

Fasting and Urinary Stones

Ali Shamsa*

Professor of Urology and Renal Transplantation, Mashhad University of Medical Sciences, Mashhad, Iran

Believers! Fasting has been written upon you as it was upon those before you to make you righteous (183). A few days (you should fast) and whosoever of you is ill or a traveler, (fast) some other days, and for those who fasting is exhausting (e.g. those with chronic diseases, aged men and women), they need to atone, and fasting is better for you if you know (184).
Baqarah verses 183-4.

ARTICLE INFO

Article type:
Review article

Article History:
Received: 05 Sep 2013
Revised: 26 Sep 2013
Accepted: 10 Oct 2013
Published: 25 Dec 2013

Keywords:
Fasting
Ramadan
Urinary stone

ABSTRACT

Introduction: Fasting is considered as one of the most important practices of Islam, and according to Prophet Mohammad, fasting is obligatory upon Muslims. The aim of this study is to evaluate the effects of fasting on urinary stones.

Method: Very few studies have been carried out on urinary stones and the effect of Ramadan fasting. The sources of the present study are Medline and articles presented by local and Muslim researchers. Meanwhile, since we are acquainted with three well-known researchers in the field of urology, we contacted them via email and asked for their professional opinions.

Results: The results of studies about the relationship of urinary stones and their incidence in Ramadan are not alike, and are even sometimes contradictory. Some believe that increased incidence of urinary stones in Ramadan is related not to fasting, but to the rise of weather temperature in hot months, and an increase in humidity.

Conclusion: Numerous biological and behavioral changes occur in people who fast in Ramadan and some researchers believe that urinary stone increases during this month.

► Please cite this paper as:

Shamsa A. Fasting and Urinary Stones. J Fasting Health. 2013; 1(2): 85-89.

Introduction

Urinary stone is the third most common urological disease. During Ramadan, patients with renal colic refer to hospitals every day. The prevalence of the disease during a person's lifetime is 1-15% (1). Some countries, located on "kidney stone belt", have high rates of urinary stones. This belt starts from Turkey, Iraq and Iran and expands to Afghanistan, Pakistan, India, Thailand and Australia.

Invention of Extracorporeal shock wave lithotripsy (ESWL) in 1980 by German Dornier Company, led by Christian Chozy and other physicists, the invention of percutaneous lithotripsy by John Vebeckam from England, and advances made by Alken from Germany in 1981,

and Ralph Coly Man in 1984, sparked a great revolution in the treatment of urinary stones.

With changes in people's lifestyles and adopting the western model, location of stone has moved from lower urinary tract to the upper pathways. The incidence of urinary stone is more frequent in populations residing in mountains, deserts, and tropical regions (2).

Every year during Ramadan, the Muslim adults are obliged to abstain from drinking, eating and sexual activities, from dawn until sunset; although, the barriers are removed from dusk until dawn. Ramadan is a lunar month, and since lunar months are 11 days shorter than other calendar months, Ramadan migrates

* Corresponding author: Ali Shamsa, Professor of Urology and Renal Transplantation, Mashhad University of Medical Sciences, Mashhad, Iran. E-mail: ShamsaA@mums.ac.ir

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throughout the seasons and in some cases is in long, hot months of summer. For instance, once every 33 years, Ramadan falls in the summer months.

Literature Review

In this section, I briefly review the results of previous studies on Ramadan and fasting. Miladipour and colleagues performed a study on 57 men with a history of urinary stones, and 20 men were chosen as the control group. Twenty-four-hour urine examples were collected before Ramadan and during Ramadan (on two occasions). Blood tests were performed including CBC, BUN, creatinine, sodium, potassium, glucose, calcium, phosphorus, alkaline phosphatase, parathyroid hormone, and uric acid.

Urine was measured by standard methods in terms of culture, volume, specific gravity, creatinine, phosphate, calcium, oxalate, citrate, sodium, potassium, magnesium, uric acid, PH (fresh urine), supersaturation of calcium oxalate and uric acid calcium phosphate (3).

Another study was conducted by Basir and his colleagues (4). They retrospectively studied 547 patients with ureteral colic who were admitted from March 2000 to March 2001, at two hospitals in the tropical city of Varamin, Iran. Among them, 398 patients (69.3%) were males and 176 (30.7%) were females, and the mean age was 36.4 ± 14 years old. The number of the patients who had colic was ascending in the warm months of June, July, August, and November. The number of patients in these months was 68 (11.8%), 65 (11.3%), 64 (11.1%) and 74 (12.9%), respectively. The lowest number of patients was admitted in February (25, 4.4%), January (27, 4.7%) and March (28, 4.9%).

