

ORIGINAL RESEARCH

Evaluating the prevalence of nephrolithiasis in kidney transplant recipients admitted to Imam Khomeini Hospital in Urmia in 2018-2019

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Abstract: **Introduction:** Nephrolithiasis is almost common urological disease in the world that involves near 10 percent of adult population. Several researches are demonstrative of increasing prevalence and incidence of nephrolithiasis in industrial societies, because of changing the life style, food regimen and obesity that is very common. Though prevalence of nephrolithiasis in grafted kidney is rare, but because of importance of effects after grafting or graft rejection is needed to attention and study.

Methods: In this research incidence of nephrolithiasis and the difference of it before and after the kidney transplantation in graft receiver of kidney in Urmia Imam Khomeini hospital for two years in 2018-2019 has studied, and followed after one year. Relation between age, education level, and sex have been evaluated too.

Results: In this study 32 receiver of kidney transplant have been studied. Among this 32 patient 3 cases had nephrolithiasis after transplantation that they didn't have any history of nephrolithiasis, And 3 cases had history of nephrolithiasis that after transplantation no kidney stone was seen ($P < 0.05$). Higher prevalence of nephrolithiasis was significantly related to higher level of education ($p < 0.05$), but age and sex was not significantly different in two groups ($P > 0.05$).

Conclusions: It's concluded that the main reason of nephrolithiasis is the kidney organ that can make stone in the new body, and level of education was higher in the nephrolithiasis group (affected or have the history) than the healthy group.

Keywords: Nephrolithiasis, Kidney transplantation, Effect

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1. Introduction

Nephrolithiasis have been known since ancient times. The prevalence of urinary system stones is estimated at 2 to 15%. Nephrolithiasis is a common clinical disorder and its prevalence is influenced by lifestyle changes, geographical changes, race and ethnicity and many other factors (1). The prevalence of nephrolithiasis is reported to be 1 to 5% in different places, which is estimated to be 2 to 3% in developed countries and 0.5 to 1% in developing countries (2).

Also, studies show that 8 to 15% of people in America and Europe get nephrolithiasis during their lifetime. Studies in white men show that at the age of 70, 1 out of every 8 people have this disease (3). The common age of this disease is the third and fourth decades of life, and men are affected 3 to 5 times more often than women. 50% of patients have recurrence of urinary stones within 5 years after treatment. Therefore, urinary stones have a high prevalence, recurrence, destructive and harmful to human resources (4). In Iran, the average stone recurrence is 16% after one year, 33% after five years and 53% after ten years (5). Recurrence of nephrolithiasis not only causes pain and anxiety in affected people, but also imposes a significant economic burden related to the loss of daily work and health care costs (6). Environmental and genetic factors, including polymorphisms, affect the oc-

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currence of nephrolithiasis (7). Nowadays, there is important evidence that single nucleotide polymorphism (SNP) is related to nephrolithiasis (6). The incidence of nephrolithiasis is increasing, its morbidity is such that the stone is usually a lifelong problem for the patient, which requires preventive treatments. The treatment of choice is a change in lifestyle and diet. Drug treatment is recommended if lifestyle changes do not work (1). The increase in the incidence of nephrolithiasis is due to changes in lifestyle, diet and obesity, which is very common (2), can manifest with symptoms of severe and acute one-sided flank pain and nausea with or without vomiting and hematuria (4). Disturbance in the regulation of minerals along with local inflammation in the kidney can cause nephrolithiasis (5). Modifiable risk factors include diet, fluid intake, occupation, environmental factors, number of pregnancies, and intestinal microbiome, as well as non-modifiable risk factors include gender, race, positive family background, as well as genetic defects and Calcium and phosphate polymorphisms are important in the follow-up of patients (6). Conservative treatment includes pain control, drug treatment for stone removal with alpha blocker and follow-up to two weeks to check the location of the stone and evaluate hydronephrosis (7). Kidney transplant is a preferred treatment for end-stage kidney disease, in such a way that patients who receive a transplant are freed from dialysis and their quality and quantity of life improves (8). Allograft lithiasis is a recognized but rare complication of renal transplantation, with a reported incidence ranging between 0.2 and 6.3 % [3–5]. Despite its rarity, allograft nephrolithiasis can result in significant morbidity, leading to acute deterioration in renal function if obstruction occurs. The immunosuppressed state, the extra-anatomic location of the transplanted kidney and renal denervation can make the diagnosis and management of allograft kidney calculus challenging, and there is little empiric evidence to inform management decisions (9). Until recently, donors with a history of nephrolithiasis or stones seen in screening were not accepted as suitable donors. But recent guidelines have provided less strict criteria for donors with nephrolithiasis potential (10). Considering that nephrolithiasis disease has a genetic origin, therefore, in this study, its occurrence in a new kidney in a person with a history of stones was investigated, as well as its frequency and the distribution of age and sex in these patients.

