

KNOWLEDGE ASSESSMENT OF CHRONIC KIDNEY DISEASE AMONG FRESHMEN COLLEGE STUDENTS OF PAMANTASAN NG LUNGSOD NG MARIKINA THROUGH WEB-BASED INFOGRAPHICS

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ABSTRACT

Chronic Kidney Disease (CKD) is an escalating public health concern in the Philippines, with cases increasingly affecting young adults. Early prevention requires health literacy, yet young adults often lack foundational knowledge regarding CKD risk factors and prevention. This study evaluated the impact of web-based infographics on improving CKD knowledge levels among freshman college students across five academic programs. A quantitative quasi-experimental pre-test and post-test design was conducted among 356 freshman students at Pamantasan ng Lungsod ng Marikina, selected via non-probability quota sampling. Knowledge was evaluated using an adapted CKD knowledge assessment scale before and after exposure to web-based infographics in Audio Visual Room 606. Data were analyzed using percentage distribution, paired-sample *t*-test, independent-sample *t*-test, and one-way ANOVA. Statistical analysis revealed a significant increase in CKD knowledge scores from pre-test to post-test following the web-based infographic intervention. Web-based infographics are effective educational tools for enhancing CKD awareness among college freshmen, providing a scalable strategy for early primary prevention and long-term renal health promotion in young adults.

Keywords: Chronic Kidney Disease, web-based infographics, health literacy, pre-test knowledge scores, post-test knowledge scores.

INTRODUCTION

Chronic Kidney Disease (CKD) remains a significant a global public health burden due to its high prevalence and severe complications, including the end-stage renal disease, cardiovascular diseases, and premature mortality (Deng et al., 2025). Characterized by the progressive decline of renal function, CKD typically remains asymptomatic until advanced stages, driven primarily by diabetes mellitus, hypertension, glomerulonephritis, and nephrotoxic exposures (Mallamaci & Tripepi, 2024). Alarming, recent epidemiological data indicate a sharp rise in CKD incidence among adolescents and young adults aged 15–29 years, particularly in Southeast Asia where cases have reached 5,370.39 per 100,000 individuals (Wang et al., 2025). A critical driver behind this trend is low health literacy and limited disease awareness, leading to delayed presentation, diagnosis, and intervention (Nakamura, 2024).

In the Philippines, CKD poses a substantial socioeconomic and health challenge. Approximately 12.94 million Filipinos, roughly 11.2% of the national population are currently living with various stages of CKD, with one individual developing chronic renal failure every hour (Capitol Medical Center & Virginia, 2024). Furthermore, clinical trends observed at major medical centers such as Baguio General Hospital and Medical Center demonstrate that patients requiring renal replacement therapy, such as dialysis, are becoming progressively younger (Virginia, 2024). Because lifestyle behaviors and health management habits are heavily formed during emerging adulthood,

young adults represent a key demographic for targeted preventive education.

Digital health communications, particularly web-based infographics, have emerged as highly effective tools for translating complex clinical data into accessible visual formats. Analysis across health literature demonstrates that visual tools significantly enhance information retention, health literacy, and user engagement compared to traditional text-heavy materials (Chanzu et al., 2023; Kong et al., 2025; Navarrete-Muñoz et al., 2024). However, despite growing literature on visual educational interventions, limited empirical evidence evaluates the direct impact of web-based infographics on CKD knowledge among college freshmen a population undergoing critical behavioral transitions (Arafa et al., 2024).

Anchored on the United Nations Sustainable Development Goal 3 (Good Health and Well-Being), this study aims to assess the impact of web-based infographics on CKD knowledge levels among freshman students across five academic programs at Pamantasan ng Lungsod ng Marikina. By evaluating digital health education as an intervention for early disease awareness, this research seeks to support primary prevention strategies and cultivate long-term kidney health literacy among young adults.

