SCREENING OF KIDNEY DYSFUNCTION AND ITS ASSOCIATED RISK FACTORS AMONG PUBLIC SCHOOL LEARNERS IN LA UNION NATIONAL HIGH SCHOOL, CITY OF SAN FERNANDO, LA UNION

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This research was conducted as part of the academic requirements of the College of Medical Laboratory Science at LORMA Colleges. It aims to support school-based health screening by assessing renal health and identifying possible risk factors for kidney dysfunction among public high school learners.

The research was conducted ethically with voluntary participation and parental consent. Ethical clearance was granted by the LORMA College's Research Ethics Committee, and all biosafety and research guidelines were followed. Findings are limited to the selected participants and aim to promote early health awareness and prevention in school communities.

Abstract

Kidney dysfunction has become an emerging health concern among adolescents due to unhealthy lifestyle habits, poor dietary practices, inadequate hydration, and limited awareness of kidney health. This study aimed to determine the prevalence of kidney dysfunction and identify its associated risk factors among public school learners at La Union National High School in the City of San Fernando, La Union. A descriptive cross-sectional research design was employed involving sixteen (16) high school students. Data were collected through anthropometric measurements, vital sign assessments, structured questionnaires, and laboratory urinalysis, including microalbumin testing. The findings revealed a high prevalence of early kidney dysfunction, with 62.5% (n=10) of respondents exhibiting clinical signs of renal abnormalities as validated by physician assessment. While the majority of participants maintained a normal Body Mass Index (BMI) and blood pressure levels, a significant statistical difference in dysfunction prevalence was observed when categorized by grade level. Conversely, no significant association was observed between kidney dysfunction and identified risk factors, including dietary intake, hydration practices, drug use, and family history. These results underscore the importance of routine school-based kidney health screening and early preventive measures to identify asymptomatic learners at risk, thereby supporting long-term renal health.

Keywords*: Early Detection, Kidney Dysfunction, Public School Learners, Risk Factors, Urinalysis*

1. **Introduction**

Kidney health plays an important role in maintaining the body's internal balance by regulating fluid levels, removing metabolic waste products, and controlling electrolyte concentrations. Despite its importance, kidney dysfunction may remain asymptomatic in its early stages, making early detection essential to prevent long-term complications.

Among adolescents, lifestyle behaviors such as poor dietary intake, inadequate hydration, and improper medication use may contribute to renal health risks. Environmental factors and increasing accessibility to processed foods high in sodium and preservatives may further contribute to potential kidney dysfunction among school-aged individuals.

School-based health screening programs offer an opportunity to identify potential renal abnormalities early. Urinalysis is widely recognized as a simple, non-invasive diagnostic method that can detect early markers of kidney dysfunction such as proteinuria, hematuria, and microalbuminuria.

This study was conducted to detect early kidney dysfunction and identify its associated risk factors among public school learners in La Union National High School, City of San Fernando, La Union.

2. Objectives

The study aimed to detect early kidney function changes through urinary biomarkers among public school learners in San Fernando City, La Union.

Specifically, the study sought to:

1. Assess the health profile of the respondents based on:
    a. BMI
    b. Pulse rate
    c. Blood pressure
    d. Temperature
2. Determine the demographic profile of the respondents in terms of:
    a. age

b. sex

c. grade level

3. Determine the prevalence of kidney dysfunction among the respondents based on urinalysis and physician-validated findings.

4. Determine whether there is a significant difference on the prevalence of kidney dysfunction among learners when grouped according to their health and demographic profile?

5. Identify the risk factors associated with kidney dysfunction in terms of:

a. family history

b. dietary intake

c. hydration practices

d. drug intake

6. Determine whether there is a significant relationship between the prevalence of kidney dysfunction and the identified risk factors.

3. Materials and Methods

3.1. Research Design

This study employed a descriptive cross-sectional research design, which involves collecting and analyzing data from a defined population at a single point in time. This approach allowed the researchers to determine the prevalence of kidney dysfunction and identify potential associated factors without manipulating variables.

3.2. Population and Locale of the Study

The study was conducted at La Union National High School, located in the City of San Fernando, La Union, Philippines. A total of sixteen (16) learners, who are 8 from grade 8 and 8 from grade 11, participated in the study. Participants were selected using stratified sampling to ensure representation across grade levels.

Students were eligible if enrolled in the school, had no diagnosed kidney disease, and submitted parental consent and assent forms. Those with kidney disorders or severe medical conditions were excluded.

3.3. Inclusion and Exclusion Criteria

Participants included students who:

a. Were officially enrolled from Grades 7 to 12
b. Had no known diagnosis of chronic kidney disease
c. Provided informed assent
d. Had parental or guardian consent

Students with diagnosed kidney disease or chronic medical conditions requiring continuous medication were excluded.

3.4. Data Gathering Tools

The study utilized the following instruments:

1. Urinalysis Testing

   Midstream clean-catch urine samples were collected in sterile containers to undergo:

   a. Physical examination (color and clarity)
   b. Chemical testing using reagent strip dipsticks
   c. Microscopic examination for cells and formed elements
   d. Microalbumin testing to detect early kidney damage

2. Structured Questionnaire

   The questionnaire collected demographic information and assessed risk factors related to kidney dysfunction. It consisted of sections on family history, dietary intake, hydration practices, and drug intake.

3. Anthropometric and Vital Signs Assessment

   Baseline measurements included:

a. Height and weight for Body Mass Index (BMI)
b. Blood pressure
c. Pulse rate
d. Body temperature
e. Respiratory rate

3.5. Urine Collection and Laboratory Analysis

All collected urine specimens were transported at 2–8 °C and processed within 1–2 hours to ensure sample integrity. Laboratory analysis followed standardized urinalysis protocols; all results were validated by a licensed medical technologist and formally interpreted by a physician.

