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FREQUENCY OF RENAL COLIC DUE TO RENAL STONE ASSOCIATED WITH CHANGE IN CLIMATE DURING DIFFERENT MONTHS OF THE YEAR

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ABSTRACT

OBJECTIVE: To study the incidence of renal colic attacks due to renal stone and its relationship with climate during different months of the year.

MATERIAL AND MONTHS: This prospective study was conducted on patients with renal colic secondary to stones, who were admitted in the Institute of Kidney Diseases Hayatabad Peshawar between October 2010 & September 2013.

RESULTS: This study included 980 patients, 765 (78.06%) were male and 215 (21.93 %) were female. The mean age of the patients was (33.1± 9.8years). Majority of the patients 807(82.4%) were under 40 years of age. Renal colic was more common in summer months like June 118 (12%), July 111 (11.3%) August 109 (11.1%) and September 88 (9%) respectively. The lowest no of admission was in February 40 (4.1%), January43 (4.4%), and March 45 (4.6%). It shows that the mean admission of the year due to renal colic secondary to stone was significantly different from mean admission of the warmer months 578 patients (59%) in comparison to winter month 402 patients (41%). It shows that there was 18% increased incidence of renal colic visits in the warmer months of June, July and august compared with the colder months of December, January and February.

CONCLUSION: The renal colic visit was more in the summer and highest in the month of June, July, August and declining start from September onward and lowest in February. We found a strong positive correlation between ambient temperature and renal colic visits.

INTRODUCTION

Urolithiasis is the presence of stones in the urinary system, and remains a common public world Health issue as well as a preventable cause of morbidity. The estimated global prevalence of urolithiasis in developed countries is between 5% and 13% and in developing countries it is 0.5–1%[1]. The study suggest that an increased fluid intake and subsequently urine dilution could have a protective effect on the crystallization of calcium salts [2]. In the USA, the prevalence of urolithiasis has been reported to be higher in the Southeast than in the Northwest, and in all other regions of the United States[3]. The prevalence of stone disease in workers chronically exposed to dehydration due to heat stress was significantly higher compared to controls working in normal temperature[4]. There are uncertainties about the change in the incidence of renal colic in Ramadan month compared with the other periods of the year[5].

The overall probability of forming stones differs in various parts of the world, 1–5% in Asia, 5–9% in Europe, 13% in North America and 20% in Saudi Arabia[6]. Sub-tropical and tropical climate and better socio-economic standards of living may predispose to the increased occurrence of urinary Stone disease. Some studies have shown a positive association between animal protein intake and stones, whereas others have not[7]. The other spectrum of physical manual labour involving working outside exposed to heat and sun, low socioeconomic status, malnutrition and reduced fluid intake. Some experts speculated that this increased risk might be due to a hormone called vasopressin, which is released during stress, which increases the concentration of urine. A report suggested that manual workers had a higher incidence of urolithiasis when compared to sedentary workers[8].

An association between temperature and seasonal

pattern of urinary stone disease has been observed. Temperature far above the comfort zone increases perspiration and results in concentrated urine. This in turn will promote increased urinary crystallization[9]. Studies conducted in regions with extreme temperature showed the incidence rising in summer months and falling in the winter months[10]. Seasonality, ambient temperature was found to be the sole major factor having positive association with the monthly renal colic attack rates[11].

In addition to regional variation in stone disease, evidence is mounting that in Western societies the overall prevalence of stone disease is increasing[12]. No significant seasonal variation was observed with calcium oxalate or calcium phosphate stones. The incidence of uric acid stones increased significantly during summer and autumn and that of infection stones decreased significantly during spring and summer respectively. There is significant seasonal variation in uric acid and infection stones[13].

The incidence of stone disease is expected to increase in individuals with persistently low urinary volumes, especially in warmer seasons[14]. High perspiration and high concentration of stone-forming substances in the urine during summer months lead to the highest incidence of urolithiasis[15]. Transient variations in stone prevalence, such as seen with desert military deployments and seasonal cyclicity can also be accounted for by temperature changes[16].

It is also demonstrated that both urinary calcium excretion and renal stone episodes are increased during the warmer weather[17]. The seasonal trends in the monthly urinary calculi attack rates revealed a peak in July to September, followed by a sharp decline in October[11].

