# Seasonal Distribution of Renal Colic Visits to Emergency Department

## *Acil servis renal kolik başvurularının mevsimsel dağılımı*

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**SUMMARY**

**Objectives:** Acute renal colic is the clinical term for the symptoms produced by urinary tract calculi as they migrate from the kidney. Many researchers investigated the seasonal effects as a risk factor in urinary calculi formation. However, the results of these studies vary. The aim of this study is to determine whether renal colic visits to our emergency department, stated in a warm region of Turkey, exhibit seasonal patterns.

**Materials and Methods:** Patients who were considered to have renal colic and coded N20-23 according to ICD-10 codes, between January 1, 2001 and August 22, 2008 were enrolled into the study. Patient's age, gender and the visit dates in a monthly interval were recorded.

**Results:** There were 6786 renal colic patients during the study period. 57.9% were males and the mean age was 40.1±14.6 years (min 16, max 96). Significant seasonal variations were found in renal colic visits. Only 21.6% of all visits (1466 patients) were in winter, 23.3% (1582 patients) were in spring, 25.6% (1737 patients) were in autumn and 29.5% (2001 patients) were in summer (p=0.000). The post-hoc analysis revealed significant differences between all seasons except between winter and spring (p=0.036).

**Conclusion:** The present study revealed the effects of warm seasons on renal colic. Possible causes of this relation may be the relative dehydrated status of the patients. Informing the patients on the importance of adequate fluid intake may lower the incidence of renal colic visits.

**Key words:** Emergency department; renal colic; seasonal distribution.

***ÖZET***

***Giriş:*** *Akut renal kolik, üriner taşların böbrekten göç etmesiyle ortaya çıkan semptomları tanımlamak için kullanılan klinik bir terimdir. Üriner taş oluşumunda mevsimlerin etkisi birçok araştırmacı tarafından incelenmiştir. Ancak bu araştırmaların sonucu değişkenlik göstermektedir. Bu çalışmanın amacı, Türkiye Cumhuriyeti'nin sıcak bir bölgesinde bulunan Akdeniz Üniversitesi Acil Servisi'ne başvuran renal kolik hastalarının mevsimsel dağılım gösterip göstermediğinin araştırılmasıdır.*

***Gereç ve Yöntem:*** *01.01.2001 ile 22.08.2008 tarihleri arasında acil serviste renal kolik tanısı alan hastalar çalışmaya alındı. Çalışma hastalarını International Code of Disease-10 kodları (N20-23) kullanılarak ulaşıldı. Hastaların yaşı, cinsiyeti ve başvuru tarihleri kaydedildi.*

***Bulgular:*** *Çalışma süresince acil servise toplam 6786 renal kolik başvurusu saptandı. Çalışma hastalarının ortalama yaşı 40,1±14,6 (min 16, maks 96) ve %57,9'u erkekti. Renal kolik başvurularında mevsimlere göre anlamlı fark bulundu. Başvuruların %21,6'sı (1466 hasta) kış aylarında, %23,3'ü (1582 hasta) ilkbaharda, %25,6'sı (1737 hasta) sonbaharda ve %29,5'i (2001 hasta) ise yaz aylarında başvurmuştu (p=0,000). Post-hoc analizde kış ve ilkbahar (p=0,036) hariç tüm mevsimler arasında istatistiksel olarak anlamlı fark saptandı.*

***Sonuç:*** *Bu çalışma sıcak ayların renal kolik visitleri üzerindeki etkisini ortaya çıkarmıştır. Bunun nedeni göreceli bir dehidratasyon olabilir. Hastaları yeterli sıvı almaları konusunda uyarmak renal kolik başvurularını azaltabilir.*

***Anahtar sözcükler:*** *Acil servis; renal kolik; mevsimsel dağılım.*

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## Introduction

Nephrolithiasis, the presence of calculi in the kidney is a common chronic renal condition and a preventable cause of morbidity. Acute renal colic is the clinical term for the symptoms produced by urinary tract calculi as they migrate from the kidney. The migration of the calculus into the ureter can cause irritation, damage, smooth muscle spasm and partial or complete obstruction. Unilateral colicky pain typically starts in the flank area and progresses downward and anteriorly into the genital region as the stone moves down the ureter. The pain is often associated with nausea and vomiting and accompanied by urinary symptoms such as urgency, dysuria and gross or microscopic hematuria.

