

The use of three to five Tablespoonful per day of garlic ,olive and sesame oil mixture can improve health of patients suffering from rheumatoid arthritis disease

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Key word: Rheumatoid arthritis, Garlic oil, Olive oil, Sesame oil, Erythrocytes sedimentation rate, Rheumatoid factor, Neutrophiles , anti-cyclic citrullinated peptide antibody .

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Abstract

Background: Rheumatoid arthritis (RA) is an autoimmune disease where the body immune system attacks different normal joint tissues organs causing inflammation of the joint lining . Rheumatoid arthritis still one of an important diseases affecting large population. Different kinds of medicine where used but still the needs for extra herbal medicine that assist and improve patients movements is needed for decreasing patients compliance. This study summarized the benefit of using Garlic, Olive and Sesame oil (GOS) mixture on patients health though its anti-inflammatory and anti-bacterial effects and this effect was seen after using mostly three to five tablespoonful/day. Such results was confirmed by decreasing most of inflammatory markers (Erythrocyte sedimentation rate (ESR), Rheumatoid factor (RF), Neutrophile count, anti-cyclic citrullinated peptide antibody (Anti-CCP) level and bacterial growth) with improving patients health. **Aim of the study:** to study the efficiency of garlic oil, olive oil and sesame oil mixture in treatment of Rheumatoid arthritis disease. **Methods:** A 80 serum samples (27 women and 43 men; mean age 45.5 ± 13.8 years; range, 25-74 years) of patients with sign and symptoms of Rheumatoid arthritis attending Karbala Teaching Hospital for Rheumatology department were studied. The patients were divided into three groups :1- Twenty- five rheumatic patients were advised to administer five tablespoonful / day from mixture containing GOS oil . 2- Thirty-five rheumatic patients were advised to administer three table spoonful/ day of mixture containing GOS oil.3- Twenty patients were advised to administer one tablespoonful/ day of mixture containing GOS oil. All the groups were advised to use topical ointments containing mixture of GOS oil for 30 days. Inflammatory blood marker like Erythrocyte sedimentation rate (ESR) , Rheumatoid factor (RF), Neutrophile count and Anti-CCP level in addition to bacterial growth was evaluated before and after administration of GOS oral and topical mixture.

Results: The results demonstrated that the level of ESR was decreased upon oral (three and five tablespoonful/day) and topical use of GOS mixture. While RF level decreased if the patients use five tablespoonful/day compared to three tablespoonful/day which show slight decrease in RF level. However, Neutrophiles count was also found to be reduced during administration of three tablespoonful/day while dosing of five and one tablespoonful/day shows a similar level of reductions.

Anti-cyclic citrullinated peptide antibody regarded one of specific test for diagnosis of RA disease. Five tablespoonful/day the patients describe a slight decline in the curve compared with (three tablespoonful/day) that will have a sharp decrease in Anti-CCP level with subsequent improvement in patients health . However, one tablespoonful/day , have relatively a similar effect on Anti-CCP level to that of five tablespoonful/day). Bacterial growth profile was found in all patients to be reduced sharply upon using GOS mixture. This decrease mostly associated with the use of (three tablespoonful/day, five tablespoonful/day and one tablespoonful/day) respectively.

Conclusion: Administration of oral (three to five tablespoonful/day) of GOS mixture was found to reduce sign and symptom of RA disease with subsequent improvement in patients health. Such results was accompanied by decreased in RA blood marker (ESR, RF, Neutrophiles count and Anti-CCP) level. In addition, to the reduction in bacterial growth. However, a further study is required to investigate the effect of GOS mixture in compared to other anti-rheumatic drugs effects.

استعمال ثلاثة الى خمسة ملاعق يوميا من مستحضر زيت الزيتون والثوم والسمسم يساعد في التخفيف من مرض التهاب المفاصل الرثوي .

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الكلمات المفتاحية: التهاب المفاصل الرثوي, زيت الثوم , زيت الزيتون , زيت السمسم , نسبة ترسيب الكريات الدم الحمر , قياس عامل التهاب المفاصل الرثوي . كريات الدم البيض.

