

## DIFFICULTIES IN IMPLEMENTING THE DIETARY REGIMEN IN OBESE LITHIASIC PATIENTS

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DIFFICULTIES IN IMPLEMENTING THE DIETARY REGIMEN IN OBESE LITHIASIC PATIENTS (Abstract): Obesity and kidney stones are two related diseases. We initiated a program that involved monitoring patients who had an episode of urinary lithiasis in the past three months and providing a personalized diet regimen adapted to the type of kidney stone. **Material and methods:** Of the 687 patients diagnosed with urinary lithiasis and obesity between January 2021 and February 2023, only 243 accepted a first evaluation. We enrolled 115 females and 128 males, aged between 32 and 74 years, with a mean age of 54.51 (SD+/- 11.13). **Results:** Of the 243 patients who accepted the first evaluation, 49.79% (n=121) followed the recommended plan, which included a diet, drinking at least 2.5 liters of water daily, and frequent measurement of urinary pH. Of these, 34.97% (n=85) patients measured their urinary pH twice daily, while 10.69% (n=26) measured it only once in the morning. It is important to note that every patient who adhered to the dietary and urological recommendations was able to sustain an average weight reduction rate of roughly 1 kg/week. Additionally, body weight and urine pH were negatively related, with larger body weights corresponding to lower pH readings. A bodyweight surplus of less than 30 kg had no impact on lipid constants, but over this amount, the average went over the upper limit. Working with obese urolithiasis patients might be difficult, but it's essential to get results. **Conclusions:** However, patients who adhered to the guidelines and the weight reduction program had positive outcomes, which encouraged us to stick with this strategy. Additionally, we discovered that no patient gained weight again throughout a time spanning from 4 months to 2 years while under intensive surveillance and counseling. This proves that our weight loss plan is successful and long-lasting. **Keywords:** KIDNEY STONES, OBESITY, WEIGHT LOSS, DIET.

Obesity is a complex multifactorial disease, defined as an abnormal or excessive accumulation of adipose tissue that causes a major health risk (1). It represents a seri-

ous global problem because it significantly increases morbidity and mortality due to the physio-pathological and metabolic implications for cardiovascular, pulmonary,

rheumatological, and oncological conditions but also due to mental health impairment (2, 3).

Approximately 39% of adults worldwide are overweight, of which 13% are obese. (4). In the European Union, 52.7% of adults are overweight, of which 16.5% are obese. Comparatively, in Romania, the data show that approximately 58.7% are overweight, of which 10.9% are obese (4).

On the other hand, urinary lithiasis is a common multifactorial disease in the general population, with a global incidence of approximately 10-11% (5). Different studies indicate that obesity increases the risk of developing and recurrence of urinary stones, with a significant association between BMI, abdominal circumference, and the risk of kidney stones, both for adult and young populations (6, 7). The relationship between obesity and lithiasis is complex and can be explained by multiple mechanisms. People with obesity are prone to excrete higher calcium and uric acid concentrations.

Trying a multidisciplinary approach to the complex problem of binom obesity - lithiasis, we encountered numerous difficulties that we tried to overcome. We aimed to evaluate the compliance of obese lithiasic patients to the lifestyle changes program

### MATERIAL AND METHODS

We initiated at the Urology Clinic of "Dr. C.I. Parhon" Clinical Hospital in Iasi a Program for Evaluating and Monitoring Lithiasic Patients with Obesity (PEMLPO) The inclusion criteria include patients under 75 years of age with BMI>24.99 and diagnosed with at least one episode of urinary lithiasis. The program involved monitoring patients who had an episode of uri-

nary lithiasis in the past three months and providing a personalized diet regimen adapted to the type of kidney stone.

Patients were excluded from the program if they were uncooperative, non-compliant, refused to be included, had various forms of dementia/oligophrenia, were pregnant, had associated tumor pathology, or opted for specialized nutritional and medical counseling in another medical center.

