

URBANIZATION AS A RISK FACTOR FOR RENAL STONE FORMATION

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Abstract

This is a prospective study of 270 patients presented with renal stone over four years. Side of the renal stone whether in left kidney or right kidney was considered. The size of the stone was measured by imaging techniques (ultrasound or by CT scan) in 166 patients, in the remaining 104 patients imaging was done only for diagnosis, but without measuring the renal stone size (for different reasons). Residency was considered as urban or rural for any of these patients. The study shows that urban residency has increased risk for developing renal stone (63.7%) as compared to rural areas (37.3%), this effect was clearly significant for stone size between 1-2 centimeters.

Introduction

Kidney stone disease represents a significant health care expenditure. The lifetime prevalence of experiencing kidney stone disease has been estimated to be 13 percent for men and 7 percent for women¹ though these numbers are on the rise². Furthermore, the likelihood of recurrence has been estimated to be as high as 50 percent within 5 years of the initial event³, despite medical treatment and life style changes.

Risk factors for developing renal stone include: gender, race, age, metabolic factors, anatomical factors, dietary factors and geographical factors.

In this study we try to find the correlation between the residency of the patient and stone formation and if there is any effect of the residency on the size of the renal stone, as this will affect the subsequent planning for the management of the renal stone.

Patients & Methods

This is a prospective study of 270 patients who have been seen at the department of

surgery at Al-Sader Teaching Hospital and Al-Zahrawi Surgical Hospital in Missan in the period from December 2010 to May 2014.

Data collected from these patients regarding: age, sex, residency, the side of the stone (left kidney, right kidney), size of the stone was measured by ultrasound or by CT scan investigation in 166 patients. In the remaining 104 patients, the size of the kidney stone was not measured or neglected for the following reasons:

Diagnosis of kidney stone was done by KUB (kidney,ureter,bladder) imaging, or by IVU (intravenous urography) without mentioning precise size of the kidney stone.

Diagnosis of kidney stone was done by CT scan, without mentioning precise size of the kidney stone.

Patients diagnosed to have bilateral kidney stones, or multiple kidney stones of different sizes.

Residency was considered as urban for any patient living in city center; and considered as rural for patients living in peripheral areas or villages.

Stone size have been classified as: stone size > 1 centimeter, stone size 1-2 centimeter and stone size <2 centimeter. Statistical analysis was done using Chi square test and a p-value less than 0.05 was considered significant.

Results

The commonest age to be affected by kidney stone is between the age of 21 years to 50 years as shown in figure 1. Males are affected (66.7%) as twice as females (33.3%) as in figure 2.

About 63.7% of patients with kidney stone were living in urban regions; whereas only 36.3% of patients were living in rural areas as in figure 3.

Left kidney was more affected than the right kidney (figure 4).

Urban residency has increased risk for developing kidney stone; this can be seen by its effect in relation to different age groups (Figure 1).

Urbanization also acts as a risk factor for renal stone in relation to sex; and stone size (Figures 2, 5 & 6).

