PROCEEDING

2nd Banten International Conference on Health Advancement & Research
binar@poltekkesbanten.ac.id
https://binar.poltekkesbanten.ac.id/
Vol. 1 No. 2 (2026)

DEVELOPMENT OF A KIDNEY-FOCUSED PREVENTIVE USING EDUCATION DIGITAL AIDS BASED ON THE INDONESIAN NURSING INTERVENTION STANDARD

Tulus Puji Hastuti[1], Erna Erawati[2]✉, Hermani Triredjeki[3], Susi Tentrem Roestyati Talib[4]

[1]Tulus Puji Hastuti: Pediatric Nursing Department, Poltekkes Kemenkes Semarang, hastutituluspuji@yahoo.co.id
[2]Erna Erawati: Psychiatric Nursing Department, Poltekkes Kemenkes Semarang, ernaerawati57@gmail.com
[3]Hermani Triredjeki: Pediatric Nursing Department, Poltekkes Kemenkes Semarang, hermanitriredjeki@ymail.com
[3]Susi Tentrem Roestyati: Pediatric Nursing Department, Poltekkes Kemenkes Semarang, susi_0973@yahoo.com
**Corresponding author: ernaerawati57@gmail.com*

ABSTRACT

Chronic kidney disease (CKD) has become a major public health challenge due to its increasing prevalence, delayed diagnosis, and preventable risk factors. In Indonesia, preventive efforts remain fragmented, and educational interventions are often not systematically integrated with the Indonesian Nursing Intervention Standard (Standar Intervensi Keperawatan Indonesia/SIKI). A standardized, evidence-based educational model is therefore needed to strengthen preventive nursing practice and improve public awareness and self-management of kidney health in community.

This study aimed to develop and validate a Kidney-Focused Preventive using Education Digital Aids based on the Indonesian Nursing Intervention Standard (SIKI) to enhance knowledge, attitudes, and preventive health behaviors among individuals at risk of kidney disease.

This research employed a research and development (R&D) design using a modified ADDIE model consisting of analysis, design, development, implementation, and evaluation phases. The analysis phase involved a literature review, needs assessment, and focus group discussions with nursing educators, nephrology nurses, and public health experts. The educational model was developed according to SIKI recommendations for health education interventions and validated by an expert panel using the Content Validity Index (CVI). Expert validation demonstrated excellent content validity (I-CVI = 0.92–1.00; S-CVI/Ave = 0.96). The Kidney-Focused Preventive Education Model based on the Indonesian Nursing Intervention Standard is a valid, feasible, and effective approach for strengthening preventive nursing care. The model has the potential to standardize kidney health education across community and primary healthcare settings while promoting early prevention and healthy lifestyle behaviors.

Keywords: chronic kidney disease; health education; Indonesian Nursing Intervention Standard (SIKI), nursing intervention, preventive education model.

INTRODUCTION

Chronic kidney disease (CKD) has emerged as one of the fastest-growing non-communicable diseases worldwide and represents a substantial challenge to global health systems. Characterized by progressive and irreversible deterioration of kidney function, CKD contributes significantly to morbidity, mortality, disability, and healthcare expenditure (Kidney Disease: Improving Global Outcomes [KDIGO], 2024; World Health Organization [WHO], 2022). According to the Global Burden of Disease Study, CKD is among the leading causes of years of life lost worldwide, with its prevalence continuing to increase because of population aging, urbanization, diabetes mellitus, hypertension, obesity, and unhealthy lifestyle behaviors (GBD Chronic Kidney

Disease Collaboration, 2020; Institute for Health Metrics and Evaluation [IHME], 2024). The disease often progresses silently without noticeable symptoms until reaching advanced stages, resulting in delayed

diagnosis and poor clinical outcomes (KDIGO, 2024). Consequently, preventive strategies emphasizing early detection, health promotion, and behavioral modification have become essential components of kidney disease management (WHO, 2022).

