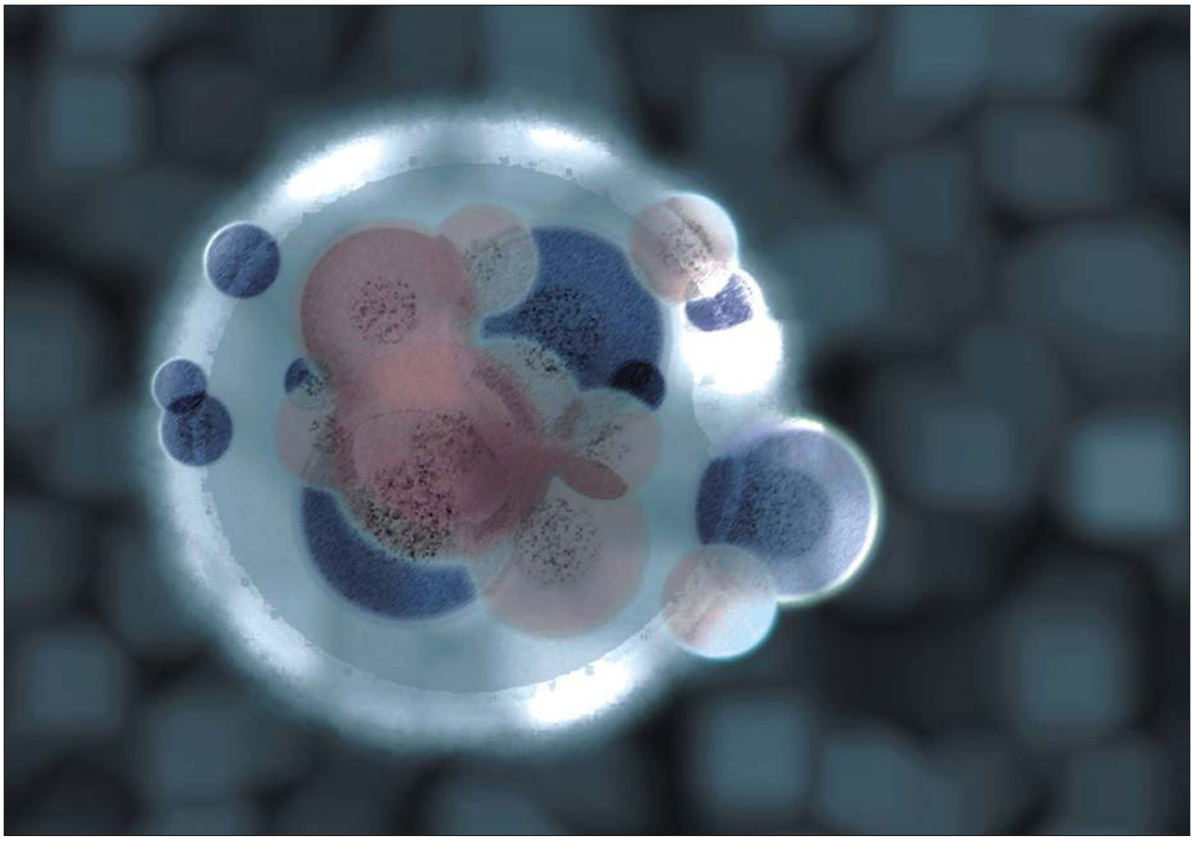

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Chemical Composition of Urinary Calculi in North Jordan

