ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 5, Issue, 04, pp. 4080-4083, April, 2015

International Journal of
DEVELOPMENT RESEARCH

Full Length Research Article

A STUDY OF 24 HOURS URINARY PARAMETERS IN KIDNEY STONE DISEASE

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ARTICLE INFO

Article History:
Received 19th January, 2015
Received in revised form
21st February, 2015
Accepted 25th March, 2015
Published online 29th April, 2015

Key words:

Measurements,
Measurements,
Emphasize,
Management,
Population.

ABSTRACT

Urinary metabolic abnormalities such as low urine volume, hypercalciuria, hyperoxaluria, hyperuricosuria and hypocitraturia predispose the patient to early recurrence in kidney stone disease. This present study was planned to measure calcium, magnesium, oxalate, citrate, phosphate and uric acid in 24 hours urine samples in first time kidney stone disease and recurrent kidney stone disease patients to emphasize the importance of these measurements in metabolic evaluation and management of kidney stone disease. A total of 60 individuals were studied comprising of a control group of 20 healthy individuals and a case group of 40 kidney stone patients. The case group was sub divided into one group of 20 patients having first time kidney stone and other group of 20 patients having recurrent kidney stones. Significantly higher levels of 24 hours urinary calcium and oxalate were found in first time kidney stone disease patients and recurrent kidney stone disease patients when compared to normal healthy controls. Significantly lower levels of 24 hours urinary citrate and magnesium were present in first time kidney stone disease patients and recurrent kidney stone disease patients when compared to normal healthy controls. This study suggests to emphasize the importance of these measurements in metabolic evaluation and management of kidney stone disease. However, large population based studies are required to draw any conclusion.

INTRODUCTION

Kidney stone disease is the third most common problem of the urinary system (Marshall L. Stoller, 2007). First-time stone formers have a 25 to 50% risk of recurrence within subsequent 5 to 10 years (Ljunghall and Danielson, 1984). Urinary metabolic abnormalities such as low urine volume, hypercalciuria, hyperoxaluria, hyperuricosuria and hypocitraturia predispose the patient to early recurrence. This study was planned to measure calcium, magnesium, oxalate, citrate, phosphate and uric acid in 24 hours urine samples in kidney stone disease patients and its significance.

MATERIALS AND METHODS

The kidney stone disease patients diagnosed by plain abdominal X-ray, ultrasonography or intravenous pyelography were selected from the Surgery/Urology department in Prathima institute of medical sciences during the year 2010-11. A total of 60 Male and female individuals between 20 to 50 years of age were studied comprising of a control group of 20 normal healthy individuals, a case group of 20 patients having first time kidney stone and 20 patients having recurrent kidney stones. The 24 hours urine sample was collected by the participants in a laboratory given clean plastic urine container. Urinary calcium, phosphate, magnesium and uric acid were measured on semi autoanalyser by kit method. Urinary oxalate and citric acid were measured by manual method (Direct precipitation and Redox Titration method (End point) and Rajgopal, 1984).

RESULTS

The absolute values of calcium, oxalate, uric acid, phosphate, magnesium and citrate were used to calculate Mean, SD and Turkey-Kramer post ANOVA test 'p' values between all the three groups and were represented in Tables & Graphs – 1, 2 & 3 whereas Mean, SD and student 't' test (unpaired) 'p' values between controls and Kidney stone cases were represented in Table & Graph - 4.

