URINARY STONE COMPOSITION ANALYSIS IN INDONESIAN POPULATION: A SINGLE MAJOR CENTRE ANALYSIS

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ABSTRACT

Objective: *To evaluate the urinary stone composition of Indonesian population.* ***Material & Methods:*** *This is a retrospective study analyzing total 277 urinary stone, obtained from urinary stone patient that underwent treatment in Cipto Mangunkusumo Hospital Jakarta in period 2000-2013.* ***Results:*** *Urinary stone disease is more common in male, with male : female ratio 1.8:1, with both in male and female patient, the incidence are highest at 51-60 years old. Calcium containing stone is predominant in this study with calcium oxalate as the most frequent stone with 61% overall, 43.7% in male and 17.3% in female and founded most frequent in 51-60 years old. Uric acid become the second most common stone after calcium containing stone with 9.0% overall, 6.5% in male and 2.5% in female. Infection associated stone such as struvite is 5.8% and Amonium urate 0.7%. In our study, struvite is founded more in male 3.6% than in female 2.2%. Cystine is a rare stone which is only founded 0.7%, in young age at 21-30 years old.* ***Conclusion:*** *Calcium oxalate is the most frequently stone type in our country as it is worldwide. This study revealed information of stone composition in Indonesian population, that could be beneficial for strategies and management to prevent urinary stone disease and recurrence.*

Keywords: *Stone composition, Indonesia, urinary stone.*

ABSTRAK

Tujuan: *Untuk mengevaluasi komposisi kencing batu di masyarakat Indonesia.* ***Bahan & cara:*** *Penelitian ini penelitian retrospektif yang meneliti 277 kasus kencing batu, dikumpulkan dari pasien kencing batu yang menjalani perawatan di RSUPN Cipto Mangunkusumo Jakarta pada periode 2000-2013.* ***Hasil:*** *Penyakit kencing batu lebih sering dijumpai pada laki-laki, dengan rasio laki-laki wanita 1.8 : 1, dengan angka kejadian tertinggi pada laki-laki dan wanita yang berusia 51-60 tahun. Batu kalsium adalah yang paling besar pada penelitian ini, dan kalsium oksalat adalah jenis batu yang paling sering muncul yaitu keseluruhan 61%, 43.7% pada laki-laki dan 17.3% pada wanita, dan ditemukan paling sering pada 51-60 tahun. Asam air kencing menjadi jenis batu paling sering dijumpai kedua, setelah batu kalsium dengan 9.0% keseluruhan, 6.5% pada laki-laki dan 2.5% pada wanita. Infeksi karena batu seperti struvite 5.8% dan ammonium urate 0.7%. Pada penelitian kami, struvite ditemukan lebih banyak pada laki-laki 3.6% daripada wanita 2.2%. Cystine merupakan batu yang jarang dijumpai hanya 0.7%, pada usia muda sekitar 21-30 tahun.* ***Simpulan:*** *Kalsium oksalat adalah jenis batu paling sering muncul di Negara kita dan di seluruh dunia. Penelitian ini menemukan informasi komposisi batu pada masyarakat Indonesia, yang bisa bermanfaat untuk strategi dan manajemen untuk mencegah penyakit kencing batu dan kambuhnya.*

Kata kunci: *Komposisi batu, Indonesia, kencing batu.*

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INTRODUCTION

Urinary stone is still an important health problem worldwide. Considering its incidence that could reach 1-5% in Asians, 5-10% in Europe and 13-15% in United States.[1] Many studies and reports also confirmed that the incidence and prevalence of urinary stone in many countries around the world are increasing now.[2]

Even there is no sufficient and objective data of incidence and prevalence of urinary stone in Indonesia at this time, the incidence and prevalence

of urinary stone disease in Indonesia are expected high enough. Indonesia is included in a regions called "World Stone Belt", regions and places in the world that had urinary stones prevalence higher than others. Finlayson (1974) review several worldwide geographic surveys and found that areas of high stone prevalence included United States, British Isles, Central Europe Scandinavian and Mediterranean countries, Northern India and Pakistan, Northern Australia, Malay peninsula (Thailand, Malaysia, Indonesia) and China.[3] Rahardjo founded escalation the number of patient urinary stone that received treatment in Cipto Mangunkusumo Hospital, a countries top referral health center in Jakarta, Indonesia years by years start by 182 patients in 1997 became 847 patients in 2002.[4]

Because urinary stone disease has a high recurrence rate,[3,5] the evaluation of patients metabolism is as crucial as the treatment itself. Stone composition analysis is important information that complement metabolic evaluation, that important in preventive therapy.