The highest incidence of renal stone diseases has been reported during the months of July, August and September, when presumably dehydration due to perspiration is common and the urine contains high concentration of lithogenic substances[15]. The type of food and amount of water consumed are important considerations in the production of urinary stone[18]. The incidence of stone disease is expected to increase in patients with persistently low urinary volumes, especially in warmer seasons[19]. Several factors could explain the effect of warm sunny weather on kidney stone formation. Studies indicate that obesity was associated with greater risk of kidney stones disease[20].

Some previous researchers have demonstrated that both urinary calcium excretion and renal stone episodes are increased during the warmer weather[12]. Urinary electrolytes have circadian and circannual variation[21]. Trend of renal colic as "stone wave" has been explained in terms of changing social conditions and the consequent changes in eating habits[14]. Vitamin D endocrine system regulates multiple aspects of calcium and bone metabolism, including calcium absorption and excretion, but also plays an important role in glucose homeostasis, notably in the mechanism of insulin release[22]. Serum 25 (OH) D3 level, urinary calcium and oxalate excretion are higher during May to October than November to April in all except the long - stay hospital patients[6]. The effects of fasting on these variations have not been determined in previous studies. Some investigators found that the frequency of renal colic's in the summer was higher than winter which might be due to a relative D hypervitaminosis, a greater intake of oxalate or a relative dehydration[23]. The mean age of urinary volume are likely during fasting, the effect of fasting on urinary stone formation is controversial[24].

MATERIALS AND METHODS

This prospective study was conducted on 980 patients who presented with various symptoms of urolithiasis at the Department of Urology at Institute of Kidney Diseases Hayatabad Peshawar between October 2010 & September 2013.The Peshawar and most of the districts of Khyber Pukhtun Khawa has a warm climate with short spring, winter and autumn seasons. The patients age, gender and the seasonality of disease were assessed. The study included all the patients who presented to emergency department secondary to renal stone disease without any structural abnormality. All those patients were excluded from the study that have renal colic secondary to

other causes than renal stone or urinary tract infection. A proper proforma was designed for each patient and all the relevant data regarding patient name age, sex, and season and number of pain attacks score were mentioned. Urinary output and biochemical parameters of all patients were noted. The total number of patients who visited the hospital with renal colic and the number of urolithiasis cases were recorded for each month. The year was divided into four seasons: December to March as winter, April and May as spring, June to September as summer and October and November as autumn.

The data was analyzed using SPSS 10 version. We calculated frequencies and percentage proportion for socio-demographic characteristics. The values are given as mean ± SD and percentage of measurement. Spearman's correlation coefficient was used to determine whether there was any correlation between number of urolithiasis cases and temperature in the different months of the year.

RESULTS

This study included 980 patients among them 765 (78.06%) were male and 215 (21.93 %) were female. The mean age of the patients was 33.1±9.8years. Majority of the patients 82.4% were under 40 years of age. Renal colic was more common in summer months like June in 118 patients (12%), July 111 patients (11.3%), August 109 patients (11.1%) and September 88 patients(9%) respectively. The lowest no of admissions were in February 40 (4.1%) January 43 (4.4%), and March 45 (4.6%). It shows that the mean admission of the year due to renal colic secondary to stone was significantly different from mean admission of the warmer months 578 patients (59%) in comparison to winter month 402 patients (41%). It shows that there is 18% increased incidence of renal colic visits in the warmer months of June, July and August compared with the colder months of December, January and February.