الخلاصة : مرض التهاب المفاصل الرثوي هو احد الامراض المناعية التي يهاجم فيها الجهاز المناعي الغضاريف الموجودة في المناطق المفصالية مؤديا الى حدوث التهابات مفصالية حادة و يعتبر هذا المرض واحد من الامراض المهمة التي تصيب اعداد كبيرة من المرضى في العالم . هناك عدة أنواع من العلاجات والتي تستعمل بكميات كبيرة والتي لها اعراض جانبية كثيرة لطالما يعاني منها المرضى طويلا ومن هنا برزت الحاجة الى ايجاد علاجات طبيعية اخرى تعطي تقريبا نفس مفعول العلاج بالادوية وذات اعراض جانبية اقل, لذا تم في هذا البحث تحضير مزيج فموي وموضعي مكون من زيوت الثوم والزيتون والسمسم بنسب معينة واعطائه لمجموعة من المرضى بجرع مختلفة ولفترة شهر وقد لوحظ ان اعطاء المرضى (ثلاثة الى خمسة ملاعق طعام يوميا مع استخدام مستحضر دهني تم تحضيره من نفس الزيوت اعلاه) كان له تأثير كبير حيث تحسنت حالات المرضى والذي انعكس ايجابا مع نقصان قيم بعض العوامل المستخدمة في تشخيص المرض مثل معدل الرواسب الكريات الحمراء , عامل الروماتيد, عدد العدلات , مكافحة الببتيد السيترولينيبيد الدوري و نقصان كبير في نمو البكتريا التي قد تتسبب في زيادة معدل المرض وأخيرا فان العلاج الجديد لم يسجل أي أعراض جانبية .

Introduction: Rheumatoid arthritis (RA) is an autoimmune disease where the body's immune system attacks different normal joint tissues organs causing inflammation of the joint lining. Rheumatoid arthritis (RA) is the disease represent the most common form of chronic inflammatory arthritis. Although the disease mostly can be recognized by its periarticular and articular manifestations, RA can affect any organ system. In some patients, the disease can even affect any parts of the body other than the joints, including the eyes, lungs, blood, and the heart. This kind of the joint lining inflammation (called the synovium) can cause swelling, stiffness, pain, warmth, and redness. The affected joint may also lose its normal shape, resulting in loss of normal movement. RA is an ongoing disease, with active periods of pain and inflammation, known as flares, alternating with periods of remission, when pain and inflammation disappear. The course of presentation and disease are distinct for any individual patient, making diagnosis and management a thoughtful, complex, and dynamic process (1).

Prevalence

In a patient with a compatible clinical presentation RA affects more than 1% of the world's population which defined by either erosive changes on radiographs or presence of serum rheumatoid factor (RF) . The incidence of the disease is two to three times greater in women than men , and the incidence is most pronounced in individuals younger than 50 years. The incidence of RA continues to increase with age until about the seventh decade of life (2).

Pathophysiology : RA can be caused by many different factors. However, the main causes of RA are unknown and multiple. The combination of either genetic susceptibility with an as-yet-unknown inciting event (or events) leads to disease expression. The concordance of RA in identical twins was reported as 10% to 30%, suggesting that non-genetic factors have shown a predominant impact on disease expression (3). In addition, many infectious agents have long been suspected as potential triggers of RA. Although many investigations have failed to specify any one organism in synovial tissue or fluid, polymerase chain reaction techniques have detected bacterial nucleotide sequences in synovial tissues in patients with RA patients. Viral pathogens are also under study, with the Epstein-Barr virus (EBV) targeted for several reasons (4). Rheumatoid factor, is an important immunoglobulin (Ig) M anti globulin against the Fc portion of human IgG, forming an immune complex is detected in about 75% of patients with RA. Evidence suggests its participation in disease pathogenesis. The presence of RF in RA was mostly associated with extra-articular manifestations of disease, and its absence is generally associated with milder disease (2). Although other inciting factors have yet to be identified, the presence and activity of many pro-inflammatory chemokines and cytokines have established roles in disease pathogenesis. The infiltration and activation of T cells and macrophages in the synovium result in production of interleukin-1, -2, -6, -8, -10, -17; platelet-derived growth factor; tumor necrosis factor- α (TNF- α); insulin-like growth factor; and transforming growth factor β (5). Such effector molecules are implicated in synovial tissue inflammation and proliferation, leading to cartilage and bone destruction, with subsequent systemic effects. Other cells like B cells also infiltrate the synovium and differentiate into plasma cells, producing polyclonal immunoglobulin and RF. In addition, synovial fibroblasts are activated, releasing collagenases and activating metalloproteinase gene expression, which leads to destruction of matrix tissues. Formation of pannus is the net result of these activities with periarticular erosions and osteoporosis, articular cartilage invasion and joint swelling with destruction of periarticular structures (6).

