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Effect of diet and physiotherapy for reducing gout associated symptoms

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Abstract

Increased levels of uric acid in the blood cause gout, a chronic and progressive disease. This causes urate crystals to develop in our joints, which causes inflammation and encourages gout attacks. Gout, a form of arthritis, results in painful, joint stiffness and decrement of joint space. Strengthening of muscles along with the biomechanical correction as much as possible, also maintenance and improving the joint range of motion reducing joint pain, increasing the mobility which are the benefits of physiotherapy. The act of walking may be painful or challenging in some cases of acute or, chronic joint discomfort. There are four stages that gout can go through. Asymptomatic hyperuricemia is the first stage, followed by acute gout, inter-critical gout, and chronic tophaceous gout as the fourth stage. Complex carbohydrate, low protein, low fat (mainly from MUFA and PUFA), high fibre, suitable vitamins, minerals, and adequate hydration intake are recommended for patients who are having gout-related symptoms. On the other hand, physiotherapy is essential in the treatment of gout in addition to diet. In this review article, the effectiveness of diet and physiotherapy in reducing gout-related symptoms is reviewed.

Keywords: Arthritis, cryotherapy, diet, PUFA, MUFA, hydrotherapy

Introduction

An inflammatory arthritis known as gout develops when monosodium urate crystals accumulate in synovial joints (Beyl *et al.*, 2016) ^[5]. It is a typical inflammatory arthritis whose prevalence has grown in recent years. Gout typically develops as a result of the interplay of risk factors from the environment, constitution, and genes. Men and older persons are more likely to experience it. The extent to which uric acid levels are raised over the saturation point as a result of urate crystal formation, which is mostly brought on by ineffective renal urate excretion, is a key determinant (Doherty, 2009) ^[9].

As stated in the definition of gout, it is "a disease characterized by recurrent episodes of violent arthritis associated with the presence of monosodium urate monohydrate crystals in the synovial fluid, and in many cases, the eventual appearance of gross uratic deposits (tophi) in and around the joints, in the kidneys, and in certain subcutaneous sites" (Kwan *et al.*, 2013) ^[16].

Gout is a type of chronic and progressive disease occurred due to increased level of uric acid in the blood. This results formation of urate crystals in our joint, leading to inflammation and promotes gout attack. Gout may progress through four stages. First stage is asymptomatic hyperuricemia, second stage acute gout, third stage inter-critical gout, and fourth stage is chronic tophaceous gout (Nuki and Simkin, 2006) ^[17].

Bardin and Richette (2014) ^[2] reported that there are several factors that contribute gout attack. These are high protein rich diet, fructose rich drinking beverages, over weight/obesity, diabetes, heart disease, hypertension, alcohol consumption, family history, certain drugs and medications, surgery, trauma, dehydration. The sign and symptoms of gout include intense joint pain, tenderness, swelling, redness, stiffness, burning sensation. Generally, gout attacks our big toe, but gradually the inflammation spreads heels, knees, ankles, fingers and elbows

The first gouty arthritis attack typically affects just one joint. The metatarsophalangeal (MTP) joint at the base of the big toe is where gout most frequently manifests itself. 90% of gout sufferers will eventually have discomfort in the MTP joint. Knee joints, ankle joints, heels, and mid-foot joints are additional joints that are frequently impacted. Gout can also occur in the elbows, wrists, and fingers less frequently (Roddy, 2011) ^[22].

Effect of diet to control gout

The therapeutic diet is focused on satisfying the nutritional needs of patients with various disorders and recommending the proper diet. Depending on the patient's disease, it is prepared (Tewari, 2019) [25]. Lifestyle and dietary recommendations for gout patients should consider overall health benefits and risk, since gout is often associated with the metabolic syndrome and an increased future risk of cardiovascular disease (CVD) and mortality. Weight reduction with daily exercise and limiting intake of red meat and sugary beverages would help reduce uric acid levels, the risk of gout, insulin resistance, and co-morbidities. Heavy drinking should be avoided, whereas moderate drinking, sweet fruits, and seafood intake, particularly oily fish, should be tailored to the individual, considering their anticipated health benefits against CVD. Dairy products, vegetables, nuts, legumes, fruits (less sugary ones), and whole grains are healthy choices for the co-morbidities of gout and may also help prevent gout by reducing insulin resistance. Coffee and vitamin C supplementation could be considered as preventive measures as these can lower urate levels, as well as the risk of gout and some of its co-morbidities (Rai *et al.*, 2018) [19].