Several epidemiological and risk factors are known to be related with urinary calculi formation. Many researchers looked for seasonal effects as a risk factor in urinary calculi formation; several studies found seasonal variations[1-6] yet the others did not find any.[7-9]

The aim of this study was to determine whether the renal colic visits to emergency department (ED) exhibit seasonal patterns.

## Materials and Methods

We retrospectively searched the records of the patients presented with renal colic from Medi-Acil database program, including all emergency department visits from January 1, 2001 to August 22, 2008. Patients who were considered to have renal colic were coded as N20-N23 in the database, according to International Classification of Diseases 10th revision and Clinical Modification (ICD-10) codes (Table 1). All patients coded as renal colic were enrolled into the study. Patient's age, gender and the monthly frequencies of renal colic visits were recorded.

The renal colic visits were grouped by three-month periods. December, January and February were grouped as the coldest winter months. June, July and August were grouped as the warmest summer months. March, April and May were grouped as spring and September, October and November were grouped as autumn.

**Table 1.** *Renal colic codes according to ICD-10.*

| ICD-10 Codes | Explanation |
|---|---|
| N20 | Calculus of kidney and ureter |
| N21 | Calculus of lower urinary tract |
| N22 | Calculus of urinary tract in diseases classified elsewhere |
| N23 | Unspecified renal colic |

The Emergency Department of Akdeniz University Hospital was stated in Antalya, located in the southern Turkey, and mostly has a warm climate. Furthermore, the temperature measurements of Antalya between 1975 and 2008 were also obtained from Turkish state meteorological service.

The study data were analyzed in SPSS 16.0 for Windows. Continous variables were expresses as mean±standard deviation and frequent variables as rates. The comparison of three or more groups was performed by chi-square and Bonferroni correction was used for the post-hoc comparisons. All the hypothesis was constructed two tailed and an alpha critical value of 0.05 was accepted as significant.

## Results

A total of 300.965 patient visits were established during the study period and 6786 of them were diagnosed as renal colic. The mean age of the renal colic patients was 40.1±14.6 years (min 16, max 96). 57.9% (n=3929) of all patients were males and 42.1% (n=2857) were females.

Significant seasonal variations were found in renal colic visits. Only 21.6% of all visits (1466 patients) were in winter, 23.3% (1582 patients) were in spring, 25.6% (1737 patients) were in autumn and 29.5% (2001 patients) were in summer (p=0.000) (Fig. 1). The post-hoc analysis revealed significant differences between all seasons except between winter and spring (p=0.036). This was also correlated with the average temperatures of Antalya which was categorized