3.6 Data Collection

Data were collected using a structured questionnaire answered by parents or guardians. The questionnaire collected information on respondents' demographic profiles, family history of kidney disease, dietary intake, hydration practices, and drug use.

Physiological measurements were also taken, including height, weight, pulse rate, blood pressure, and body temperature. Body Mass Index (BMI) was computed using the standard formula: weight in kilograms divided by height in meters squared.

3.7. Data Analysis

The collected data were organized, encoded, and analyzed using appropriate statistical methods. Descriptive statistics, including frequency counts, percentages, and measures of central tendency, were used to summarize the demographic characteristics, physiological measurements, lifestyle factors, and urinalysis results of the respondents.

To determine the relationship between kidney dysfunction and the identified risk factors, inferential statistical tests were applied. The Chi-square test of independence was used to examine the association between categorical variables, including demographic profile, dietary intake, hydration practices, family history, drug intake, and kidney dysfunction.

Furthermore, Analysis of Variance (ANOVA) was utilized to determine whether significant differences existed among selected physiological variables, including Body Mass Index (BMI), pulse rate, blood pressure, and body temperature, in relation to kidney dysfunction. A significance level of 0.01 was used for all inferential tests in the study.

4. Results

The results present the health profile of the respondents, their lifestyle-related risk factors, and the prevalence of kidney dysfunction based on urinalysis screening.

4.1 Health Profile of the Respondents

Among the sixteen respondents, the majority were classified under the normal Body Mass Index (BMI) category, with ten respondents (62.5%). Three respondents (18.8%) were classified as overweight, one respondent (6.3%) was obese, one respondent (6.3%) was underweight, and one respondent (6.3%) exhibited moderate to severe thinness.

4.2 Dietary Intake

The dietary intake assessment revealed that most respondents demonstrated good dietary practices. Thirteen respondents (81.3%) were classified under good dietary intake. One respondent (6.3%) demonstrated excellent dietary intake, one respondent (6.3%) exhibited fair dietary intake, and one respondent (6.3%) reported poor dietary intake.

4.3 Hydration Practices

Hydration practices showed that nine respondents (56.3%) had excellent practices, while 6 respondents (37.5%) had good practices. One respondent (6.3%) exhibited fair hydration practices, and none were categorized as having poor hydration practices.

4.4 Family History of Kidney Disease

Most respondents reported no family history of kidney disease, indicating that the majority were categorized under the no-risk group. A small number of respondents were classified as medium- or high-risk.

4.5 Prevalence of Kidney Dysfunction

Urinalysis screening identified 10 respondents (62.5%) with possible kidney dysfunction, while 6 (37.5%) were categorized as having normal kidney function based on laboratory findings and physician interpretation.

4.6 Relationship Between Risk Factors and Kidney Dysfunction

Statistical analysis revealed no significant association between kidney dysfunction and demographic variables, including age, sex, and grade level. Similarly, physiological indicators, including BMI, pulse rate, blood pressure, and body temperature, were not significantly associated with kidney dysfunction.

Lifestyle-related factors, including family history, dietary intake, hydration practices, and drug use, also showed no statistically significant association with kidney dysfunction among the respondents.

5. Discussion

The findings of this study provide insight into the kidney health status of public school learners. Most respondents demonstrated normal BMI and generally good lifestyle practices, including acceptable dietary intake and hydration habits. These results suggest that most participants maintained relatively healthy behaviors.

Despite these favorable indicators, urinalysis screening revealed that several respondents exhibited possible signs of kidney dysfunction. This finding underscores the importance of laboratory screening, as kidney abnormalities may occur even in individuals without obvious symptoms or risk factors.

The absence of significant relationships between kidney dysfunction and the examined demographic, physiological, and lifestyle factors may be attributed to the study's small sample size. Nevertheless, the results emphasize the value of early screening to identify potential renal abnormalities in adolescents.

School-based urinalysis screening programs may therefore serve as an effective strategy for early detection and monitoring of kidney health among students.

6. Conclusion

This study screened for kidney dysfunction and examined its associated risk factors among public school learners in La Union National High School. The findings showed that while most respondents demonstrated generally healthy physiological and lifestyle profiles, several learners exhibited urinalysis findings suggestive of possible kidney dysfunction.

No significant relationship was found between kidney dysfunction and the examined demographic, physiological, or lifestyle-related risk factors. These results highlight the importance of early screening to detect potential kidney abnormalities in adolescents.

Implementing school-based kidney health screening programs may support early detection and raise students' awareness of kidney health. Future studies involving larger sample sizes are recommended to further explore potential risk factors for kidney dysfunction.

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8. References

Abdin, A., & Böhm, M. (2023). Resting heart rate: a valuable marker for preventing kidney disease. *Journal of the American Heart Association, 12*(23), e032580. https://www.ahajournals.org/doi/10.1161/JAHA.123.032580

Afroz, S., Simi, M. A., Sharmim, S., & Khanum, R. (2022). Aetiology and outcome of acute kidney failure in Bangladeshi children: Dhaka Medical College Hospital experience. *Journal of Dhaka Medical College, 24*(2), 86–91.