A complex carbohydrate, low protein, low fat mainly from MUFA, PUFA, high fiber, adequate vitamins, minerals, and adequate fluid are recommended among patients suffering in gout associated symptoms. The most common dietary cause of gout is consumption of high purine rich foods mainly animal based foods including red meats such as beef, pork, lamb, organ meats including liver, kidneys, sea foods such as salmon, mussels, tuna, sardines, trout, and alcohol specially beer. Because purines are converted into uric acids in blood and increase the risk of development of gout related symptoms. So, purines rich foods should be excluded to treat urinary gout (Yang *et al.*, 2022) [29].

Simple carbohydrates such as glucose, fructose should be limited for gout patients. These types of foods include fruits such as bananas, pineapple, mango, grapes, watermelon, as well as fruit juices, rice, white breads, vegetables such as

potatoes, pumpkins, winter squash, snacks, sweetened beverages, sugary sauces, cookies, bakery products. They have high glycemic index, that cause increased level of sugar in blood and strongly associated with a high uric acid level (Juraschek *et al.*, 2016) [14].

On the other hand, high fiber rich foods, whole grains such as brown rice, oats, corn flake, barley legumes, nuts such as almonds, walnuts, pistachios, cashews, fruits like cherry, and other citrus fruits have beneficial effect in reducing inflammation and thus helps in curing gout. Fiber also decreases the risk of high blood pressure, high blood glucose, cholesterol level that are related to increase serum uric acid level (Bolton *et al.*, 1981) [6].

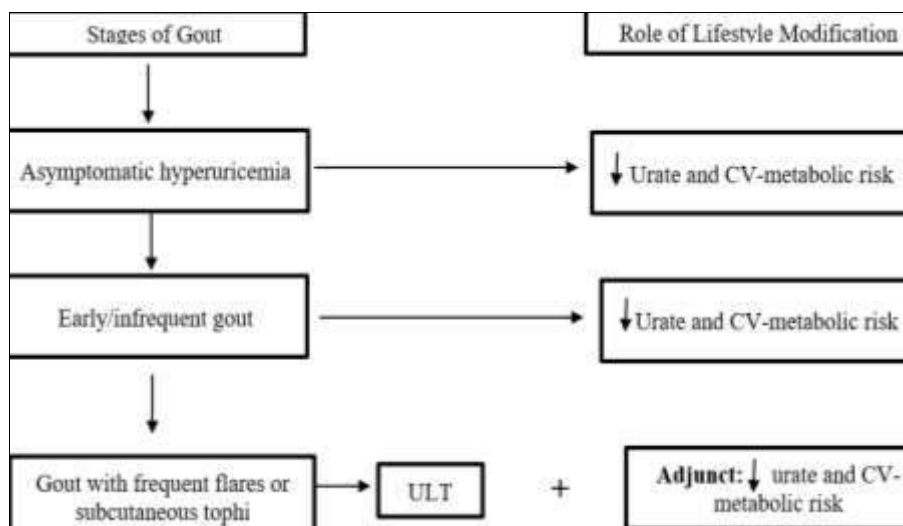
Studies show that a lean protein diet including low fat dairy products, small fish, chicken, eggs can be considered in low purine-based diet (Berlinger *et al.*, 1985) [4].

Beverages such as green tea, coffee helps to treat gout associated symptoms. Several research studies have found that antioxidant catechins present in green tea inhibits xanthine oxidase activity and reduce oxidative damage, thus decreases the risk of increasing serum uric acids level. According to the university of Maryland Medical Center consumption of green tea 2 to 4 cups each day helps to reduce gout related symptoms (Juraschek *et al.*, 2021) [13].

Fish liver oil, a dietary supplement, is made from the fish liver. Significant amounts of omega-3 fatty acids are present (Tewari *et al.*, 2022) [26] that is good for lowering the risk of gout (Danve *et al.*, 2021) [33].

An adequate fluid should be consumed to excrete sufficient urine. That helps to eliminate uric acid from our system. So at least 8 glasses of water in a whole day are recommended in patients suffering with gout associated symptoms (Álvarez-Lario and Macarrón-Vicente, 2010) [11].

Yokose *et al.* (2021) [30] reported that by reducing adiposity and insulin resistance, however, a number of well-known healthy diets can simultaneously lower blood urate, gout risk, and overall cardiometabolic risk. These dietary strategies should serve as the cornerstone of lifestyle counselling for patients with gout of all stages (Figure: 1).