Figure 1: Male and Female ratio regarding gender distribution

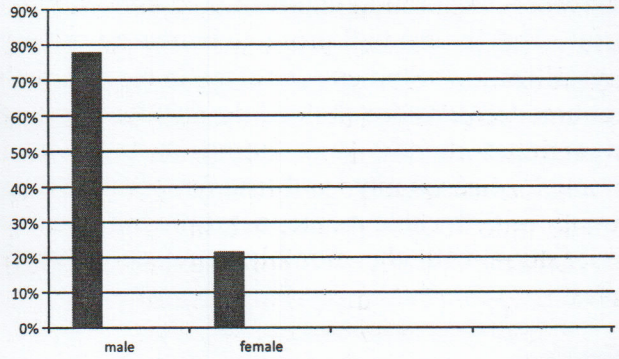
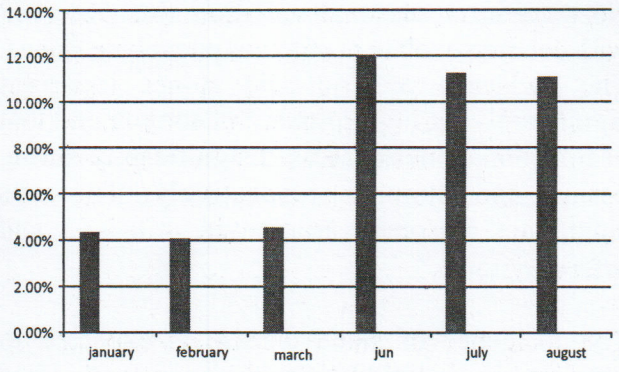


Figure 2: Percentage of renal colic during different months of the year.



DISCUSSION

The effect of intrinsic factors including age, sex and heredity as well as extrinsic factors like geographic situation, climatic and seasonal factors, water intake, diet and occupation, on renal colic and kidney stone disease have been determined[15].

Information on the seasonal pattern of urolithiasis among stone formers is important for the treating physician to apply both pharmacological and non-pharmacological interventions.

Several climatic, environmental, genetic, septic and dietary factors had been incriminated in the etiology of stones formation[25]. Urolithiasis was more frequent in men than in women in our study, with a male to female ratio 5:1 .This observation is in accordance with studies conducted by Naas[26]et al, Fetter et al [27] which show that urolithiasis is predominantly seen among males compared with females. The fall of estrogen production

significantly influences the emergence of metabolic syndrome in postmenopausal women by increasing body mass index and visceral fat accumulation. On the other hand, ovarian failure significantly increases bone turnover and urinary calcium excretion and at the same time reduces the excretion of inhibitors of urinary crystal nucleation and growth (i.e. citrate)[28]. The male-to-female ratio ranges from 1.2:1 in Iran[29]. In our study, the maximum number of cases was below 40 years of age. This finding is in agreement with the observations made by Naas et al[26]. They observed that urolithiasis occurred more regularly in the third decade of life. In our study, we found more number of cases during summer compared with the other seasons, but the difference was not statistically significant. The seasonal variations do exist in the monthly urinary calculi attack rates for all age and gender populations, and that following time series statistical adjustment, only ambient temperature had any consistent association with monthly attack rates11. Chauhan et al[30] conducted a retrospective study in New Jersey and observed that renal colic visits were more common during the warmer months, and that it was highest in older patients and male gender. Chen et al, in their study conducted in Taiwan, observed that urinary calculi related colic attacks were highest from July to September, and a decline was seen in the winter months. Most studies of seasonal variation in the diagnosis of renal stones show an increase in summer and autumn[31]. In stone formers, a decrease in urine volume, sodium, and pH, with correspondingly higher super saturations of calcium oxalate and uric acid has been demonstrated during the summer months[32]. Stone disease in United States shows marked geographic variability; it has been found in several studies that the Southeast has a 50% higher prevalence of stone disease than the Northwest. Major risk factors that contribute to stone formation and its recurrence include "classic" risk factors in the urine (low urine volume, hypercalciuria, hyperoxaluria, hyperuricosuria, hypocitrauria, and hypomagnesuria), epidemiological factors-climate, race, ethnicity, age, sex and body weight. Several studies from West indicated that in the industrial countries, renal stones are a common problem affecting 1 person in 1,000 annually and the incidence is increasing in tropical developing countries too[34].

Davidson et al in their study observed that the highest number of stone presentations was during autumn and the lowest was in spring, even though the observation was not statistically significant. They also reported that the season of presentation did not differ significantly by age, gender, stone size, location or whether patients presented with pain, hematuria or incidental[35]. The finding of an over representation of trades and machine operator jobs among the Stone presenters are consistent with other studies. Serio and Fraioli showed a higher prevalence in non educated than educated stone formers. While hot occupations and outdoor work have also been associated with increased stone risk[3]. A study by Al-Hadramy observed that during the summer season, the urine volume and pH decrease and thus super saturation of calcium oxalate and uric acid occurs[24]. A retrospective study conducted by Pincuset al[36] observed that the rate of urolithiasis was significantly greater in summer when compared with winter. Baker et al demonstrated significant seasonal variation in urinary stone incidence. He also showed that men are at a higher risk of forming stones than women, with the exception of infections stones[13]. A study by Chen et al reported that during the summer and autumn seasons, the diagnosis of renal stone was more compared with the other seasons[31].