Clinical manifestations

Generally, signs and symptoms of RA begin insidiously and are additive over weeks to months. They commonly include pain, malaise, fatigue, generalized stiffness, and generalized arthralgias or myalgias. Synovitis disease usually develops gradually, often involving the knees, hands, wrists, or feet, often symmetrically. However, the onset of disease is explosive (in 10% to 15% of patients) with poly arthritis, fever, lymphadenopathy, and splenomegaly developing over days to weeks (7). Symptoms of articular disease in RA can appear as tenderness, swelling, warmth, and painful motion. The joints outward appearance in many cases does not necessarily correlate with the amount of active synovitis or pain expressed by the patient. Morning stiffness is often the most characteristic. Patients complain in patient suffering from inflammatory arthritis. Stiffness, known as *gelling*, can also manifest after brief periods of inactivity. In addition, the pain associated with ongoing synovitis often leads to decreased motion at the affected joints. This, in addition to the ongoing pathologic tissue changes, results in loss of range of motion or, at its most extreme, soft-tissue contractures, fibrosis, and bony ankylosis (5).

Treatment

The mainstays of therapy in RA are the disease-modifying anti-rheumatic drugs (DMARDs). These medical therapy prevent or reduce joint pain, destruction, maintain or improve function, and, in some cases, improve other aspects of the patient's general health.

1- Glucocorticoids

Glucocorticoids (GCs) are used to inhibit or suppress inflammation and preserve joint structure and thus may be considered DMARDs. Such medicine are often used when the disease onset started or with disease flares as a temporary aid in obtaining disease control. Because of their side effect which may persist for long-term, it is desirable to obtain disease control without excessive use of GCs whenever possible and to use the lowest doses necessary. In chronic long-acting form, they are also useful for intra-articular injectional treatment when only one or two joints are active. GCs in high doses are an essential method of treating organ-threatening disease in RA, such as in rheumatoid vasculitis. They are also show useful effect in maintaining disease control during pregnancy when most other DMARDs are contraindicated (8).

2- Methotrexate

Methotrexate (MTX) is another drugs that should be considered as first-line therapy for the treatment of RA. MTX is a folic acid antagonist, but its specific or precise mechanism of action is unknown in RA treatment. MTX effect appear within weeks to diminish disease activity. Radiographic progression of disease was also shown to be decrease during MTX treatment. MTX can be used in combination with other DMARDs to achieve and maintain disease remission (9).

3- Hydroxychloroquine and Sulfasalazine

Hydroxychloroquine and sulfasalazine are DMARDs that used in most patients can provide mild anti-inflammatory activity. They can be used as single agents (only in patients with very mild, non erosive disease) or in combination (in sever cases). They are both well tolerated and have few side effects. In RA their major application is as a supplement to MTX or other kinds of DMARD therapy (10).

4-Nonsteroidal Anti-inflammatory Drugs

Nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesic drugs should be used as symptomatic treatment only in combination with DMARD therapy in RA. These drugs do not produce any significant positive effects on disease function or progression. They should not be considered as the primary or sole therapy in patients with RA. Treatment with these drugs can result in hypertension, edema, gastritis, peptic ulcer disease, or renal insufficiency. A lower risk of gastrointestinal erosions and ulcerations, can be achieved by using selective cyclooxygenase-2 inhibitors, such as celecoxib and rofecoxib, that confer a lower risk, but they are otherwise as toxic as their predecessors. The concern with these newer drugs, as for the other NSAIDs, is that there will be an increased risk of having cardiovascular complications for patients taking these medications. Indeed, one of these agents, rofecoxib (Vioxx), was withdrawn from the market because of evidence documenting such side effects. Whether these findings are specific to rofecoxib or represent a class effect remains to be determined. They should be used with extreme caution or not at all in people with renal or cardiovascular disease. Instead the needs of other kinds of medicine like the conventional drug therapy that can be used with lower events of side effect represents the leading way for new methods of treatment (11).

Conventional Arthritis Drug Therapy

Olive oil: It is the mono-unsaturated healthy fats found in olive oil that are used by the body to produce substances having relatively anti-inflammatory effect. By reducing inflammation, these fats may be capable to reduce and prevent the severity of diseases like arthritis and asthma. Since un-inflamed cell membranes contain more fluid and better able to move healthy nutrients into the cells and push waste products out. Recently discovered a substance in olive oil named oleocanthal was isolated and identified as an important compounds responsible for the anti-inflammatory benefits of olive oil. Oleocanthal is a natural organic product isolated from extra virgin olive oil it is a tyrosol ester and its chemical structure is related to oleuropein, which is also found in olive oil. Recently it have been shown that oleocanthal not only possesses anti-inflammatory properties but additional antioxidant properties as well. Oleocanthal from extra virgin olive oil appears to be a promising new compound in the future management of different anti-inflammatory diseases like arthritis (12). Although its chemical structure is quite different from the anti-inflammatory compounds in non-steroidal drugs, olive oil's anti-inflammatory component has a similar effect. (13).