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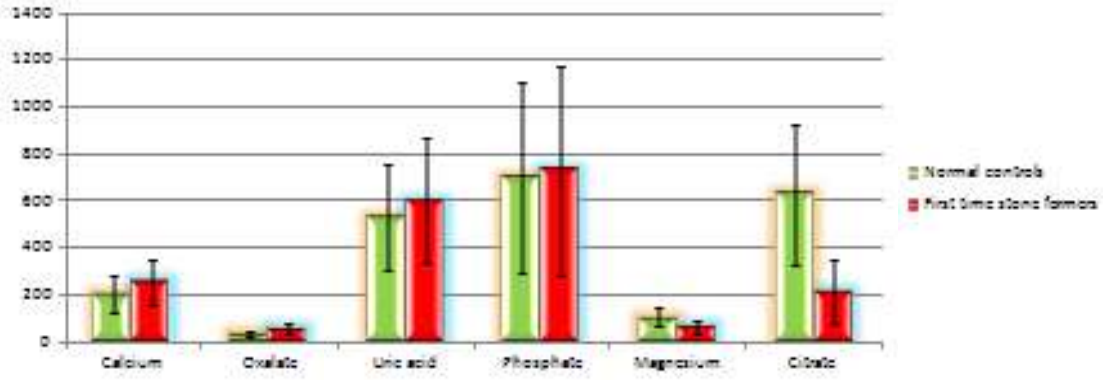
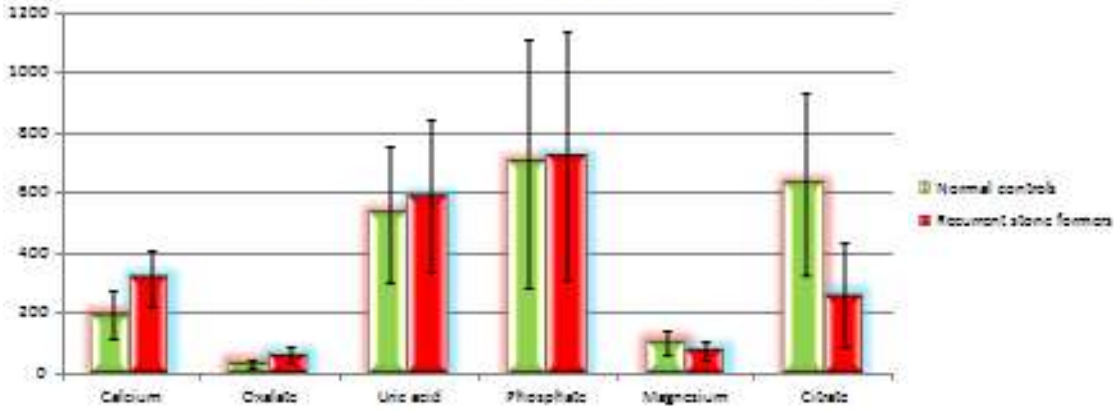
24 hours Urinary parameters	MEAN ± STANDARD DEVIATION		TUKEY KRAMER POST ANOVA 'P' VALUES
	Normal controls	First time stone formers	
Calcium	199.85 ± 78.30	254.40 ± 97.50	>0.05 ns
Oxalate	37.40 ± 13.37	55.40 ± 22.99	<0.05 *
Uric acid	534 ± 226.14	601.80 ± 264.29	>0.05 ns
Phosphate	699.00 ± 408.80	730.95 ± 442.33	>0.05 ns
Magnesium	105.25 ± 37.50	63.55 ± 29.50	<0.001 *
Citrate	629.70 ± 301.71	216.50 ± 135.50	<0.001 *

1. Normal Control vs. First Time Stone Formers



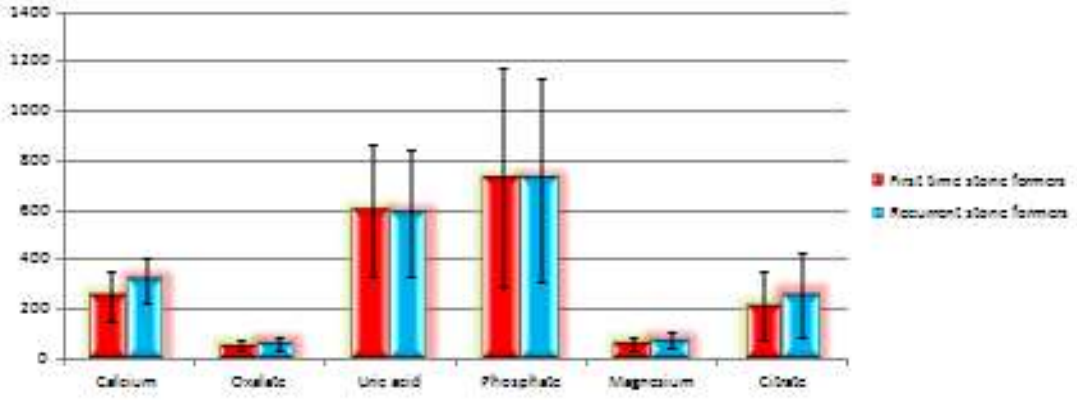
24 hours Urinary parameters	MEAN ± STANDARD DEVIATION		TUKEY KRAMER POST ANOVA 'P' VALUES
	Normal controls	Recurrent stone formers	
Calcium	199.85 ± 78.30	318.35 ± 90.38	<0.001 *
Oxalate	37.40 ± 13.37	62.95 ± 25.82	<0.01 *
Uric acid	534 ± 226.14	590.75 ± 252.55	>0.05 ns
Phosphate	699.00 ± 408.80	723.95 ± 410.33	>0.05 ns
Magnesium	105.25 ± 37.50	79.35 ± 33.49	<0.05 *
Citrate	629.70 ± 301.71	262.30 ± 171.96	<0.001 *