The International Society of Nephrology estimates that approximately 850 million people worldwide are affected by kidney disease, making CKD one of the most common chronic diseases globally (International Society of Nephrology [ISN], 2023). Despite advances in renal replacement therapy and pharmacological management, prevention remains considerably more cost-effective than treatment of end-stage kidney disease (Luyckx et al., 2021). Dialysis and kidney transplantation impose substantial financial burdens on individuals and healthcare systems, particularly in low- and middle-income countries where access to specialized nephrology services remains limited (Bikbov et al., 2020). Therefore, strengthening preventive interventions at the community level has become an international public health priority (WHO, 2022).

Indonesia is experiencing a similar epidemiological transition, with non-communicable diseases increasingly dominating the national disease burden. The prevalence of hypertension, diabetes mellitus, obesity, and metabolic syndrome continues to rise, consequently increasing the population at risk of CKD (Kementerian Kesehatan Republik Indonesia, 2023). National health surveys have demonstrated a gradual increase in CKD prevalence over the past decade, while hospital-based reports indicate growing demand for dialysis services (Kementerian Kesehatan Republik Indonesia, 2023; Badan Pusat Statistik, 2023). These findings suggest that preventive efforts have not adequately addressed modifiable risk factors before irreversible kidney damage occurs.

Several factors contribute to delayed prevention of CKD in Indonesia. Public awareness regarding kidney function and risk factors remains limited, particularly among individuals with hypertension and diabetes who are at substantially increased risk of developing renal impairment (ISN, 2023). Many individuals do not routinely undergo kidney function screening because early CKD is generally asymptomatic (KDIGO, 2024). Moreover, unhealthy dietary habits, inadequate hydration, excessive salt consumption, self-medication with nephrotoxic drugs, smoking, physical inactivity, and poor management of chronic diseases continue to accelerate kidney function decline (WHO, 2022; KDIGO, 2024). These challenges highlight the urgent need for effective community-based preventive education programs capable of improving knowledge, fostering positive attitudes, and promoting sustainable healthy behaviors.

Health education has consistently been recognized as one of the most effective nursing interventions for preventing chronic diseases (WHO, 2022). Educational interventions facilitate informed decision-making, increase self-efficacy, encourage healthy lifestyle adoption, and improve adherence to preventive recommendations (Bastable, 2023). Previous studies have demonstrated that structured health education significantly improves knowledge regarding CKD risk factors and promotes healthy behaviors such as blood pressure monitoring, adequate water consumption, dietary modification, and regular physical activity (Narva et al., 2016; Tuot et al., 2019). Nevertheless, many educational programs remain inconsistent in their content, delivery methods, evaluation procedures, and theoretical foundations. Consequently, educational outcomes often vary across healthcare settings.

Nurses play a central role in disease prevention because they represent the largest healthcare workforce and frequently interact with individuals, families, and communities across the continuum of care (International Council of Nurses [ICN], 2021). In primary healthcare settings, nurses are expected not only to provide clinical care but also to promote health, prevent disease, facilitate behavioral change, and empower communities through education (WHO, 2022). Standardized nursing interventions are therefore necessary to ensure that preventive education is evidence-based, measurable, reproducible, and consistent across different healthcare institutions.

Indonesia has established the Indonesian Nursing Intervention Standard (Standar Intervensi Keperawatan Indonesia; SIKI) as the national framework for standardized nursing practice (Persatuan Perawat Nasional Indonesia [PPNI], 2018). SIKI provides comprehensive guidance for nursing interventions, including health education, counseling, risk identification, behavioral modification, and patient empowerment (PPNI, 2018). The implementation of SIKI aims to improve the quality, safety, and consistency of nursing services while supporting professional accountability and documentation. However, despite its widespread adoption within clinical settings, relatively few educational models have been explicitly developed using SIKI as the primary conceptual framework for preventive health education, particularly in kidney disease prevention.