The largest number of patients were admitted in the lunar month of Rabi al-Awwal (between April and May, with 69 patients, 4.8%). In Ramadan (between October and November) there were 27 males (62.8%) and 26 females (37.2%). The mean number of patients in the warm months was more than Ramadan ($P=0.001$).

In the study of Norouzy and colleagues in August and October of 2008, they prospectively evaluated the number of patients suffering from ureteral colic referring to urology department of Ghaem Hospital, one of Mashhad teaching

hospitals. They analyzed the referrals two weeks before, and two weeks after Ramadan. Also, the first two weeks and the last two weeks of Ramadan were evaluated (5).

The number of referred patients was 610, among whom, 441 (72.3%) were males and 169 (27.7%) were females. The number of referred patients was more in the first two weeks of Ramadan compared with the other weeks ($P<0.05$). The diagnosis of disease was based on the symptoms, and weather temperature was measured every day. Temperature of about 27°C and humidity less than 45% increases the incidence of colic (5).

Another interesting study was the study of Mohammed Salim Alhadrami from the Hospital of Soltan Abdulaziz in Jeddah (6). He evaluated the referred patients to the emergency department of this university hospital during three consecutive years, from 1992 to 1994, and counted the cases with symptoms of ureteral colic in the month before Ramadan, during Ramadan and the month after Ramadan. Emergency doctors using Dipstick and KUB tests diagnosed the disease.

A significant correlation was found between the mean number of patients, outdoor temperature and atmospheric pressure ($P<0.001$). No significant relationship was observed between the number of patients with colic and the relative humidity. The maximum number of patients was in summer months (June to August), the minimum number was observed in winter months, and the lowest number was in March, which is prior to two coldest months of the year.

Gumma and colleagues in 1978 at Biochemistry and Physiology Department of Medical University of Khartoum conducted a study about the concentration of uric acid and serum lipids in Ramadan (7). They believe that the incidence of urinary stone and kidney angina significantly increases in Ramadan, especially if coinciding with hot dry summer months (Sudan).

Their study was performed on 16 healthy male volunteer students, who were 20-22 years old.

Patient's blood sample was taken three times per day (at 6 a.m., at 6 p.m. before breaking the fast, and at 7 p.m. after it), and was measured in terms of cholesterol, phospholipids, triglycerides, total lipid and 3-hydroxy-butylate

levels.

This study showed that intermittent fasting and breaking the fast are associated with increased uric acid and triglycerides. The increase is positively correlated with time of the test at all three times (6 a.m., 6 p.m., and 7 p.m.).

P-value was <0.50 for triglycerides after breaking the fast, and <0.010 for serum uric acid at all three times, for triglycerides at the first and second times, and for total lipid at the first time. It is estimated that increased serum uric acid is due to purine increase coinciding with breaking the fast or RNA (ribonucleic acid) breaking in the tissues during fasting. They believe that the simultaneous increase of serum uric acid with oliguria caused by dehydration may underlie the uric acid crystal formation in the urinary system and cause dysuria and colic attacks in fasting months.

Salem Qureshi and colleagues in 2012, during the month of Ramadan, which was the warmest time of the year (August) in Saudi Arabia, performed a prospective study on 43 fasting patients with renal transplant, and 37 non-fasting patients with renal transplant with glomerular filtration rate (GFR). This study concluded, "Fasting during Ramadan has no negative effects on the activity of transplanted kidney" (8).

Mustafa and colleagues from Sudan University of Khartoum performed a study on 16 healthy volunteer students who were 20-22 years old. This study aimed to investigate the effects of fasting in Ramadan on fluids and electrolyte balance (7). Volunteers' urine samples were collected one day before Ramadan, during weeks 1 to 5, and 10 days after Ramadan, and then they were tested. Also, fluid intake, urine volume and perspired water were measured. All the patients were complicated by negative fluid balance, which reached its peak in the first three weeks of fasting, but this loss was compensated for in the next weeks.

However, these researchers concluded that young healthy cases had good control of water and electrolytes during Ramadan, but it should be noted that this investigation was carried out in Sudan, where the prevalence of urinary stone is high. Therefore, the high concentration of urine that occurs during fasting time, and the

increase in serum uric acid, which was shown by the same study, are jointly involved in the formation of crystals, and eventually lead to urinary stones.

Temperature at the time of the mentioned study was $32 \pm 1.7^\circ\text{C}$, though it could reach 40°C , and the situation would deteriorate.

Discussion

Urolithiasis has been a well-known condition for a long time. Three common surgeries before the birth of Jesus (AS) included circumcision, piercing the skull and bladder stone.