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Abstract: The purpose of this study is to report the type and composition of urinary stones in North Jordan. Four hundred and eighty six urinary calculi (398 renal, 88 ureteric) from Jordanian patients 364 male (74.9%) and 122 female (25.1%) from different ages were chemically analyzed. The study takes place in the Collage of Medicine, Jordan University of Science and Technology during the period 2002-2006. The most common type of upper urinary tract stones among patients in North Jordan was a calcium oxalate stone represent (64.8%). Next common stones were calcium phosphate stones (17.7%). While uric acid, triple phosphate and cystine stones occurred in 13.0, 3.3 and 1.2%, respectively. The incidence of calcium oxalate containing stones was predominant in both male and female patients (66.2 and 60.6%), followed by calcium phosphate and uric acid stones (17.0 and 19.7%), (12.6 and 13.9%), respectively. The relationship between age, sex and stone formation illustrates that urinary stones are most common in male than female (ratio 3:1) and regard the age it's most common within the age 30-40 years for female (39.3%) and within the age 20-30 for male's patients (26.6%). Renal calculi in Jordanian population were found to be within the range of the world population since renal calculi is a worldwide problem, sparing no geographical, cultural, or racial groups.

Key words: Urinary calculi, chemical composition, Jordan

INTRODUCTION

Urinary calculi are deposited chemicals that arise due to physical factors which affect the solubility and insolubility of crystalloids in body fluids (Pak, 1998). Urinary calculi formation is a common multifactorial disorder, of unknown etiology, with an established genetic contribution (Gatto *et al*., 2001). It is one of the oldest diseases known to man and represents a common problem through out the world. Evidence of renal calculi has been found in the pelvic area of a young Egyptian tomb dated 4800 BC (Kesner and Dominak, 2001). Several factors that may lead to the formation of calculi which are include metabolic disorders such as cystinuria and gout, endocrinopathies such as hyperparathyroidism, urinary obstruction, infections, mucosal metaplasia due to vitamin A deficiency, extrinsic conditions such as dehydration, dietary excess, drug excess or chemotherapy and isohydruria (Winer, 1959).

Chemical composition of urinary stones includes several constituents. The most common ones are calcium oxalate, apatite, triple phosphate and to some degree magnesium ammonium phosphate. Cystine and xanthine are rare ingredients but uric acid and urate is noted in kidney stones. However, qualitative and quantitative chemical analysis is of interest to the clinician for diagnostic and therapeutic purposes because it gives very important information about the stone-formation mechanism and the pharmaceutical manner to prevent recurrent stone formation (Kourambas *et al*., 2001).

The purpose of this study is to report the type and composition of urinary stones in North Jordan.

MATERIALS AND METHODS

Four hundred and eighty six upper urinary calculi (398 renal, 88 ureteric) belong to 364(74.9%) males; aged from 17 to 84 year (median 43) and 122 (25.1%) females, aged 16 to 90 (median 47) obtained from upper urinary tract by surgery or endoscopic manipulation from patients in north Jordan. The stones were examined by Henry method (Henry, 1974) of qualitative chemical analysis and classified according to their main component into five main groups, Ca-Ox (calcium oxalate), Ca-Ph (calcium phosphate), Ur-A(uric acid), Tr-Ph(triple phosphate) and C (cystine). The study takes place in the Collage of Medicine, Jordan University of Science and Technology during the period 2002-2006.

RESULTS

Present results indicated that, a male patient predominates: Male to female ratio 3:1 (74.9 vs. 25.1%). The composition of 486 urinary stones analyzed is as follows: The most common type was calcium oxalate containing stones (64.8%), followed by calcium

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Table 1: Chemical composition of urinary stones (main component)

Chemical composition of urinary stones	Male	Female	Total
Calcium oxalate stones	241(66.2)	74 (60.6)	315 (64.8)
Calcium phosphate stones	62 (17.0)	24 (19.7)	86 (17.7)
Uric acid stones	46 (12.6)	17 (13.9)	63 (13.0)
Triple phosphate stones	11 (3.0)	5(4.0)	16 (3.3)
Cystine stones	4 (1.0)	2 (1.6)	6 (1.2)
Total	364 (100)	122 (100)	486 (100)

