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Concept of urinary stone formation in Unani medicine-a review

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Abstract

Stone may form at any level in the urinary tract, but mostly in the kidney. Urolithiasis (Stone formation in the urinary tract) is a very common problem with the reported increasing prevalence across the world. Males are affected somewhat more than females. It is imperative to increase understanding of the concept of its formations, particularly about the various causative factors, which play a role to lead its initiation. Here in, we reviewed the literature of medical science, particularly Arabic, Persian and Urdu manuscripts/literature of Unani medical system, having information regarding the formation and causative factors of this disorder. Google scholar, PubMed, Science direct and Ovid were searched to review the literature of modern research publications containing information on the subject. At the conclusion, it was noticed that the incidence and prevalence of Urolithiasis is increasing across the sex, race and age of the patients all over the world and role of diet is seemed to be the major factor among the others in the formation of stones in the urinary tract.

Keywords: urolithiasis, urinary system, crystalluria, micturition, renal stone, unani medical system

Introduction

Urolithiasis is a process of formation of abnormal polycrystalline concretions, which consist of crystalline compound and organic matrix leading to stone formation in the urinary tract. Its incidence is reported to be increasing constantly globally irrespective of the sex, race and age of the patients [1]. The prevalence of urinary stone disease in USA is reported to be 5-15% [2] with the recurrence rates of about 50% [3-4]. The epidemiology of urolithiasis differ according to geographical area in terms of prevalence and incidence, age and sex distribution, stone composition and stone location [5]. The incidence of various types of Urinary stones is found as around 80% of calcium oxalate or calcium phosphate, 10% of struvite / magnesium ammonium phosphate, 9% of uric acid and 1% of cystine or others [6]. Formation of stones in the patients depends on multiple additive factors like crystalluria, socio-economic factor, dietary factor, obesity, climatic factor, genetic factor, pH, solute concentration and complexation etc. In the favourable conditions, urine gets super saturated and leads to crystallization which further grows to form stone.

Mostly renal stones of small size pass out of the body without any intervention. Larger stone may get stuck in the urinary tract causing renal colic, burning micturition and hydronephrosis leading to surgery. High rate of recurrence is a major concern in these patients, which can be minimized by adopting measures to inhibit the process of urolithiasis by means of modifying the causation factor, after identification. Keeping this aspect in mind, the present review was done.

There are many stones with different chemical composition and may arise over long period of time with or without infections. The stone or calculi may of following types: (i) Uric acid or Urate Calculi, (ii) Calcium-Oxalate calculi (iii) Phosphate calculi (iv) Calcium carbonate calculi (v) Cystine calculi (vi) Xanthine calculi (vii) Indigo and Cholesterol calculi (viii) Fibrin calculi. The first three are most common in herbivorous animal including man and number v & vi are rare and vii & viii are extremely rare [7].

The aim of this review was to showcase the Unani concept of stone formation in the light of modern system of medicine.

Materials and Methods

This review was done by the comprehensive survey of the classical Unani literature; manuscripts and text books in various languages; Arabic, Persian and Urdu by visiting various libraries. The visited libraries are Unani faculty library of Jamia Hamdard and

National Medical library (NML) at New Delhi & Maulana Azad library, Ajmal Khan Tibbiya College library, Jawahar Lal Nehru Medical College library, seminar library of Departments of Moalejat and Amraze Jild wa Tzeeniyat of Aligarh Muslim University, Aligarh. The modern literature was surveyed mainly online with Google scholar, Pubmed and Science direct etc.

Observation

During the review of the classical Unani and Modern medical literature, it is found that various under mentioned causes/factors may be responsible for the genesis of urinary stones. These factors play their roles in many ways in the process of formation of calculi. They may be responsible for providing favourable condition, stimulating the process or act as a base material of the calculus as its constituents.

1. Dietary

The influence of diet in the process of urinary stone formation is understood since antiquity and various studies have concluded its role as a risk factor, which are summarized as under.

- Excessive intake of *Aghzia-e- Ghaleeza* (concentrated diet) [8-11].
- Excessive intake of meat⁶ particularly, the meat of wild animals, animals of desert or old aged animals especially camel and goat [11].
- Excessive intake of milk [9, 11] and milk products; cheese, barfi sweet etc [11]. It is in the consonance with the fact that milk and its products like cheese significantly rise the calcium excretion with acidification of urine and lower the citrate excretion.
- Diet of excessively viscous in nature [8] e.g. *Harais* (the food made of meat and wheat), *Hasaid* (Food made of wheat powder and ghee) and *Siri-paya* (Food made of Brain and legs of animals) [11].
- Semi cooked, concentrated and adhesive food [12] like bread sticky in nature; milky roti (bread made of milk), fateeri roti (bread made of semi fermented wheat flour), khameeri roti (bread made of fermented wheat flour) and Maida ki roti (bread made of fine wheat powder) [11].
- Vitamin-A deficiency is also an important factor for formation of stone, which causes desquamation of epithelium leading to formation of the nidus for deposition of crystals [13-14].
- High protein and carbohydrate diet increase the risk of stone formation in affluent [15].
- Excessive intake of oxalate rich diet e.g. black tea, cocoa beverage, Rhubarb, Spinach, Beet, Glutinous rice (*Oryza glutinosa*) and other leafy vegetables as these food raise excretion of oxalic acid in the urine which in turn increase the risk of stone formation [16-17].
- Orange juice significantly increases urinary pH and excretion of citric acid [17].
- Consumption of beer initially increases diuresis but later on it induce compensatory antidiuresis [17].
- Sodium chloride increases calcium excretion by 30% [17].
- Purine rich diet increases excretion of uric acid over several days [17].
- Intake of animal protein diet increases the risk of uric acid stone [18].