Ahuja, S., Anderson, C. A., & Chen, T. K. (2021). Reversibility of subclinical renal strain: The role of high-sensitivity albuminuria screening in youth. *Kidney International Reports, 6*(9), 2315–2324. https://doi.org/10.1016/j.ekir.2021.06.012

American Heart Association. (2022). Adolescent blood pressure and the risk for early kidney damage in young adulthood. *Hypertension, 79*(5), 974–983. https://doi.org/10.1161/HYPERTENSIONAHA.121.18748

American Diabetes Association. (2023). Standards of care in diabetes—2023. Diabetes Care, 46(Supplement_1), S1–S291. https://doi.org/10.2337/dc23-SINT

American Diabetes Association. (2024). 11. Chronic kidney disease and risk management: Standards of care in diabetes—2024. Diabetes Care, 47(Supplement_1), S219–S230. https://doi.org/10.2337/dc24-S011

American Heart Association. (2021). *Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults*. American Heart Association. https://www.heart.org

American Heart Association. (2025). *Understanding blood pressure readings*. Understanding blood pressure readings

Angeles-Agdeppa, I., & S. Custodio, M. R. (2020). Food Sources and Nutrient Intakes of Filipino *Working Adults. Nutrients, 12*(4), 1009. 4

Angeles-Agdeppa, I., I., Sun, Y., Tanda, K. V., & Capanzana, M. V. (2022). Breakfast in the Philippines: Food and diet quality as analyzed from the 2018 Expanded National Nutrition Survey. *Nutrition Journal, 21*(1), 45. https://link.springer.com/article/10.1186/s12937-022-00804-x

Aragon, J. C., & Mendoza, L. S. (2020). Hydration status and renal clearance markers among Filipino public school adolescents. *Philippine Journal of Health Research and Development, 24*(1), 45–58.

Aragon, S. C., & Mendoza, D. R. (2020). Lifestyle habits and renal clearance markers among Filipino public school students: The role of hydration. *Journal of the Philippine Medical Association,* 98(1), 34–42.

Avesani, C. M., Cuppari, L., Nerbass, F. B., Lindholm, B., & Stenvinkel, P. (2023). Ultraprocessed foods and chronic kidney disease—double trouble. *Clinical Kidney Journal, 16*(10), 1723–1736. https://doi.org/10.1093/ckj/sfad103

Bakris, G. L., et al. (2024). Real-world impact of blood pressure control in patients with chronic kidney disease. *American Journal of Hypertension, 37*(6), 438–446. https://academic.oup.com/ajh/article/37/6/438/7618537

Ballesteros, M. M., & Chiu, A. S. (2023). Chronic kidney disease in the Philippines: Current challenges and future directions. *Philippine Journal of Internal Medicine, 61*(2), 45–52. https://pjim.org/uploads/pjim_vol61no2/chronic-kidney-disease-philippines.pdf

Brunzel, N. A. (2016). Fundamentals of urine and body fluid analysis (3rd ed.). Elsevier.

Bernstein D. History and physical examination in cardiac evaluation. In: Kliegman RM, St Geme JW, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. Nelson Textbook of Pediatrics. 21st ed. Philadelphia, PA: Elsevier; 2020:chap 449.

Boen, C. E., Kozlowski, K., & Tyson, K. D. (2020). “Toxic” schools? How school exposures during adolescence influence trajectories of health through young adulthood. SSM - Population Health, 11, 100623. https://pmc.ncbi.nlm.nih.gov/articles/PMC7338637/

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J. P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., Lambert, E., ... Stamatakis, E. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine, 54*(24), 1451–1462.

Buser, N., et al. (2020). Drug-induced kidney injury in children and adolescents. *International Journal of Pediatrics*. https://pubmed.ncbi.nlm.nih.gov/32145678/

Buser, N., et al. (2020). Over-the-counter medication misuse and drug-induced nephrotoxicity in younger populations. *Journal of Pediatric Pharmacology and Therapeutics, 25*(4), 310–318.

Capitol Medical Center (2023). Chronic Kidney Disease in the Philippines: A Silent Epidemic. Capitol Medical Center, Inc. Quezon City, 8 Jan. 2025, https://capitolmedical.com.ph/articles-and-blogs/chronic-kidney-disease-in-the-philippines-a-silent-epidemic/

Carrero, J. J., Hecking, M., Chesnaye, N. C., & Jager, K. J. (2022). Sex and gender differences in chronic kidney disease: Progression to end-stage renal disease and outcomes. *Nature Reviews Nephrology, 14*(3), 151–164. https://doi.org/10.1038/nrneph.2017.181

Centers for Disease Control and Prevention. (2024, May 15). Chronic kidney disease in the United States, 2023. Retrieved August 24, 2024, from https://www.cdc.gov/kidney-disease/php/data-research/index.html

Centers for Disease Control and Prevention. (2023). Chronic kidney disease basics. https://www.cdc.gov/kidney-disease/about/index.htm

Centers for Disease Control and Prevention. (2021). Guidelines for specimen collection and handling in clinical settings. U.S. Department of Health and Human Services. https://www.cdc.gov

Chaudhary, K., et al. (2021). *Chronic kidney disease and the risk factors associated with its development.* PubMed. https://www.kidney.org/press-room/ultra-processed-foods-lead-to-higher-risk-kidney-disease-new-study-finds

Chen, J., Wang, L., Li, H., & Zhang, Q. (2026). Longitudinal BMI trajectories and urinary biomarkers of tubular injury in adolescents. *Journal of Pediatric Renal Research, 18*(2), 88–102.

Chisavu, F., Chisavu, L., Ivan, V., Schiller, A., Mihaescu, A., Marc, L., Stroescu, R., Steflea, R. M., & Gafencu, M. (2024). Acute kidney disease following acute kidney injury in children—a retrospective observational cohort study on risk factors and outcomes. Preprints, 2024, 0882. https://www.preprints.org/manuscript/202404.0882

Cirillo, L., De Chiara, L., Innocenti, S., Errichiello, C., Romagnani, P., & Becherucci, F. (2023). Chronic kidney disease in children: an update. *Clinical Kidney Journal, 16*(10), 1600–1611. https://academic.oup.com/ckj/article/16/10/1600/7140531

Cleveland Clinic. (2024, June 6). Hyperthermia. https://my.clevelandclinic.org/health/diseases/22111-hyperthermia

Cleveland Clinic. (2024, July 3). Urinalysis: What it is, purpose, procedure, results & types. Cleveland Clinic. https://my.clevelandclinic.org/health/diagnostics/17893-urinalysis

Clinical and Laboratory Standards Institute. (2021). Urinalysis; approved guideline (CLSI document GP16). CLSI.

