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In vitro effect of hydro alcoholic extract of *Adiantum capillus-veneris* Linn. on calcium oxalate crystallization

Ajij Ahmed, Nasreen Jahan, Abdul Wadud, Alia Bilal, Syeda Hajera¹

Departments of Ilmul Advia, National Institute of Unani Medicine, Kottigepalya, Bangalore, Karnataka, ¹Obstetrics and Gynaecology, Government Nizamia Tibbi College, Charminar, Hyderabad, Andhra Pradesh, India

Background: *Adiantum capillus-veneris* Linn. is widely used in the management of urolithiasis in Unani system of medicine. **Aim:** To evaluate the effect of the hydro alcoholic extract of *A. capillus-veneris* Linn. on calcium oxalate crystallisation by *in vitro* study. **Materials and Methods:** The study includes crystallization, nucleation and aggregation assay. Crystallization was induced by addition of 50 µl of 0.1 M sodium oxalate in whole urine in the absence and the presence of extract at different concentrations (0.50 mg, 0.75 mg and 1 mg). The nucleation and aggregation rates were followed at 620 nm after mixing calcium chloride and sodium oxalate solution and in a buffered solution containing calcium oxalate monohydrate crystals, respectively. The rate was evaluated by comparing the slope of turbidity in the presence of extract with that of control using the spectrophotometer. Crystals in the urine were also analysed by light microscopy. **Results and Conclusion:** Extract of the test drug inhibited the crystallization in solution; less and smaller particles were observed in the presence of extract. These results were further confirmed in the nucleation assay, though the rate of nucleation was not inhibited but number of crystals was found to be decreased. The test drug also inhibited crystal aggregation. It can be concluded therefore, that the test drug possesses significant antilithiasic activity.

Key words: Calcium oxalate crystallization, *in vitro*, lithotriptic activity, unani medicine, urolithiasis

INTRODUCTION

Urolithiasis is a complex process that is a consequence of an imbalance between promoters and inhibitors in the kidneys.^[1] Nearly 90% of kidney stone patients form stones composed of calcium oxalate (CaOx), calcium phosphate, or mixture of the two. CaOx crystals are the typical type of stone that are found in three hydrate forms of CaOx; calcium oxalate monohydrate (COM), calcium oxalate dihydrate (COD), and calcium oxalate trihydrate (COT). COM is the most common form found in the inorganic matrix of a kidney stone, because it is the most thermodynamically stable form. COD is also found as the metastable state of a stone, but COT is rarely found.^[2] Kidney stone disease is a common disorder estimated to occur in approximately 12% of the population. Lithiasis is a male predominant disorder, with a recurrence rate of 70-80% in male and 47-60% in female.^[3] Besides dietary factor, the most common cause

of kidney stone is drinking insufficient amount of water. Excessive consumption of meat protein also leads to marked increase in kidney stones, because meat causes over acidification of urine, which leads to increased excretion of oxalates, calcium and uric acid, whereas the excretion of citrate, provides protection and reduction in stone formation.^[4] The aetiology of this disorder is multifactorial and is strongly related to dietary life-style habits or practices.^[5] *Adiantum capillus-veneris* Linn. is an important drug widely used in patients of urolithiasis and is included as an important ingredient in many formulations used for litholytic activity. It has been described to possess lithotriptic, solvent, deobstruent and diuretic actions and its decoction is frequently used for its lithotriptic effect moreover, it is considered that it is capable of expelling stones from kidney and bladder.^[6-10] Many scientific studies have been carried out on *A. capillus-veneris* Linn and it has been reported to possess antifungal,^[11] antibacterial,^[12] antiviral,^[13] and antioxidant^[14] activities but the drug has not been studied for its lithotriptic activity. Hence, this drug was taken up to evaluate its antilithiasic activity in *in vitro* models.

MATERIALS AND METHODS

Plant Materials

The plant of *A. capillus-veneris* Linn. were purchased from an authentic herb supplier in the local market of

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Address for correspondence: Dr. Ajij Ahmed, Department of Ilmul Advia, National Institute of Unani Medicine, Kottigepalya, Magadi Main Road, Bangalore, Karnataka, India. E-mail: aziznium@gmail.com

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