One limitation of current kidney health education programs is the lack of standardized educational materials that comprehensively integrate nursing interventions with digital learning technologies. Traditional

health education methods frequently rely on lectures or printed leaflets, which may provide limited engagement and retention among participants (Mayer, 2021). Advances in digital health technologies have created opportunities to enhance educational effectiveness through interactive multimedia, audiovisual resources, mobile learning, and digital decision-support tools (WHO, 2021). Digital educational aids allow learners to access standardized educational content repeatedly, facilitate self-paced learning, and improve participant engagement through interactive features. Such technologies have demonstrated promising effects on knowledge acquisition, health literacy, self-management, and behavioral change across various chronic disease populations (Marcolino et al., 2018).

Educational models incorporating digital learning resources are particularly relevant in Indonesia because smartphone ownership and internet accessibility have expanded substantially during the past decade (Asosiasi Penyelenggara Jasa Internet Indonesia [APJII], 2024). Community-based digital education offers flexibility, scalability, and accessibility while reducing dependence on face-to-face educational sessions. Furthermore, digital educational tools enable healthcare professionals to deliver standardized information consistently regardless of geographical location or healthcare facility capacity (WHO, 2021). Nevertheless, the development of digital kidney health education models explicitly aligned with standardized nursing interventions remains limited.

Behavioral science further supports the development of structured educational interventions. Social Cognitive Theory proposes that behavioral change occurs through reciprocal interactions among personal factors, environmental influences, and behavioral experiences (Bandura, 1986). Self-efficacy, observational learning, reinforcement, and goal setting constitute key mechanisms influencing health behavior adoption. Similarly, the Health Belief Model emphasizes perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy as determinants of preventive health behavior (Rosenstock et al., 1988). Integrating these theoretical perspectives into standardized nursing education may enhance individuals' motivation to adopt kidney-protective lifestyles.

Previous educational interventions targeting CKD prevention have generally focused on isolated educational sessions or disease-specific counseling without incorporating standardized nursing intervention frameworks, digital multimedia learning, individualized behavioral planning, or structured follow-up evaluation (Narva et al., 2016; Tuot et al., 2019). Consequently, there remains a significant research gap concerning the development of comprehensive preventive education models that combine evidence-based nursing standards with contemporary digital educational strategies.

MATERIALS AND METHODS

The Research and Development (R&D) approach provides an appropriate methodological framework for creating healthcare educational innovations. By systematically progressing through needs assessment, instructional design, prototype development, expert validation, implementation, and evaluation, R&D enables the production of educational models that are scientifically rigorous, contextually appropriate, and practically applicable. The modified ADDIE instructional design model has been widely employed in nursing education because of its systematic structure and emphasis on continuous evaluation and refinement.

Accordingly, this study sought to develop and validate a Kidney-Focused Preventive Education Model using Digital Educational Aids based on the Indonesian Nursing Intervention Standard (SIKI). The model was designed to strengthen preventive nursing practice by integrating standardized health education, kidney risk assessment, interactive multimedia learning, individualized behavioral planning, and structured evaluation into a comprehensive educational framework. Specifically, the study aimed to (1) identify educational needs related to kidney disease prevention, (2) develop a standardized digital education model grounded in SIKI recommendations, (3) evaluate its content validity through expert review, and (4) assess its feasibility for implementation in community and primary healthcare settings. It is anticipated that this model will contribute to the standardization of preventive kidney health education, enhance nursing practice, improve public health literacy, and support national efforts to reduce the growing burden of chronic kidney disease in Indonesia.

The primary outcome of this study was the development and validation of a Kidney-Focused Preventive Education Model using Digital Educational Aids based on the Indonesian Nursing Intervention Standard (Standar Intervensi Keperawatan Indonesia; SIKI). The study emphasized content development, expert validation, and feasibility assessment rather than evaluating long-term clinical effectiveness.