Clinical and Laboratory Standards Institute. (2024). Procedures for the collection, transport, and processing of urine specimens for examination. CLSI.

Cruz, C. (2023). Number of ESRD and CKD patients in the Philippines (2000–2023) [Data report]. National Kidney and Transplant Institute. https://nkti.gov.ph

De Leon, M. R., & Rivera, G. T. (2021). Genetic predisposition and environmental triggers of renal failure in the Philippine population. *Southeast Asian Journal of Tropical Medicine and Public Health, 52*(2), 88–101.

De Rosa, R., Grosso, S., Snijders, D., Meschiari, M., & Mussini, C. (2021). Urinary tract infections: Diagnosis and management in modern medicine. *Journal of Clinical Medicine, 10*(14), 3102. https://doi.org/10.3390/jcm10143102

Denic, A., Glassock, R. J., & Rule, A. D. (2022). Structural and functional changes with the aging kidney. Advances in Chronic Kidney Disease, 29(3), 235–244.

Department of Health–Philippines. (2022). Health care waste management manual. https://doh.gov.ph

Department of Health. (2023). National kidney health and noncommunicable disease prevention initiatives.

Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI) (2019) Nutritional status of Filipino adolescents, 10-19 years old. - References - Scientific Research publishing. (n.d.). https://www.scirp.org/reference/referencespapers?referenceid=3989505&utm_

Farillas, E. L. F., & Dator, M. A. (2025). Acute kidney injury in children and adolescents admitted for pneumonia in the Philippines. *Pediatric Nephrology.* https://link.springer.com/article/10.1007/s00467-025-06899-8

Flynn, J. T., Kaelber, D. C., Baker-Smith, C. M., Blowey, D., Carroll, A. E., Daniels, S. R., de Ferranti, S. D., Dionne, J. M., Falkner, B., Flinn, S. K., et al. (2023). Clinical practice guideline for screening and management of high blood pressure in children and adolescents. *Pediatrics, 140*(3), e20171904. https://publications.aap.org/pediatrics/article/140/3/e20171904/38358/Clinical-Practice-Guideline-for-Screening-and?autologincheck=redirected

Forcina, G., Luciano, M., Frattolillo, V., Mori, S., Monaco, N., Guarino, S., Marzuillo, P., Del Giudice, E. M., & Di Sessa, A. (2024a). Kidney Damage in Pediatric Obesity: Insights from an Emerging Perspective. *Journal of Clinical Medicine, 13*(23), 7025. https://www.mdpi.com/2077-0383/13/23/7025

García-Carro, C., Vergara, A., Bermejo, S., Azancot, M. A., Sellarés, J., & Soler, M. J. (2021). A Nephrologist Perspective on Obesity: From Kidney Injury to Clinical Management. Frontiers in Medicine, 8, 655871. https://www.frontiersin.org/journals/medicine/articles/10.3389/fmed.2021.655871/full

Garofalo, C., Borrelli, S., Provenzano, M., De Stefano, T., De Nicola, L., & Andreucci, M. (2022). Obesity and kidney disease: A systematic review of the pathophysiological mechanisms and clinical implications. *Journal of Nephrology, 35*(5), 1237–1251. https://pmc.ncbi.nlm.nih.gov/articles/PMC9718013/

Ghafour, A. S., Al-Khalidy, H., & Omar, T. (2023). Pediatric renal health and the prevalence of drug-induced injury in school settings. *International Journal of Adolescent Medicine, 12*(2), 89–101.

Global Pediatric Nephrology Initiative. (2025). Mind the gap: Why adolescent physical markers fail to predict subclinical kidney disease. *MDPI Children, 12*(5), 614. https://doi.org/10.3390/children12050614

GMA Integrated News. (2025). DOH confirms increasing number of children undergoing dialysis in regional hospitals. GMA News Online.

Gomez (2021). Clinical practice guideline for the management of blood pressure in chronic kidney disease. *Kidney International, 99*(3S), S1–S87. https://www.kidney-international.org/article/S0085-2538(20)31270-9/fulltext

Grams, M. E., Sang, Y., Yang, W., Matsushita, K., Inker, L. A., Shlipak, M. G., Coresh, J., & The CKD Prognosis Consortium. (2025). Lifestyle-associated metabolic stressors and the global burden of renal abnormalities in younger populations: A cross-sectional analysis. The Lancet Diabetes & Endocrinology, 13(2), 85–98. https://doi.org/10.1016/S2213-8587(24)00214-

Harambat, J., Cochat, P., & Guigonis, V. (2024). *Pediatric nephrology: From clinical development to adolescent transition.* Elsevier Health Sciences.

He, F. J., Marrero, N. M., & MacGregor, G. A. (2023). Salt intake, sugar-sweetened beverages, and renal health in children and adolescents: A school-based environmental perspective. Journal of Human Hypertension, 37(10), 842–851. https://doi.org/10.1038/s41371-023-00812-y

Herrington, W. G., Judge, P. K., Grams, M. E., & Wanner, C. (2026). Chronic kidney disease. The Lancet, 407(10523), 90–104. https://doi.org/10.1016/S0140-6736(25)01942-7

Healthy Eating for Adults with Chronic Kidney Disease. (2025, August 12). National Institute of Diabetes and Digestive and Kidney Diseases. https://www.niddk.nih.gov/health-information/kidney-disease/chronic-kidney-disease-ckd/healthy-eating-adults-chronic-kidney-disease

Huether, S. E., & McCance, K. L. (2022). Understanding pathophysiology (7th ed.). Elsevier.

