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Incidence of Renal Stone: An Investigation among the Aimol Tribe of Manipur

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ABSTRACT The present study is based on the demographic data collected from December 2007 to February 2008 among the Aimol tribe of Chandel district, Manipur. A questionnaire schedule was administered among 163-households of nine villages covering 496 adult individuals of either sex ranging in age from 18-90 years. A total of 34 adult individuals (6.86%) were found to have kidney stones and Chi–square ($\chi^2 = 0.48$; $0.50 < p < 0.30$), comparison showed non significant sexual differences. The majority of the renal stone cases were found among the age range of 33-37 years and none was reported before 22 years of age and among individuals above the age of 58. Water hardness of both the water streams in the area due to $CaCO_3$ content in mg/l was found to be 74 mg/l and 92 mg/l, respectively, which indicates that the water resources that they are using is moderately hard. A high meat intake indicating a high animal protein consumption, which is associated with increased risk of renal stone formation, and less fluid intake may be the main cause of renal stone formation among Aimol.

INTRODUCTION

The Aimol is a peace loving small tribal community of Manipur. They maintain a distinctive identity of their own and are distributed in three districts namely, Churachandpur, Senapati and Chandel districts of Manipur. Their population size is around 3000. They speak the Aimol tongue, which belongs to Sino-Tibetan linguistic family. They are hardworking people and their main economy is based on forest and agricultural work activities.

The extremely painful nature of renal stone presentation has been affecting mankind since time immemorial. It is formed in our body when crystals from salt and mineral substances in the urine, combine and grow to a large stone like material. These are formed when there is a high concentration of calcium (hypercalciuria), oxalate (hyperoxaluria), or uric acid (hyperuricosuria) and the lack of citrate (hypocitraturia) in the urine. Insufficient water in the kidneys to dissolve waste products is again a risk factor for causing renal stones. Kidneys maintain an adequate amount of water to remove the waste products in our body. Thus, if dehydration occurs high levels of substances like calcium, oxalate, uric acid, etc that don't dissolve completely may form crystals that slowly build up into kidney stones. Thus, kidney stones generally form when specific compounds in the urine become overly concentrated, causing minerals to crystallize. There are four main types of kidney stones, each of which is associated with different chemical conditions in the urinary tract. They are calcium oxalate stones, uric acid stones, pure calcium phosphate stones and struvite stones. The most common type of stone contains calcium in combination with either oxalate or phosphate. These chemicals are part of a person's normal diet and help build important parts of the body, such as bones and muscles. Struvite stone is caused by infection in the urinary tract. It is also called as infection stone.

In the present study an attempt was made to explore the effect of life style and age and sex differences in renal stone formation among the Aimol. Attempt was also made to find whether the community based dietary habits, water resources and climatic conditions were associated with an increased frequency of renal stone presentation by examining the composition of food rich in meat products and water hardness (Bellizzi et al. 1997) in the community water supply and salt concentration. It has been reported that excessive intake of animal proteins is directly associated with the risk of stone formation (Hesse et al. 1993; Robertson et al. 1997; Hassapidou et al. 1999).

MATERIAL AND METHODS

The present investigation is based on demographic data collected among the Aimol tribal population group of Chandel district, Manipur from December 2007 to February 2008. An interview schedule was administered among 163-house holds that covered 496 adult individuals of either sex ranging in age from 18-90 years, who were residents of nine villages of Chandel district. As a part of the larger demographic study the information regarding the presence of renal stone was gathered. The prevalence of the renal stone was estimated through a physician-based diagnosis of renal stone or had been told by the physician that they had a urinary tract stone. To determine the effect of water on renal stone presentation water of two different river streams of the area was tested at the Environmental Science laboratory, D.M College of Science, Imphal to determine water hardness and other mineral concentrations like those of chloride, calcium and magnesium. Inhabitants of all the nine villages consume water from the same resource, i.e., stream water which falls from the hillock. To assess the impact of dietary habits, participants were asked about the frequency with which they consumed protein in the form of meat products and other food items that are likely to be associated with incidence of renal stone problem. The degree of fluid consumption was also noted as an indicator of hydration level. Their overall dietary pattern was also taken into account.

