



Community-Based Dipstick Urinalysis Screening for Early Detection of Kidney Disorders in Rural Indonesia

Rodhi Hartono^{1*}, Dina Afrianti²

Published online: 09 Januari 2026

ABSTRACT

Chronic kidney disease (CKD) is a major public health problem due to its increasing prevalence, late diagnosis, and limited awareness, particularly in rural communities. Early detection through simple and accessible screening methods is essential to prevent disease progression. This community service program aimed to enhance kidney health awareness and identify early risk factors for renal disorders through the integration of health education and dipstick urinalysis screening among residents of Pundan Village, Banyubiru District, Semarang Regency, Indonesia. The program was implemented using a participatory approach involving 45 adult community members. Activities included interactive health education sessions, urine dipstick screening, basic health measurements, and individualized counseling. The results showed that most participants initially had low knowledge of kidney health, while screening identified several risk indicators related to kidney dysfunction, including metabolic risk factors and abnormal urinalysis findings. The combination of education and hands-on screening improved participants' understanding of kidney health and encouraged preventive behaviors. This program demonstrates that integrating health education with dipstick urinalysis is a feasible, low-cost, and effective community-based approach for early detection and prevention of kidney disorders. The model can be replicated in other rural settings to support promotive and preventive health efforts and reduce the burden of chronic kidney disease.

Keywords: Community empowerment; Dipstick screening; Health education; Kidney health literacy; Preventive health services

INTRODUCTION

Chronic kidney disease (CKD) has become a major global public health concern due to its increasing prevalence, high mortality rate, and substantial economic burden. The World Health Organization (WHO, 2022) estimates that more than 850 million people worldwide are affected by kidney disorders, with CKD contributing to over two million deaths annually. One of the main challenges in controlling CKD is its asymptomatic nature in the early stages, which often results in delayed diagnosis and late initiation of treatment. This condition is particularly critical in developing countries, where limited access to healthcare services and low public awareness further exacerbate the burden of kidney disease.

In Indonesia, the prevalence of CKD continues to increase. Data from the Basic Health Research (Riskesdas, 2018) reported that approximately 0.2% of the population suffers from chronic kidney disease, with most cases identified at advanced stages. The Indonesian Renal Registry (IRR, 2023) also documented a steady rise in new dialysis patients, exceeding 70,000 cases per year. In Central

Java Province, including Semarang Regency, the prevalence of major CKD risk factors such as hypertension and diabetes mellitus has reached 37.5% and 11.3%, respectively (Ministry of Health, 2023). These figures highlight the urgent

^{1*}, ² Department of Health Analyst, Politeknik Kesehatan
Kemenkes Semarang

**) corresponding author*

Rodhi Hartono
Email: rodhi.hartono@poltekkes-smg.ac.id

need for early detection and preventive strategies, particularly at the community level.

Early screening plays a crucial role in preventing the progression of kidney damage. The Kidney Disease: Improving Global Outcomes (KDIGO, 2023) guidelines emphasize urinalysis as a simple, affordable, and effective method for identifying early markers of kidney dysfunction, including proteinuria, hematuria, and glycosuria. Urine dipstick testing is especially suitable for community-based settings because it requires minimal equipment, provides immediate results, and can be performed by trained health workers in areas with limited laboratory facilities. Previous studies have shown that integrating health education with dipstick screening significantly improves public awareness and encourages preventive health behaviors related to kidney disease (Rahman & Yunita, 2022; Nurfadilah et al., 2024).

Community service programs that combine promotive and preventive approaches are essential to address the gap between health knowledge and practice in rural populations. Such programs not only facilitate early detection of disease but also empower communities to take an active role in maintaining their health. In line with Indonesia's Health System Transformation agenda, which prioritizes community empowerment and preventive health efforts (Kemenkes RI, 2023), higher education institutions are encouraged to implement sustainable, community-based health interventions.

In response to these challenges, Poltekkes Kemenkes Semarang implemented a community service program under the Program Pengembangan Desa Mitra (PPDM) in Pundan Village, Banyubiru District, Semarang Regency. This program integrated health education with dipstick urinalysis and basic kidney function screening to enhance community awareness, identify early risk factors for renal disorders, and promote preventive health behaviors. The novelty of this program lies in its integrative and participatory approach, combining health literacy improvement, hands-on screening, and individualized counseling within a village-based empowerment framework. This article aims to describe the implementation process and outcomes of the program as a model for early detection and prevention of kidney disorders at the community level.