Sesam oil: Sesame oil is related to the plant species of *Sesamum indicum* L., an herbaceous annual belonging to the Pedaliaceae family (14). In India and other East Asian countries Sesame seeds and oil have long been categorized as traditional health food. Sesame lignans like : sesamin, episesamin, and sesamolin has been found in a considerable amounts in Sesame oil. The oil of Sesame also may contains vitamin E (40 mg/100 g oil), 43 percent of polyunsaturated fatty acids, and 40 percent monounsaturated fatty acids. The antioxidant and antihypertensive properties of sesame oil is related to lignans substance which is thought to be responsible for many of its unique chemical and physiological properties. Sesame oil is a rich source of nutrients including , iron, calcium, magnesium, vitamin E, copper, zinc and Vitamin B6. All these minerals and vitamins are essential for the healthy functioning of the body. Due to its tranquilizing and soothing properties, sesame oil can be used for massages by mixing it with other oils. It also can be used in the treatment of sensitive skin conditions in infants and kids by rubbing directly to the affected area. In addition It is used also for healthy nourishment of hair and skin. Gentle massage of the oil to the joints reduces the pain and swelling (15). In traditional Taiwanese medicine, sesame oil was used to relief the pain in people with joint pain, scraps , cuts toothache and pre-menstrual syndrome. Recently, sesame oil has been proved to possess potent anti-inflammatory properties (16).

Garlic oil: Garlic has been used in traditional medicine as a food component to prevent the development of cancer and cardiovascular diseases, by modifying risk factors such as hypertension, high blood cholesterol and thrombosis, and preventing other chronic diseases associated with aging (17). These pharma-cological effects of garlic are attributed to the presence of pharmacologically active sulfur compounds including diallyl sulfide, diallyl disulfide, allicin, and dipropyl sulfide. These compounds have been known to increase the activity of enzymes involved in the metabolism of carcinogens , and have anti-oxidative activities as well as anti-inflammatory effects in vitro and in vivo . Despite their widespread medicinal use and anti-inflammatory effects, little is known about the cellular and molecular mechanisms of the component of garlic. Several studies have shown that inhibitors of NF-k B may be useful in the treatment of inflammatory diseases including arthritis(18).

Material and methods:

Selection of patients: In this cross sectional study we studied 80 serum samples (32 women and 48 men; mean age 45.5 ± 13.8 years; range, 25-74 years) and consecutively recruited from the rheumatology out-patient clinic of Al-Hussein Teaching Hospital in Karbala for the period from July 2014 to September 2015. A fifty (62.5%) of these patients were classified as having early RA because their symptoms' onset, had

appeared <1 year before this study and radiological examinations revealed no lytic lesions . To provide data on assay specificity, 10 controls patients including 5 males and 5 females with RA rheumatic diseases selected on the basis of their clinical diagnosis, were also studied.

Mixture preparation:

Garlic oil (30 ml) was mixed with equal amount of Olive oil and the liquid phase was completed to 100 ml by adding Sesame oil (40ml) in a bottle container. The patients were advice to store the mixture in a cool and dark environment. The topical mixture was prepared by mixing equal (30 ml) amount of Garlic, Olive and Sesame oil in a container and the weight was completed to 100 gm by adding Vaseline.

Study design: A detailed clinical history and physical examination were performed by a Rheumatologist at baseline, and the following measurements: Erythrocyte sedimentation rate (ESR) was regarded positive at values ≤ 13 mm/hr , Rheumatoid factor (The RF was measured by turbidimetry on a latex-enhanced agglutination assay (Roche Integra, Penzberg, Germany). The RF was considered positive at values greater than 10 U/ml., Neutrophile counts was considered positive at values $\geq 75\%$, anti-cyclic citrullinated peptide antibody (Anti-CCP antibodies were tested by first-generation ELISA (AESKULISA). The anti-CCP was considered positive at values greater than 18 U/ml). Bacterial swabs from rheumatic area were taken for each patients before and after oral and topical administration of a mixture containing Garlic oil ,Olive oil and Sesame oil(GOS oil). The patients were divided into three groups :

1- Twenty- five rheumatic patients were advised to administer five tablespoonful per day from mixture containing GOS oil in addition to the use of topical ointment (containing mixture of GOS oil) once time daily for 30 days.