Torres Ramirez et al. studied the influence of the season, age, sex and composition of the drinking water on of the incidence of renal colic in patients of different villages in Granada. They found that in the summer the frequency of renal colic was double than winter. They suggested this seasonal variation of urinary phenomenon may be due to a relative D hypervitaminosis, a calcium and oxalate excretion, serum 25 (OH) D3 and albumin level in relation to renal stone formation, greater intake of oxalate or a relative dehydration[23].

In our study, there was no relation between number of stone formers and the fasting month variation of Ramadan, and this observation is consistent with the study conducted by Al-Hadramy[24]. Change in social condition and alteration in eating habits also

have an influence. The effect of fasting month of Ramadan, the Holy month when all Muslims are obliged to abstain from food and drink for about 12 hours a day is under debate. Co incidence of this month in warmer season may alter the real effect of fasting on renal colic. There were some seasonal variations in presentations although these were not statistically significant. The season with the highest number of presentations was autumn (31%), followed by winter (26%), summer (26%), and spring (17%). The season of presentation did not differ significantly by age, gender, stone size, location, or whether patients presented with pain, hematuria, or incidentally[37].

CONCLUSION

Renal colic secondary to urolithiasis is a major health condition that affects people of predominantly productive ages and men more than women. This study demonstrates significant seasonal pattern in the occurrence of renal colic secondary to urolithiasis. There is a strong positive correlation between ambient temperature and renal colic visits.

