

Gout

The information explosion in the science of nutrition very often creates the impression that available information is contradictory. Consequently, it is no longer easy to distinguish between fact, misinformation and fiction. The Nutrition Information Centre of the University of Stellenbosch (NICUS) was established to act as a reliable and independent source of nutrition information.

What is gout?

Gout is well known for its repeated attacks of pain in joints, especially the big toe, the knee and the elbow. The pain is caused by inflammation and swelling of the joints. It is the most common type of inflammatory adult arthritis and results from the deposition of monosodium urate crystals in joints, causing an inflammatory response with typical flare-ups (worsening of symptoms, pain and inflammation) and eventual development of chronic arthritis and urate tophi in some patients. There are more than a hundred types of arthritis, two of the most common being gout and osteoarthritis. Other forms of the disease are Rheumatoid arthritis, systemic lupus erythematosus, scleroderma, ankylosing spondylitis and juvenile arthritis.

Hyperuricemia (Increased uric acid in the blood) is the most important risk factor for gout. Serum uric acid normally falls between 4 and 6 mg/dL. Patients with elevated serum uric levels do not always develop gout. The Normative Aging Study reported a 4.9% annual incidence for persons with urate concentrations of >9 mg/dL compared with 0.1% in persons with urate concentrations <7 mg/dL. Importantly, higher levels of serum uric acid are associated with higher levels of serum markers of inflammation, increasing the risk for chronic diseases of lifestyle and especially heart disease and atherosclerosis. Even when there is no active arthritis, the synovial fluid of patients with gout shows low-grade inflammatory activity.

Risk factors for gout:

Risk factors include the metabolic syndrome (see also The deadly “quartet” of insulin resistance, hypertension, obesity and dyslipidemia: <http://www.sun.ac.za/nicus>) hypertension, diuretic and low-dose aspirin use, total and intra-abdominal obesity (typical apple shape), excessive weight gain in early adulthood, alcohol consumption, renal insufficiency, renal and other major organ transplantations, and family history.

There is a significant increase in risk with increasing body weight, overweight and obesity. An increase in Body Mass Index (BMI) or body fatness, waist circumference (not independent of BMI), and chest circumference (also not independent of BMI) poses a significant risk for the development of gout. Among women, unhealthy weight gain, hypertension, and diuretic use are independent risk factors for increasing the incidence of gout and low-fat dairy consumption is associated with a lower incidence of gout.

Other co morbidities and potential health complications associated with gout:

Cardiovascular Disease

People with gout have chronic and sometimes severe hyperuricemia (increased uric acid levels in the blood) and additionally experience intense inflammatory episodes. There is some epidemiological evidence that hyperuricemia is a condition associated with adverse cardiovascular disease (CVD) outcomes in its own right. Two large studies found a direct link between gout and heart disease. The Framingham Heart Study Group found an association between gout and coronary artery disease in men and in the Multiple Risk Factor Intervention Trial (MRFIT), gout was associated with an increased risk of nonfatal acute heart attacks. Health Professionals Study reported significant cardiovascular mortality risk for patients with gout; however, information on serum uric acid levels was not studied in that report. Ongoing low-grade inflammation in patients with gout may also promote atherogenesis, as it appears to be the case in other inflammatory rheumatic disorders associated with higher risk of cardiovascular disease.

Metabolic syndrome

The Metabolic Syndrome (MS) (also known as Syndrome X or Insulin Resistance Syndrome) is a cluster of primarily metabolic disorders, contributes to morbidity and mortality and hence health care costs. Its prevalence is reported to be increasing with one in five and approximately one in seven Americans and non-diabetic Europeans having MS. It is also emerging as a significant clinical disorder in childhood and adolescence as well as in the developing world. Many studies have linked MS (high blood pressure, high blood triglycerides, low blood HDL-cholesterol and insulin resistance) independently and significantly to an increased risk for type II Diabetes, heart disease and/or stroke.

The WHO (World Health Organisation) defines MS as follows:

At least ONE of	Plus at least TWO of the following:
Type II Diabetes	Hypertension (BP \geq 140/90 mmHg)
Impaired glucose tolerance	Obesity (BMI \geq 30 kg/m ² , or waist-hip ratio > 0.90 for men, > 0.85 for women)
Insulin resistance	Hypertriglyceridaemia (\geq 1.7 mmol/l) or low serum HDL level (< 0.9 mmol/l for Men, < 1.0 mmol/l for women)
	Microalbuminuria (urinary albumin excretion rate of \geq 20 μ g.min ⁻¹ ; ine ratio \geq 30 mg.g ⁻¹)

Other clinical features associated with this syndrome include: hyperuricaemia and gout, raised C-reactive protein levels, pro-inflammatory cytokines [Interleukin 1 (IL-1), Tumor Necrosis Factor alpha (TNFa)], elevated stress-related cortisol secretion abnormalities in blood coagulation, low cardio-respiratory fitness, presence of fatty liver disease or polycystic ovarian syndrome, increased sympathetic nervous system activity and low heart rate variability.