2- Thirty-five rheumatic patients were advised to administer Three table spoonful per day from mixture containing GOS oil in addition to the use of topical ointment (containing mixture of GOS oil) once time daily for 30 days.

3- Twenty patients were advised to administer one tablespoonful per day from mixture containing GOS oil in addition to the use of topical ointment (containing mixture of GOS oil) once time daily for 30 days.

- Ten patients taking placebo mixture orally and topically were regarded as control.

Statistical Analysis: The data were analyzed using Statistical Packing for Social Science (SPSS) version 14 (19).

Results

The demographic data are summarized in Tables 1 and 2

Table-1 : Rheumatic arthritis distribution in male and female.

RF	Positive		Control		Sum	
	Number	Percent	Number	Percent	Number	Percent
Female	27	84.4	5	15.5	32	100
Male	43	89.5	5	10.5	48	100
Sum	70	87.5	10	12.5	80	100

Table-2: Distribution of rheumatic arthritis in different age groups

RF	Positive		Control		Sum	
	Number	Percent	Number	Percent	Number	Percent
25-34	20	86.9	3	13.2	23	100
35-44	15	8.8	2	12	17	100
45-54	25	92.6	2	7.4	27	100
55-75	10	76.9	3	23.1	13	100
Sum	70	87.5	10	12.5	80	100

The mixture of GOS was given to three different groups of patients having rheumatic disease. It was found that the use of three to five tablespoonful/day from oral GOS mixture with topical application for one month was found to improve both patients' health and symptom of the disease compared to one tablespoonful/day. Such improvement was associated with the results of large decrease in ESR values after administrating the GOS mixture (table-3) and (figure-1).

Table-3: Mean erythrocyte sedimentation rate of the four experimental groups during period of experiment ; expressed by mean \pm SEM.

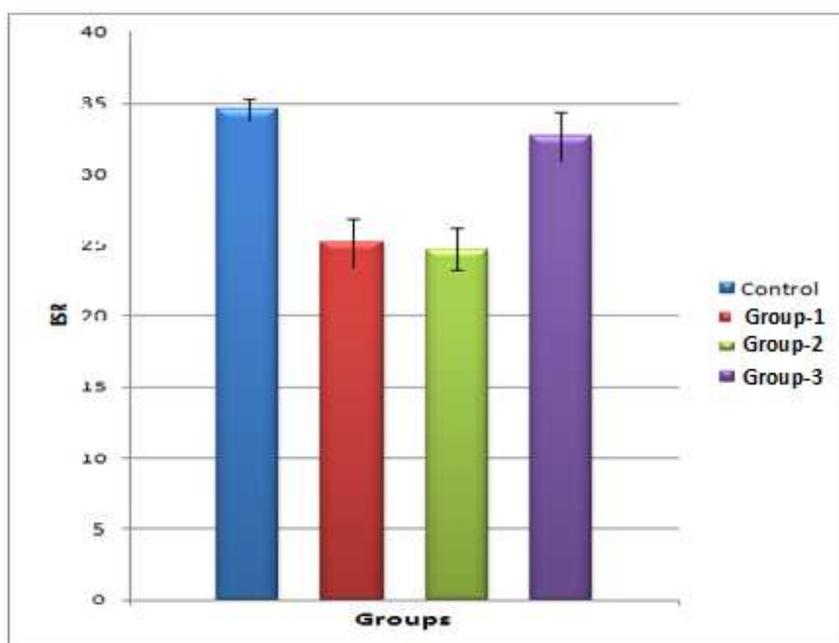
Group	ESR (mean \pm SEM)	P value
Control	34.48 \pm 0.77	<0.05*
Group-1	25.12 \pm 1.73	>0.05**
Group-2	24.64 \pm 1.51	>0.05**
Group-3	32.64 \pm 1.72	<0.05***

*: significant vs. three treated groups (Group-1, Group-2, and Group-3).

** : not significant difference between treated groups in compare Group-1 with Group-2.

***: significant difference between treated groups in compared Group-3 with Group-1 and Group-2.

Figure-1: Differences of Means Plots of ESR during administration of GOS mixture .



RF level represents another parameter which was also found to be decreased during uses of first dose (5 tablespoonful/day) while the second dose (three tablespoonful/day) also shows beneficial effect compared to the last dose (one tablespoonful/day) which shows lesser effect on patient's health (table-4) and (figure-2).

