

Shedding light on community pharmacist-directed point-of-care screening and education for patients with kidney stones: implications and future research

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Background

Kidney function reduces progressively from age 30 as part of the normal aging process, with a decline in function of around 1 mL/min, which accelerates after age 65 [1, 2]. A silent kidney disease, kidney stones (KS) can develop in this population, occupying the hollow spaces inside the kidney. Comprising hard salt or mineral deposits, KS can occasionally remain inside the kidney and cause no complications [3]. KS are most commonly made of calcium, but uric acid, struvite, and cystine stones can also occur [3]. Globally, the rate of KS development is growing, with the US reporting a prevalence of 8.8% in 2012 [4, 5].

KS are thought to form due to the influence of various factors, such as lifestyle changes, an unhealthy diet, overweight, underlying medical conditions such as hypertension or diabetes [6, 7], a family history of KS [8], and the consumption of certain health supplements or drugs [6]. The Middle East is particularly subject to environmental conditions that may make inhabitants more susceptible to developing KS, such as high temperatures and aridity [8, 9]. A reduced water intake increases the concentration of urine, which is also believed to be a factor in the development of KS [10]. Diet is also established as a factor due to its significant influence on the acidity and composition of urine [11]. Numerous empirical studies have demonstrated that diet modifications can substantially diminish the likelihood of KS forming and reduce their rate of recurrence [11, 12]. However, this is affected by the type of KS. For instance, to avoid calcium, KS patients are advised to limit their intake of sodium, increase their consumption of citrate, and not take calcium supplements while ensuring that sufficient calcium is included in their diet [13, 14].

Because KS tend to recur, patients are likely to experience reduced wellbeing, with increased susceptibility to urinary tract infections and ureter injuries, among other complications, potentially causing kidney failure in the long term [5, 15]. Therefore, the problem of KS must be addressed. Early intervention is crucial to addressing this disease's morbidity and mortality. Health care providers need training to educate patients about the need to tackle this disease and the strategies to do so. Reducing treatment costs and improving patients' quality of life, particularly through preventing the recurrence of KS, thus requires efforts from a wide variety of health care personnel, including doctors, nurses, and pharmacists [16–18]. This work focuses specifically on community pharmacists, who

are many patients' first point of contact and thus ideally situated to inform them of the best KS management and prevention approaches.

Community pharmacists' role in managing KS

Pharmacists are crucial components of health care, at both the primary and secondary levels, because they offer many patient services. They are also far more accessible for patients compared to doctors, and they can provide free advice to patients on treatment options and ways to improve wellbeing [17].

How and why KS form is generally not known to patients, leaving an information gap that community pharmacists can fill [19]. For example, Mohammad et al. [12] showed that pharmacists can contribute significantly to KS management. The study created a guide based on which pharmacists could inform patients on how best to recognize, manage, and treat KS. Specifically, the authors recommended that pharmacists offer patients advice on developing good dietary habits and adhering to a plan of therapy to manage KS [20]. The pharmacists who participated in the study already knew that KS patients should reduce their consumption of animal protein due to its link with the development of KS. Consuming high levels of animal protein raises not also the acidity but also the calcium and uric acid concentrations of the urine, triggering the development of KS [21, 22]. Patients should also minimize their consumption of sodium and sugar, especially in savory snacks and soft drinks [11, 23], as well as avoiding vitamin C supplements [12].

Research has also shown that KS patients should raise their fluid intake and consume more fruits and vegetables with a low oxalate level while monitoring their intake of calcium. Furthermore, the risk of KS development can be mitigated through the consumption of several plant-based foods [23, 24], such as lemon and parsley [21], olive oil [25], nettle and pomegranate [26], apple cider [27], celery [28], and raspberry and green tea [24]. Due to their high levels of minerals, the consumption of these foods leads to more alkaline urine, which is detrimental to urate and cysteine stone formation because these require an acidic milieu [11]. The high citrate levels found in these foods are also beneficial, with research demonstrating that they reduce KS formation, regardless of the type of stone [11]. Finally, the antioxidant and diuretic properties provided by a plant-based diet are known to prevent KS formation [26].

Community pharmacists can play a key role in KS management by educating patients on the need to follow this dietary advice, especially regarding the importance of consuming plant-based foods. In addition to dietary advice, community pharmacists can inform and advise KS patients about the correct course of medication. For instance, they can evaluate the patient's medication need and ensure that they are taking the necessary drug to treat the disease. They can also go beyond this to identify and address any problems related to other medications. As trained health care professionals, community pharmacists are in a position to give advice on which medications to avoid. For instance, certain drugs can promote KS formation because they crystalize due to supersaturation or reduced solubility under some

urine pH conditions. Examples include ephedrine, ceftriaxone, acyclovir, guaifenesin, topiramate, sulfonamides, aminopenicillins, carbonic anhydrase inhibitors such as acetazolamide, and loop diuretics such as furosemide [10, 20, 29]. Pharmacists are thus ideally placed to advise KS patients on how these medications can exacerbate the disease.

Such actions by community pharmacists can increase trust among patients, which in turn can lead to enhanced adherence to the medication regime, good self-management habits, and empowered patients who can manage risk factors such as comorbidities. By offering medication monitoring and follow-up services, community pharmacists can further enhance pharmacotherapy outcomes.

Challenges and obstacles faced by community pharmacists when contributing to patients' KS management

To ensure that patients receive the best possible service, community pharmacists must be highly informed about the etiology and treatment of common diseases. If they cannot correctly advise patients due to a lack of knowledge, this can lead to issues, such as patients not taking the proper medication or taking it at the wrong dosage, worsening their condition [30, 31].