2. Methods

This descriptive cross-sectional study have been done after the approval of the project in the proposal review council at the hospital and university kidney and transplant research center and the university ethics committee with the aim of investigating the prevalence of nephrolithiasis in kidney transplant recipients (before and after kidney transplant)

admitted to Imam Hospital Khomeini Hospital of Urmia in 2018-2019, and during this study, with cochrane formula the sample size estimated was 30, so we retrospectively reviewed the records of a consecutive series of 32 patients who had undergone renal transplantation at Imam Khomeini Hospital of Urmia in 2018-2019, who were admitted to donate and receive kidney transplants.

Patient characteristics including age, gender, education level, history of nephrolithiasis disease before transplantation in kidney transplant recipients, history of nephrolithiasis disease in kidney donors, history of nephrolithiasis disease in the family of patients admitted to donate and receive kidney transplant, results Urinalysis, patient outcomes (mortality, discharge, rejection of kidney transplant) were extracted from the patient files located in the medical records unit of the hospital and entered into the checklist, and further information was obtained by telephone calls to the patients in March 2020 for evaluating the outcome of patients in that time after about one year. The data was received and finally analyzed after the completion of the study. SPSS17 and EXCELL statistical software and independent t-test, Mann-Whitney, chi-square, and McNemar tests were performed for this purpose.

3. Results

All patients who admitted to Imam Khomeini Hospital in Urmia from 2018 to 2019 who underwent kidney transplantation due to End Stage Renal Disease (ESRD) and were transplant recipients were included in the study. During this period, 32 kidney transplants were successfully performed. It was done that all of them were checked. In this study, 32 patients who received a kidney transplant in 2018 - 2019 were included in the study. Out of these 32 patients, 18 were men (56%) and 14 were women (44%), and the data analysis with chi-square test showed $P > 0.05$ that demonstrated the prevalence of nephrolithiasis in two sexes was not different significantly. The average age in this study was 34.39 years with a standard deviation of 49.13. In this study, the youngest patient was 14 years old and the oldest patient was 66 years old. In this study, 6 people were illiterate (18.75%), 8 people were elementary literate (25%), 8 people were middle school literate (25%), 4 people had a high school diploma (12.5%), and 6 people had a post-graduate degree (18.75%). Among the patients, 29 people (90.63%) had no history of urinary stones until the kidney transplant surgery, and 3 people (9.38%) had a history of urinary stones, one of them was found to have nephrolithiasis during ultrasound during hospitalization. None of them had recurrence of nephrolithiasis after surgery. Among the kidney transplant recipients, three cases of nephrolithiasis in the transplanted kidney were reported after the transplant, one case a year after the transplant, one

case two years after the transplant, and one case five years after the transplant, who had no history of nephrolithiasis. Among the studied patients, 6 people had nephrolithiasis, three of them had nephrolithiasis before transplantation and the other three had them after transplantation. The average age of the people who had nephrolithiasis was 33.5 years and the standard deviation was 5.72 and the average age of people who had no history of infection was 40.69 years and the standard deviation was 2.6. Considering that 3 of the patients had nephrolithiasis before the transplant and the other three patients developed nephrolithiasis after the transplant. In total, 6 patients were considered in whom nephrolithiasis changed after surgery, they were formed in three patients and disappeared in the other three patients. The data were analyzed using McNemar test in SPSS software, and was analyzed and according to $P=0.041$, it can be concluded that after kidney transplant surgery, the prevalence of nephrolithiasis changes significantly and the occurrence of nephrolithiasis is related to the kidney organ itself. According to the independent t-test to compare the average age between the two groups with a history of nephrolithiasis and the healthy group, according to $P>0.05$, there is no significant difference in the average age of the two groups. In order to test and compare education level in patients and healthy people, a score was considered for each educational qualification, which was illiteracy equivalent to grade 1, elementary literacy equivalent to grade 2, middle school literacy equivalent to grade 3, high school diploma equivalent to grade 4 and post-graduate degree equivalent to grade 5. Mann-Whitney test was used to investigate the effect of education on the incidence of nephrolithiasis. According to the above scoring, the average of the affected group is 4 and the standard deviation is 0.89, and the average of the healthy group is 2.62 and the standard deviation is 1.35, which according to $P=0.23$, there is a significant difference between the scores and the educational qualification is higher in the affected group, which requires more research with a higher statistical population.