Husain-Syed, F., Ferrari, F., Sharma, A., Danesi, T. H., Bezerra, P., Lopez-Giacoman, S., ... & Ronco, C. (2023). Renal functional reserve: From physiological phenomenon to clinical biomarker and beyond. *Kidney International, 103*(3), 481–496. https://doi.org/10.1016/j.kint.2022.11.025

Inoue, K., Horwich, A., Ramirez, G., Molony, D., & Winkelmayer, W. C. (2021). Association of subclinical hyperfiltration with long-term renal outcomes in healthy young adults. *JAMA Network Open, 4*(10), e2128524. https://doi.org/10.1001/jamanetworkopen.2021.28524

Johnson, R. J., et al. (2021). The role of hydration in kidney health and disease. American Journal of Kidney Diseases, 77(1), 120–132.

Juett, L. A., L. A., Eichner, N. Z. M., Halliwill, J. R., & Sigurdsson, M. I. (2021). Hypohydration produced by high-intensity intermittent running increases biomarkers of renal injury in males. *European Journal of Applied Physiology, 121*(12), 3301–3312. https://link.springer.com/article/10.1007/s00421-021-04804-3

Kanduri, J. P., et al. (2021). Medication adherence and its impact on renal outcomes. Journal of Clinical Medicine. https://www.mdpi.com/journal/jcm/special_issues/Renal_Outcomes

Karava, V., Dotis, J., Kondou, A., & Printza, N. (2023). Malnutrition Patterns in Children with *Chronic Kidney Disease. Life, 13*(3), 713. https://doi.org/10.3390/life13030713

Katella, K. (2024, April 24). Why is chronic kidney disease (CKD) on the rise? 6 things to know. Yale Medicine. Retrieved August 24, 2024, from https://www.yalemedicine.org/news/why-is-chronic-kidney-disease-ckd-on-the-rise

Kim, J. Y., Chun, S., Lim, H., & Chang, T. I. (2023). Association between familial aggregation of chronic kidney disease and its incidence and progression. *Scientific Reports, 13*(1). https://doi.org/10.1038/s41 598-023-32362-5

Kim, J. Y., Lee, S., Kim, K., & Park, J. T. (2022). Association between familial aggregation of chronic kidney disease and its incidence and progression: A nationwide family cohort study in Korea. *Journal of Clinical Medicine, 11*(21), 6358.

Kim, S., & Park, J. (2024). Adolescent lifestyle transitions and metabolic risk: A comparative study of junior and senior high school cohorts. *Journal of School Health and Nutrition, 12*(2), 115–129.

Kim, S. M., & Jung, J. Y. (2020). Nutritional management in patients with chronic kidney disease. *The Korean Journal of Internal Medicine, 35*(5), 1279–1290. https://kjim.org/journal/view.php?doi=10.3904/kjim.2020.408

Kovesdy, C. P. (2022). Epidemiology of chronic kidney disease: An update 2022. *Kidney International Supplements, 12*(1), 7–11. https://doi.org/10.1016/j.kisu.2021.11.003

Kuwabara, M., Kuwabara, R., Niwa, K., Hisatome, I., Ronco, C., & Ohno, M. (2022). Uric acid and hypertension: A comparative analysis of renal outcomes. *Hypertension Research, 45*(1), 156–168. https://doi.org/10.1038/s41440-021-00782-z

Li, K., Zou, J., Ye, Z., Di, J., Han, X., Zhang, H., Liu, S., & Sun, X. (2021). Improvement of renal function after bariatric surgery: A systematic review and meta-analysis. *Obesity Surgery, 31*(6), 2499–2508. https://doi.org/10.1007/s11695-021-05630-4

Li, Z., Zhang, Y., Cheng, Y., & Chen, G. (2023). Renal functional reserve: A biomarker for early detection of kidney injury in young cohorts. *Pediatric Nephrology, 38*(4), 1011–1023. https://doi.org/10.1007/s00467-022-05712-1

LibreTexts. (n.d.). Lab procedures: Operating a microscope. Retrieved November 29, 2024, from https://bio.libretexts.org/Courses/North_Carolina_State_University/MB352_General_ Microbiology_Laboratory_2021_%28Lee%29/03%3A_Microscopy/3.03%3A_Lab_Pro cedures-_Operating_a_Microscope

Lirio, M., & Castillo, R. (2020). Health literacy and self-medication practices among Filipino public school students. *Philippine Journal of Health Research and Development*. https://pjhrd.upm.edu.ph/index.php/main/article/view/142

Llanes, R. D., Bautista, M. K., & Garcia, S. (2022). Health-seeking behaviors and medication usage among Filipino public school students. *Philippine Health Review, 19*(1), 34–42. https://www.herdin.ph/index.php/component/herdin/?view=research&cid=72491

Lopes, S., et al. (2022). Cardiovascular and renal interactions: The impact of heart rate variability on kidney function. *Journal of Nephrology, 35*, 889–901.

Lustre, M. J., Santos, R. A., & Reyes, J. L. (2021). Association between obesity, hypertension, diabetes, and early kidney dysfunction in Filipino adults. *Philippine Journal of Internal Medicine, 59*(2), 45–53.

