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The Effectiveness of Health Promotion in the Prevention of Urolithiasis: A Narrative Literature Review

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Abstract: This study aims to review the effectiveness of health promotion interventions in preventing urolithiasis between 2020 and 2025 and to examine their contribution to achieving Sustainable Development Goal (SDG) 3, considering the high recurrence of urolithiasis and its strong association with lifestyle-related risk factors. A narrative literature review was conducted using secondary data from articles published between 2020 and 2025, retrieved from Google Scholar, GARUDA, and university journal portals. Selected studies were analysed descriptively and thematically to identify intervention types and outcomes. The findings indicate that health promotion interventions effectively improve knowledge, attitudes, and preventive behaviours related to urolithiasis. Community- and school-based programs enhanced awareness of adequate hydration, healthy dietary patterns, and water-consumption habits, demonstrating their preventive impact. Health promotion represents a practical and cost-effective strategy for urolithiasis prevention and supports broader non-communicable disease prevention efforts aligned with SDG 3. The integration of digital health approaches is recommended to strengthen sustainability and long-term behavioural change. This review provides a focused synthesis of post-2020 evidence on preventive health promotion strategies for urolithiasis, offering context-specific insights that extend beyond clinical management and contribute to public health practice.

Keywords: Health promotion; Urolithiasis; Prevention; Health behavior; Community education.

INTRODUCTION

Current public health challenges indicate that population health and social well-being are no longer determined solely by medical care but are strongly influenced by factors outside the health system, including socioeconomic conditions, lifestyle patterns, urbanization, environmental change, and broader sociocultural and policy contexts (Kumar & Preetha, 2012). The global health landscape is increasingly characterized by a complex disease burden involving the persistence of communicable diseases, the emergence and re-emergence of new health threats, and a rapid rise in non-communicable diseases (NCDs) associated with modern lifestyle changes (Kumar & Preetha, 2012). These trends have intensified behavioral risk factors such as sedentary lifestyles, unhealthy dietary patterns, and low health literacy, which place growing pressure on individuals, communities, and

health systems. This situation underscores the limitations of purely curative and biomedical approaches and highlights the importance of preventive strategies that address behavioral and social determinants of health through health promotion.

Within this broader public health context, urolithiasis has emerged as a significant and growing global health problem. Approximately 12% of the world's population is estimated to experience kidney stones during their lifetime, with recurrence rates reaching up to 50% within 5–10 years after the initial episode (Wang et al., 2020). In Indonesia, kidney stone disease is among the leading causes of hospital admissions, with increasing prevalence driven by inadequate fluid intake, high consumption of sodium and animal protein, obesity, and lifestyle-related factors (Lin et al., 2022). Indonesia's tropical climate further elevates the risk due to excessive fluid loss through sweating, which increases susceptibility to dehydration. Although urolithiasis is not a direct cause of mortality, it is closely associated with chronic kidney disease, hypertension, diabetes, and metabolic syndrome, thereby contributing to the broader burden of NCDs and increasing healthcare costs (Reese et al., 2024).

Previous studies on urolithiasis prevention can be grouped into three main categories. First, clinical and biomedical research has focused on pharmacological therapy, dietary management, and hydration strategies, with systematic reviews emphasizing the role of fluid intake and dietary modification in reducing stone recurrence (Courbebaisse et al., 2021; Wang et al., 2020; Lin et al., 2022). Second, community- and school-based studies in Indonesia have demonstrated improvements in knowledge, attitudes, and preventive behaviors following health promotion interventions, particularly those emphasizing hydration and healthy lifestyles (Hadibrata et al., 2022; Nafisah & Mubarak, 2024; Mardiyani et al., 2022; Siregar et al., 2023; Sutrisno et al., 2023). Third, emerging international evidence has explored technology-assisted interventions, such as mobile applications and digital monitoring tools, to support sustained behavioral change related to hydration and lifestyle modification (Reese et al., 2024). However, these studies remain fragmented, context-specific, and often emphasize short-term outcomes, highlighting the need for a comprehensive synthesis that evaluates the effectiveness of health promotion as a preventive strategy for urolithiasis.