OBJECTIVE

This study aims to evaluate urinary stone composition in Indonesian population by evaluating patient that came in Cipto Mangukusumo Hospital, a countries top referral, a major center that serves patient form many different regions in Indonesia.

MATERIAL & METHOD

A retrospective study of urinary stone disease in Cipto Mangunkusumo Hospital Jakarta, Indonesia, in period 2000 until 2013 was done. Cipto Mangunkusumo Hospital in Jakarta Indonesia in countries top referral, so the patients came form many places and regions in Indonesia, so it can represented Indonesian population. In those period, a total 1036 of urinary stone patient that underwent PCNL or open surgery were founded, then from those number there were 277 patients with stone composition analysis. This 277 urinary stone patients then became this study subject. The data that been collected then analyze by SPSS program.

RESULTS

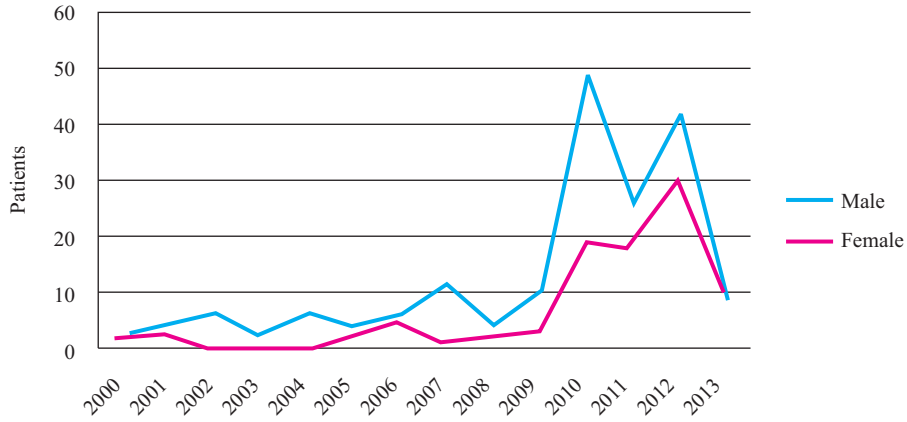
Of the 277 patients 180 (65%) patients are male and 97 (35%) are female, so the male and female ratio is 1.8:1 with age mean 51.01 ± 11.5 years old. For male patients the age range from 25-76 years old with mean 51.16 ± 10.8 years old. And for female patients, the age has more wide range from 7-83 years old, with no different average 50.74 ± 12.71 years old. In both male and female patients the urinary stone disease is rare in young age and then raises through age, and in this study got its peak at 51-60 years old in both male and female.

Table 1. Demography.

Parameter		
Male	65%	n=180
Female	35%	n=97
Age	51.01 ± 11.5 yo	
Age in male	25-76 yo	51.16 ± 10.8 yo
Age in female	7-83 yo	50.74 ± 12.71 yo

Table 2. Urinary stone distribution according to age and gender.

Age	Male		Female	
	n	**%**	**n**	**%**
<10	0	0	1	0.4
11-20	0	0	1	0.4
21-30	6	2.2	4	1.4
31-40	22	7.9	13	4.7
41-50	59	21.3	27	9.7
51-60	**62**	**22.4**	**32**	**11.6**
61-70	24	8.7	15	5.4
>71	7	2.5	4	1.4



Graphic 1. Patients years by years.

Table 3. Stone composition related to gender.

Stones composition	Male		Female	
	n	%	n	%
Ca Oxalate	121	43.7	48	17.3
Ca Oxalate + Ca Phosphate	24	8.7	26	9.4
Ca Phosphate	7	2.5	6	2.2
Uric Acid	18	6.5	7	2.5
Struvite	10	3.6	6	2.2
Amonium Urate	0	0	2	0.7
Cystine	0	0	2	0.7

Calcium oxalate is the dominant in our data set by 169 patients (61.0%), then followed also by calcium containing stone which is the combination of calcium oxalate and calcium phosphate with 50 patients (18.1%).