Values in parentheses show percentage

Table 2: Relationship between age and stone formation

Years (range)	Male	Female	Total
0-9	0 (0.0)	0 (0.0)	0 (0.0)
10-19	6 (1.6)	3 (2.5)	9 (1.85)
20-29	97 (26.6)	29 (23.8)	126 (25.9)
30-39	64 (17.6)	48 (39.3)	112(23.0)
40-49	79(21.7)	21 (17.2)	100 (20.6)
50-59	48 (13.1)	17 (13.9)	65 (13.4)
60-69	32 (8.8)	2 (1.6)	34 (7.0)
70-79	35 (9.6)	0 (0.0)	35 (7.2)
80-89	3 (0.82)	1 (0.82)	4 (0.82)
90-99	0 (0.0)	1 (0.82)	1 (0. 2)
Total	364 (100)	122 (100)	486 (100)

Values in parentheses show percentage

phosphate, uric acid, triple phosphate and cystine containing stones (17.7, 13.0, 3.3 and 1.2%), respectively. The incidence of calcium containing stones was predominant in both male and female patients (66.2 and 60.6%), respectively (Table 1).

The relationship between age, sex and stone formation illustrates that urinary stones are most common within the age 30-40 years for female (39.3%) followed within the age 20-30 (23.8%) while in male's patients it was most common within the age 20-30 years (26.6%) followed by the age 40-50 (21.7%), however it could occur earlier or later in both male and female patients (Table 2).

DISCUSSION

Chemical analysis of urinary stone can clarify clues about why it formed, as well as provide information about therapeutic treatment and recurrence prevention (Winer, 1959). Calcium containing oxalate stones (64.8%) predominate among urinary stones that was analyzed which correspond with other studies from Saudi Arabia, Sudan, Thailand, Albania, Israel and Indonesia (Khan *et al*., 2004; Hodgkinson, 1979; Balla, 1998; Bulo *et al*., 2004; Jacob, 1974) as shows in Table 3. Calcium oxalate is the main component of calcium containing stone, perhaps due to diet which is high in green vegetables and hot climate that lead to lose body fluids. On the other hand, reduction in the physical activities due to modern life style may also contribute in the kidney calcium containing stone formation (Decoster *et al*., 2002).

Table 3: Relative incidence of upper urinary calculi in different population

Populations	Calcium oxalate	Calcium phosphate	Uric acid	Triple phosphate	Cysine
North Jordan	64.8	17.7	13.0	3.3	1.2
Lebanon	56.0	14.0	16.0	3.0	0.0
Yemen	62.4	6.1	8.1	0.0	0.0
Israel	44.0	10.0	6.5	0.0	0.0
Greece	64.0	6.2	6.2	1.8	0.0

There is a high frequency of cystine stones (1.2%) compared with other studies in the region, while still in the range of the rest of the world studies less than 2% (Herring, 1962) this may be due to genetic factors since all the patients with cystine stones are relatives from the same family. This could be due a rare congenital condition called cystinuria (autosomal recessive disorder that is characterized by impaired transport of cystine in the proximal renal tubule, high cystine concentration in the urinary tract most often causes the formation of urinary stones (Segal and Their, 1989) or as a consequence of limited number of kidney stones studies by us.

The relationship between sex and urinary stone formation indicated that males were more affected than females (ratio 3:1) which correspond with other studies from Saudi Arabia, Sudan, Thailand, Albania and Indonesia (Khan *et al*., 2004; Hodgkinson, 1979; Balla, 1998; Bulo *et al*., 2004; Jacob, 1974) and this perhaps due to relatively high urethral resistance. The relationship between sex, age and urinary stone formation indicated that the stone formation take place mainly within the age 20-40 (around 24.5%) which correspond with other studies from Israel, Saudi Arabia (Gault and chafe, 2000; Daudon and Eveillaud, 1985) have the most stone formation within the age 30-40 year which is differ from males with most stone formation within the age 20-30 year this is may be due to the life style in Jordan but it need more investigation.

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