Frequency calculation and two-by-two contingency table analysis were done to determine the frequency of the prevalence of the renal stone and to see if there were any sexual differences in the kidney stone presentation.

RESULTS

Table 1 shows the prevalence of the renal stone in different age cohorts. The observed percentage of the presence of renal stone among individuals of 9 villages of Chandel District was 6.86%, which is quite high. Data on sex differences in the incidence of renal stone problem is given in table 2. The Chi–square value was found to be 0.48, which is statistically non-significant indicating no sexual differences on the prevalence of renal stone formation among the Aimol. The majority of the renal stone cases were found among the age range of 33-37 years and no renal stone cases were reported before 18 year of age and among individuals above the age of 58. Its absence in the younger ages can be explained by the fact that renal stone formation is an accretional one. As to why it is absent in >58 year age persons may be due to the small sample size in these groups.

Table: 1: Prevalence of renal stones among 496 adult individuals aged 18-90 year, in 5 year intervals of current age.

Age (years)	*No. of kidney stone cases M/F*	*Total population*	*Percentage (%) prevalence*
18-22	0	91	0.000
23-27	6	85	7.059
28-32	4	77	5.195
33-37	8	51	15.687
38-42	5	67	7.463
43-47	3	38	7.895
48-52	6	50	12.000
53-57	2	19	10.527
>58	0	18	0.000
Total	34	496	6.855

Table: 2: Differential renal stone presentation among male and female

Sex	*No. of individual having renal stone problem*	*No. of normal individual*	*Total*
Male	20	243	263
Female	14	219	233
Total	34	462	496

$\chi^2 = 0.482$; $0.50 < p < 0.30$

The test conducted for water hardness of both the water streams due to $CaCO_3$ content in mg/l was found to be 74 mg/l and 92 mg/l, respectively, which indicates that the water resources that they were using was moderately hard [soft (0-60 mg/l), moderately hard water (60-120 mg/l), hard water (120-180 mg/l) and very hard water (over 180 mg/l)]. The etiological role of the hardness of water in the development of renal stone has already been reported earlier (Bellizzi et al. 1997; Siener et al. 2004).

DISCUSSION

In addition to the environmental factors, diet also plays a major role in idiopathic hyperoxaluria (Naya et al. 2000; Meschi et al. 2004; Taylor et al. 2004**).** Insufficient fluid intake and diets rich in animal protein are considered to be important

determinants of stone formation (Siener 2006). It has been reported that intake of animal proteins is directly associated with the risk of stone formation (Hesse et al. 1993; Robertson et al. 1997; Hassapidou et al. 1999). Aimolis consume a large amount of meat products. They consume meat products as frequently 5-7 times a week. Over-weight and associated dietary pattern additionally contribute to the increasing incidence and prevalence of stone disease (Siener 2006). They also regularly consume a kind of food product that is prepared from small dried fish. To prepare this the whole body of fish is taken and ground. It probably includes the mud and sand present in the fish stomach, which would aggravate the formation of renal stones. In addition, Aimolis have a poor habit of consuming very little amount of water. But kidneys must maintain an adequate amount of water to remove the waste products from the body. It points to a strong possibility that the dehydration leading to crystallization of mineral substances in the urine may be causing the renal stone presentation among them (Goldfarb 1994). Earlier studies have suggested that between 10 and 50 % of the urinary oxalate is derived from the diet (William and Wandzilak 1989; Holmes et al. 2001). Some food items, particularly vegetables and cereals, contain high amounts of oxalic acid and other salts and their consumption results in a significant increase in urinary oxalate excretion in urine (Hesse et al. 1993).