METHODS

Study design

A quantitative, quasi-experimental pre-test-post-test design was used in this study to evaluate the effectiveness of a

web-based infographic about chronic kidney disease (CKD) among the freshmen’s knowledge. Participants completed a pre-test to determine their baseline knowledge, received the web-based infographic as the intervention, and completed a post-test to assess changes in knowledge. This design allows researchers to statistically compare the pre-test and post-test scores to determine the intervention’s effectiveness as a tool in raising knowledge about the rising number of CKD cases. The report was organized by Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) for clear and transparent important data.

Setting and participants

The study was conducted in Pamantasan ng Lungsod ng Marikina, specifically in Room 606 (Audio Visual Room) with an accessible, organized and controlled environment that facilitated a smooth collection process during March 2026. Eligible participants were first year college students from five academic programs of the university ages 18 to 29 due to increasing prevalence of Chronic Kidney Disease (Wang et al., 2024). Non-probability quota sampling was used. From a population of 3,058 freshmen, slovin’s formula yielded an estimated sample of 354, with a final sample of 356 participants. The distribution included 107 students from the College of Management, 43 students from the College of Arts and Sciences, 40 students from the College of Criminology, 135 students from the College of Hospitality Management, and 31 students from the College of Nursing. The sample was distributed across the programs to ensure proper representation in each academic program.

Variables and instruments

The primary outcome was the participants’ CKD knowledge through web-based infographics, measured using an adapted 34-item CKD Knowledge Assessment Tool by Younes et al. (2022), with permission for use and modification. The tool included demographic variables including age, sex, and academic program with CKD knowledge covering kidney functions, definition and stages, risk factors, signs and symptoms, diagnostic, prevention, and treatment. Knowledge scores were categorized as poor (0–11), moderate (12–23), and good (24–34). The adapted instrument was reviewed by a nephrologist, hemodialysis nurse, and psychometrician, and pilot-tested with 30 participants with acceptable internal consistency with a Cronbach’s alpha of 0.752. The same instrument was used for the pre-test and post-test, and language translation was provided for proper understanding. Secondary analyses examined differences between participants CKD knowledge according to age, sex, and college program.

Data collection

Researchers obtained consent from the Dean of the College of Nursing, followed by coordination with the five academic programs of PLMAR and permission from universities AKLATAN for ethical considerations. All participants involved were briefly oriented regarding the study, procedures, duration, voluntary participation, and confidentiality. All research participants obtained informed consent before participating in the study and were grouped into batches with 25–30 students per batch and completed the online pre-test through Google Forms. Participants then accessed the web-based infographic using a QR code for a maximum of 15 minutes, followed by the same instrument for post-test. Pre-test and post-test results were then

analyzed and computed by the statistician to determine changes in CKD knowledge.

Data analysis

The collected data were organized, analyzed and statistically computed using both descriptive and inferential statistical methods. Descriptive statistical method was used for the respondents demographic profile and to determine the respondents pre-test and post-test knowledge scores obtained by mean score, standard deviation and a standard error. One Way Analysis of Variance (ANOVA) was used to identify whether there are statistically differences in the mean scores of the dependent results across the three or more independent groups, specifically the age and college program. Independent samples t-test was used to identify whether there is a statistical significant difference specifically in sex. While paired samples t-test was used to compare the respondents’ pre-test and post-test scores in terms of their knowledge of Chronic Kidney Disease (CKD). Statistical test was used for data interpretation using a 0.05 level of significance ($\alpha = 0.05$). Where in, if the p-value is less than 0.05 (< 0.05) the result is statistically significant.

Ethical considerations

The study was approved by the College of Nursing members including the dean and head of the program dated in October 2025, and was permitted for data collection. Prior to the actual data collection, all ethical considerations were followed across all academic programs in the university. Participants were then provided an informed consent and right to withdraw from participation without any consequences. Ethical principles specifically autonomy, beneficence, non-maleficence, fidelity, veracity, justice, anonymity and confidentiality were observed throughout the study. Participant’s privacy and confidentiality were protected through restricted access to the collected email addresses. All necessary information was used solely for academic purposes specifically in research study.