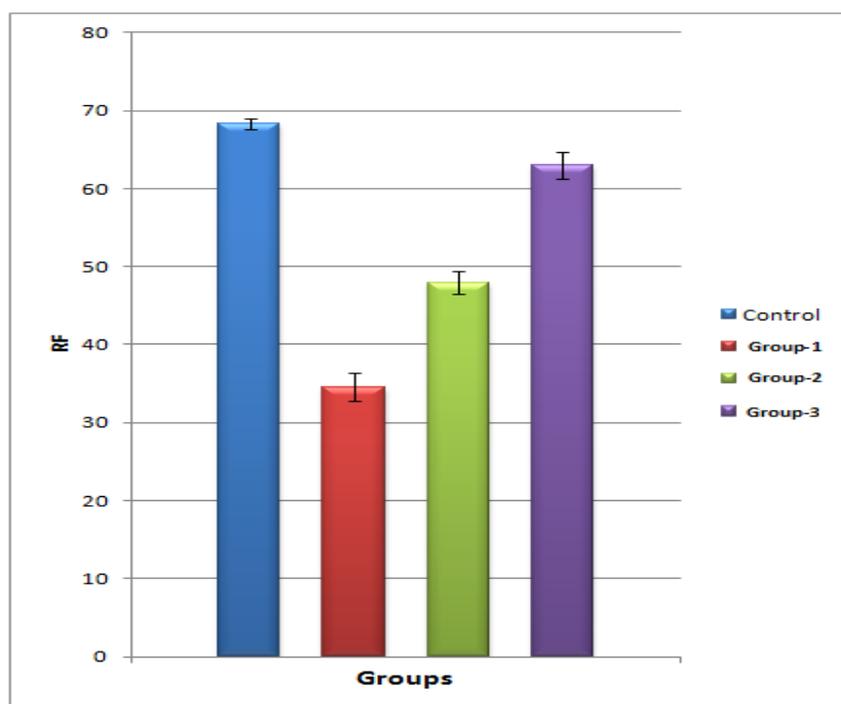
Table-4: Mean RF of the four experimental groups during period of experiment ; expressed by mean \pm SEM.

Group	RF (mean \pm SEM)	P value
Control	68.32 \pm 0.66	<0.05*
Group-1	34.52 \pm 1.82	<0.05**
Group-2	47.96 \pm 1.43	<0.05**
Group-3	63.04 \pm 1.71	<0.05**

*: significant vs. three treated groups (Group-1, Group-2, and Group-3).

** : significant difference between three treated groups (Group-1, Group-2, and Group-3).

Figure-2: Differences of Means Plots of RF during administration of GOS mixture.



Neutrophils values are another important inflammatory cells which increased during RA disease. The administration of three tablespoonful/day from GOS oral mixture with topical application lead to reduction in neutrophils count with subsequent decrease in inflammatory symptoms such response was also seen but with lesser effect when the patients used five tablespoonful/day and one tablespoonful/day) respectively (table-5) and (figure-3).

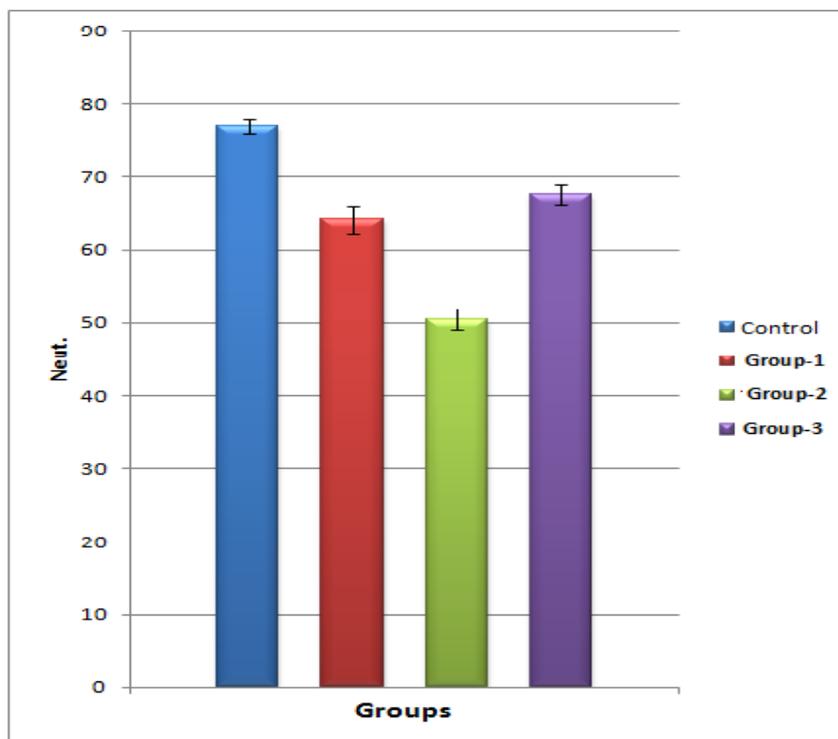
Table-5: Mean Neutrophil count of the four experimental groups during period of experiment ; expressed by mean \pm SEM.