The stream water used by the Aimolis after falling from the hillock passes from a salt deposit area, locally known as " Thumkhong', "Thum" meaning salt and 'khong' meaning canal'. Thus, salt concentration is high in water and it is tasty to drink. Because of the high salt concentration skin becomes dry on taking bath with that water. In addition, dietary habits and lifestyles are suggested to contribute markedly to the rise in the prevalence and incidence of renal stones during the past decades (Siener 2006). It is also suggested that increased exposure to sunlight seems to be the most likely cause of hypercalciuria (Parry 1975). It can thus be said that diet pattern, water hardness, high salinity (WHO 2003) with decreased water intake jointly or singly perhaps influence the prevalence of renal stones in the Aimol population.

CONCLUSION

Although it is not clear to what extent this specific observation may be related to diet, water quality, environmental exposures, it is probable that all of these potential sources play a role. As reported by various researches environmental factors, including dietary intake and water supply are associated with a greater prevalence of renal stone (Bellizzi et al. 1997; Siener 2006). If such is the case, treating water hardness and modifying dietary habits could be used as public health strategies to reduce the prevalence of renal stones in a population. Particular sensitivity to various foods in stone formers can lead to urinary alterations such as hypercalciuria, hyperoxaluria, hyperuricosuria, hypocitraturia and an excessively acid urinary pH (Meschi et al. 2004). But a more comprehensive and exhaustive study is needed to highlight the environmental as well as underlying genetic predispositions responsible for triggering the renal stone formation (Jaeger 1996).

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REFFERENCES

Bellizzi V, DeNecola L, Minutolo R, Russo D, Cianciaruso B et al. 1999. Effects of water Hardness on Urinary Risk. Factors for Kidney stones in patients with Idiopathic Nephrolithiasis. *Nephron*, 81: 66-70.

Goldfarb S 1994. Diet and nephrolithiasis. *Annu Rev Med*, 45: 235-243.

Hassapidou MN, Paraskevopoulos STH, Karakoltsidis PA, Petridis D, Fotiadou E 1999. Dietary habits of patients with renal stone disease in Greece**.** *J Hum Nutr Diet,* 12: 47-51.

Hesse A, Seiner R. Heynck H, Jahnen A 1993. The influence of dietary factors on the risk of urinary stone formation. *Scan Microsc,* 7: 1119-1128.

Holmes RP, Goodman HO, Assimos DG 2001. Contribution of dietary oxalate to urinary oxalate excretion. *Kidney Int*, 59: 270-276.

Jaeger P 1996. Genetic versus environmental factors in renal stone disease**,** *Curr Opin Nephrol Hy,* 5: 342-346.

Meschi T, Schianchi T, Ridolo E, Adorni G, Allergri F et al. 2004. Body height, Diet and Water Intake in preventing stone Disease. *Uro Int*, 72(1): 29-33.

Naya Y, Ito H, Masai M, Yamaguch K 2000. Effect of Dietary Intake on Urinary oxalate Excretion in Calcium Oxalate stone Formers in their forties. *Eur Urol,* 37: 140-144.

Parry ES, Lister IS 1975. Sunlight and hypercalciuria, *Lancet*, 1: 1063-1065.

Robertson WG, Heyburn PJ, Peacock M, Hames FA, Swaminathan R 1997. The Effect of high animal protein intake in theUrinary tract. *Clin Sci (Lond)*. 57: 283-288.

Siener R 2006. Impact of dietary habits on stone incidence. *Urol Re*s, 34: 131-133.

Siener R, Jahnen A, Hesse A 2004. Influence of a mineral water rich in calcium, magnesium and bicarbonate on urine composition and the risk of calcium oxalate crystallization. *Eur J Clinic Nutr*, 58: 270-276.

Taylor EN, Gary G, Curhan G 2004. Role of Nutrition in the formation of Calcium-containing Kidney Stones. *Nephron Physiol*, 98: 55-63.

Williams HE, Wandzilak TR 1989. Oxalate synthesis, transport and the hyperoxaluric syndromes. *J Urol*, 141: 742-747.

World Health Organisation 2003. *Report on a Seminar Health Impact of Highly Saline Water.* Copenhagen, Denmark, 14-16.Geneva: WHO.