Therefore, this narrative literature review aims to identify and synthesize existing research on the effectiveness of health promotion interventions in preventing urolithiasis, both in Indonesia and internationally. This review examines a range of health promotion

approaches, including community-based education, school health programs, public campaigns, and digital health interventions. It is argued that health promotion strategies grounded in behavioral and planning frameworks such as the Health Belief Model and the PRECEDE–PROCEED model can effectively modify lifestyle-related risk factors associated with urolithiasis by enhancing awareness, encouraging adequate hydration, and supporting sustained healthy behaviors. Strengthening health promotion is thus expected not only to reduce the risk and recurrence of kidney stones but also to contribute to the achievement of Sustainable Development Goal (SDG) 3 by reducing the long-term burden of NCDs and reinforcing preventive health systems.

RESEARCH METHOD

Unit of Analysis

The unit of analysis in this study consists of published scientific articles that discuss health promotion interventions for the prevention of urolithiasis. The focus of analysis is not on individual patients or clinical outcomes, but on health promotion strategies, intervention settings, target populations, and reported outcomes related to knowledge, attitudes, and preventive behaviors. These articles represent empirical evidence of promotive and preventive efforts aimed at reducing the risk of kidney stone formation at the community and school levels.

Research Design

This study employed a narrative literature review (NLR) design. The narrative review approach was chosen because the objective of the study was not to statistically synthesize effect sizes, but to explore, describe, and interpret patterns of health promotion practices across diverse contexts. Given the heterogeneity of study designs, intervention models, and outcome measures in health promotion research on urolithiasis, an NLR was considered the most appropriate method to provide a comprehensive and contextualized understanding of existing evidence and to identify conceptual gaps in the literature.

Data Sources

The study relied exclusively on secondary data sources in the form of published academic literature. Literature searches were conducted using Google Scholar, GARUDA (Garba Rujukan Digital), and selected university journal portals. These databases were

chosen to ensure adequate coverage of national-level research outputs relevant to the Indonesian context. The search covered publications from 2020 to 2025, reflecting recent developments in health promotion and preventive strategies for kidney stone disease.

Data Collection Techniques

Data collection was carried out through a systematic literature search and screening process. The keywords used included "kidney stones," "urinary tract stones," "urolithiasis," "health promotion," "prevention," and "hydration". Inclusion criteria were limited to Indonesian-language articles that explicitly addressed health promotion or educational interventions related to urolithiasis prevention. Studies focusing solely on pharmacological treatment, surgical management, or purely clinical interventions were excluded. Based on these criteria, five articles were selected for inclusion in the review (Hadibrata et al., 2022; Sutrisno et al., 2023; Nafisah & Mubarak, 2024; Mardiyani et al., 2022; Siregar et al., 2023).

Data Analysis

The selected articles were analyzed using descriptive and thematic analysis. First, relevant information was extracted from each study, including intervention type, setting, target population, and main outcomes. The data were then organized into thematic categories to identify recurring patterns and differences in health promotion approaches. To ensure the methodological rigor of the narrative review, the quality of the included articles was assessed using the Scale for the Assessment of Narrative Review Articles (SANRA) guidelines. This process enabled a structured and transparent synthesis of findings related to the effectiveness of health promotion in preventing urolithiasis.

RESULT AND DISCUSSION

This section presents and discusses the findings of the narrative literature review on the effectiveness of health promotion in preventing urolithiasis. The analysis integrates empirical evidence from five Indonesian studies and interprets the findings in relation to existing international literature and public health frameworks.