LITERATURE REVIEW

Chronic kidney disease (CKD) is a progressive non-communicable disease characterized by a gradual decline in kidney function and is strongly associated with lifestyle-related conditions such as hypertension, diabetes mellitus, and obesity. Recent literature has consistently reported that the increasing global burden of CKD is closely linked to low public awareness, limited preventive screening, and delayed diagnosis, particularly in low- and middle-income countries (Levey et al., 2020; WHO, 2022). In rural settings, inadequate health literacy and restricted access to diagnostic facilities further contribute to late detection and poor disease outcomes.

Community-based screening has been widely recognized as an effective strategy for the early detection and prevention of chronic diseases. Urine dipstick testing, in particular, offers a practical and low-cost method for identifying early indicators of kidney dysfunction, such as proteinuria, hematuria, and glycosuria, in primary healthcare and community settings (Rahman & Yunita, 2022). The KDIGO (2023) clinical practice guidelines recommend routine urinalysis as an initial assessment tool for kidney health, especially among high-risk populations, including individuals with hypertension and diabetes mellitus. Its simplicity and immediate results make dipstick urinalysis highly suitable for community service programs in resource-limited areas.

Health literacy is a critical determinant of preventive health behavior and plays an important role in reducing the risk of chronic kidney disease. Nurfadilah et al. (2024) reported that individuals with higher levels of kidney health literacy were more likely to adopt preventive behaviors, such as maintaining adequate hydration, reducing salt intake, and participating in regular health check-ups. Educational interventions that are integrated with practical health screening activities have been

shown to significantly improve both knowledge and engagement, leading to better health awareness at the community level (Kemenkes RI, 2023; WHO, 2022).

Previous community service initiatives in Indonesia have demonstrated that participatory approaches combining health education, screening, and counseling are effective in promoting behavioral change and increasing early disease detection (Hartono et al., 2024; Saskiyanti et al., 2025). Such integrated models align with Indonesia's Health System Transformation strategy, which emphasizes promotive and preventive actions through community empowerment (Kemenkes RI, 2023). These programs not only enhance individual awareness but also strengthen community capacity to support sustainable health practices.

Despite the availability of national guidelines and evidence-based recommendations, routine kidney screening has not been widely implemented at the village level. Many community members remain unfamiliar with early signs of kidney disorders and the significance of urinalysis findings. Therefore, community service programs that integrate health education with accessible screening tools are essential to bridge the gap between knowledge and practice. This literature supports the implementation of village-based kidney health screening as a strategic approach to early detection and prevention of renal disorders, particularly in rural Indonesian communities.

MATERIALS AND METHODS

Design of the Community Service Program

This community service program was designed using a participatory and community-based approach under the Program Pengembangan Desa Mitra (PPDM) scheme implemented by Poltekkes Kemenkes Semarang. The program focused on promotive and preventive health actions through health education and early detection of kidney disorders using dipstick urinalysis. The activities were conducted over a 12-month period (January–December 2025) in Pundan Village, Kebondowo, Banyubiru District, Semarang Regency, Central Java, Indonesia. The design emphasized active community involvement to enhance health literacy, encourage preventive behavior, and facilitate early identification of potential kidney health problems.

Participants and Community Engagement

The target participants were adult residents of Pundan Village aged 30–70 years. A total of 45 community members voluntarily participated in the program following coordination with the village head, community leaders, and local health volunteers. Inclusion criteria included willingness to attend health education sessions, provide urine samples for screening, and give informed consent. Individuals with acute illness or those unable to complete the educational activities were excluded. The high participation rate reflected strong community engagement and trust in the program.

Implementation Procedures

The program was implemented in three main stages: preparation, implementation, and evaluation. During the preparation stage, coordination meetings were conducted with village authorities, community health cadres, and local healthcare workers to obtain permission and organize logistics. Educational materials, including a booklet entitled “Test Urine: Jaga Ginjal Sehat”, were developed by the team and reviewed to ensure clarity, relevance, and cultural appropriateness.

The implementation stage consisted of interactive health education sessions followed by kidney function screening. Educational activities were delivered through lectures and group discussions covering kidney function, common risk factors, early signs of kidney disorders, and preventive behaviors. After the education session, participants underwent screening using urine dipstick tests to assess urinary parameters such as pH, protein, glucose, bilirubin, leukocytes, and creatinine. Additional basic health measurements, including blood pressure, blood glucose, uric acid, and

cholesterol levels, were also performed. All procedures were carried out by trained health analysts and supervised students to ensure accuracy and safety.

