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Demographic Characteristics Associated with Bilateral Renal Lithiasis

Daniel García Flores[1], José Armando Pérez Espinoza[2]

[1]Universidad Autónoma de Guadalajara

[2]Instituto Mexicano del Seguro Social

ABSTRACT

Bilateral renal lithiasis, characterized by the presence of kidney stones in both kidneys, poses significant clinical challenges. This condition is associated with a higher risk of chronic kidney disease (CKD), kidney tubular injury, metabolic disorders, and diminished health-related quality of life (HRQoL). Patients with bilateral stones experience more frequent stone events, a younger age of onset, and a higher prevalence of metabolic abnormalities such as elevated blood pressure and serum glucose. Demographic factors, including socioeconomic status, race, age, and gender, further influence the impact of this condition, with nonwhite ethnicities and lower-income groups reporting worse HRQoL. Untreated bilateral renal lithiasis significantly increases the risk of CKD progression, while advanced surgical approaches like bilateral synchronous percutaneous nephrolithotomy offer effective and safe management options. Addressing this condition requires a multifaceted approach that considers both medical interventions and social determinants of health.

KEYWORDS: Bilateral renal litiasis, Chronic kidney disease (CKD), Kidney tubular injury

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INTRODUCTION

Bilateral renal lithiasis refers to the presence of kidney stones in both kidneys. This condition can have significant clinical implications, as it is associated with a higher risk of chronic kidney disease (CKD) and kidney tubular injury compared to unilateral stone disease. Studies have shown that individuals with bilateral renal stones are more likely to experience metabolic disorders, such as elevated blood pressure and serum glucose, which can contribute to the progression of kidney disease.[1] Additionally, patients with bilateral stones tend to have a higher number of stone events and a younger age of onset for kidney stone disease, which can negatively impact their health-related quality of life (HRQOL).[2]

Management of bilateral renal lithiasis may involve surgical interventions, such as simultaneous bilateral endoscopic surgery or bilateral synchronous percutaneous nephrolithotomy, which have been shown to be effective and safe in achieving high stone-free rates with minimal morbidity.[3-4] It is crucial for clinicians to monitor and address the metabolic and renal implications of bilateral renal lithiasis to prevent further complications and preserve kidney function.

Complications

Untreated bilateral renal lithiasis can lead to several complications, impacting chronic kidney disease (CKD), kidney tubular injury, metabolic disorders, and health-related quality of life (HRQOL).

1. **Chronic Kidney Disease and Kidney Tubular Injury**: Bilateral renal stones are significantly associated with an increased risk of CKD. Fan et al. (2022) demonstrated that individuals with bilateral renal stones have a higher prevalence of CKD compared to those with unilateral stones or no stones, with an odds ratio (OR) of 3.18 for CKD. Additionally, markers of kidney tubular injury, such as urine N-acetyl-ß-D-glucosaminidase (NAG) and alpha-1-microglobulin (α1-MG), are elevated in patients with bilateral stones, indicating significant tubular damage.[1]

2. **Metabolic Disorders**: The presence of bilateral renal stones is associated with a higher prevalence of metabolic disorders, including elevated blood pressure and serum glucose levels, which are risk factors for CKD progression. These metabolic abnormalities may exacerbate kidney damage and contribute to the development of CKD.[1]

3. **Health-Related Quality of Life**: Bilateral renal lithiasis negatively impacts HRQOL. Raizenne et al. (2023) found that patients with bilateral stones experience a greater number of stone events and have a younger age of onset for kidney stone

disease, which correlates with a significant reduction in HRQOL scores. The increased frequency of stone events and associated symptoms, such as pain and anxiety, contribute to this diminished quality of life.[2]

Overall, untreated bilateral renal lithiasis poses a substantial risk for CKD, kidney tubular injury, and metabolic complications, while also significantly impairing patients' quality of life. These findings underscore the importance of early detection and management of bilateral renal stones to mitigate these adverse outcomes.

Demographic characteristics

Bilateral renal lithiasis, particularly when associated with chronic kidney disease (CKD), metabolic disorders, and reduced health-related quality of life (HRQoL), tends to affect certain demographic groups more significantly. The medical literature highlights several key demographic factors:

1. **Socioeconomic Status and Race**: Lower income and nonwhite race are strongly associated with worse HRQoL in patients with nephrolithiasis. These socioeconomic factors are significant predictors of reduced quality of life, independent of clinical characteristics.[5]
2. **Age and Gender**: Younger patients and females with kidney stones generally report lower HRQoL compared to older and male patients. This suggests that age and gender are important demographic factors influencing the impact of kidney stones on quality of life.[6-7]
3. **Ethnicity**: Ethnic differences also play a role, with non-Caucasian patients experiencing lower HRQoL compared to Caucasian patients. Additionally, specific ethnic groups, such as Hispanic/Latinx individuals, may experience disparities in HRQoL, potentially driven by socioeconomic factors like insurance type rather than clinical differences.[6][8]
4. **Comorbidities and Clinical Factors**: Patients with bilateral stones often have a higher prevalence of comorbid conditions such as depression, anxiety, renal tubular acidosis, and rheumatoid arthritis, which can exacerbate the impact on HRQoL. These patients also tend to have a younger age of onset and a higher frequency of stone events, further contributing to reduced quality of life.[2]
5. **Cardiovascular Risk Factors**: The presence of cardiovascular risk factors, including diabetes and hypertension, is associated with reduced renal function in stone formers, which can complicate the clinical picture and affect quality of life.[9]

These demographic and clinical factors highlight the complex interplay between socioeconomic, racial, and health-related variables in the context of bilateral renal lithiasis and its complications. Addressing these disparities requires a multifaceted approach that considers both medical and social determinants of health.

Conclusion

Bilateral renal lithiasis represents a significant clinical condition due to its association with chronic kidney disease (CKD), kidney tubular injury, metabolic disorders, and reduced health-related quality of life (HRQoL). The condition's complexities are influenced by demographic, socioeconomic, and clinical factors, with certain populations, including younger patients, females, and individuals of nonwhite ethnicities, experiencing greater impacts. Untreated, bilateral stones pose a high risk of progressing to CKD and substantially diminishing quality of life through increased stone events, metabolic abnormalities, and associated comorbidities.

Management strategies, including advanced surgical interventions such as simultaneous bilateral endoscopic procedures or synchronous percutaneous nephrolithotomy, offer effective approaches for achieving high stone-free rates with minimal morbidity. However, the presence of cardiovascular risk factors and disparities in socioeconomic and ethnic groups underscores the need for comprehensive care that addresses both medical and social determinants of health.

Ultimately, early detection, tailored interventions, and proactive management are essential to mitigate the adverse outcomes of bilateral renal lithiasis and improve patient outcomes.

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