Study Setting

The study was conducted between January and August 2026 in collaboration with the Nursing Department of Poltekkes Kemenkes and community primary healthcare services in Central Java, Indonesia. The analysis phase involved consultations with academic experts, nephrology nurses, public health

professionals, and community health educators. Pilot implementation of the educational model was conducted in a community setting involving adults identified as being at risk for chronic kidney disease.

Development Framework

The educational model was developed according to the Health Education intervention described in the Indonesian Nursing Intervention Standard (SIKI). SIKI served as the principal framework to ensure that all educational components reflected standardized nursing interventions recognized by the Indonesian National Nurses Association (PPNI). Additional evidence was obtained from current international clinical guidelines for chronic kidney disease prevention, health promotion literature, adult learning principles, and digital health education strategies.

.

RESULTS AND DISCUSSION

The development of the Kidney-Focused Preventive Education Model Using Digital Education Aids Based on the Indonesian Nursing Intervention Standard (Standar Intervensi Keperawatan Indonesia/SIKI) was conducted through four sequential phases: needs assessment, model development, expert validation, and pilot implementation. The development process produced a structured educational model integrating standardized nursing interventions with interactive digital learning media to improve public knowledge, attitudes, and preventive behaviors related to chronic kidney disease (CKD).

The final educational model consisted of five integrated components:Kidney disease risk assessment; Standardized kidney health education based on SIKI; Interactive digital educational media; Individualized behavior change planning; Structured follow-up and evaluation.

Phase 1: Analysis

The analysis phase aimed to identify educational needs, knowledge gaps, and existing nursing practices regarding kidney disease prevention. Three complementary approaches were employed:Literature Review. A comprehensive literature review was conducted using PubMed, Scopus, ScienceDirect, CINAHL, and Google Scholar. Articles published between 2015 and 2025 in English or Indonesian were reviewed using combinations of the keywords chronic kidney disease, kidney disease prevention, health education, digital education, behavior change, nursing intervention, and SIKI. National clinical practice guidelines, WHO recommendations, KDIGO guidelines, and Indonesian nursing standards were also examined.

Phase 2: Design

Based on findings from the analysis phase, the research team developed the instructional design of the educational model. Learning objectives were formulated according to SIKI competencies and preventive kidney health recommendations. Educational contents included:Basic kidney anatomy and physiology, CKD risk factors, Early warning signs, Healthy hydration, Low-salt dietary practices, Blood pressure and diabetes control, Safe medication use, Smoking cessation, Physical activity, Kidney function screening, Self-monitoring strategies. .

Phase 3: Development

During the development phase, digital educational materials were produced by a multidisciplinary development team consisting of nursing lecturers, instructional designers, multimedia developers, and nephrology specialists. The digital educational package included: Interactive PowerPoint presentations, Self-assessment checklist, Kidney risk screening questionnaire, Educational handbook, Educational materials incorporated illustrations, narration, animations, and culturally appropriate examples suitable for Indonesian communities. The readability of educational materials was evaluated using expert recommendations to ensure that the language was understandable for individuals with diverse educational backgrounds. The Item Content Validity Index (I-CVI) was calculated for each evaluation item. An I-CVI value ≥0.78 was considered acceptable. Overall content validity was determined using the Scale Content Validity Index based on Average Agreement (S-CVI/Ave), with values ≥0.90 indicating excellent content validity. Expert comments were incorporated into several rounds of revision before finalization of the educational model.

Table 1. Expert Validation Results

Validation Domain	Mean Score (1–5)	Percentage (%)	Category
Content validity	4.82	96.4	Excellent
SIKI conformity	4.89	97.8	Excellent

Digital media quality	4.76	95.2	Excellent
Ease of use	4.71	94.2	Excellent
Language clarity	4.85	97.0	Excellent
Overall validity	4.81	96.2	Highly Valid

Experts suggested simplifying several medical terminologies, increasing culturally appropriate illustrations, improving navigation between modules, and incorporating local dietary examples. These recommendations were incorporated into the revised version before pilot testing.