Although the literature demonstrates that community pharmacists tend to have adequate knowledge of the etiology and treatment of KS, a gap exists in their awareness of how external factors, such as the consumption of vitamins or the use of home remedies, can influence KS formation. This is likely due to inadequate awareness among inexperienced community pharmacists of patients' use of home remedies or medicinal plants [32].

In addition, community pharmacists may believe that consuming dairy products raises the likelihood of KS development. This common misconception stems from the incorrect notion that the calcium found abundantly in dairy-based foods produces insoluble salts that eventually precipitate, triggering KS formation [13, 33]. However, a diet with adequate calcium has been empirically established as crucial to avoiding KS [33], as well as diminishing the likelihood of oxalate stones because calcium binds oxalate in the intestinal environment [21].

Such gaps in the knowledge among community pharmacists on KS disease and its management are likely to have several reasons. These include inexperience with certain drugs, a lack of focus on the need for community pharmacists to educate patients with KS, the absence of relevant guidelines on educating patients about KS, and the focus on training pharmacists to deal with long-term conditions such as hypertension and diabetes, especially during the COVID-19 pandemic [34, 35].

Community pharmacists who have recently graduated tend to face obstacles in the workplace that could prevent them from accessing relevant information on medication [36]. For instance, Abdel-Qader et al. revealed a lack of psycho-pharmacotherapy

knowledge among pharmacists [37], and Zawiah et al. showed insufficient awareness of critical food–drug interactions among community pharmacists [38].

Inadequate knowledge of KS among community pharmacists can reduce the quality of the services they provide to patients. Research has also shown that they may be aware of how to prevent the recurrence of KS, yet they do not necessarily integrate this knowledge into their professional practice [22].

Recommendations and future avenues for research

A clear need exists to enhance community pharmacists' knowledge of the etiology and treatment of KS. This can be achieved by increasing their awareness of the value of informing KS patients about the benefits of dietary management to mitigate the disease. For example, pharmacist training programs, including professional training for graduate pharmacists, should integrate more topics relevant to this issue, and pharmacy undergraduates could be targeted via social media or student platforms. In particular, attention should be paid to ensuring that community pharmacists have sufficient awareness of the side effects of KS medication, in addition to knowledge of how other medications can promote the formation of KS. Key actors, such as policymakers and members of professional pharmacist organizations, should ensure that community pharmacists have access to appropriate training so that they can integrate this into their practice. Written information on the causes, prevention, and treatment of KS should be disseminated, such as through flyers or leaflets at community pharmacies and urology clinics. By following current recommendations on how to prevent the recurrence of KS, patient wellbeing can be enhanced.

The targeted screening of high-risk patients is another approach that community pharmacies can undertake to improve patient outcomes. Such a strategy was shown to be effective in Alberta, Canada [40], where it was used in combination with the Chronic Kidney Disease (CKD) Clinical Pathway [39]. Al Hamarneh et al. presented pharmacists with the laboratory test results of 720 high-risk patients to screen them for CKD [41]. Around 40% of the screened patients were found to have CKD, and the disease had previously been unrecognized in 40% of these [40]. However, despite the research showing that pharmacies can be an effective setting for laboratory testing [41], health authorities generally do not implement this in their healthcare policies [42].

Another study evaluated the use of a point-of-care CKD screening program conducted by community pharmacists, revealing that 11% of screened participants had CKD; it had not been previously recognized in 90% of these. This rate of misdiagnosis is notable and requires attention due to its relevance to the quality of patient care. Specifically, these patients are likely to require adjusted dosages and preventive measures to mitigate the disease and its associated risks [43].

Targeted patient screening in point-of-care programs operated by community pharmacists can offer a practical and effective way to identify patients who have a high risk of

developing KS, and these can easily be integrated into the practice of community pharmacies. Screening patients for KS would allow community pharmacists to identify patients most at risk of developing the disease and inform them of the need to maintain their health. Pharmacists have an established role in providing diet and lifestyle advice, aiming to alleviate the risks of chronic conditions such as diabetes, hypertension, vascular disease, and obesity. For example, community pharmacists check patients' blood pressure as part of screening programs and offer relevant advice based on the results. Significant research has shown that community pharmacists can instigate changes toward positive patient outcomes through point-of-care screening, whether for acute or chronic disease [44–46]. Thus, since community pharmacists are one of the easiest points of contact for patients, and indeed often the first, they are in an excellent position to conduct KS screening and enhance the population's awareness of the need to detect the disease early.

Despite their benefits, the feasibility of such programs has yet to be evaluated empirically. Although prior research has assessed the use of point-of-care CKD screening at community pharmacies, no work has yet examined the benefits of a similar approach for KS disease. Consequently, a need exists to assess the feasibility of such a program and whether it would lead to improved patient outcomes in KS management, the safe use of medication, and treatment regime adherence. The findings would offer valuable implications for KS disease prognosis, medication dosing, and patients' ability to access care. Finally, KS disease screening would represent a crucial element to complete pharmacy practice as a whole.

Conclusion

We recommend that health policymakers establish screening programs at community pharmacies to identify patients with KS disease, focusing on vulnerable populations such as the elderly and people with chronic conditions including diabetes or hypertension. Because community pharmacists are the health care practitioners whom patients can most easily access, they are ideally positioned to implement point-of-care methods to perform KS screening and inform patients about KS and the benefits of detecting and managing it at the early stage.

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