REFERENCE

1. Kim H, Jo MK, Kwak C, et al. Prevalence and epidemiologic characteristics of urolithiasis in Seoul, Korea. Urology 2002;59:517-21.)
2. Pak CYC, Sakhaee K, Crowther C & Brinkley L (1980): Evidence justifying a high fluid intake in treatment of nephrolithiasis. Ann. prevalence and risk factors for stones. Am. J. Epidemiol. 143, Intern. Med. 93, 36–39
3. (Borghi L, Meschi T, Amato F, Novarini A, Romanelli A &Cigal (1993):Hot occupation and nephrolithiasis. J. Urol. 150, 1757–1760)
4. Curhan GC, Rimm EB, Willett WC &Stampfer MJ (1994): Regional variation in nephrolithiasis incidence and prevalence among United States men. J. Urol. 151, 838–841
5. Emami-Naini A[1], Roomizadeh P[2], Baradaran A[3], Abedini A[2], Abtahi M[2] Ramadan fasting and patients with renal diseases: A mini review of the literature. J Res Med Sci. 2013 Aug;18(8):711-16
6. Huang WY, Chen YF, Carter S, Chang HC, Lan CF, Huang KH. Epidemiological studies on the prevalence of upper urinary calculi in Taiwan. J Urol. 2013 Jun;189(6):2158-63
7. Curhan GC, Willett WC, Knight EL, Stampfer MJ. Arch Intern Med. 2004 Apr26;164(8):885-91
8. Tanthanuch, M., Apiwatgaroon, A., Pripatnanont, C., 2005.Urinary tract calculi in longkorn University, Bangkok.southern Thailand. J. Med. Assoc. Thailand 88, 80–85
9. Hallson PC, Rose GA. Seasonal variations in urinary crystals. Br J Urol 1977;49:227-84
10. Abdolreza N, Omalbanin A, Mahdieh TS, Mohammad Ali MR, Reza MS, Maryam S, Mohsen N Saudi J Kidney Dis Transpl.Comparison of the number of patients admitted with renal colic during various stages of peri-Ramadan month. 2011 Nov;22(6):1199-202
11. Yi-Kuang Chen Herng-Ching Lin Chin-Shyan Chen Shauh-Der Yeh. Seasonal variations in urinary calculi attacks and their association with climate. The Journal of Urology 2008 Feb 179(2): 564-9.
12. Jujitak K. Influence of the weather on ureteral stone colic. Nippon JinzoGakkai Shi 1998;30: 297-304
13. Baker PW, Coyle P, Bais R, Rofe AM Influence of season, age, and sex on renal stone formation in South Australia Med J Aust. 1993 Sep 20; 159(6):390-2)
14. Trinchieri A, Mandressi A, Luongo P. The influence of diet on urinary risk factors for stones in healthy subjects and idiopathic renal calcium stone formers. Br J Urol 1991; 67:230-6
15. Elomaa I, Karonen SL, Kairento AL. Seasonal variation of urinary calcium and oxalate excretion, serum 25 (OH) D3 and albumin level in relation to renal stone formation. Scand J Urol Nephrol 1982;16:156-61
16. Scales CD Jr, Curtis LH, Norris RD, et al. Changing gender prevalence of stone disease. J Urol 2007;177:979-82
17. Lieske JC, Peña de la Vega LS, Slezak JM, et al. Renal stone epidemiology in Rochester, Minnesota: An update. Kidney Int 2006; 69:760-4
18. Trinchieri A. Epidemiology of urolithiasis. Arch Ital Urol Androl 1996;68:203-49
19. Robertson WG. Epidemiology of urinary stone disease. Urol Research 1990;18 (Suppl):S3-8
20. Grundy SM. Metabolic syndrome: a multiplex cardiovascular risk factor. J Clin Endocrinol Metab. 2007; 92:399–404
21. Touitou Y., Touitou C, Charramsol G, et al. Alterations in circadian rythmicity in calcium oxalate renal stone formers. Int J Chronobiol 1983;8:175-92
22. Dusso AS, Brown AJ, Slatopolsky E, Vitamin D. Am J Physiol Renal Physiol. 2005;289:F8–F28 .
23. Torres Ramirez C, Navarro Sanchez-Ortiz A, Zuluaga Gomez A, et al. Seasonal effect of age, sex and drinking water composition on nephritic colic. Arch EspUrol 1981;34:273-88
24. Al-Hadramy MS. Seasonal variations of urinary stone colic in Arabia. J Pak Med Assoc 1997;47:281-4
25. Al-Rasheed SA, el-Faqih SR, Husain I, et al. The aetiological and clinical pattern of childhood urolithiasis in Saudi Arabia. Int Urol Nephrol 1995; 27(4): 349-55.
26. Naas T, Al-Agili S, Bashir. Urinary calculi: Bacteriological and chemical association. East Mediterr Health J 2001;7:756-62.
27. Fetter TR. Statistical analysis of patients with ureteral

calculi. JAMA 1963;186:21-3
28. Carr MC. The emergence of the metabolic syndrome with menopause. J ClinEndocrinolMetab.2003; 88:2404–11.
29. Safarinejad MR. Adult urolithiasis in a Population-based study in Iran: Prevalence, incidence, and associated risk factors. Urol Res 2007; 35:73-82
30. Chauhan V, Eskin B, Allegra JR, Cochrane DG. Effect of season, age, and gender on renal colic incidence. Am J Emerg Med 2004;22:560-3.
31. Chen YK, Lin HC, Chen CS, Yeh SD. Seasonal variations in urinary calculi attacks and their association with climate: a population based study. J Urol. 2008; 179:564–9
32. Parks JH, Barsky R, Coe FL. Gender differences in seasonal variation of urine stone risk factors. J Urol. 2003;170(2 Pt 1):384–8.)
33. Cramer JS, Forrest K. Renal lithiasis: Addressing the risks of austere desert deployments. Aviation Space Environ Med 2006; 77: 649-53
34. Robertson, W.G, 2003. Renal stones in the tropics. Semin.Nephrol. 23, 77–87
35. Davidson PJ, Sheerin IG, Frampton C. Renal stone disease in Christchurch, New Zealand. Part 1: presentation and epidemiology. N Z Med J 2009; 122:49-56
36. Pincus S, Mac Bean C, Taylor D.The effects of temperature, age and sex on presentations of renal colic in Melbourne, Australia. Eur J Emerg Med 2010;17:328-31
37. Peter J Davidson, Ian G Sheerin, Chris Frampton Renal stone disease in Christchurch, New Zealand. NZMJ 19 June 2009, Vol 122 No 1297; ISSN 1175 8716

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