Figure 1: Age distribution

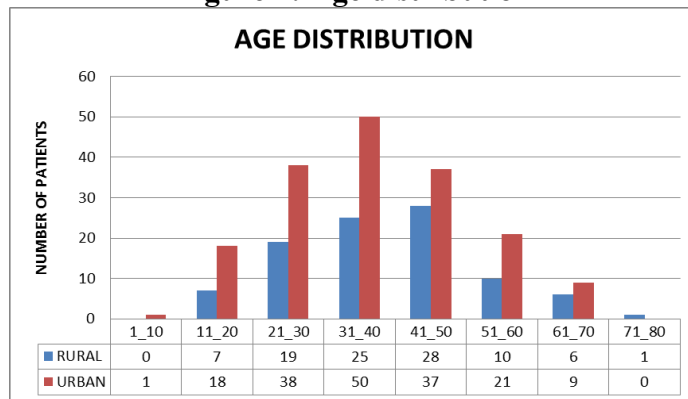


Figure 2: Sex distribution

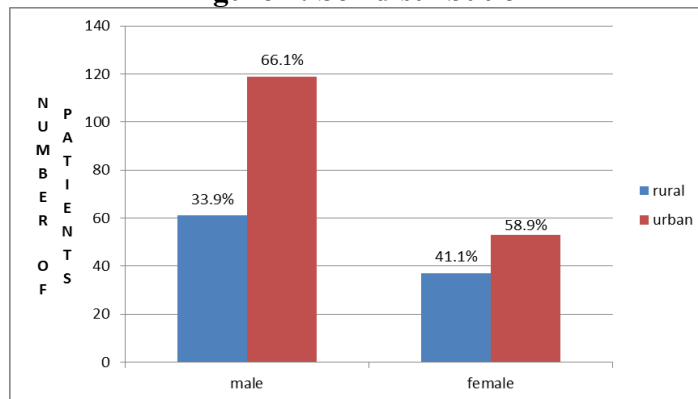


Figure 3: Residency of the patients

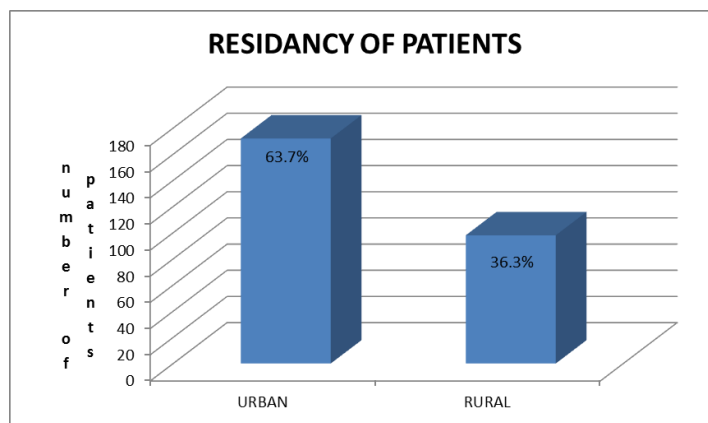
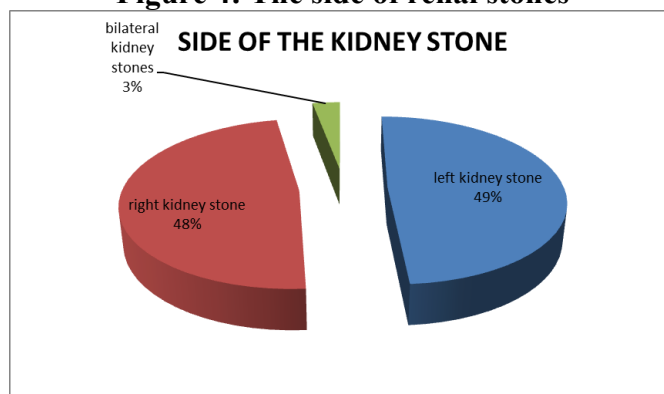


Figure 4: The side of renal stones



Figures 5 & 6: Size of stones

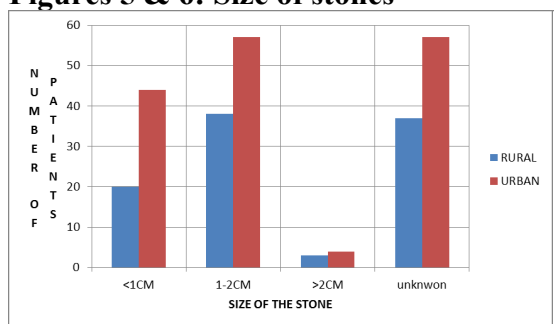


Table I: Sex distribution of renal stone according to the size of the stone.

Size of the stone	sex	Number of the patients			P. value
		urban	Rural	Total	
> 1 centimeter	male	30	16	46	<0.05*
	female	14	4	18	
1-2 centimeter	Male	45	22	67	>0.05**
	female	12	16	28	
<2 centimeter	male	3	3	6	<0.05*
	female	1	0	1	
unknown	male	41	20	61	
	female	26	17	43	

* non-significant p value. ** significant p value.

Discussion

Urbanization negatively impacts the environment mainly by production of pollution, the modification of the physical and chemical properties of the atmosphere, and the covering of the soil surface, this may result in compromised human health.