Group	Neutrophil (mean \pm SEM)	P value
Control	76.92 \pm 1.06	<0.05*
Group-1	64.12 \pm 1.96	>0.05**
Group-2	50.4 \pm 1.45	<0.05*
Group-3	67.56 \pm 1.29	>0.05**

*: significant vs. experimental groups.

** : not significant difference between treated groups in compare Group-1 with Group-3.

Figure-3: Differences of Means Plots of Neutrophile counts during administration of GOS mixture.



Anti-cyclic citrullinated peptide antibody regarded one of specific test for diagnosis of RA disease . When the mixture given (five tablespoonful/day, three tablespoonful/day and one tablespoonful/day orally with topical uses for one month to the patients groups) all doses showed a good response with improvement in patients health (table-6) and (figure-4).

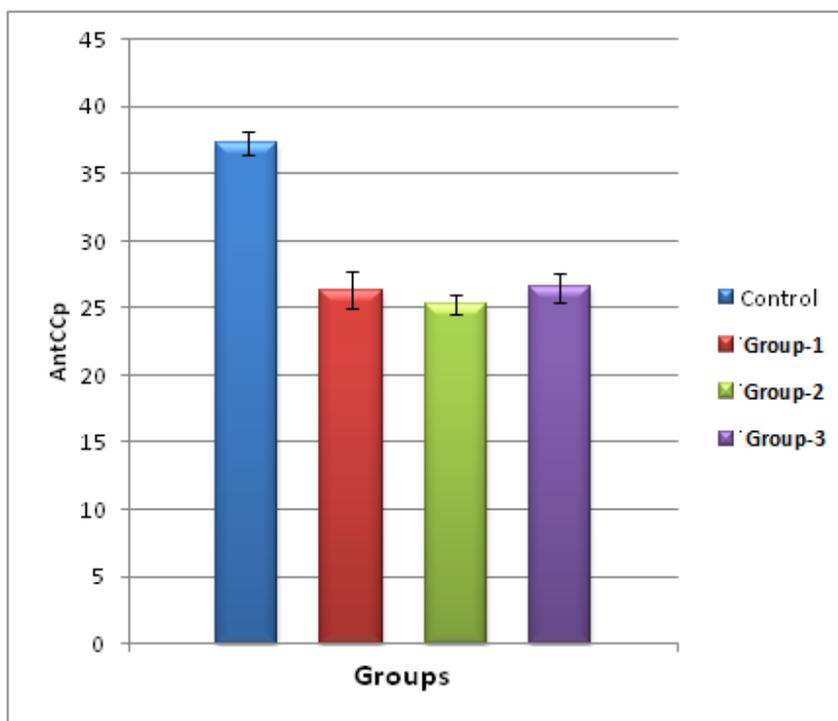
Table-6: Mean serum Anti-CCP levels of the four experimental groups during period of experiment; expressed by mean \pm SEM.

Group	Anti-CCP (mean \pm SEM)	P value
Control	37.32 \pm 0.88	<0.05*
Group-1	26.32 \pm 1.35	>0.05**
Group-2	25.28 \pm 0.71	>0.05**
Group-3	26.52 \pm 1.1	>0.05**

*: significant vs. three treated groups (Group-1, Group-2, and Group-3).