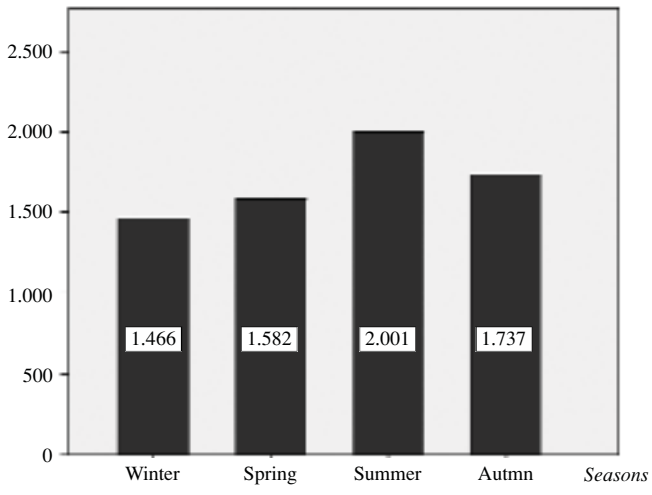


**Fig. 1.** *Prevalence of renal colic visits according to the seasons.*

**Table 2.** *Minimum, maximum and average temperatures (°C) measured in Antalya.*

| Antalya | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum temp. | 22.0 | 23.4 | 28.2 | 33.2 | 37.6 | 44.8 | 45.0 | 43.3 | 41.2 | 37.7 | 33.0 | 25.4 |
| Minimum temp. | -2.0 | -4.0 | -1.6 | 1.4 | 6.7 | 11.1 | 14.8 | 15.3 | 10.6 | 4.9 | 0.8 | -1.9 |
| Average temp. | 9.6 | 9.9 | 12.2 | 15.8 | 20.3 | 25.3 | 28.3 | 27.8 | 24.3 | 19.5 | 14.2 | 10.8 |

according to the seasons as 10.1 °C for winter, 16.1 °C for spring, 19.3 °C for autumn and 27.1 °C for summer (Table 2).

## Discussion

Renal colic visits in Akdeniz University Hospital Emergency Department have shown significant seasonal variations. These results confirm the past studies reported the increasing effect of the hot weather in renal colic visits. However, the results of the studies evaluated the effects of seasons on renal colic varies. Studies performed in Japan, Saudi Arabia, Iran and South Australia underlined an association between a higher incidence of renal colic and the hottest months of the year.[1-4] In a larger database, Chauhan et al. reported a clear seasonal variation of renal colic, with a 16% increased incidence in the warmer months.[5] Chen et al. also concluded that seasonal variations do exist in the monthly urinary calculi attack rates for all age and gender populations,[6] whereas, an analysis performed in Kuwait and one in Sweden showed no relation with seasonal variations.[7,8] In contrast, a Norwegian study established an association of renal colic with winter and autumn months.[10]

Several factors can be associated with these results. Initiation and growth of stones requires the crystal retention within the kidney and urine must be supersaturated for crystal formation. It was definitely shown that increasing fluid intake to at least 2 l/day is the initial therapy for the prevention of stone recurrence.[11] Inadequate water intake to compensate fluid loss; which increases by sweating and insensible route in hot summer days can precipitate the speeding up of stone formation and acute renal colic. In a previous study, Boscolo-Berto et al. found that the temperature rising above 27 °C and relative humidity falling below 45% are associated with a marked increase in renal colic.[12] The average temperatures of seasons in Antalya were also correlated with the frequencies of renal colic visits. Summer is the hottest season with an average temperature of 27 °C and autumn was the second with 19.3 °C. However we were not able to determine the relative humidity.

If calcium excretion increases while serum calcium is normal, it is named as 'idiopathic hypercalciuria' and vitamin D excess can cause idiopathic hypercalciuria. Increased renal colic incidence in summer may be a result of the relative D hypervitaminosis in sunny days.

Alterations in eating and drinking habits may also influence renal colic. Soft drinks and fruit juice can alter stone formations. Curhan et al. found that the risk of stone formation markedly increased by 35% for apple juice and 37% for grapefruit.[13] However alkalizing beverages such as citrus fruit juices have been found to be suitable for the prevention of calcium oxalate, uric acid and cystine stones.[14] In our region, citrus fruits are widely grown up in winter months that may be related to the lower incidences of renal colic and which may also be an interest of future works.

Renal colic incidence was higher in male patients in our study, as similar with the previous studies.[4,5]

The major limitation of our study is the retrospective design. Since the diagnosis of renal colic is based on the ICD-10 codes assigned at discharge from emergency department, we cannot be sure if the patients were truly renal colic because of the lack of any confirmative gold standard diagnostic modality. Another limitation of the study was that some of the patients visited our emergency department might be voyagers in Antalya and had been living in another city for the rest of the year. Since stone disease is a chronic condition, all seasonal effects cannot clearly defined by the onset of acute renal colic. Revisits were also not evaluated in this study. We only displayed the average temperatures, the effects of global warming was not considered.

## Conclusion

Seasonal variations may affect the incidence of renal colic. Seasons with high temperatures are related to increased renal colic visits as a result of relative dehydrated status. Informing the patients on the importance of adequate fluid intake may lower the incidence of renal colic visits.

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