RESULTS

Age. The majority of participants were 18 years old (38.48%, $f=137$), followed closely by those aged 19 years old (36.80%, $f=131$). Collectively, these two groups comprised more than three-fourths of the total sample, indicating that most respondents were within the typical early college age range. The older age groups (20–29 years old) were represented by only small proportions, suggesting that the study population was primarily composed of younger college students, with minimal participation from older individuals.

Table 1. Demographic Profile of the Participants

Age	<i>f</i>	%
18	137	38.48%
19	131	36.80%
20	49	13.76%
21	21	5.90%
22	5	1.40%
23	6	1.69%
24	3	0.84%

27	2	0.56%
29	1	0.28%
41	1	0.28%
Total	356	100%

Sex. Female participants comprised the majority of the sample (f=205, 57.58%), while male participants accounted for f=151 (42.42%). This indicates that the study population was slightly dominated by female students. The higher proportion of female respondents reflects the enrollment distribution within the participating college programs.

Table 2. Demographic Profile of the Participants

Sex	f	%
Male	151	42.42%
Female	205	57.58%
Total	356	100%

College Program. The largest group of participants came from the College of Hospitality Management (f=135, 37.92%), followed by the College of Management (f=107, 30.06%). Smaller proportions were drawn from the College of Arts and Education (f=43, 12.08%), College of Criminology (f=40, 11.24%), and College of Nursing (f=31, 8.71%). These results indicate that the majority of respondents were enrolled in hospitality and management-related programs, while fewer participants represented other academic disciplines. This distribution highlights the academic diversity of the sample but shows greater representation from specific programs.

Table 3. Demographic Profile of the Participants

College Program	f	%
College of Hospitality Management	135	37.92%
College of Management	107	30.06%
College of Arts, Science, and Education	43	12.08%
College of Criminology	40	11.24%
College of Nursing	31	8.71%
Total	356	100%

Table 4 presents the pre-test level of knowledge of the respondents regarding chronic kidney disease (CKD). The analyzed sample consisted of 356 students. The mean pre-test score was 20.41 (SD = 5.24, SE = 0.28). The lowest score recorded was 4, which indicates poor knowledge, while the highest score recorded was 32, which indicates good knowledge. These values indicate a wide variation in baseline knowledge. Some respondents demonstrated relatively high scores, suggesting prior awareness of CKD, while others obtained low scores, reflecting limited understanding of the condition. Overall, the results suggest that the level of knowledge of the respondents before the intervention was not the same for all participants.

Table 4. Pre-Test Level of CKD Knowledge

N	M	SD	SD ϵ	Min	Max
356	20.41	5.24	0.28	4	32

Table 5 presents the post-test knowledge scores of the respondents regarding chronic kidney disease (CKD). The analyzed sample consisted of 356 students. The mean post-test score was 27.65 (SD = 3.64, SE = 0.19), with scores ranging from a minimum of 13 to a maximum of 33. Compared to the pre-test mean, the post-test mean was substantially higher, indicating improved knowledge following the infographic intervention. The increase in scores suggests that the educational material was effective in enhancing the respondents' understanding of CKD, with most participants achieving moderate to good knowledge levels after exposure.

Table 5. Post-Test Level of CKD Knowledge

N	M	SD	SD ϵ	Min	Max
356	27.65	3.64	0.19	13	33

Pre-Test CKD knowledge in terms of:

Age. The result of the one-way ANOVA showed that the p-value for the pre-test was 0.238, which shows greater than the value of 0.05 level of significance. The finding suggests that age did not significantly influence the respondents' level of knowledge score regarding Chronic Kidney Disease (CKD) prior to web- based infographic exposure. This may be attributed to the fact that respondents were all college students who likely share a similar learning environment and have access to health information.