The evaluation stage focused on assessing participants' understanding of kidney health after the intervention. Post-education questionnaires were administered to evaluate knowledge improvement and awareness. Screening results were communicated individually to each participant, followed by brief counseling sessions to explain the findings and provide practical health recommendations. Participants with abnormal results were advised to seek further evaluation at the nearest primary healthcare facility.

Instruments and Materials

The primary instruments used in this program were multi-parameter urine dipstick reagent strips for kidney health screening and structured questionnaires to assess knowledge and awareness. The dipstick method was selected due to its simplicity, affordability, and suitability for community-based settings. The questionnaire included items related to kidney function, risk factors, symptoms of kidney disorders, and preventive practices. All instruments were reviewed by two nephrology experts and one public health educator to ensure content validity and cultural relevance.

Ethical Considerations

Ethical approval for the community service program was obtained from the Ethics Committee of Poltekkes Kemenkes Semarang. All participants received clear information regarding the purpose, procedures, and voluntary nature of the activities before participation. Written informed consent was obtained prior to data collection. Participant confidentiality was maintained by using coded identifiers, and individuals with abnormal screening results were referred to the local primary healthcare center (puskesmas) for further management and follow-up.

RESULTS AND DISCUSSION

Community Participation and Program Implementation

The community service program was successfully implemented in Pundan Village with active participation from local residents. A total of 45 adults aged 30–70 years attended the health education and kidney screening activities, resulting in a participation rate of 100%. This high level of attendance reflects strong community interest and trust, which were fostered through prior coordination with village authorities and community health cadres.

The implementation process of the program followed a structured sequence, starting from preparation and socialization to education, screening, counseling, and evaluation. The overall flow of the community service activities is illustrated in Figure 1, which demonstrates how educational and screening components were integrated within a single intervention framework. This structured approach ensured that participants not only received health information but also directly experienced kidney health screening and personalized counseling.

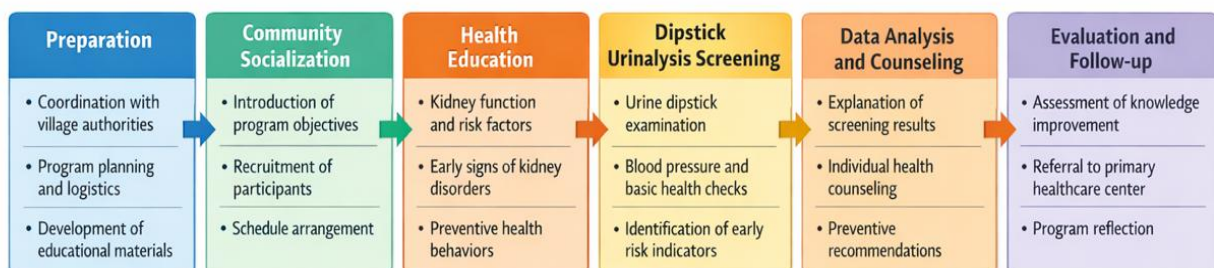


Figure 1. Flow of community service program implementation integrating health education, dipstick urinalysis screening, and individualized counseling.

Community engagement during the activities is documented in Figure 2, which shows the health education session conducted through interactive lectures and discussions. In addition, Figure 3 presents the dipstick urinalysis screening process performed by trained health analysts with assistance from students. These documentation photos highlight the participatory nature of the program and demonstrate how community members were actively involved throughout the intervention.



Figure 2. Health education session on kidney health delivered to community members in Pundan Village.



Figure 3. Dipstick urinalysis screening and basic health examination conducted among community participants

The strong participation observed in this program is consistent with findings from other rural community-based health initiatives, where direct involvement and practical activities increase acceptance and program effectiveness (Nurfadilah et al., 2024).

Community Knowledge of Kidney Health

Baseline assessment of participants' knowledge indicated limited understanding of kidney function, risk factors, and preventive behaviors. As presented in Table 1, 32 participants (71.11%) were categorized as having poor knowledge prior to the intervention, while only 13 participants (28.89%) demonstrated good baseline knowledge. This finding supports reports by the World Health Organization (WHO, 2022) that low health literacy remains a major barrier to early detection of chronic diseases in developing countries.