A close association between serum urate levels and components of the metabolic syndrome has been reported. It has been suggested that hyperuricemia should be regarded as an intrinsic part or marker for the metabolic syndrome. In a large representative sample of adult US men and women (NHANES III) the prevalence of the metabolic syndrome, was 63% among adults with gout and 25% among individuals without gout. Furthermore, the prevalence of the metabolic syndrome increased substantially with increasing levels of serum urate from 19% for serum urate levels less than 6 mg/dl to 71% for levels of 10 mg/dl or greater. In this large population sample, data indicate that the prevalence of the metabolic syndrome is high among individuals with hyperuricemia and gout. Higher insulin levels reduce renal excretion of uric acid and insulin may enhance renal urate reabsorption. It is postulated that the conventional low-purine diet recommended for gout patients (allowing unlimited fructose ingestion) could also contribute to the high prevalence of the metabolic syndrome among gout patients, since fructose intake is associated with serum insulin levels, insulin resistance, and weight gain.

Patients diagnosed with hyperuricemia or gout should be screened for the coexistence of the metabolic syndrome. Importantly, lifestyle interventions, such as physical activity and dietary modifications, such as weight loss may delay or prevent the transition from impaired glucose tolerance to type 2 diabetes and provide relevant treatment for patients with the metabolic syndrome.

Type 2 diabetes

Preliminary data from the Multiple Risk Factor Intervention Trial (MRFIT) showed that males with gout had a 41% increased risk for type 2 diabetes. The association remained significant after adjusting for serum urate levels, and increasing serum urate levels were associated with an increased risk of type 2 diabetes. Confirmation for these findings is needed, but it could highlight the need for management of diabetes risk factors in patients with gout.

Dietary risk factors

Drug treatment has become the focus point for the effective management of gout, but recently there seem to be more and more evidence emerging that lifestyle and dietary changes could be very effective in the management of the disease. Studies based on the Third National Health and Nutrition Examination Survey (NHANES III) suggest that specific foods such as foods high in fructose affect serum uric acid and could lead to gout attacks and chronic disease in those individuals with elevated levels. Furthermore, lifestyle and dietary recommendations for gout patients should consider other health benefits, since gout is often associated with major chronic disorders such as mentioned above and at an increased risk for mortality.

Coffee:

Coffee and decaffeinated coffee is the major source of the phenol chlorogenic acid, which is a strong antioxidant. A large prospective study found that coffee consumption, not caffeine consumption, reduced the risk for gout. In a large Japanese study, the mean serum acid level in individuals consuming >5 cups of coffee daily was lower than that in individuals consuming <1 cup by 0.4 mg/dl.

The inverse link between coffee and the risk of gout suggests that coffee could be allowed among gout patients. Regular coffee consumption is also linked to a lower risk of type 2 diabetes, kidney stones and gallstone disease. Certain individuals are very sensitive to the effect of caffeine and these individuals seem to be more likely to develop adverse effects from the excessive consumption of caffeine. Pregnancy and aging may increase caffeine sensitivity. Typically, on average, a cup (180 ml) of instant coffee provides 57 mg, a cup of filter coffee 75 mg, a cup of tea 36 mg and a can (340 ml) of cola cold drink 35-50 mg of caffeine. A moderate caffeine consumption of not more than 400 mg per day is recommended and not associated with increased risks for heart disease, hypertension, cholesterol or bone disease. During pregnancy caffeine intake should be limited to not more than 300 mg per day. Higher intakes have been associated with miscarriage and low birth weight. Dirpertenenes, cafestrol and kahweol, compounds in roasted coffee beans, have been identified as cholesterol raising factors and consequently filtered or instant coffee might be better options for regular consumption. These also provide less caffeine per cup. Irrespective, the importance of these associations may be revised in view of recent evidence indicating that the reported increased risk for myocardial infarction in relation to coffee intake may be genetically determined and confined to those individuals with a slow caffeine metabolism.

Adults should limit their intake of caffeine drinks to no more than 4 cups of coffee per day or 8 cups of tea per day. Preferably, these should be with fat free or low fat milk and no sugar.

Those individuals, who choose to drink coffee, can also benefit from choosing decaffeinated products to limit their caffeine consumption.