Table 6. Pre-Test Demographic Profile in terms of Age

Source	Sum of Squares	df	M square	F	Sig.	Decision	Interpretation
Between Groups	36.95	8	4.62	1.31	0.238	Accept null hypothesis	No Significant Difference
Within Groups	1231.16	347	3.55				
Total	3066.5	355					

Sex. The independent Sample t-Test showed that the p-value for the pre- test was 0.709, which value was greater than 0.05 level of significance. The finding suggests that sex did not significantly influence the level of CKD knowledge score before the infographic intervention. Both sexes demonstrated understanding regarding CKD, which may indicate that both male and female participants had primary knowledge of health-related information.

Table 7. Pre-Test Demographic Profile in terms of Sex

Test	t	df	Sig. (2-tailed)	Decision	Interpretation
Pre-Test	0.373	354	0.709	Accept null hypothesis	No Significant Difference

College Program. The result of the one-way ANOVA showed that the p-value for the pre-test was 2.06e-04, which shows less than the 0.05 level of significance. The result indicates a statistically significant difference in CKD knowledge score among respondents from different college programs prior to the educational intervention.

Table 8. Pre-Test Demographic Profile in terms of College Program

Source	Sum of Squares	df	M square	F	Sig.	Decision	Interpretation
Between Groups	512.87	4	128.22	5.76	2.06e-04	Reject null hypothesis	Significant Difference
Within Groups	7815.32	351	22.27				
Total	8328.19	355					

Post-Test CKD knowledge in terms of:

Age. The result of the one-way ANOVA showed that the p-value for the post-test was 0.646, which shows greater than the value of 0.05 level of significance. Finding suggests that age did not significantly influence the respondent's level of knowledge score regarding Chronic Kidney Disease (CKD) after the exposure to the supplemental material. Suggesting that web-based tools, particularly infographics can be effective across age groups.

Table 9. Post-Test Demographic Profile in terms of Age

Source	Sum of Squares	df	M square	F	Sig.	Decision	Interpretation
Between Groups	19.36	8	2.42	0.75	0.646	Accept null hypothesis	No Significant Difference
Within Groups	1097.21	347	3.15				
Total	1113.57	355					

Sex. The independent Sample t-Test showed that the p-value for the post- test was 0.879, which value was greater than 0.05 level of significance. The finding suggests that sex did not significantly influence the level of CKD knowledge score after the infographic intervention. Finding implies that web-based infographic intervention was equally effective for both sexes, which allows both male and female participants to improve their knowledge about CKD.

Table 10. Post-Test Demographic Profile in terms of Sex

Test	t	df	Sig. (2-tailed)	Decision	Interpretation
Pre-Test	-0.153	354	0.879	Accept null hypothesis	No Significant Difference

College Program. The result of the one-way ANOVA showed that the p-value for the post-test was 0.016, which

shows less than the 0.05 level of significance. The result indicates that there is a statistically significant difference in Chronic Kidney Disease knowledge scores among the respondents from different college programs, even after the web-based infographic intervention. However, the post-test results show a smaller degree of difference compared to the pre-test findings.

Table 11. Post-Test Demographic Profile in terms of College Program

Source	Sum of Squares	df	M square	F	Sig.	Decision	Interpretation
Between Groups	163.54	4	40.88	3.08	0.016	Reject null hypothesis	Significant Difference
Within Groups	4654.20	351	13.26				
Total	4817.74	355					

Significant Difference Between Pre-Test and Post-Test Scores

Analysis revealed a mean difference of 7.24 between the pre-test and post-test scores. The computed t-value was 22.05 with 355 degrees of freedom and a significance value of 1.74e-68. Since the p-value is significantly lower than the 0.05 level of significance, the results indicate a statistically significant difference between the pre-test and post-test scores. The finding confirms that the infographic intervention conducted during the study was effective in improving the respondents' knowledge about chronic kidney disease.