The oath of Hippocrates has said, "Do not operate on bladder stones and leave it to its people." The first bladder stone presented at the English surgery museum belonged to a young 16-year-old Egyptian who lived in 4800 BC, in a region called 'Almra'.

In February 1980 in Germany (Western Germany), kidney stone of a human was broken without a surgery using shock waves and it fell out of his body. Invention of lithotripsy machines caused a revolution in the treatment of urinary stones.

Despite the antiquity of related research, and the ongoing advancements, the first cause of urinary stones is still unclear. Apart from congenital diseases and metabolites, super-saturated state and epitaxy (deposition of a substance on the basic core of other substance) are the accepted and known hypotheses (2).

Time duration of urine passing from the nephrons is approximately 5-7 minutes. In a normal status, crystals do not grow with such a rate to block the renal tubular lumen. However, if the basic core becomes stone-made and grows, the crystals become concrete within few minutes and block the lumen. There are stone inhibitors in the urine such as citrate, magnesium, nephrocalcin, Thamm-Horsfall and Bikunin that prevent the adhesion, and in some cases stop the growth of crystals (1).

Environment temperature, atmospheric pressure, and sunlight are important factors in causing stone, but among these factors, the most significant one is the environment temperature (1).

One study found that American soldiers, who had gone to desert regions, had an increase

in their symptomatic colic attacks during summer months (1).

Alhadramy's study confirms an inverse relationship between atmospheric pressure and ureteral colic, but unlike others does not confirm the effect of humidity on stone formation. In addition, he has suggested that increased colic caused by stones in the month of Ramadan is due to increased temperature. He quoted Guimibiet and colleagues that the changes observed in the urine during Ramadan disappear within ten days after this month.

The study of Gumma and colleagues about the increase of ureteral colic during Ramadan is more comprehensive than other studies, but it has two major defects; small number of volunteers, and not testing the substances that have positive or negative influences on causing stones such as calcium, phosphorus, blood and urine uric acid.

The study of Norouzy and colleagues confirms the increased ureteral colic in the first two weeks of Ramadan and suggests that it is due to changes in eating habits; although, it does not mention an alternative explanation.

Moreover, they report that other causes of increased ureteral colic are high weather temperature, more than 27°C, and humidity less than 45%, but he does not mention the temperature and humidity at the time of the study.

The strength of this study is the large number of colic cases referring in Ramadan of 2008 (between August and October) to emergency departments of two biggest academic hospitals of Mashhad, Ghaem and Imam Reza hospitals. Its weakness is the clinical diagnosis of ureteral colic without any tests or imaging.

Basiri and colleagues believe that the number of patients admitted due to stones in Ramadan is not considerably higher than other months of the year, and the number of patients in Ramadan was not more than warm months of the same year.

We are not sure whether all colic patients were admitted in this month. However, we know that stones less than two millimeters in diameter will pass without causing colic. Emil Tanagho, editor, scientist, and Egyptian-born researcher living in America, is in agreement with the increase of stones in

Ramadan. He believes that stone formation and stone expulsion (due to dehydration) both increase during Ramadan (Personal communication).

In January of 1994 in Casablanca, Morocco, at the First International Congress on Health and Ramadan (Health & Ramadan), scholars of Islamic and non-Islamic countries presented 50 articles about Ramadan, and they concluded that individuals with high rates of stone formation should avoid fasting due to high incidence of stone in Ramadan (9).

The interesting study of Miladipour and colleagues failed to offer sufficient evidence for an increase of ureteral colic in Ramadan. They also attribute the increased urinary stones to hot months of the year rather than Ramadan month.

Egyptian Abdul-Rahim's study about urinary stone and fasting is also interesting. He presented his research in the First International Congress on Health and Fasting in Casablanca, and believed that fasting has a protective effect against urinary stones, and even those with urinary stone or urinary tract infection can fast. Although, fasting has a detrimental effect on pregnancy, and pregnant women should avoid fasting (9).

These contradictory opinions about the relationship between urinary stones and Ramadan may be due to "fasting" in non-Islamic countries, which is different from Islamic practice. In Ramadan fasting, only one meal is removed from the daily diet and a fasting person is allowed to eat and drink from sunset until dawn.

Due to lack of enough experience and the problems of volunteering (i.e. fasting, daily testing of urine, serum, etc.), we may think of Ralph Clayman's suggestion as a reasonable solution, and make a more definite decision by testing it.

Acknowledgement

We are thankful to Mrs. Maryam Saleh Haeri, expert at Library and Information Science of Medicine in Mashhad University of Medical Sciences, who assisted me with finding the articles.

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