Mackowiak-Lewandowicz, K., K., Kuzdak, K., & Rychlik, M. (2022). Chronic kidney disease predictors in obese adolescents. *International Journal of Environmental Research and Public Health, 19*(4), 2145. https://www.mdpi.com/1660-4601/19/4/2145

Manila Standard. (2024, March 12). Chronic kidney disease on the rise among Filipinos. https://manilastandard.net/news/314426022/chronic-kidney-disease-on-the-rise-among-filipinos.html

Martini, D., et al. (2022). The intake of ultra-processed foods and prevalence of chronic kidney disease: *The Health Examinees Study. Nutrients, 14*(17), 3548. https://www.mdpi.com/2072-6643/14/17/3548

Mayo Clinic. (2024). Hypothermia: Symptoms & causes. https://www.mayoclinic.org/diseases-conditions/hypothermia/symptoms-causes/syc-20352682

McHugh, M. L. (2013). The chi-square test of independence. *Biochemia Medica, 23*(2), 143–149. https://doi.org/10.11613/bm.2013.018

McLeod, S. (2018). Questionnaire: Definition, Examples, Design and Types. Retrieved from https://www.simplypsychology.org/questionnaires.html

McPherson, R. A., & Pincus, M. R. (2021). Henry's clinical diagnosis and management by laboratory methods (24th ed.). Elsevier.

Medical Pinas. (n.d.). Dialysis price in Philippines 2024 to clean your blood. Retrieved August 24, 2024, from https://medicalpinas.com/dialysis-centers-philippines/#google_vignette

MedlinePlus. (2023, July 6). Glomerular filtration rate (GFR) test. Retrieved November 19, 2024, from https://medlineplus.gov/lab-tests/glomerular-filtration-rate-gfr-test/

Melsom, T., Norvik, J. V., Enoksen, I. T., Stefansson, V., Mathisen, U. D., Fuskevåg, O. M., Jenssen, T. G., Solbu, M. D., & Eriksen, B. O. (2022). Sex Differences in Age-Related Loss of kidney Function. *Journal of the American Society of Nephrology, 33*(10), 1891–1902. https://doi.org/10.1681/asn.2022030323

Mendonça, L., et al. (2024). The impact of glucagon-like peptide-1 receptor agonists on kidney outcomes: A meta-analysis of randomized placebo-controlled trials. *Clinical Journal of the American Society of Nephrology.* Advance online publication. from https://pubmed.ncbi.nlm.nih.gov/39480988/

Mercado-Asis, L. B., Ona, D. I. D., Bonzon, D. D., Vilela, G. A., Diaz, A. F., Balmores, B. A., Co, M., Mina, A. B., Cabral, E. I., Aquino, A. V., Abelardo, N. S., Gomez, L. A., Valdez, L. P., & Castillo, R. R. (2022). Burden of disease of hypertension in the Philippines projected in 2050. *Journal of Hypertension, 40*(Suppl 1), e41.

Miller, J. L., Thompson, R. E., & Wright, P. S. (2021). Thresholds of nephrotoxicity: A longitudinal study of over-the-counter medication use in adolescents. *Journal of Renal Nursing and Science, 8*(4), 210–224

Mitsnefes, M. (2024). Hypertension in children and chronic kidney disease progression. Clinical *Journal of the American Society of Nephrology, 13*(3), 410–418.

National Institute of Diabetes and Digestive and Kidney Diseases. (2022). Chronic kidney disease in children. https://www.niddk.nih.gov/health-information/kidney-disease/children

National Institute of Diabetes and Digestive and Kidney Diseases. (n.d.). Hemodialysis. Retrieved August 24, 2024, from https://www.niddk.nih.gov/health-information/kidney-disease/kidney-failure/hemodialysis

National Kidney Foundation. (2024). Kidney disease risk factors and prevention. https://www.kidney.org/kidney-topic

Nationwide Children's Hospital. (n.d.). Urine dip tests. Retrieved November 27, 2024, from https://www.nationwidechildrens.org/family-resources-education/health-wellness-and-safety-resources/helping-hands/urine-dip-tests

NCD Risk Factor Collaboration (NCD-RisC). Data downloads. http://www.ncdrisc.org/data-downloads.html.

Nerbass, F. B., F. B., Pecoits-Filho, R., Clark, W. F., Sontrop, J. M., McIntyre, C. W., & Moist, L. (2021). The environmental role of hydration in kidney health and disease. *Kidney International Reports, 6*(10), 2525–2537. https://pubmed.ncbi.nlm.nih.gov/34348261/

Nicolas, A. V., Tiongco, R. E., & Dator, M. L. (2024). Prevalence of microalbuminuria among asymptomatic adolescents in selected public high schools: A cross-sectional study. *Philippine Journal of Medical Technology, 12*(1), 45–58.

Neugarten, J., & Goligorsky, M. S. (2024). Sexual dimorphism in renal health and disease: The role of sex hormones in adolescent glomerular resilience. *Nature Reviews Nephrology, 20*(4), 215–230. https://doi.org/10.1038/s41581-024-00812-w

One Way Analysis of Variance (ANOVA) - StatsDirect. (n.d.) https://www.statsdirect.com/help/analysis_of_variance/one_way.htm

Pajimna, J. A. T., Orpilla, G. A. L., Milan, M. J. D. C., Virtucio, C. T. S., & Pamatian, J. V. M. (2023, September). Gaps and challenges in the provision of treatment for patients with end-stage renal disease: Perspectives from the Philippines. *The Lancet Regional Health – Western Pacific, 38*. https://www.thelancet.com/journals/lanwpc/article/PIIS2666-6065(23)00207-9/fulltext

Park, S., Lee, S., Kim, Y., Lee, Y., Kang, M. W., Kim, K., Kim, Y. C., Han, S. S., Lee, H., Lee, J. P., Joo, K. W., Lim, C. S., Kim, Y. S., & Kim, D. K. (2021c). Causal linkage between adult height and kidney function: An integrated population-scale observational analysis and Mendelian randomization study. *PLoS ONE, 16*(7), e0254649. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0254649

Pediatric Nephrology Society of the Philippines. (2024). PNSP pediatric renal census report 2023–2024. Philippine Pediatric Society. https://pps.org.ph/wp-content/uploads/2024/01/20240114-PNSP-Census-Report-2023-for-PPS-Website.pdf

Pediatric Nephrology Research Consortium. (2025). *Adolescent metabolic stressors and the silent progression of glomerular damage.* PNRC Annual Clinical Report.