Table 12. Significant Difference between Pre- Test and Post-Test Level Score of the Respondents

M diff.	SD	SDe	t	df	Sig. (2-tailed)	Decision	Interpretation
7.24	6.20	0.33	22.05	355	1.74e-68	Reject Null Hypothesis	Significant Difference

DISCUSSION

Demographic Characteristics and CKD Knowledge

The statistical analyses indicated that participants' knowledge of chronic kidney disease (CKD) did not significantly differ by age or sex, suggesting that demographic characteristics exert minimal influence on CKD-related awareness. Respondents ranged from 18 to 29 years old, with the majority being 18 and 19. The older age group, ranging from 20-29 years old, was represented by a small portion, reflecting the typical age bracket of younger freshman college students. Female participants outnumbered males, a distribution likely mirroring institutional enrollment trends, though both sexes were adequately represented. All five academic programs were included, with Hospitality Management contributing the largest proportion, followed by Management, while Arts, Sciences and Education, Criminology, and Nursing were also represented, ensuring diversity and reliability of findings. Supporting literature affirms that younger

respondents tend to demonstrate more favorable knowledge levels (Gibbs et al., 2023).

Pre Test Level of CKD Knowledge

The pre-test CKD knowledge scores indicated a statistically significant difference among students from the different college programs. This suggests that baseline knowledge varied depending on academic background. First-year students enrolled in health-related programs, such as Nursing, likely demonstrated higher scores due to prior exposure to kidney function topics within their curriculum. In contrast, non-medical students showed lower baseline knowledge, consistent with the findings of Wang et al. (2025), who reported that medical students with a health-related academic background scored higher than non-medical peers. Similarly, Bawazir et al. (2025) found that non-medical students had lower levels of CKD knowledge, highlighting the importance of educational materials in raising awareness. These differences in baseline scores emphasize the role of academic background in shaping health literacy and strengthen the rationale for implementing educational tools such as web-based infographics across diverse programs. As Majka (2024) noted, pre-testing provides valuable insights into participants' initial knowledge and establishes a baseline for evaluating the effectiveness of interventions. Without such data, it becomes difficult to determine how much an intervention contributes to changes in outcomes or behaviors.

Post-Test Level of CKD Knowledge.

The post-test CKD knowledge scores revealed an increase among first-year college students from different programs after exposure to the intervention. This improvement reflects the implementation of the web-based infographics and suggests that the tool effectively enhanced students' understanding of CKD. The results are consistent with the findings of Imelda et al. (2020), who reported that educational materials such as informational leaflets significantly improved senior high school students' knowledge of CKD. Similarly, Ahmad et al. (2024) emphasized that online platforms, including web-based infographics, foster greater retention, comprehension, focus, and engagement by simplifying complex medical concepts, making them particularly effective in medical education. In addition, Subaveerapandiyani et al. (2024) highlighted the importance of providing accessible infographics to improve knowledge among students. Taken together, these findings indicate that web-based infographics contribute meaningfully to strengthening CKD knowledge and promoting health literacy among college students.

Difference Between the Pre-Test CKD Knowledge Scores and Demographic Profile.

The statistical analysis showed that age did not significantly affect the respondents' CKD knowledge scores prior to the infographic exposure. This indicates that participants from different age groups had relatively similar baseline knowledge about CKD. This aligns with the previous findings that younger individuals, particularly those within the young adult age group tend to demonstrate a comparable level of CKD knowledge, as access to different educational and health information can be obtained (Mahmoud et al., 2023). Similarly, sex did not significantly influence the

pre-test CKD knowledge scores. Indicating that both male and female respondents possessed relatively similar baseline knowledge regarding CKD, consistent with the previous study's findings that CKD awareness regarding causes and symptoms across sociodemographic variables has no statistically significant differences between male and female respondents (Gok et al., 2025). In contrast, significant differences were observed in CKD knowledge scores across college programs. This indicates that first-year students from PLMAR possessed varying levels of baseline knowledge about health information, specifically CKD. Such variation suggests that academic background, particularly the program or academic field, contributed to differences in students' knowledge (Kurbanoglu et al., 2023).