Table 1. Community Understanding of Kidney Health (n = 45)

Category	Frequency	Percentage (%)
Good	13	28.89
Poor	32	71.11

Following the health education session, participants demonstrated improved comprehension, as reflected in their ability to recognize early signs of kidney disorders and understand the importance of preventive behaviors such as adequate hydration, reduced salt intake, and regular health check-ups. Although this program did not employ inferential statistical testing, observations during post-

education discussions indicated increased awareness and engagement. These results are in line with Rahman and Yunita (2022), who reported that combining education with simple diagnostic demonstrations effectively enhances community understanding and motivation toward preventive health actions.

Kidney Health Screening Outcomes

The results of the kidney health screening conducted through dipstick urinalysis and supporting measurements are summarized in Table 2. The screening revealed several risk indicators associated with potential kidney dysfunction among participants. Elevated blood pressure was identified in 40.00% of participants, while 71.11% showed high cholesterol levels and 28.89% exhibited hyperuricemia. These metabolic conditions are recognized risk factors that contribute to the development and progression of chronic kidney disease (Levey et al., 2020; KDIGO, 2023).

Urinalysis findings showed that 8.89% of participants had mild proteinuria, 4.44% had glucosuria, and 42.22% presented with leukocyturia, as detailed in Table 2. Proteinuria is widely acknowledged as an early marker of glomerular damage, and its detection through dipstick testing enables timely preventive intervention (KDIGO, 2023). Meanwhile, glucosuria may indicate impaired glucose metabolism, and leukocyturia suggests possible urinary tract infection, both of which can indirectly affect kidney health if not appropriately managed.

Table 2. Results of Kidney Function Screening (n = 45)

Parameter	Category	Frequency	Percentage (%)	Remarks
Gender	Male	11	24.44	
	Female	34	75.56	
HBsAg	Reactive	1	2.22	Positive hepatitis screening
	Non-reactive	44	97.78	
Blood Pressure	Hypertensive (>140/90 mmHg)	18	40.00	Risk for CKD
Blood Glucose (GDS)	High	5	11.11	Possible diabetes mellitus
Uric Acid	High	13	28.89	Hyperuricemia
Cholesterol	High	32	71.11	Hypercholesterolemia
Urine pH	Normal (5–7)	45	100	Within range
Proteinuria	Positive (+1 to +2)	4	8.89	Mild proteinuria
Glucosuria	Positive (+2)	2	4.44	Abnormal
Leukocyturia	Positive (+1 to +2)	19	42.22	Possible infection
Creatinine (Dipstick)	Positive (+1 to +2)	27	60.00	Elevated marker

Although parameters such as cholesterol, uric acid, and hepatitis screening are not direct measures of kidney function, their inclusion provided a comprehensive overview of health conditions related to kidney disease risk. The screening outcomes reflect national trends reported by the Ministry of Health (2023) and emphasize the importance of integrated screening approaches in community-based preventive programs.

Educational Impact and Community Empowerment

Beyond clinical indicators, an important outcome of this program was the increased awareness and empowerment of community members regarding their kidney health. Immediate feedback on screening results, combined with individualized counseling, enabled participants to better understand their personal health status and associated risks. This approach transformed screening activities into educational experiences rather than merely diagnostic procedures.

Many participants expressed willingness to adopt healthier lifestyles, including improving dietary habits, increasing daily water intake, and participating in routine health check-ups. The combination of education, hands-on screening, and counseling strengthened participants' sense of responsibility toward their own health. Such outcomes are consistent with the principles of community

empowerment (pemberdayaan masyarakat) emphasized in Indonesia's Health System Transformation strategy (Kemenkes RI, 2023).

Program Reflection

Overall, the implementation of dipstick urinalysis within a community service framework proved to be feasible, effective, and well accepted by the community. The simplicity, affordability, and immediacy of dipstick testing make it a practical tool for early detection of kidney-related risk factors in rural areas with limited laboratory infrastructure.

This program demonstrates that integrating health education with accessible screening tools can serve as an effective entry point for early disease prevention and behavioral change. However, the program was limited by its cross-sectional nature and short-term follow-up. Longitudinal monitoring is recommended to assess sustained behavioral changes and long-term kidney health outcomes. Strengthening collaboration with local primary healthcare centers is also essential to ensure continuity of care for individuals identified as at risk.

Despite these limitations, the findings support the inclusion of kidney health screening as part of routine community service programs. The approach applied in this program can serve as a replicable model for similar rural communities aiming to reduce the burden of chronic kidney disease through early detection and community empowerment.