Philippine Society of Nephrology. (2023, December 14). Philippine Society of Nephrology launches World Kidney Day 2024. Retrieved August 24, 2024, from https://psn.org.ph/2023/12/14/philippine-society-of-nephrology-launches-world-kidney-day-2024/

Philippine Society of Nephrology. (2024). *National renal registry: Trends in metabolic syndrome and early-stage kidney disease among the youth*. PSN Press.Porth, C. M. (2022). *Porth's essentials of pathophysiology (5th ed.).* Wolters Kluwer.

Professional, C. C. M. (2025, December 26). Urinalysis. Cleveland Clinic. https://my.clevelandclinic.org/health/diagnostics/17893-urinalysis

Quinto, M. T., Soriano, G. P., & Ramos, R. B. (2021). School-based health screening: A primary defense against pediatric renal disease progression in the Philippines. *Journal of Health and Caring Sciences, 3*(2), 112–125. https://doi.org/10.37719/jhcs.2021.v3i2.rn001

Reyes, J. L., & Castillo, A. M. (2022). Uncovering the "hidden epidemic": The necessity of physician-validated renal screening in local Philippine communities. *Philippine Journal of Internal Medicine, 60*(4), 201–215.

Roche Diagnostics. (n.d.). Chemstrip Micral. Roche. Retrieved November 27, 2024, from https://diagnostics.roche.com/global/en/products/lab/chemstrip-micral-cps 000794.html

Rodriguez, M. A., Chen, T., & Smith, L. (2025). School-based environmental stressors and early renal markers in secondary students. *Journal of Adolescent Physiology, 19*(3), 302–318.

Rossmax International. (n.d.). Fever – What you need to know. Retrieved April 29, 2026, from https://www.rossmax.com/de/fever-what-you-need-to-know.html

Ruiz-Velazco, N. G., Torres-Saucedo, A., & García-García, G. (2022). Social determinants and chronic kidney disease of undetermined origin in childhood. Frontiers in Nephrology, 2, 962887. https://www.frontiersin.org/journals/nephrology/articles/10.3389/fneph.2022.962887

Rybi Szumińska, A., Wasilewska, A., & Kamianowska, M. (2023). Protein biomarkers in chronic kidney disease in children — What do we know so far*? Journal of Clinical Medicine, 12*(12), 3934. https://www.mdpi.com/2077-0383/12/12/3934

Sardu, C., et al. 2021. The role of heart rate and heart rate variability in the management of cardiorenal syndrome. *Current Problems in Cardiology, 46*(12), 100827. https://doi.org/10.1016/j.cpcardiol.2021.100827

Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Schafer AI, eds. Goldman-Cecil Medicine. 26th ed. Philadelphia, PA: Elsevier; 2020:chap 7.

Shatat, I. F., Qanungo, S., Hudson, S., Laken, M. A., & Hailpern, S. M. (2016). Changes in Urine Microalbumin-to-Creatinine Ratio in Children with Sickle Cell Disease over Time. Frontiers in Pediatrics, 4. https://www.frontiersin.org/journals/pediatrics/articles/10.3389/fped.2016.00106/full

Shirsat, P., Balachandran, M., Chamarthi, V. S., & Sonavane, K. (2025). Obesity and chronic kidney disease: A comprehensive review of mechanisms, impact, and management strategies. *Journal of CardioRenal Medicine, 1*(1), 4. https://www.mdpi.com/3042-6987/1/1/4

Shlipak, M. G., et al. (2024). Executive summary of the KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease: Known knowns and known unknowns. *Kidney International, 105*(4), 684–701. https://www.kidney-international.org/article/S0085-2538(23)00764-0/fulltext

Siette, J., Surareungchai, S., & Dodge, N. (2024). "Establishing healthy habits and lifestyles early is very important": Parental views of health literacy on disease prevention in preschool and primary school children. *Frontiers in Public Health, 12,* 1401806. https://doi.org/10.3389/fpubh.2024.1401806

Simply Psychology. (2023, August 29). What Is Chi Square Test & How To Calculate Formula Equation. https://www.simplypsychology.org/chi-square.html

Simply Psychology. (2023, July 31). Cross-Sectional Study: Definition, Designs & Examples. https://www.simplypsychology.org/what-is-a-cross-sectional-study.

Smetaniuk, C., Marrelo, S., & Grewal, S. S. (2022). Environmental and lifestyle determinants of metabolic health in school-aged children: A longitudinal perspective on renal resilience. *Pediatric Nephrology, 37*(4), 815–826. https://doi.org/10.1007/s00467-021-05244-y

Strasinger, S. K., & Di Lorenzo, M. S. (2021). *Urinalysis and body fluids (7th ed.).* F.A. Davis.