4. Discussion

Nephrolithiasis are one of the most common metabolic disorders and urological problems, which have a prevalence of about 7% in the adult population. The incidence of stones within 10 years is more than 30%. The incidence of nephrolithiasis is increasing, especially in industrialized countries, and it is estimated that its global prevalence is between 10 and 15% of the population. Approximately 13% of men and 7% of women will develop nephrolithiasis during their lifetime. Several studies have shown that stone recurrence is less when Glomerular Filtration Rate (GFR) decreases. Glomerular filtration rate (GFR) represents the flow of plasma from the glomerulus into Bowman's space over a

specified period and is the chief measure of kidney function (11). Therefore, patients with Chronic Kidney Disease (CKD) and ESRD are less likely to develop nephrolithiasis. The definition and classification of chronic kidney disease (CKD) have evolved over time, but current international guidelines define this condition as decreased kidney function shown by glomerular filtration rate (GFR) of less than 60 mL/min per 1.73 m², or markers of kidney damage, or both, of at least 3 months duration, regardless of the underlying cause (12), and End-stage renal disease is defined as a GFR of less than 15 mL/min (13). Reports show that the rate of stone formation in ESRD patients is less than one percent. After the successful transplantation of ESRD patients, with the improvement of kidney function, the increase in the excretion of metabolites from the urine increases the stone formation. Studies show that the occurrence of stones in allografts It is one of the most serious problems of transplant recipients. The prevalence of stones among transplant recipients is 0.2 to 4.4% and in meta-analysis it is 1%. Unlike the normal population, the occurrence and characteristics of stones in transplant recipients have been less studied. As mentioned, 32 patients who were admitted to Imam Khomeini Hospital in Urmia and underwent kidney transplant in 2018-2019 were included in this study. In a similar study it is said that the prevalence of nephrolithiasis in transplanted kidneys is rare, which is not consistent with our study, because in this study, the prevalence of nephrolithiasis in transplanted kidneys is. Despite being the same as the prevalence in non-transplanted kidney, it is high (14). In this study, it was found that due to the presence of nephrolithiasis after transplantation in people who did not have a history of nephrolithiasis and the recovery of nephrolithiasis in people who had a history of nephrolithiasis, the occurrence of nephrolithiasis is probably related to the kidney organ and the stone-forming kidney in the recipient individuals can also cause stones. This is consistent with another study, in which nephrolithiasis were observed on the same side in kidney transplant recipients who had no history of stones (15). Also, in a study, there was a correlation that 8.1% of patients after transplantation who had no history of nephrolithiasis had nephrolithiasis in the transplanted kidney that is consisted with the present study (13). In other study, it was determined that the incidence of transplanted nephrolithiasis is 1%, while in our study this rate was 9%, which is not consistent with this study. Also, the average The age of kidney transplant recipients with nephrolithiasis was 42 years (standard deviation 7), which in our study was 29 years and standard deviation 2.4, which is not consistent with this study (14).



5. Conclusion

In this study, the prevalence of nephrolithiasis before and after transplantation was significant and high, and it was found that the occurrence of nephrolithiasis is probably related to the kidney organ, and in another person's body, the nephrolithiasis can cause stones. Also, the level of education among People who had nephrolithiasis or had a history of nephrolithiasis were higher than the healthy group, and age and sex has no effect on the occurrence of nephrolithiasis.

According to the findings of this study, it seems that the examination of more samples along with the examination of other factors will lead to confirmation or new results, which can help in the prevention and early diagnosis of the disease and the reduction of morbidity in patients.

6. Appendix

6.1. Acknowledgment

The researchers wish to thank all the individuals who participated in the study.

6.2. Conflict of interest

All the authors declare that they have no conflict of interest.

6.3. Funding support

Self-funding.

6.4. Author's contributions

All the authors have the same contribution.

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