Patients were clinically and anthropometrically evaluated at the initial examination, laboratory tests were performed, renal and vesical ultrasound was performed, and a KUB was performed if necessary. After analyzing the dietary pattern and macro- and micronutrient requirements, a personalized diet was developed based on the body's needs, offering foods with low concentrations of oxalates/urates or that reduce the inflammatory syndrome.

Based on the medical history and interpretation of paraclinical results, other diseases associated with urinary lithiasis were identified (endometrial neoplasm, ovarian neoplasm, hypertension, diabetes, dyslipidemia, irritable bowel syndrome), and patients were referred to specialized medical consultations.

Patients received written recommendations regarding dietary restrictions and conduct specific to the type of stone, paraclinical data results, and a personalized nutritional plan for 7-14 days. The nutritional plans were calculated and verified based on the ideal weight according to the modified Lorentz formula for age.

The nutritional plans were developed in a specialized program that respected the proportions of macronutrients (protein 15-20%, fat 25-30%, carbohydrates 50-55%) and the requirement of micronutrients (vit-

amins and minerals), as well as the requirement for water and physical exercise (ideally outdoors). Patients were asked to send pictures of their three main meals and two daily snacks and additional information about blood pressure, blood glucose, urinary pH, and regular body weight measurements to a dietitian. After the first two weeks of the nutritional plan, each patient received a personalized physical exercise program based on age and sex. To ensure adequate monitoring, patients were regularly re-evaluated, and nutritional plans were adjusted based on the new measurements.

## RESULTS

Between January 2021 and February 2023, we identified 687 patients diagnosed with urinary lithiasis and obesity who were invited to be included in PELO. Out of these patients, 223 accepted a first evaluation. At the same time, 444 declined the invitation due to reasons such as a lack of interest in losing weight, not considering obesity as a disease, not wanting to follow a dietary program, not having the time and desire to be monitored for a long period, living far away from Iasi, or residing in rural areas.

We enrolled 105 females and 118 males, aged between 32 and 74 years, with a mean age of 54.51 (SD $\pm$  11.13). Of the 223 patients who accepted the first evaluation, 49.77% (n=111) followed the recommended plan, which included a diet, drinking at least 2.5 liters of water daily, and frequent measurement of urinary pH. Of these, 76.57% (n=85) patients measured their urinary pH twice daily, while 23.42% (n=26) measured it only once in the morning. Additionally, 39 patients followed only the dietary plan and frequently communi-

cated with the nutritionist through phone or messages. At the same time, 17.11% (n=19) monitored their urinary pH carefully but did not adhere to the recommended dietary plan and consumed between 2-2.5 liters of water daily.

On the other hand, 54 patients only came for the first evaluation. They withdrew from the program later, citing lack of time, demanding work schedules, or difficulty following a balanced diet. The majority of patients had a surplus body weight of over 20 kg and were between 31-70 years old, with the highest number of patients aged between 51-60 years old.

Regarding comorbidities, out of the 223 enrolled patients, 41 (18.39%) were diagnosed with type 2 diabetes. At the same time, nine were found to have altered basal glycemia during the initial paraclinical evaluation, and five were put on Metformin treatment. Out of the 41 patients with diabetes, 29 collaborated with the program. Furthermore, 49 patients were diagnosed with hypertension for which they received medical treatment, 46 had dyslipidemia, and 68 had hyperuricemia.

During the initial evaluation, several comorbidities were discovered, such as one case of endometrial cancer, one case of ovarian cancer, four cases of irritable bowel syndrome, and seven cases of hypertension. Five patients were diagnosed with type 2 diabetes and referred to a specialist for further consultation.

Regarding the evolution of known comorbidities, 11 patients under oral anti-diabetic treatment and following dietary recommendations normalized their glycaemic values, while five patients reduced their medication doses under direct supervision from their diabetologist. Of the 49 hypertensive patients, 23 were able to re-

duce their medication doses under cardiologist supervision as their blood pressure values improved with weight loss. Among the 46 patients with dyslipidemia, 28 stopped taking their lipid-lowering medication under medical supervision as their values improved, while 9 reduced their medication doses. Moreover, out of the 68 patients with hyperuricemia, 29 normalized their serum uric acid values. Finally, one patient with hepatic fibrosis resulting from chronic infection with hepatitis C improved from F2 to F1 according to the results of their periodic FibroScan.