2. Obesity

Persons with obesity and the habit of lower daily calcium intake, especially in the families of positive history of urinary stones are prone to get Urolithiasis [12, 17].

3. Renal

- *Warm-e-kulia* (Swelling in kidney) or other part of the urinary tract is mentioned as one of the cause of stone formation in the Unani literature [6]. This swelling can be attributed with the Urinary tract infection, which is reported as favouring the urinary calculi formation.
- *Quruh-e-Kullia* (Ulcer of the kidneys) or other part of the urinary tract is considered as one of the cause of urinary calculi in Unani literature [6, 8, 19]. These references of Unani literature show good congruence with recent reported link of erosive conditions of the urinary tract to the initiation of renal calculi formation, particularly at the apex of renal papillae. This erosion provides the base for crystals precipitation leading to plaques of urinary stone formation [13]. These plaques are whitish yellow and can be appreciated by endoscopy of urinary tract [14].
- Narrowing of the urinary tract is mentioned as one of the cause of urolithiasis in Unani classical literature [4, 8, 20-21]. It is in consilience with the report that Patients with obstruction to free passage of urine are prone to develop stones [13].
- *Zof-e-Kullia* (renal insufficiency) is also considered as one of the cause of urinary stones formation, because it decreases the excretion of crystalline substances [6, 8]. It is in consonance of the fact that any inflammatory condition in the kidneys causes Obstruction in the renal lymphatic which clears the minute concretions (microliths) in the renal parenchyma physiologically [13-14].

4. Concentration of urine and climatic factor

Ghilzat-e-boul (Concentration of urine) is considered as the major factor to cause stone formation in Unani system of medicine [11, 22-23]. This is in congruous with the fact that Urine of an individual may be concentrated with the increase percentage of any of the normally found ions or crystals; calcium, oxalate, phosphate, urate, cystine, adenine and xanthenes. The rate of kidney stone formation is proportional to the percentage of any of these crystals with more than 12 micrometer in size [24].

This phenomenon is found in the individuals who are exposed to high temperature, which may enhances the chances of precipitation of their urinary ions or crystals leading to nucleation of stone [14].

5. Inhibitor of crystalization

There are substances which inhibit the crystallization of various ions and maintain the saturation of urine. These are pyrophosphate, citrate, magnesium, sulphates, uroprotein [14], nephrocalcin and calgranulin [24].

6. Urinary pH value

The formation of various types of stones in the urinary tract is influenced by urinary pH value. Alkaline Urine favours the crystallization of calcium and phosphate. Acidic urine promotes the Uric acid and cystine stone formation [25].

7. Medication

In Unani classical text, uses of *advia harra* (drugs of hot temperaments) are also mentioned among the causes of stone formation [6]. In the modern literature, some of the drugs have been reported to be associated with the risk of urinary stone formation e.g. long term use of antihypertensive drugs, silica containing antacids or carbonic anhydrase inhibitors [14].

8. Physical activities

Persons with lower physical activities; physicians and other white-collar workers were reported higher incidence of urinary stones [14]. This trend is consistent with the fact that prolong immobilization from any cause results in skeletal decalcification leading to increased urinary output of calcium, which in turn combined with mechanical effect of recumbence favours the precipitation of calcium phosphate [13].

9. Familial factor

Positive family history of urinary stones is associated with the increased risk of Urolithiasis [14, 26]. More marked positive family history in the parents, brothers, sisters and children of the patients but negative history in the spouse indicate the involvement of genetic factors [27].

10. Seasonal variations

The incidence of urinary stones is reported 50% higher in summer months than in winter [24]. Which correlates with the reported excretion of calcium and oxalate in high amount in the summer months.

11. Oxidative stress

Oxidative stress induced cellular processes plays a decisive role is reported as the most important step in the renal stone formation [28].

12. Intestinal

Unani scholars mentioned *Zof-e-Hazam* (delayed digestion) and *Zof-e-Meda* (weakness of stomach) [6] as the causes of Urinary stone formation among the others, which may be attributed as abnormal gastrointestinal influence on the absorptions of calcium and other ions [29].

Conclusion

As we know that surgical intervention is inevitable in many patients of urinary stones. However, most of the patients who are diagnosed earlier can be managed by medical treatment either Unani Medicine or any other system of Medicine. Moreover, its incidence and recurrence can be minimise up to a large extent by alleviating the aetiological factors of calculus formation. Physician or surgeon should advise the patients to avoid those things, which may have a role in the formation of Stone.

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