Overview of Included Studies

Five studies conducted between 2022 and 2024 met the inclusion criteria and were included in this review. These studies evaluated health promotion interventions for urolithiasis prevention across community and school settings, employing educational, counseling, and screening-based approaches. A summary of the included studies is presented in Table 1**.**

Table 1. Summary of Health Promotion Interventions for Urolithiasis Prevention in Indonesia (2022–2024)

No	Author(s) & Year	Setting / Participants	Study Design	Health Promotion Intervention	Main Findings
1	Hadibrata et al. (2022)	Community, South Lampung (n=30 adults)	Quasi-experimental (pre–post)	Lectures and interactive discussions on kidney health	Increased knowledge and improved kidney health behaviors
2	Sutrisno et al. (2023)	Community, Solo	Community-based program	"2G" lifestyle counseling and practical activities	Improved awareness of hydration and healthy diet
3	Nafisah & Mubarak (2024)	Village community, Demak	Quasi-experimental (pre–post)	Hydration education via lectures and booklets	Significant increase in knowledge on water intake
4	Mardiyani et al. (2022)	Senior high school students, Pontianak	School-based education	Kidney health awareness program	Improved knowledge, attitudes, and behaviors
5	Siregar et al. (2023)	Junior high school students, Medan	Screening and education	Adolescent kidney care program	Increased awareness and preventive behaviors

Community-Based Health Promotion and Behavioral Change

The reviewed community-based studies demonstrate that health promotion interventions delivered at the community level can effectively improve knowledge and preventive behaviours related to urolithiasis. Hadibrata et al. (2022) reported that counselling and interactive discussions significantly enhanced participants' understanding of kidney health and encouraged healthier daily practices. Similarly, Sutrisno et al. (2023) implemented a more structured lifestyle-based program combining education with practical guidance on hydration and diet, which resulted in increased community awareness of kidney stone prevention.

These findings indicate that **simple, low-cost educational approaches** can be effective when tailored to community contexts. From a public health perspective, community-based health promotion aligns with empowerment-oriented strategies,

enabling individuals to take greater control over lifestyle-related risk factors. This evidence supports international findings that emphasize hydration and dietary modification as key preventive behaviors in urolithiasis management, reinforcing the role of community engagement in disease prevention.

Hydration Education as a Core Preventive Strategy

Hydration-focused health promotion emerged as a central theme across the reviewed studies, particularly in the work of Nafisah and Mubarak (2024). Their findings demonstrate that targeted education on adequate water intake, delivered through lectures and printed materials, significantly increased community knowledge regarding the prevention of kidney stones. This result is particularly relevant in the Indonesian context, where tropical climate conditions increase the risk of dehydration.

International evidence strongly supports these findings. Adequate hydration has been identified as one of the most effective and feasible preventive measures for urolithiasis, with recommendations emphasizing sufficient urine output to reduce stone formation risk. The consistency between local and global evidence suggests that hydration education represents a **high-impact, low-cost, and culturally appropriate** health promotion strategy. By focusing on a single, actionable behavior, hydration-centered interventions may facilitate better adherence and long-term behavior change among the population.

School-Based Health Promotion and Long-Term Prevention

School-based health promotion interventions targeting adolescents were shown to be effective in improving knowledge, attitudes, and preventive behaviors related to kidney health. Studies by Mardiyani et al. (2022) and Siregar et al. (2023) highlight schools as strategic settings for early health education. Through interactive learning activities, these programs fostered awareness and positive attitudes toward hydration and healthy lifestyles among students.

From a life-course perspective, adolescence represents a critical period for establishing long-term health behaviors. Health education delivered during this stage is likely to influence future lifestyle choices and reduce the risk of preventable diseases in adulthood. These findings are consistent with international literature emphasizing the importance of early lifestyle interventions in the primary prevention of urolithiasis and other non-

communicable diseases. Thus, school-based health promotion contributes not only to immediate preventive outcomes but also to sustained population health benefits.

Implications for Public Health and Future Research

Collectively, the reviewed studies indicate that health promotion interventions are effective in increasing knowledge and encouraging preventive behaviors related to urolithiasis across different population groups. However, most studies employed pre–post designs without control groups and relied on self-reported outcomes, limiting causal inference. In addition, interventions predominantly used conventional educational methods, with limited integration of digital health technologies.