2. Normal Control vs. Recurrent Stone Formers



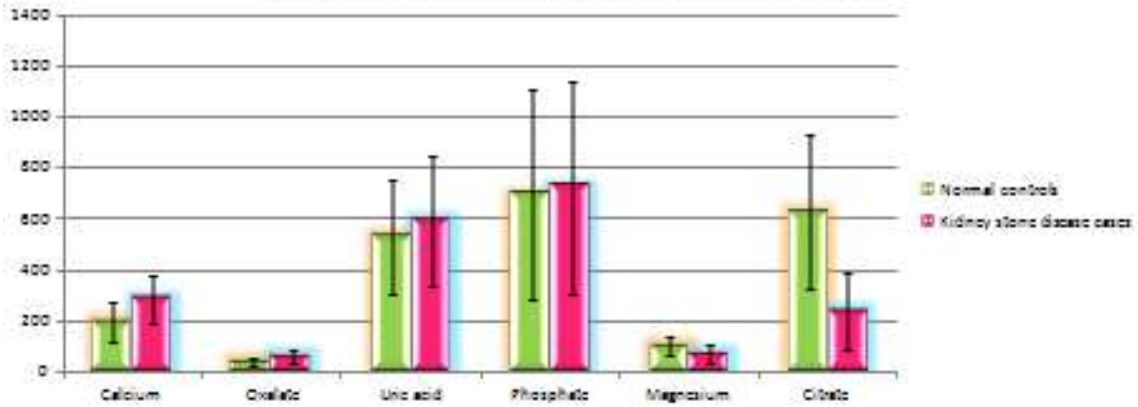
24 hours Urinary parameters	MEAN ± STANDARD DEVIATION		TUKEY KRAMER POST ANOVA "P" VALUES
	First time stone formers	Recurrent stone formers	
Calcium	254.40 ± 97.50	318.35 ± 90.38	>0.05[a]
Oxalate	55.40 ± 22.99	62.95 ± 25.82	>0.05[a]
Uric acid	601.80 ± 264.29	590.75 ± 252.55	>0.05[a]
Phosphate	730.95 ± 442.33	723.95 ± 410.33	>0.05[a]
Magnesium	63.55 ± 29.50	79.35 ± 33.49	>0.05[a]
Citrate	216.50 ± 135.50	262.30 ± 171.96	>0.05[a]

3. First Time Stone Formers vs. Recurrent Stone Formers



24 hours Urinary parameters	MEAN ± STANDARD DEVIATION		STUDENT T-TEST (UNPAIRED) "P" VALUES
	Normal controls	Kidney stone disease cases	
Calcium	199.85 ± 78.30	286.37 ± 98.28	0.001*
Oxalate	37.40 ± 13.37	59.17 ± 24.43	0.0005*
Uric acid	534 ± 226.14	596.27 ± 255.21	0.362[b]
Phosphate	699.00 ± 408.80	727.45 ± 421.14	0.804[b]
Magnesium	105.25 ± 37.50	71.45 ± 32.16	0.0006*
Citrate	629.70 ± 301.71	239.40 ± 154.56	0.0001*

4. Normal Control vs. Kidney Stone Disease Cases



'p' values <0.05 are statistically significant[a] and >0.05 are not statistically significant[b]. The groups were age and gender matched.

DISCUSSION

In this study group the high mean 24hr urinary calcium and oxalate concentration in first time, recurrent and overall stone formers when compared with controls were statistically significant. Except urinary calcium in first time stone formers which was higher though not statistically significant. The mean 24hr urinary magnesium and citrate concentration were significantly lower in first time, recurrent and overall stone formers when compared with controls. The mean 24hr urinary calcium, oxalate, uric acid, phosphate, magnesium and citrate concentration were not significantly varying when first time stone formers are compared with recurrent stone formers. It suggests that almost same levels of these parameters as in first time stone formers were sufficient to cause recurrence. These observations were almost similar to other studies (Kumar *et al*., 2003; Jawalekar *et al*., 2010 and Sharada R. Deshmukh and Zia H. Khan, 2006). The mean 24hr urinary uric acid and phosphate concentration were not significantly higher in first time, recurrent and overall stone formers when compared with controls.

Conclusion

24 hour urinary measurements of these constituents are indicated as a part of metabolic evaluation of kidney stone disease but are least used compared to plain abdominal X-ray, ultrasonography or intravenous pyelography. This study gives emphasis on the importance of these measurements in metabolic evaluation, individualising management of kidney stone disease and preventing recurrence. However, large population based studies are required to draw any conclusion.

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