It is worth saying that all patients who followed the recommended nutritional and urological guidelines were able to maintain an average weight loss rate of about 1 kg/week. Furthermore, urinary pH was inversely proportional to body weight, meaning that the higher the body weight, the lower the urinary pH values. However, lipid constants were unaffected by a body-weight surplus of less than 30 kg, while above this value, the average exceeded the upper limit.

Of all the patients who collaborated with us, 45 have reached their ideal weight, +/- 2 kilos. However, the most satisfying aspect was that they have managed to maintain it until now.

### DISCUSSION

Although there are several interventions available to manage obesity and prevent urinary stones, their effectiveness is highly dependent on patient engagement and adherence. Our study investigated the difficulties in implementing a dietary regimen in obese lithiasic patients. The findings reveal several important challenges that healthcare providers and patients face in achieving the two main goals: normal

weight and nonrecurrence of kidney stones.

One major obstacle is the difficulty in collaborating with obese lithiasic patients. Patients who struggle with obesity often have difficulty adhering to dietary recommendations and may lack the motivation to make lifestyle changes. As a result, healthcare providers must employ creative strategies to engage patients and encourage compliance with dietary guidelines.

Additionally, healthcare providers must address the psychological barriers patients may face in adhering to a dietary regimen. Patients may struggle with feelings of deprivation or boredom when following a restricted diet, which can lead to non-compliance or binge eating. Nutritionists can address these challenges by providing patient education, support, and motivation to maintain adherence to the dietary regimen.

In a large South Korean cohort, Lim *et al.* found that approximately 27% of patients who had undergone the initial evaluation were determined to take serious measures to lose weight (8). This is an optimistic result because in our study, only 17% fully complied with the recommendations and the diet and can be considered to have taken serious measures to lose weight. Moreover, the authors reported that 84% of patients considered obesity to be an important factor in their general health, but some patients who refused enrollment indicated that they did not consider obesity to be a problem. The authors propose that patients can be persuaded to acknowledge the true consequences of obesity through informative and easy-to-understand materials (8). The study also found that 78% of patients had made at least one serious attempt to lose weight in the past, but they did so on their own, without the support of

a monitoring program. In our study, only 16.8% of obese patients agreed to be enrolled. This lack of support may have contributed to their failure and reduced their confidence in future attempts. Therefore, the article suggests that providing patients with the necessary support may help improve their chances of success (8).

We think patients can achieve weight loss through adherence to different diets, but the type of diet should be chosen based on the individual's needs and preferences to which the type of twist should be added.

In conducting studies and implementing weight loss programs, enrolling participants is difficult. As demonstrated by Rounds *et al.*, participation in weight loss programs is often low, with only a small percentage of eligible individuals opting to enroll. This highlights the need for strategies to increase enrollment and engagement, such as targeted outreach efforts and tailored interventions based on patient preferences (9).

Another study, Caterson *et al.* showed that people with obesity are aware of their health problems and that many are motivated to lose weight. However, there is a difference between perception and reality regarding obesity and weight loss. For example, while 88% of patients consider obesity a disease and 46% are concerned about the impact of excess weight on their health, only 48% are motivated to lose weight (10).

The yo-yo effects represent another issue regarding weight loss and maintaining weight loss. These refer to repeated cycles of weight loss and weight gain, which can have a negative impact on physical and psychological health. Although weight loss is important for overall health, it is important to provide patients with information

and support to maintain long-term weight loss and avoid the yo-yo effect (11).