Future research should explore **technology-assisted health promotion strategies**, such as mobile health applications and digital monitoring tools, to enhance long-term adherence to preventive behaviors. Strengthening methodological rigor through controlled designs and larger sample sizes would also improve the evidence base. From a policy perspective, integrating kidney health promotion into broader non-communicable disease prevention programs and school health initiatives may enhance sustainability and contribute to the achievement of Sustainable Development Goal (SDG) 3.

Discussion

This review shows that health promotion interventions consistently improve knowledge, attitudes, and preventive behaviors related to urolithiasis across community and school settings in Indonesia. Community-based education, hydration-focused counseling, and school-based programs were all associated with increased awareness of kidney health and healthier daily practices, particularly adequate fluid intake and lifestyle modification. These findings confirm that promotive and preventive approaches can complement clinical management in addressing urolithiasis as a public health issue.

The effectiveness of these interventions can be explained by their focus on modifiable behavioral factors, especially hydration and diet, which are central to kidney stone prevention. Educational activities increase risk awareness and perceived benefits, thereby facilitating behavior change. In the Indonesian context, where dehydration risk is elevated due to climatic conditions, hydration-centered messages are especially relevant and easily adopted. Interventions delivered within familiar social environments, such as communities and schools, also benefit from social reinforcement that supports healthier behaviors.

The results of this review are consistent with international studies emphasizing hydration and lifestyle modification as key preventive strategies for urolithiasis. However, this review adds value by highlighting evidence from Indonesia, where health promotion interventions are often implemented at the community and school levels rather than through technology-based or clinical programs. By synthesizing local evidence, this study underscores the importance of contextualized health promotion approaches that account for cultural, environmental, and health system characteristics.

Despite the positive findings, several limitations should be acknowledged. Most included studies employed pre–post designs without control groups and relied on self-reported outcomes, which may limit causal interpretation and overestimate behavioral change. In addition, the majority of interventions used conventional educational methods, raising concerns about long-term sustainability. These limitations should be considered when interpreting the results and form the basis for future research directions.

Overall, the findings of this review directly support the conclusion that health promotion is an effective and feasible strategy for preventing urolithiasis in Indonesia. At the same time, the identified methodological limitations highlight the need for more rigorous study designs and the integration of digital health approaches in future interventions. These insights provide a clear transition to the concluding section, which emphasizes practical recommendations and directions for strengthening kidney health promotion programs.

CONCLUSION

This study demonstrates that health promotion is an effective strategy for the prevention of urolithiasis in Indonesia. Community-based interventions consistently increased public knowledge and awareness of hydration and healthy lifestyles, hydration-focused education produced tangible improvements in daily drinking habits, and school-based programs successfully fostered protective behaviors among adolescents. Together, these findings highlight that health promotion not only improves understanding but also facilitates meaningful behavioral changes that support sustained kidney health across different population groups.

From a scientific perspective, this narrative literature review contributes by synthesizing context-specific evidence on health promotion for urolithiasis prevention in Indonesia, an area that has received limited attention compared with clinical and

pharmacological approaches. By integrating findings from community and school settings and situating them within public health and behavioral frameworks, this study reinforces the role of promotive and preventive strategies in addressing urolithiasis as a public health issue. The findings also underscore the relevance of health promotion to the achievement of Sustainable Development Goal (SDG) 3, particularly in reducing the long-term burden of non-communicable diseases associated with kidney stones.

Despite these contributions, several limitations should be acknowledged. This review relied on a small number of Indonesian studies, most of which employed pre–post designs without control groups and used self-reported outcomes, limiting causal inference and generalizability. In addition, the predominance of conventional educational methods restricts conclusions regarding long-term sustainability and scalability. Future research should employ more rigorous study designs, include larger and more diverse populations, and explore the integration of digital health technologies to strengthen the effectiveness and durability of health promotion interventions for urolithiasis prevention.

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