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Effect of standard and low protein diets containing Gum Arabic on hyperuricemic rats

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LIST OF ABBREVIATIONS

ACR	American College of Rheumatology
ADH	Antidiuretic hormone
AKI	Acute kidney injury
ALP	Alkaline Phosphatase
ALT	Alanine amino transferase
AMA	Antimicrobial activity
AMP	Adenosine monophosphate
APRT	Adenine phosphoribosyl transferase
AST	Aspartate amino transferase
ATP	Adenosine triphosphate
SD	Standard diet
BWG	Body weight gain
CKD	Chronic kidney disease
CRF	Chronic renal failure
EULAR	European League Against Rheumatism
FAO	Food and Agriculture Organization
GA	Gum arabic
GFR	Glomerular filtration rate
GLUT9	Glucose transporter 9
GWAS	Genome-wide association studies
HDL– C	High density lipoprotein – cholesterol
HFCS	High-fructose corn syrup
HPRT	Hypoxanthine phosphoribosyl transferase
IgE	Immuno globulin E
JECFA	Joint Expert Committee for Food

	Additives
LP	Low protein
LPD	Low protein diet
LDL – C	Low density lipoprotein – cholesterol
LSD	Least significant differences
MSU	Monosodium urate crystals
NHANES	National health and nutrition examination surveys
PRPP	Phosphoribosyl pyrophosphate
ROS	Reactive oxygen substances
RRT	Renal replacement therapy
SSBs	Sugar-sweetened beverages
TC	Total cholesterol
TG	Triglycerides
UA	Uric acid
URAT1	Uric acid transporter 1
USDA	United States Department of Agriculture
VLDL–c	Very low density lipoprotein – cholesterol
WHO	World Health Organization
XO	Xanthine oxidase

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Abstract

Hyperuricemia is a common disorder that affects patients of all ages and genders. The most common manifestation of hyperuricemia is gout. Gum Arabic (GA) is a complex polysaccharide , believed to be an excellent curative for hyperuricemia,The present study is **aimed to** investigate the effect of diets containing gum arabic on hyperuricemic rats. A specimen of forty nine albino rats was divided into two main groups. The first main group (7 rats) was fed on a standard diet (SD) as a control negative group, the second main group (42 rats) treated with 30% fructose in drinking water for 6 weeks to induce hyperuricemia ,and treated with standard diet or low protein diet plus gum arabic in different proportions (5% and 10% of diet). The treatment continued for 4 weeks. Groups which treated with a standard or low protein diet containing 10% Gum arabic recorded the best results as decrement in the % of body weight gain and kidney weight / body weight% as compared to the other groups with hyperuricemia. the best results in decreasing glucose and kidney functions parameters which included serum uric acid, urea nitrogen and creatinine were recorded for the hyperuricemic group fed on a low protein diet containing 10% Gum arabic, followed by the group which suffer from hyperuricemia and treated with a standard diet containing 10% Gum arabic. Also feeding rats with hyperuricemia on a standard diet or low protein diet containing (5% and 10% Gum arabic) improved the lipid profile and the liver enzymes (AST, ALT and ALP), as compared to the positive control groups. **Conclusion** low protein diet plus to gum arabic improve both liver and kidney function, specially for rats suffering from hyperuriecemia.

Key words: Hyperuricemia, Gout,Gum arabic, Standard diet, Low protein diet and Rats.

INTRODUCTION

Hyperuricemia is a common disorder that affects patients of all ages and genders. The most common manifestation of hyperuricemia is gout, which can be very painful and is easily treatable **(George and Minter, 2021).**

Hyperuricemia is an elevated uric acid level in the blood. The normal upper limit is 6.8mg/dL, and anything over 7 mg/dL is considered saturated, and symptoms can occur.This elevated level is the result of increased production, decreased excretion of uric acid, or a combination of both processes. Elevated uric acid can also be seen in accelerated purine degradation, in high cell turnover states (hemolysis, rhabdomyolysis, and tumor lysis) and indecreased excretion (renal insufficiency and metabolic acidosis). Hyperuricemia can lead to gout and nephrolithiasis. It has also been implicated as an indicator for diseases like metabolic syndrome, diabetes mellitus, cardiovascular disease, and chronic renal disease **(Barkas *et al.*,2018).**

Hyperuricemia is not the only risk factor for gout. In fact, only a minority of these patients goes on to develop gout. Other factors implicated in gout and/or hyperuricemia include older age, male sex, obesity, a purine diet, alcohol, medications, comorbid diseases, and genetics. Offending medications include diuretics, low-dose aspirin, ethambutol, pyrazinamide, and cyclosporine. Genome-wide association studies (GWAS) have found several genes that are associated with gout **(Neogi , 2016).**

Gout is a systemic disease that results from the deposition of monosodium urate crystals (MSU) in tissues. Increased serum uric acid above a specific threshold is a requirement for the formation of uric acid crystals. Despite the fact that hyperuricemia is the main pathogenic defect in gout, many people with hyperuricemia do not develop gout or even form UA crystals. In fact, only 5% of people with hyperuriceamia above 9 mg/dL develop gout. Accordingly, it is thought that other factors such as genetic predisposition share in the incidence of gout **(Dalbeth *et al*., 2016).**

Gout is recognized as one of the most acute painful symptoms that affect human beings,Gout is the most common inflammatory arthritis in older people, with an incidence of in women and 4.0 in men per 1,000 persons **(Abhishek *et al.*, 2017).**

Well-known complications of gout are tophi, deforming arthropathy, urolithiasis, chronic urate nephropathy, acute uric nephropathy (usually secondary due to chemotherapy), andavascular necrosis of the femoral head. The risk of developing gout is directly linked to the development of hyperuricemia **(Glasnović, 2012).**

The urate-lowering therapy allopurinol, a xanthine oxidase (XO) inhibitor, has been the mainstay of prophylactic treatment for gout and conditions associated with hyperuricemia for many years **(Wortmann, 2002)**. In practice, approximately 20% of patients report side effects with allopurinol and 5% discontinue medication,There is a rare but serious hypersensitivity reaction to allopurinol, which involves fever, rash, eosinophilia, hepatitis, and progressive renal insufficiency **(Wortmann, 2005)**.