Another calcium containing stone, pure calcium phosphate, are founded in fewer patient, 13 patients (4.7%).

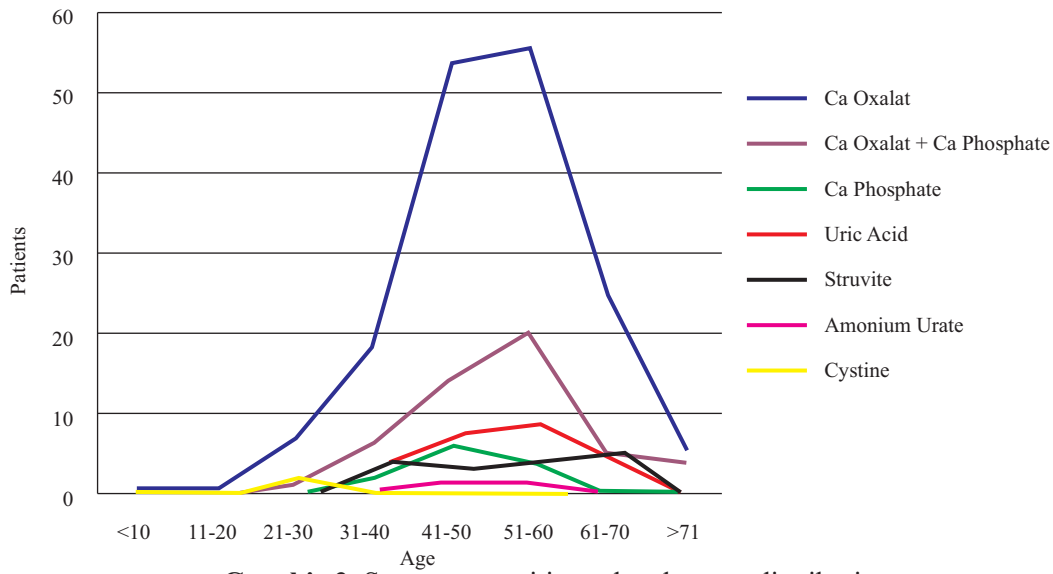
Uric acid containing stone are seen in 25 patients (9.0%). Infection associated stone such as struvite are founded in 16 patients (5.8%), whereas amonium urate are rare with only 2 patient (0.7%). Cystine containing stone are also rare, noted in 2 patients (0.7%).

In both male and female, calcium containing stone are predominant, with calcium oxalate as the most stone founded in both male 121 patient (43.7%) and female 48 patients (17.3%). Uric acid stone are under the calcium containing stone with 18 patients (6.5%) in male and 7 patients (2.5%) in female. Infection associated stone found in 10 patients (3.6%) with struvite stone and no amonium urate stone are founded. Not much different in female total 8 patients infection associated stone are noted, with 6 patients (2.2%) with struvite stone and 2 patients (0.7%) with amonium urate stone. Cystine is rare with only founded in 2 patients in female in our data set.

Stone composition related age distribution, all type stone show similar trends that low in younger age and rasie trough age. Calcium containing stone, are founded more in elderly patients in our data set calcium oxalate founded most in 51-60 years old patients. Another things is calcium oxalate has a wide range age distribution, it is founded in children <10 years old (1 patient) and over 71 years old patients (6 patients). Not different with calcium, uric acid also founded more in elderly patients with peak 51-60 years old, but it is not has a wide range age distribution just like calcium oxalate. Infection associated stone are seen in elderly patients, struvite is founded most in 61-70 years old patients. Cystine is found young age patients, 21-30 years old.

Table 4. Stone composition related to age distribution.

Age classification	Ca Oxalate	Ca Oxalate + Ca Phosphate	Ca Phosphate	Uric Acid	Struvite	Amonium Urate	Cystine
<10	1	0	0	0	0	0	0
11-20	1	0	0	0	0	0	0
21-30	7	1	0	0	0	0	2
31-40	19	6	2	4	4	0	0
41-50	54	14	6	8	3	1	0
51-60	56	20	4	9	4	1	0
61-70	25	5	0	4	5	0	0
>71	6	4	1	0	0	0	0



Graphic 2. Stone composition related to age distributions.