Another challenge is the need to address the complex nutritional needs of obese lithiasic patients while promoting weight loss. Weight loss is a critical component of a successful dietary regimen for obese lithiasic patients, as excess body weight can contribute to the formation of kidney stones. However, losing weight can be difficult, particularly for patients with failed weight loss attempts.

One strategy to address this challenge is reducing calorie intake while ensuring that patients receive adequate nutrients. This can be accomplished through a diet high in fruits, vegetables, and whole grains while limiting high-fat and high-sugar foods.

A study by Shai *et al.* aimed to determine the efficacy and safety of different types of diets for weight loss. The study included 322 obese individuals, and it was conducted over two years. The study found that the adherence rate to the diet was high, and the effect on glycemic control was better with the Mediterranean diet, while the effect on lipid levels was better with the low-carbohydrate diet (12). Tuomilehto *et al.* aimed to prevent type 2 diabetes by making changes to diet and lifestyle. The study included 522 individuals, and the incidence of diabetes was reduced by 58% through changes to diet and lifestyle (13).

In our program, 11 out of 26 diabetic patients were able to normalize their blood glucose levels, and five others were able to achieve significant reductions in their blood glucose levels. This shows that the implementation of lifestyle changes can help prevent and manage diabetes.

In a relatively large cohort, Borghi *et al.* identified an increased urinary volume as a factor that can reduce the risk of develop-

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ing kidney stones. The study included 300 patients, and it was found that an increased water intake can help prevent the recurrence of kidney stones (14). According to Siener *et al.*, a vegetarian diet that promotes urine alkalization and thus increases pH reduces the risk of uric acid stone formation (15). It is important to avoid foods with high oxalate concentrations, regardless of their type: spinach, nuts, chocolate, or sweet potatoes. Additionally, we need to differentiate between vegetarian and vegan diets, the latter being associated with uric acid stones due to hyperuricemia (16). Another dietary aspect to consider is calcium intake, which reduces the risk of stone formation. Therefore, milk and dairy products are recommended (17).

In patients with calcium phosphate stones which often develops in alkaline urine, the goals of nutritional therapy were to acidify the urine and reduce the intake of calcium phosphates. In such cases, we implemented a hypocaloric diet based on white bread, bran bread, muffins, dried fruits, pumpkin puree, vegetable oils, fruit jelly, and meat (poultry, fish). To reduce the intake of phosphates, we excluded foods such as smoked meat and products (sausages), dairy and cheese, pickles, marinades, coffee, tea, and canned food. We also contraindicated alcohol and food consumption. One aspect that requires further study is the use of phosphates as food additives (calcium phosphate - E341). Although approved by the European Union, they could contribute to the development of stones. Further studies are needed to evaluate this risk. The macronutrient ratio was subsequently adjusted individually (18).

The dietician developed a balanced and varied meal plan to address the patient's preference for meat and prevent uric acid

stone attacks. This plan included a variety of protein sources, including small amounts of lean meat (up to 100 g per day) and protein-rich plant alternatives such as legumes, nuts, and seeds. Larger portions of vegetables, salads, and whole grains must accompany meat. By avoiding foods high in purines, such as animal organs and certain types of fish and seafood (Sardines in oil - about 480 mg of purines, Anchovies - about 410 mg of purines, Herring - about 370 mg of purines, Mussels - about 350 mg of purines, Fresh sardines - about 320 mg of purines, Squid - about 260 mg of purines, Oysters - about 230 mg of purines, Octopus - about 220 mg of purines), the patient could reduce the risk of uric acid crystal formation. The patient was encouraged to choose complex carbohydrates such as whole grains, legumes, and vegetables over refined and high glycemic index carbohydrates. The diet was accompanied by the introduction of an adapted physical activity program (such as walking briskly for 30 minutes after each meal) (19).

The diet for a patient with uric acid stones should aim to reduce purine intake and increase fluid intake. According to studies, a low-purine diet can significantly decrease urinary uric acid levels and the risk of uric acid stone formation. The diet should include plenty of fruits and vegetables, whole grains, and low-fat dairy products. Protein sources should be limited to low-purine options such as chicken, fish, and tofu, while high-purine sources like red meat, organ meats, and seafood should be avoided (20). Although according to our previous data, overweight and obese patients treated in our center had the most frequent calcium oxalate kidney stones (21).