Difference Between the Post-Test CKD Knowledge Scores and Demographic Profile.

The findings of the study showed that age did not influence the respondents' level of knowledge regarding CKD after exposure to the web-based infographic. This suggests that participants across different age groups acquired relatively similar levels of knowledge regarding CKD, consistent with previous findings that younger individuals, particularly those in adolescence and early adulthood, tend to demonstrate favorable health knowledge due to psychosocial development and heightened awareness of personal well-being (Wang Z. et al., 2024; Mahmoud et al., 2023). Similarly, infographics have been shown to facilitate efficient visual information processing among younger adults, thereby enhancing comprehension of complex health topics (Gibbs et al., 2023). In terms of sex, post-test results indicated no significant differences between male and female respondents, confirming that both groups achieved comparable knowledge gains, in line with Gok (2025), who reported no statistically significant gender differences in CKD awareness. In contrast, significant differences were observed across academic programs, with students from health-related disciplines demonstrating greater knowledge compared to those from non-medical fields. This variation reflects differences in curricular exposure and access to standardized medical information, as supported by Xiang et al. (2025).

Significant Difference Between Pre-Test and Post-Test Scores.

The findings revealed a significant difference between the respondents' pre-test and post-test CKD knowledge scores, indicating that the web-based infographic intervention effectively improved students' understanding of CKD. Post-test results demonstrated that participants acquired and retained more information, particularly regarding causes, symptoms, risk factors, and preventive measures. These findings are consistent with prior studies showing that pre-test/post-test models are effective in evaluating enhanced learning outcomes (Boyce & Jordan, 2024; Malik & Alam, 2019). Moreover, the intervention enabled participants to process complex health information more effectively, consistent with the observations of Gupta et al. (2024) and Majka (2024), who emphasized the role of structured educational tools in promoting health literacy.

Strengths and limitations

The strength of the quasi-experimental design lies in its capacity to evaluate the effectiveness of the infographics.

The researcher intentionally selected participants within the age range of 18 to 29 years. The study, however, was confined to freshmen students enrolled in college programs at Pamantasan ng Lungsod ng Marikina, which may restrict the generalizability of the results to other student populations or academic institutions.

CONCLUSION

The study found that the web-based infographic intervention significantly improved Chronic Kidney Disease (CKD) knowledge among first-year students at Pamantasan ng Lungsod ng Marikina, as demonstrated by the significant difference between their pre-test and post-test knowledge scores. The findings also showed that age and sex did not significantly influence students' CKD knowledge, while significant differences were observed among the students from different college programs. Overall, the findings suggest that web-based infographics may be a useful educational tool for enhancing students' understanding and awareness of CKD. Therefore, web-based infographics could be considered as an additional educational tool for promoting CKD knowledge among college students.

IMPLICATIONS FOR NURSING AND HEALTH SCIENCES

Nursing educators may incorporate web-based infographics on Chronic Kidney Disease (CKD) into health education activities to improve students' CKD knowledge. Nursing and health science programs may use similar visual and digital materials when teaching complex health concepts, particularly among students from different academic programs. Future researchers may further evaluate web-based infographics using larger and more diverse student populations to determine their effectiveness in improving CKD knowledge and health awareness.

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AUTHOR CONTRIBUTIONS

M.E.G, A.R.D, J.I, B.D.L, D.M, D.P, J.S, and L.S equally contributed to the conceptualization, methodology, investigation, data collection, data analysis, interpretation of results, writing, review and editing, and final approval of the manuscript. All authors participated in all stages of the research and approved the final version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY

The data generated and analyzed during the study are not publicly available due to participant privacy and confidentiality considerations. The research questionnaire and web-based infographic used in the study are accessible upon reasonable request from the researchers.

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FIGURE AND SUPPLEMENTARY MATERIAL GUIDANCE

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