DISCUSSION

In this study, urinary stone disease is founded more in male than female with male:female ratio 1.8:1. This result is same in worldwide studies that stone disease typically affects adult men more commonly than adult women, even the male:female ratio varies according to race.[3] Our male:female ratio not different by Michael and colleagues (1994) study that reported male-to-female ratio of 1.8 among Asians; 1.6 among Whites; 0.7 among Hispanics, and 0.5 among African-Americans.[3]

The gender difference has always been considered related to differences in excretory function, with men excreting more oxalate in the urine, and women more citrate, which is protective against stone formation.[6]

In our study we founded that urinary stone has wide range from under 10 years old until upper 71 years old. Even though has a wide range, its incidence lower in young age and increasing through age until reach its peak then decreasing. The peak of urinary stone founded in our patients at 51-60 years both in male and female patients. This findings are conform the another studies, that stone occurrence is relatively uncommon before age 20 but peaks in incidence in the fourth to sixth decades of life.[3]

Calcium containing stone are predominant in this study. Calcium oxalate itself dominates with 61% overall. Calcium oxalate prevalence is the most

frequent worldwide.[7] However, its incidence varies worldwide. Another studies shows the of calcium oxalate is 93 in Asian countries such as India,[8] and China,[9] whereas it is 74.8% in United States.[10] Our result is not much different with study in our neighbor country Australia with 64%.[6] Hypercalciuria is the most important factor in Calcium stones. Two major causes of hypercalciuria are systemic acidosis and diets high in proteins.[7]

Related to gender, both male and female calcium oxalate still predominant, with 43% in male and 17.3% in female. Related to age, calcium oxalate is founded highest at 51-60 years old. Study in Australia also founded that the highest number of calcium oxalate stone was found in 51-60 years old.[6] Whereas another studies in Europe, revealed that calcium oxalate stones are more frequent in persons between 40 and 50 years old, in Asia, it seems that the peak frequency of calcium oxalate stone occur at an earlier age 30-50 years old, and in Tunisia, peak frequency of calcium oxalate stones in persons between 16 and 39 years old.[11]

Uric acid stone prevalence in our study is 9%. Another studies show varies result, 16% in Australia,6 17-25% in Germany, 5-9.7% in United States, 6.9% in France, and 18-40% in Israel.[12] Uric acid prevalence seems low in countries or regions where vegetarian diet is common.[7]

In male patients we founded 6.5% and 2.5% in female. Even in small portions, uric acid stone become the second most common stone after calcium containing stones, and this match with another studies world wide.[13] not different with calcium containing stone, our highest uric acid stone is founded at age 51-60 years old.

Infection associated stone, such as struvite is 5.8% and Amonium urate 0.7%. In Australia Struvite is founded 7%,6 3.8% in Tunisia,[11] and 2.2% in Turkey.[7] It's incidence relatively decrease now worldwide, the cause of these stone is urease producing micro-organism. Antibiotics abuse may be one reason for the low rate of infection associated stones. [7,11]

Different compare another studies worldwide, our data reveal that struvite stones is more common in male patients 3.6% than female 2.2%. It is said that a male predominance of calcium oxalate and uric acid, an a female predominance of calcium phosphate and struvite stones. A study from German revealed that in male its only 3.8% and 11% in female.[14] These findings could be because of lack of data of female urinary stone analysis or antibiotics abuse, considering many antibiotics are easily get in our country.

Related to age, it is not contradicted with another studies, it prevalence are high in older patients, our finding is the highest struvite stone is in 61-70 years old.

Cystine stone remains rare with only 0.7%. Study from Turkey reveal 3.08%.[7] Cystine stones, formed by patients with cystinuria, account for only a small percentage of all urinary stones.[13] In our study we only founded cystine stone in female patients, and no male patients. And founded highest at 21-30 years old age, this match with epidemiology data that the higher peak of cystine stone in younger ages, with typically occurs in the 2nd decades of life.[13]

CONCLUSION

This study reveal that calcium containing stone especially calcium oxalate is the most dominant stone founded, both in male and female. Then followed by uric acid stones in both male and female patients. This study revealed a picture of stone composition in Indonesian population, that could be beneficial for strategies and management to prevent urinary stone disease and recurrence.

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