CV = Cardiovascular; ULT = Urate-Lowering Therapy

Fig 1: Stages of Gout and Role of Lifestyle Interventions (Yokose *et al.*, 2021) [30]

Dietary consideration for controlling gout associated symptoms

- Western diet or meat containing diet create unfair condition & hampering the total immune activity

(Saltiel & Olefsky, 2017) [23]. Mediterranean diet, fruit or vegetable based dietary pattern mitigate gouty complication (Yokose *et al.*, 2022) [31]. Fibre containing foods stop the monosodium urate crystals accumulation

(Vieira *et al.*, 2017) [27]. Furthermore, ketogenic diet doesn't improve the symptoms of gout & block the activity of inflammatory neutrophil (Goldberg *et al.*, 2017) [10]. Fibre rich DASH (Diet Approach to stop Hypertension) diet elevates satiety to decrease sugar consumption & protect from complicated symptoms of gout (Rai *et al.*, 2017) [20].

- Low carbohydrate along with high fat diet promote elevated level of apolipoprotein B, total cholesterol, High density lipoprotein (HDL-C). simultaneously free fatty acids, urea is also increased along with low density lipoprotein (LDL-C) (Retterstøl *et al.*, 2018) [21].
- Dash diet with low, medium, high sodium concentration decreases serum uric acid level (Juraschek *et al.*, 2016) [14].
- Fruit & Soyabean containing diet increases HDL-C. decreases total cholesterol (TC), triglyceride (TG) (Zhang *et al.*, 2016) [32].
- Increases plasma uric acid (PUA) level by consumption of low salt diet & decreases PUA by high salt group diet. UUA (Urine uric acid) level is decreased in low salt & high salt diet containing foods (Wang *et al.*, 2018) [28].
- Regular cola, diet cola, isomeric semi skimmed milk; water elevates plasma TG level (Bruun *et al.*, 2015) [7].
- High carbohydrate, protein, unsaturated fat decrease serum uric level (Belanger *et al.*, 2021) [3].

Effect of physiotherapy to control gout

Although gout is a treatable disease. Besides diet, physiotherapy plays an important role to treat gout. Gout is a kind of arthritis that results painful and stiff joints where it can be observed the degeneration of bones and the biomechanical faults in the bony structure. Physiotherapy helps to reduce pain, maintenance or, improvement of Joint ROM and also strengthen the muscles by the different evidence-based treatment procedures like exercise therapy, electro therapy and manual therapy or, mobilizations. Walking may be extremely painful or sometimes impossible in severe joint pain. This time physiotherapy is best option for gout patients. As overweight/obesity is an important factor for gout, certain physiotherapy maneuvers help to lose some weight for patients suffering in gout (Khanna *et al.*, 2014) [15].

Exercise therapy, which is a fragment of physiotherapy where Range of motion exercises/therapy is beneficial for maintaining normal joint range of motions as well as the function of joints. It also helps to increase muscle strength and to relieve inflammations. Physiotherapy has also an effect to improve cardiovascular activity and to decrease fatigue, helps to keep patients active. It also includes electrotherapy as another splinter of physiotherapy to treat the gout associated symptoms like very common terms of musculoskeletal conditions such as Osteoarthritis, Rheumatoid arthritis, Spondylosis etc. where such electrotherapeutic modalities such as T.E.N.S. (Transcutaneous Electrical Nerve Stimulation), I.F.T (Interferential Currents), Russian Currents, Short wave diathermy, Ultrasound Therapy and also icing on the cake i.e. LASER which echoes as an advanced treatment with its class IV technology basically aims to provide pain relief and resembles as an alternative to drug treatment. (Perez-Ruiz *et al.*, 2015) [18].

Cryotherapy is a type of cold therapy used to treat gout. Cryotherapy is done in the acute stage of soft tissue injury. It involves use of ice to cool down a damaged area of effecting tissue following an injury. It is very effective therapy to reduce swelling, muscle spasm, bleeding, certain joint pain and to manage gut inflammation (Guillot *et al.*, 2014) [11].

Another therapy is hydrotherapy that involves a specific physiotherapy technique in warm water. This therapy helps to relief pain and gut inflammation, increase muscular function, circulation (Stamp and Jordan, 2011) [24].

Different concept of mobilizations such as Mulligan concept, Maitland concept are also used to treat gout associated symptoms with proper precautions. This helps to reduce stiffness, increase range of movement and joint function. So, physiotherapy is a successful way of managing symptoms related with gout (de Freitas Tavares *et al.*, 2021) [8].

Conclusion

Among patients experiencing gout-related symptoms, a complex carbohydrate, low protein, low fat—primarily from MUFA and PUFA—high fibre, appropriate vitamins, minerals, and adequate hydration intake are advised. In addition to food, physiotherapy is crucial in the treatment of gout. A kind of arthritis known as gout causes painful and stiff joints. Physiotherapy aids in strengthening muscles and easing joint discomfort. In cases of severe joint discomfort, walking may be difficult or excruciatingly unpleasant. The best choice right now for gout patients is physical therapy.

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