Fructose

Interestingly, it was over 100 years ago that Osler prescribed diets low in fructose as a means to prevent and treat gout. In his 1893 publication he wrote, "The sugar should be reduced to a minimum. The sweeter fruits should not be taken". Conventional dietary recommendations for gout have focused on restriction of purine (mainly from animal protein sources) intake, although low-purine diets are often high in carbohydrates, including fructose-rich foods. Recent data support Osler's 1893 claim that fructose poses a substantial risk for hyperuricemia. Fructose intake is also associated with increased serum insulin levels, insulin resistance, and weight gain. Since patients with gout are more at risk for other co morbidities such as the metabolic syndrome, associated with insulin resistance, the overall negative health impact from fructose is expected to be larger in gout patients. It is even postulated that the conventional low-purine, high carbohydrate diet approach that allows fructose consumption may have contributed to the high prevalence of the metabolic syndrome among gout patients.

Recent findings support the increase in serum uric acid levels associated with sugar-sweetened cold drink intake. Data from a nationally representative sample of US adults suggest that sugar-sweetened soft drink consumption is associated with serum uric acid levels and frequency of hyperuricemia, but diet soft drink consumption is not. The effects are larger among men than women. It is thought that the difference could be due to differences in sex hormones, which was confirmed by studies in rats. Future human studies would allow more refined dietary recommendations for both men and women with hyperuricemia or gout. Importantly, in the US cold drinks are sweetened with high fructose corn syrup, which is not the case for South Africa. Our manufacturers still use sucrose in sweetened carbonated cold drinks and therefore our main intake of fructose is fruit, fruit juices and imported products. The magnitudes of risk posed by ≥ 2 sugar sweetened servings cold drinks or fruit juices were slightly larger

than that of alcohol (spirits) and the increased risk of gout per serving was comparable to individual alcoholic beverages such as beer. Studies have not reported that higher fruit intake reduces the risk of gout and uric acid concentrations. Men who consumed less than a glass of fruit juice a month had a significant lower risk for the development of gout than those consuming two or more glasses of fruit juice per day. Similarly, larger intake of oranges or apples was associated with an increased risk for developing gout.

These findings show that free fructose (uses as a sweetener in the food industry) and fructose rich foods are important risk factors to be considered in the primary prevention of gout in men. Extreme care should however be taken with recommendations aimed at individuals with gout or other chronic diseases associated with gout. Fruit and vegetables are the only foods which collectively have been consistently associated with risk reduction in several diseases such as cancer, heart disease, diabetes, hypertension, age related macular degeneration, obstructive lung disease and cataract formation. Current dietary recommendations aim to increase fruit and vegetable intake to a minimum of 400g per day or 5 servings in total. Despite the emerging consistent evidence that supports and emphasizes the beneficial effects of fruit and vegetables consumption in human health, such consumption is still inadequate in both the developed and developing world.

Emphasis should therefore be placed on the avoidance of products sweetened with fructose such as fruit juice and cold drinks, the moderate intake of fruit, with an increased intake of vegetables in individuals with gout or the metabolic syndrome.

Alcohol

Alcohol is thought to increase uric acid concentration by both decreased kidney urate excretion and increased production and intake is associated with an increased risk of gout and gout attacks. The risk appears to be the same for wine and mixed drinks. The risk of self reported gout was 93% higher in men who consumed ≥ 15 g alcohol per day than in men who did not drink alcohol. There also seem to be a dose-response relationship between baseline alcohol consumption and incident self-reported gout, but the intake did not need to be excessive (as little as 10 g per day) to significantly increase risk. To quantify, a 285ml glass of 5% alcohol beer contains 11.03g alcohol; a 345ml bottle of 2.7 - 3% (light) alcohol beer contains 7.36g alcohol; a 180ml glass of 12% alcohol wine contains 17.06g alcohol and 30ml of spirits contains 8.77g of alcohol.

In conclusion, recently, the relationship between lifestyle and dietary risk factors and the incidence of gout, showed independent associations of body fatness, weight gain, hypertension and diuretic use with an increased risk of gout and importantly, weight loss was found to be protective. Dietary risk factors for gout include meat, seafood, alcohol and fructose. Dietary factors with an inverse risk relationship are coffee consumption, increased water consumption and dairy intake (in women).