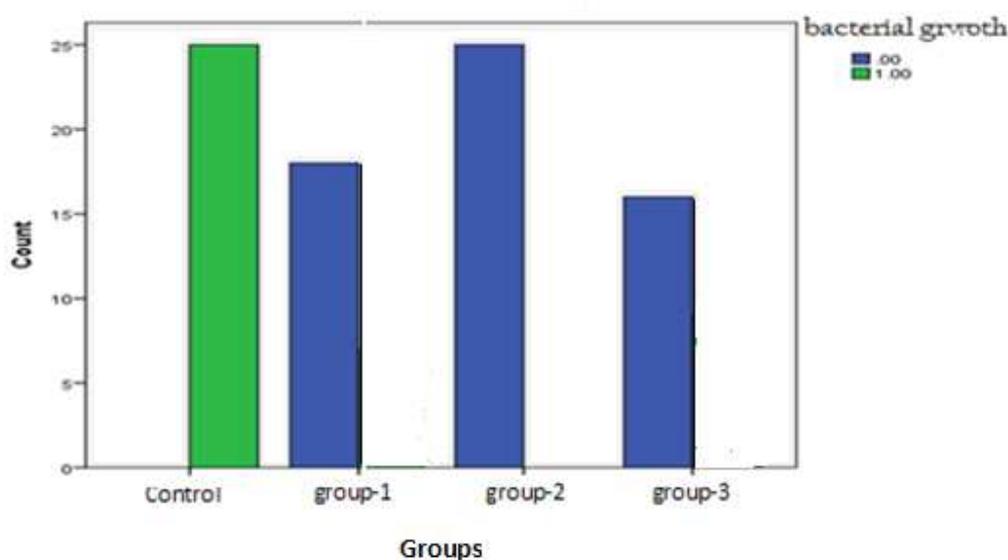
** : Not significant difference between three treated groups (Group-1, Group-2, and Group-3).

Figure-4: Differences of Means Plots of Anti- cyclic citrullinated peptide antibody during administration of GOS mixture.



Bacterial growth profile was found in all patients to be reduced sharply upon using GOS mixture. This decrease mostly associated with the use of (three tablespoonful/day, five tablespoonful/day and one tablespoonful/day) respectively. This decrease was seen as a result of both oral and topical mixture use (figure-5)

Figure-5: Bacterial growth during topical mixture use.



Discussion: RA represents an autoimmune disease that affects large number of patients tissue mostly the joints. Treatments varies depending on severity of the disease. However, Herbal remedy represent an important way for treatment of wide verity of health problems, including infection, cancer, cardiovascular and inflammatory disease including arthritis . In this study we use some natural occurring material that could be used by the patients normally either during daily food or with salad meal. From data study the results showed that administration of three to five tablespoonful / day from GOS mixture with topical ointment use have a positive effect on patients health having RA disease by decreasing sign and symptom of the disease and one of these sign is the inflammation . During inflammatory responses, the macrophages activation contributes to host damage by excessive release of various inflammatory mediators such as pro-inflammatory cytokines such as IL-1b, IL-6, TNF-a, NO and PGE2 . Many studies have demonstrated that the over- expressions of these inflammatory mediators and cytokines are responsible for many chronic inflammatory diseases such as diabetes, atherosclerosis, and rheumatoid disease (21).

The decrease in ESR, RF, Neutrophiles count and Anti CCP level was associated with using mixture containing garlic, olive and sesame oil, this decrease could be related to the presence of The sulfur compounds (which contain four anti-inflammatory compound) in garlic that inhibit the production of different inflammatory mediator and cytokines. In addition the oleocanthal compound which is available in olive oil had strong anti-inflammatory effect by preventing the production of pro-inflammatory COX-1 and COX-2 enzymes – the same way ibuprofen works. Sesame oil is also used in this study for relieving the pain and inflammation associated with arthritis Due to its anti-inflammatory properties. Such effect is related to the presence of Copper in the oil which plays an important role in the activity of lysyl oxidase, the enzyme involved in cross-linking of elastin and collagen. These two important proteins provide structure, strength and elasticity to the joint tissues, blood vessels and bones. Also, Sesame oil is unique due to its unusually high oxidative stability and anti-inflammatory property as compared to other edible oils.

Infection of joints associated with fever and other systemic symptoms. Joint destruction occurs if the infection is not treated expeditiously. Therefore, using GOS topical mixture was found to improve both patients health and decreasing bacterial growth (figure-5). Such results may be related to the presence of natural occurring material in the GOS mixture (like Allicin), which is one of the active principles of freshly crushed garlic homogenates, have a variety of antimicrobial activities, The main antimicrobial effect of allicin is due to its chemical reaction with thiol groups of various enzymes, e.g. alcohol dehydrogenase, thioredoxin reductase, and RNA polymerase, which can affect essential metabolism of cysteine proteinase activity involved in the virulence of bacteria. In addition, Polyphenols or phenolic compounds are groups of metabolites present in olive oil were evaluated for their antimicrobial activity against Gram-positive and Gram-negative bacteria. However, sesame oil also play a vital role in improving patients health either by its anti-inflammatory or through its antibacterial effect. However, further pharmaceutical investigation for formulating the GOS mixture in a suitable dosage form are needed in the future.

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