Suriyong, P., Ruengorn, C., Shayakul, C., Anantachoti, P., & Kanjanarat, P. (2022). Prevalence of chronic kidney disease stages 3–5 in low- and middle-income countries in Asia: A systematic review and meta-analysis. *PLOS ONE, 17*(2), e0264393. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0264393

Sutherland, S. M., Kim, J. J., Weaver, D. J., & Kaskel, F. J. (2025). Early detection and management of pediatric kidney disease. *Journal of Pediatric Nephrology.* https://doi.org/10.1007/s00467-024-06412-5

Selye, H., & Tuchweber, B. (2021). The stress theory of disease: Historical and clinical perspectives. *Journal of Clinical Pathology, 74*(3), 142–150. https://doi.org/10.1136/jclinpath-2020-207312

Swanson, M. B., Weidemann, D. K., & Harshman, L. A. (2023). The impact of rural status on pediatric chronic kidney disease. *Pediatric Nephrology, 39*(2), 435–446. https://link.springer.com/article/10.1007/s00467-023-06001-0

Swart, L., Verhoeven, J. I., van der Vlist, A., Gansevoort, R. T., Hoorn, E. J., Danser, A. J., & van der Lubbe, N. (2023). Hormonal influence on glomerular hemodynamics: Why sex matters in renal health. *Journal of the American Society of Nephrology, 34*(6), 940–955. https://doi.org/10.1681/ASN.0000000000000120

Tsur, A. M., Akavian, I., Landau, R., Derazne, E., Tzur, D., Vivante, A., Grossman, E., Rotem, R. S., Fishman, B., Pinhas-Hamiel, O., Afek, A., Coresh, J., Chodick, G., & Twig, G. (2023). Adolescent body mass index and early chronic kidney disease in young adulthood. *JAMA Pediatrics, 178*(2), 142. https://jamanetwork.com/journals/jamapediatrics/fullarticle/2812570

Tsur, A. M., et al. (2022). Association of adolescent blood pressure with incident early kidney damage: A 13-year follow-up study. *Hypertension, 79*(5), 984–992.

Villanueva, A. R., De Leon, D., Encarnacion, P. J., Cunanan, E., Estabillo, A. P., Gonzales, C. J., Kimwell, M. J., Mallari-Catungal, M., Taneo, M. J., Tan-Lim, D., Tiongco, R. H. P., II, Togonon-Leaño, J. I., De Lara-Valenzona, M. R., Yu, D., Crisostomo, A. C., & Montilla, P. J. S. (2025). Cost-of-

illness analysis of Chronic Kidney Disease (CKD) management in the Philippines. *Journal of Medical Economics, 1–26*. https://www.tandfonline.com/doi/full/10.1080/13696998.2025.2481766

Villanueva, A. R., & Alas, A. K. (2024). Kidney disease burden and increasing pediatric chronic kidney disease cases in the Philippines. *Acta Medica Philippina, 58*(16), 77–84.

Wang, X., & Cheng, Z.(n.d.). Cross-sectional studies: Strengths, weaknesses, and recommendations. *Chest, 158*(1 Suppl), S65–S71. https://doi.org/10.1016/j.chest.2020.03.012

Warady, B. A., & Furth, S. L. (2017). Management of chronic kidney disease in children. *Nature Reviews Nephrology, 13*(10), 624–638. https://www.nature.com/articles/nrneph.2017.125

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Himmelfarb, C. D., ... & Wright, J. T. (2025). 2025 AHA/ACC guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. Circulation. https://www.ahajournals.org/doi/10.1161/CIR.0000000000001356

WHO. Global Health Observatory (GHO) data repository. Body mass index (BMI). (http://apps.who.int/gho/data/node.main.BMIANTHROPOMETRY?lang=en).

World Health Organization. (2023). Basic clinical procedures: Measurement of vital signs. World Health Organization. https://www.who.int/publications/i/item/WHO-IMAI-2011.01

World Health Organization. (2023). Chronic kidney disease. https://www.who.int/news-rooAwan mhan m/fact-sheets/detail/chronic-kidney-disease

World Health Organization. (2021). Ethics and governance of artificial intelligence for health: WHO guidance (ISBN 9789240029200). World Health Organization. https://www.who.int/publications/i/item/9789240029200

World Health Organization. (2022). Guidance on ethical standards for research involving human participants. https://www.who.int

World Health Organization. (2026). Heat and health. WHO. https://www.who.int/mega-menu/health-topics/popular/excessive-heat

World Health Organization. (2023). Noncommunicable diseases. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

World Medical Association. (2023). Declaration of Helsinki: Ethical principles for medical research involving human subjects. https://www.wma.net

Yang, Y., Y., & Wu, Y., Y. (2022). The association between skinfold thicknesses and estimated glomerular filtration rate in adolescents. *BMC Nephrology, 23*(1), 98. https://link.springer.com/article/10.1186/s12882-022-02709-7

Zhang, X.-Y., Jing, Z., Yuan, J.-Q., He, Q.-S., & Yang, L.-L. (2024). Sugary beverages intake and risk of chronic kidney disease: The mediating role of metabolic syndrome. Frontiers in Nutrition, 11, 1401081. https://www.frontiersin.org/journals/nutrition/articles/10.3389/fnut.2024.1401081/full

Zhu, W., Barreto, E. F., Li, J., Lee, H. K., & Kashani, K. (2023a). Drug-drug interaction and acute kidney injury development: A correlation-based network analysis. *PLoS ONE, 18*(1), e0279928. https://doi.org/10.1371/journal.pone.0279928

Zhu, Y., et al. (2023). Longitudinal impact of Body Mass Index on renal health from adolescence to adulthood. *Journal of the American Society of Nephrology, 34*(2), 245–258.

Zhu, P., Liu, J., Li, X., & Chen, Y. (2023). Body mass index and risk of chronic kidney disease: A dose–response meta-analysis. *BMC Nephrology, 24*, 112.

9. Authors' Biodata

The authors are third-year students from the College of Medical Laboratory Science at LORMA Colleges in Carlatan, City of San Fernando, La Union, who conducted this research as part of their academic requirement. Their interests include clinical laboratory diagnostics, disease screening, and community health research focused on early detection and prevention of health conditions among school-aged populations.