CONCLUSION

This study concludes that the Kidney-Focused Preventive Education Model Based on the Indonesian Nursing Intervention Standard (SIKI) is highly valid and suitable for implementation as a nursing educational intervention for chronic kidney disease prevention. The expert validation demonstrated excellent performance across all assessed domains, including content validity (96.4%), conformity with SIKI (97.8%), digital media quality (95.2%), ease of use (94.2%), and language clarity (97.0%), resulting in an overall validity score of 96.2%, categorized as Highly Valid. These findings answer the research question by confirming that the developed model fulfills the theoretical, practical, and technical requirements necessary for use in nursing education and health promotion.

The significance of these findings lies in providing a standardized, evidence-based educational model that integrates national nursing intervention standards with digital learning media to enhance preventive kidney health education. The model offers a practical framework for nurses to deliver consistent, structured, and patient-centered educational interventions while supporting the implementation of SIKI in both clinical and community settings.

From the perspective of scientific development, this study contributes to the advancement of nursing science by expanding the evidence base for standardized educational interventions in chronic disease prevention and by demonstrating the integration of nursing standards with digital health education. In terms of technological development, the incorporation of digital educational media increases the accessibility, effectiveness, and scalability of preventive health education, thereby supporting broader implementation within Indonesia's digital health transformation. Future studies should evaluate the effectiveness of this model in improving knowledge, health behaviors, and clinical outcomes among diverse populations through multicenter implementation studies and randomized controlled trials.

CONFLICT OF INTEREST

The authors declare that they have no financial conflicts of interest related to the research, authorship, and/or publication of this manuscript. No financial support, commercial affiliations, or funding sources influenced the design, conduct, analysis, interpretation, or reporting of this study.

REFERENCES

Bastable, S. B. (2023). Nurse as educator: Principles of teaching and learning for nursing practice (6th ed.). Jones & Bartlett Learning.

Bikbov, B., Purcell, C. A., Levey, A. S., et al. (2020). Global, regional, and national burden of chronic kidney disease, 1990–2017. The Lancet, 395(10225), 709–733.

GBD Chronic Kidney Disease Collaboration. (2020). Global burden of chronic kidney disease, 1990–2017. The Lancet, 395(10225), 709–733.

International Council of Nurses. (2021). The ICN code of ethics for nurses.

International Society of Nephrology. (2023). Global kidney health atlas (3rd ed.).

Kidney Disease: Improving Global Outcomes. (2024). KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney International, 105(4S), S117–S314.

Kementerian Kesehatan Republik Indonesia. (2023). Profil Kesehatan Indonesia 2023.

Luyckx, V. A., Tonelli, M., & Stanifer, J. W. (2021). The global burden of kidney disease and the sustainable development goals. Bulletin of the World Health Organization, 99(6), 414–422D.

Marcolino, M. S., Oliveira, J. A. Q., D'Agostino, M., et al. (2018). The impact of mHealth interventions. JMIR mHealth and uHealth, 6(1), e23.

Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.
Narva, A. S., Norton, J. M., & Boulware, L. E. (2016). Educating patients about CKD. American Journal of Kidney Diseases, 68(1), 1–3.
Persatuan Perawat Nasional Indonesia. (2018). Standar Intervensi Keperawatan Indonesia (SIKI). DPP PPNI.
Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the Health Belief Model. Health Education Quarterly, 15(2), 175–183.
Tuot, D. S., Zhu, Y., Velasquez, A., et al. (2019). Effect of CKD education interventions on patient knowledge and self-management: A systematic review. Kidney Medicine, 1(5), 282–292.
World Health Organization. (2021). Global strategy on digital health 2020–2025.
World Health Organization. (2022). Noncommunicable diseases: Key facts