KESIMPULAN

This community service program demonstrated that the integration of health education with dipstick urinalysis screening is a feasible and effective approach for the early detection and prevention of kidney disorders in rural communities. The program revealed that most participants initially had limited awareness of kidney health, while the implementation of educational sessions combined with hands-on screening activities significantly improved understanding and engagement in preventive health behaviors.

The screening outcomes identified several early risk indicators related to kidney dysfunction, including metabolic risk factors and abnormal urinalysis findings. These results highlight the importance of community-based screening in identifying individuals at risk who may otherwise remain undiagnosed at early stages. The use of dipstick urinalysis proved to be a practical, low-cost, and easily applicable method for kidney health screening at the village level.

Beyond health outcomes, this program contributed to community empowerment by increasing health literacy and encouraging participants to take an active role in managing their own health. The integrative model combining education, screening, and individualized counseling within a participatory framework represents a key strength and novelty of this community service initiative. This approach aligns with Indonesia's Health System Transformation strategy, which emphasizes promotive and preventive actions through community involvement.

In conclusion, dipstick urinalysis can serve as an effective entry point for kidney disease prevention in community service programs. Scaling up similar integrative interventions in other rural areas, supported by collaboration with primary healthcare centers, may contribute to reducing the burden of chronic kidney disease and strengthening preventive health practices at the community level.

Acknowledgments

The authors express their sincere appreciation to the Directorate of Politeknik Kesehatan Kemenkes Semarang, the Head of Kebondowo Village, and all community members of Pundan

Village who participated enthusiastically in this program. Special thanks are extended to the Department of Health Analyst, students of the Diploma III Blood Bank Technology Program, and the Center for Research and Community Service (P3M) for their invaluable support and collaboration throughout the implementation of this project. This community engagement program was funded by DIPA/BLU Poltekkes Kemenkes Semarang (Grant No. PPDM-2025) under the Program Pengembangan Desa Mitra scheme. The authors declare no conflict of interest related to this publication.

Conflict of Interests

The authors declared that no potential conflicts of interest with respect to the authorship and publication of this article.

REFERENCES

- Hartono, R., Afrianti, D., & Surati, S. (2025). Community-based application of dipstick urinalysis for early detection of renal disorders in Semarang Regency. Poltekkes Kemenkes Semarang Monograph Series.
- Indonesian Renal Registry (IRR). (2023). Annual Report of the Indonesian Renal Registry 2023. Jakarta: PERNEFRI.
- KDIGO. (2023). KDIGO Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney International Supplements*, 13(1), 1–150. <https://doi.org/10.1016/j.kisu.2022.12.003>
- Kementerian Kesehatan Republik Indonesia (Kemenkes RI). (2023). Health System Transformation: Promotive and Preventive Health Strategy. Jakarta: Ministry of Health.
- Levey, A. S., Eckardt, K.-U., Dorman, N. M., Christiansen, S. L., Hoorn, E. J., Ingelfinger, J. R., ... & Levin, A. (2020). Chronic kidney disease. *The Lancet*, 395(10225), 709–733. [https://doi.org/10.1016/S0140-6736\(19\)32591-5](https://doi.org/10.1016/S0140-6736(19)32591-5)
- Ministry of Health of the Republic of Indonesia. (2022). Guidelines for the Prevention and Control of Chronic Kidney Disease. Jakarta: Ministry of Health.
- Notoatmodjo, S. (2018). Health Promotion and Behavioral Sciences. Jakarta: Rineka Cipta.
- Nurfadilah, R., Wibowo, E., & Pramesti, S. (2024). Health literacy and kidney disease prevention behavior in rural Java: A cross-sectional study. *BMC Public Health*, 24(1), 214. <https://doi.org/10.1186/s12889-024-02145-9>
- Rahman, M. A., & Yunita, N. (2022). Community-based kidney disease screening using urine dipstick: A practical approach for low-resource settings. *Journal of Preventive Health*, 9(2), 55–63.
- Saskiyanti, A., Sopiatur, R., & Rusmini, R. (2025). Counseling and assistance for cadres in breast cancer screening in Dasan Lekong Village. *Indonesia Berdaya Journal*, 7(1), 1–4. <https://doi.org/10.47679/ib.20261317>
- World Health Organization (WHO). (2022). Noncommunicable diseases: Key facts. Geneva: WHO. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>