We found that some patients did not

understand the importance of adequate hydration. Our data suggest that providing information about hydration's importance can help prevent kidney stone recurrence. This is more important, taking into account that in obese patients, the efficiency of shock wave lithotripsy is relatively ineffective, and more invasive procedures should be taken into account (22). Paradoxically, a higher BMI does not seem to influence infectious complications after percutaneous lithotripsy (23).

It is essential for patients with kidney stones to consume enough water to prevent the formation of new stones or to eliminate existing ones. The recommended amount of water depends on the level of physical activity, sweating, and loss of fluids through urine. To provide patients with a deeper understanding of the role of water in eliminating and preventing the formation of kidney stones, a multidisciplinary team may be involved, including urologists, dietitians, and psychologists who can offer personalized solutions for individual patient issues.

For patients who have difficulty consuming enough water, there are several solutions. If the patient does not like the taste of water, various products can be added to change the taste, such as lemon, cucumber, mint, basil, or fruits. Patients who experience nausea or vomiting may be prescribed medication by their doctor to help alleviate symptoms that interfere with water intake. In our study, one difficulty was regarding patients with overactive bladder. We encountered 17 such patients, and after the prescription of anticholinergics, their voiding frequency was reduced to normal, allowing them to have adequate water intake.

Complying with recommendations to

consume enough fluids may be challenging for patients with a busy schedules or physically demanding jobs. In this situation, patients can carry a water bottle with them and consume it during activity and take bathroom breaks during their breaks. Patients with digestive problems or a hectic lifestyle can be helped by always carrying a water bottle and setting reminders on their phones to drink water regularly.

If the patient cannot afford enough water or other hydrating drinks, alternatives such as tea, unsweetened fruit compote, and fruits and vegetables with a high-water content can be used. If the patient does not feel the need for hydration, the urologist and dietitian can investigate the reason and offer advice to encourage the patient to consume increasingly larger quantities of fluids and water-rich foods. A multidisciplinary team can provide personalized solutions for patients with kidney stones who have difficulty consuming enough fluids. It is important to recognize and address dysfunctional habits and patterns and the patient's vicious behavior to motivate them to change. In our study, of all 243 patients, 179 have maintained a daily water intake of a minimum of 2.5 liters, which is a strong suggestion that patients can understand the necessity of drinking enough water. Once a daily habit of drinking water is established, the problem of adequate hydration is less prevalent.

Our study highlights the complex challenges healthcare providers and obese lithiasic patients face in implementing a hygienic-dietary regimen.

Another issue highlighted in the literature is the relationship between obesity and urinary stone disease. Obesity is a well-established risk factor for urinary stones, likely due to changes in urine composition

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and increased urinary excretion of calcium and other stone-forming substances. BMI and urine pH have an inverse relationship. Because individuals with higher BMI have a lower increase in urine pH under treatment with potassium citrate, it is suggested that most benefits may derive from weight loss (24). Alkalinization of the urine proved to be effective not only for kidney stone prophylaxis but also with similar results as  $\alpha$ -blocker for some ureteral stones as medical expulsive therapy (25).

Urinary pH plays an important role in the formation of urinary stones. Therefore, monitoring and maintaining urinary pH within a certain range can help prevent the formation of urinary stones. This can be achieved through dietary changes, increasing water intake, and medications if necessary.

There are several reasons why some obese lithiasic patients do not monitor their urinary pH in our monitoring program, such as lack of awareness - some patients are not aware of the importance of urinary pH and how it affects the formation of kidney stones; cost or difficulty in obtaining urinary pH testing kits - some testing kits can be expensive or hard to obtain, which can discourage patients from using them; mismatch with their lifestyle - monitoring urinary pH can be a difficult task for some patients, especially those with a busy lifestyle; lack of motivation - some patients may be demotivated in monitoring their urinary pH because they do not see immediate benefits or do not understand the connection between pH level and stone formation.