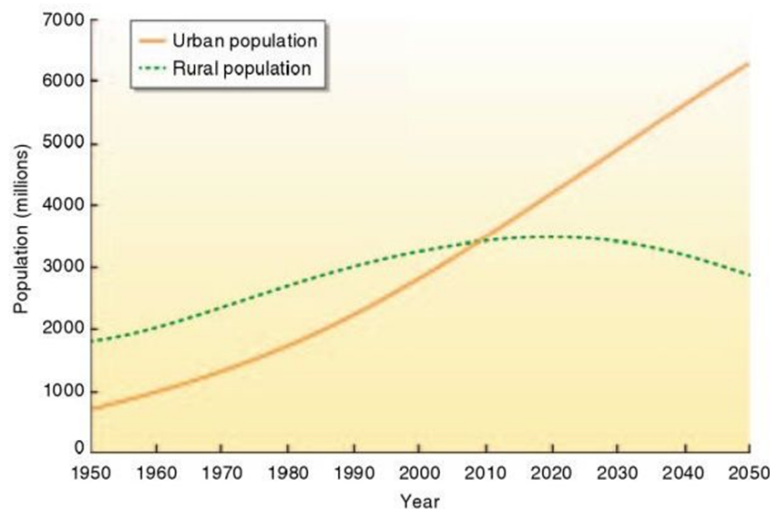
This study shows the impact of urbanization on the risk of renal stone formation which might be reached up to 50% increase than rural areas especially at 2nd, 3rd, and 4th decades of life (figure 1).

Regarding its effect on gender, males living in urban area are at higher risk

(66.1 %) for having kidney stone than those males who live in rural areas (33.9%). In females, a similar effect may be observed, females in urban area have a risk of (58.9%) whereas those in rural areas the risk is (41.1%) (Figure 2).

One of the explanations for this, is the phenomenon of 'urban heat islands,' tend to be hotter than surrounding suburbs and rural areas by 2 to 10 °F. Figure 7^{4,5}.

Figure 7



Urban and rural populations of the world from 1950 to 2050 from the United Nations Population Division. The graph shows that a greater proportion of people are living in urban areas and this trend is expected to continue in the future. Given that urban centers are hotter than surrounding areas, this could be a concern for climate-related conditions such as urolithiasis.

The effect of urbanization on different sizes of kidney stone has also clearly positive effect Figure 6. The significant effect can be noticed for the stone size between 1-2 centimeters (Table I).

Al-Dabbagh et al. shows (in 1977 Iraq) the incidence of urolithiasis was higher in urban versus rural populations, 52.0 versus 30.2 per 100,000 inhabitants (at Al-Mosul area)⁶.

In England, D J Barker et al. shows a positive correlation between high standard of living and renal stone⁷.

In Czechoslovakia the incidence of renal stones was higher in areas with a high standard of living⁸.

In USA emergency department, visits for kidney stone disease were more common among people living in rural areas than among people living in urban areas. In

large central metropolitan areas the kidney stone disease emergency department rate per 100,000 people was 351 per 100,000 people compared to 580 per 100,000 people in rural areas.

However, people from large central metropolitan and large fringe metropolitan areas had the highest admission rates from the emergency department (25%), while those from rural, micropolitan, and small metropolitan areas had the lowest admissions rates (14%)^{3,9,10}.

For pediatric age groups, David et al revealed a higher incidence of kidney stones in children living in rural communities in USA^{11,12}.

In a study from Thailand, Reungjui S et al shows there is increased incidence in people living in rural areas where magnesium deficiency is common (and this improved by supplementation with chelated magnesium)^{13,14}.

Conclusion

Urbanization may be a risk factor for kidney stone and this is significant for stone size between 1-2 centimeters.

Recommendations

Advices should be given to people living in large cities to reduce effects of urbanization as encouraging water intake especially during hot seasons.

People working in hot environment should take the same precautions, at the

same time there should be adequate time of rest during working hours.

Governorates should take in consideration the effect of heat island in large cities, and should encourage the increment of green areas in these cities.

Further researches should be done to study of additional factors, pollutants related to urban areas which might lead to increased risk of kidney stone formation.

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