Dietary recommendations for gout:

- ◆ Follow a healthy, balanced diet that promotes the maintenance or attainment of ideal body weight. [For more detailed information on weight management, contact NICUS or a registered dietician].
- ◆ It is essential to maintain a regular exercise program to aid in weight management. Non-loading aerobic exercise (such as brisk walking, cycling and swimming) has been shown to reduce symptoms, increase mobility and lessen continuous damage from the condition. It is important that an exercise programme is introduced gradually and to the capability of an individual so as not to exacerbate an existing problem. Additionally exercise often improves sleep, results in better tolerance of discomfort and promotes a greater sense of well-being. Increased muscle tone and strength as well as general conditioning protect the affected joints during exercise.
- ◆ Adequate intake of at least the RDA (Recommended Daily Allowance) of all micronutrients (vitamins and minerals) is recommended.
- ◆ **Eat 2 fresh fruit and at least 3 vegetables portions per day** for vitamins and minerals and soluble fibre. Limit the intake of very sweet fruits e.g. grapes/ mangoes. Choose fruit canned in natural juice rather than syrup. Some canned vegetables contain sugar.
- ◆ Aim to drink ≥ 2 litre (6-8 glasses) of **clean safe water** per day.
- ◆ Include at least 2 – 3 servings of **fat-free or low fat dairy products** in your daily diet.
- ◆ Ensure an adequate fiber intake. The recommendation is 20 – 35g per day, of which 3 to 10g should be soluble fiber. Good sources of soluble fiber include oats, legumes, fruit and vegetables. Whole grain products should be chosen above refined grain products.

- ◆ Low glycemic index carbohydrates should replace the high glycemic index varieties where possible.
- ◆ **Coffee** may be included in the diet. Adults should limit their intake of caffeine drinks to no more than 4 cups of coffee per day. Preferably, coffee should be taken with fat free or low fat milk and no sugar. Those individuals, who choose to drink coffee, can also benefit from choosing decaffeinated products to limit their caffeine consumption.
- ◆ Restrict energy – particularly from fats and refined carbohydrates.
- ◆ Reduce or limit your total fat intake:
 - Try to limit the intake of fats and **high fat foods**. Emphasis should be placed on lowering intake of saturated fats (most animal fats, coconut oil, palm kernel oil, cocoa butter, coconut) and trans-fatty acids (fried chips, chocolates, pies, confectionery, nuts, butter, coconut, and palm kernel oil). Concentrate on **replacing** saturated and trans-fatty acids with monounsaturated fats. Good dietary sources of monounsaturated fats include avocado pear, olives, olive oil, canola oil, peanut oil, peanut butter, cashews, almonds, hazelnuts, macadamia, peanuts, pecans and pistachio nuts.
 - Use low fat products: Dairy e.g. 2%/ skim milk, low fat cheese/ cottage cheese, low fat artificially sweetened yogurt. Other: use soft margarine (Flora, Canola) instead of hard margarine.
 - Include **chicken and fish (white fish)** more often than red meat. Limit the intake of fatty fish and seafood. Keep portions small and try out recipes in which pulses are combined with meat. Avoid offals e.g. liver, kidney, duck, goose meat sauces and extracts, since they are high in saturated fat.
 - It should be brought to mind that **fat composition** rather than the total amount of fat is important. No specific composition of fat intake has been clearly established for MS, and therefore the recommendations for the management of dyslipidemia is advised, namely < 30% total fat with < 10% saturated fat, > 10 % monounsaturated fat and ± 10% polyunsaturated fat.
 - **Cooking methods:** Remove all visible fat and skin before cooking. Use herbs and spices to add flavour instead of adding mayonnaise, margarine, oil and cream. Rather steam, boil and bake in the oven instead of frying food in oil. To pan fry: spray lightly with *Spray & Cook*.
- ◆ Dried fruit and fruit juice is a concentrated form of **fructose** and is not recommended.
- ◆ Avoid the intake of products (read food labels) sweetened with **fructose or fructose corn syrup**.
- ◆ The use of small amounts of **sugar** (sucrose) is considered acceptable. However, the intake of sweet foods with a high fat content should be limited. Use diet cold drinks.
- ◆ Try to cut down on **salt and salty foods**. Be aware of hidden salt in many tinned, smoked and processed foods (e.g. salami, polony, vienna's, and bacon).
- ◆ It is advisable to avoid **alcohol** or to keep **alcohol** consumption at moderate levels (≤1 standard drink per day). Light beers and wines have a lower sugar and alcohol content and can be used occasionally. Aim for at least 2-3 alcohol free days per week.
- ◆ HOW MUCH you eat is as important as WHAT TYPE of food you eat.
- ◆ ***It is important that food must still be enjoyed!***

Medication, in addition to physical, and nutritional therapies is the mainstay of gout management. It is essential, therefore, that newly diagnosed individuals undergo close monitoring so as to ensure that their nutritional status is maintained at an optimum level, especially in the context of the other diseases associated with gout such as heart disease. Early detection of nutritional disorders together with individual treatment(s) and monitoring is considered essential.

☒ Useful Address:

Arthritis Foundation
 PO Box 6775
 Roggebaai 8012
 Tel: 021-425 2344

For further, personalized and more detailed information, please contact NICUS or a dietitian registered with the Health Professions Council of South Africa.

References from the scientific literature used to compile this document are available on request.

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