The solutions found include explaining the importance of continuous monitoring of urinary pH and how it can help prevent the formation of urinary stones through dietary

and hydration interventions; emphasizing the importance of preventing recurrence and how monitoring urinary pH can help in this regard; teaching patients how to collect urine samples and perform tests correctly; providing free kits through the PEMLPO program to eliminate reasons related to cost or availability of kits; encouraging communication with the PEMLPO team in case of monitoring problems or concerns related to results and providing personalized advice; encouraging patients to keep a journal of pH values to see progress and gain confidence in their interventions. The importance of pH monitoring is significant as pH directly reflects whether patients are indeed following dietary and fluid recommendations.

When patients have a limited budget, it is recommended that they consume healthy and nutritious foods that are cheaper. They are suggested to buy and prepare foods in larger quantities and divide them into smaller portions to save time and money. If they cannot access fresh foods due to financial or geographic limitations, patients should buy frozen vegetables, beans, fruits, and dehydrated vegetables. Information should be provided on food assistance programs and free or reduced-price food resources to assist patients with limited food needs. Additionally, it may be beneficial to collaborate with community organizations and local health centers to find personalized solutions for each patient.

A study in Australia approximated the costs of a diet for a family of four, and the presented results show that a healthy diet is 21% cheaper than an unhealthy one. However, both diets exceed the budget for families with low to very low financial situations. Additionally, discounted prices through various offers reduce costs by



approximately 3% (26).

Contributing to the failure of weight loss diets, some authors consider the endocrine response that occurs with weight loss, consisting of increased appetite and decreased satiety (27). Another aspect is sedentary behavior, both at work and in daily life, and the modernization of transportation with the use of personal vehicles also contributes to this (27).

A meta-analysis of 29 studies shows that over 50% of patients return to their initial weight within two years and over 80% within five years. The reasons are unclear, but the lack of a regular activity and exercise program is suggested (28). Another study proposes that the reason for returning to the initial weight is a too-rapid initial weight loss followed by a period of no further weight loss (29). Grodstein *et al.* concluded after a 3-year weight loss program that only 12% of patients managed to maintain at least 75% of the weight they lost, while 40% gained more than they had initially (30).

Another study led by Wing *et al.* concluded that long-term success has better outcomes for patients who maintain their lost weight for 2-5 years. The best predictor for long-term success is weight maintenance for two years. Additionally, another predictor highlighted by Wing *et al.* is represented by low levels of dietary disinhibition, or the ability of individuals to not overeat in the presence of factors such as emotional stress and appetizing foods (31).

Finally, the study found that strict supervision and counseling can ensure compliance with dietary guidelines and prevent weight gain. Patients who received regular supervision and support were able to maintain weight loss over an extended period,

suggesting that ongoing support and monitoring may be necessary for long-term success.

Regarding weight loss strategies, an important aspect is to provide patients with adequate support for long-term changes in dietary and exercise habits. In this regard, multidisciplinary approaches involving physicians and specialists in nutrition and psychology can be effective in helping patients achieve and maintain weight loss goals.

## CONCLUSIONS

Following this study, we have reached some important conclusions. Firstly, collaborating with obese urolithiasis patients can be challenging but crucial to achieving positive results. However, patients who followed the instructions and the weight loss program achieved good results, encouraging us to continue with this approach. We also found that under strict supervision and counseling, no patient gained weight back within a period ranging from 4 months to 2 years. This demonstrates that our weight loss program is effective and sustainable in the long term.

Finally, it is important to note that no patient who became "stone-free" after ESWL or URS experienced urolithiasis recurrence. This suggests that weight loss and an appropriate diet can be powerful tools in preventing kidney stone formation and maintaining renal health in the long term.

## CONFLICT OF INTEREST AND FUNDING

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