (n=30)		Comparison of Mean change from baseline in ESR by gender		
ESR	Mean	SD	Mean	SD	Sex	Mean Change	SD
Before	44.11	4.09	56.87	4.61	Male (n=26)	4.65	1.12
After	39.27	3.83	51.27	5.27	Female (n=30)	5.65	3.94
Mean difference	4.85	1.12	5.6	3.94	Mean difference	0.75	0.44
p value = 0.0001, HS			p value = 0.0001, HS		p value = 0.3528, NS		

Result-Table no 11 reveals the mean of ESR in males and females and standard deviation. The mean difference in males is 4.85 and females is 5.6 rendering p values=0.0001 each, which is highly significant in both genders.

The mean difference in change in mean ESR in both sexes is 0.75. The p value = 0.3528, which is found to be non-significant. The reduction in ESR is due to the systemic effect of anti-inflammatory and analgesic effect of leech salivary gland secretions which are injected in every leech bite with various multifold leech actions. Hence, it can be concluded that Leech Therapy is an effective treatment in reducing ESR in patients of Aamvata in both genders significantly, irrespective of any gender specific finding

Discussion-

The mode of action of jaloukavacharan synonymously called as leech therapy depends on three main steps of medicinal leeching:

1.The blood-letting action during active suction of blood,

2. Passive oozing of the wound, and

3. Injection of biologically active substances with the saliva into the host.

The leech bites and starts sucking blood from the host site,leading to release of the static, deoxygenetated blood .In this way it allows the stagnant pool of blood at the site of joint to flow freely after the blood sucking is over. Leech injects the biologically active enzymes into the site of bite like anesthetic, anto coagulants, anti-inflammatory and analgesic enzymes, and anti-

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histamines as well. The injection of cocktail of these salivary gland secretions of leech into the joint facilitates the reduction in all parameters of inflammation like pain, swelling, redness, tenderness, local temperature and restricted movements. The passive oozing of blood from the site of bite at the joint for 4 to 8 hours leads to multiplying the anti-inflammatory and analgesic actions giving the systemic effect probably resulting in the reduction in inflammatory markers in the patients of Aamvata{RA]. along with the vasodilation and anti-edematous effects and other potent effects such as immunomodulation, tissue rejuvenation effect and improvement in microcirculation etc[25]

Till date there is no reference to this finding, and this experimental cum observational study is the first to quote the result that there is significant reduction in inflammatory markers after 10 sittings of jaloukavacharan (leech therapy) in patients of Aamvata(RA),when applied on alternate days with 5 to 15 ml of blood-letting from each joint on single sitting complimented by significant reduction in physical signs of inflammation of joints which is due to the systemic effect of anti-inflammatory and analgesic effect of leech salivary gland secretions.

Overall Effect of leech therapy was found significant on all important subjective parameters and objective parameters. Though significant but effect size was observed small (around 10%) for swelling and ESR, whereas it was large (>30%) for all other parameters**.**

Conclusion- This can be concluded that Jaloukavacharan (Leech therapy is found to be statistically significant in reducing inflammatory markers like CEP and ESR and significantly effective in reducing signs of joint inflammation in patients of Aamvata(RA) like pain, swelling, redness, tenderness, rise in local temperature and walking effect when subjected to the specified protocol in the present study.

Limitations of the present study:

This study should be done on large population**.** Multicentric, Interdisciplinary research with RCT design should be conducted. Declaration of new knowledge generated, Leech Therapy is significantly effective in decreasing the CRP to a significant level and ESR to considerable levels and effectively renders pain relief to the patients of Rheumatoid Arthritis.

Acknowledgement-

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