ANALYSIS OF URINARY BIOMARKERS FOR EARLY DETECTION OF KIDNEY DYSFUNCTION AMONG PRE-ELEMENTARY PUPILS

Lyesandra S. Almoite[1] Ian Kirbie R. Callos[2] Abelaine W. Dawara[3] Kristel R. Dumpit[4] Shadrach A. Galope[5] Philip John G. Sambrano[6]

lyesandra.almoite@lorma.edu[1]
iankirbie.callos@lorma.edu[2]
abelaine.dawara@lorma.edu[3]
kristel.dumpit@lorma.edu[4]
shadrach.galope@lorma.edu[5]
philipjohn.sarano@lorma.edu[6]

Abstract

Kidney dysfunction in children is an emerging yet underrecognized public health concern, especially in low- and middle-income countries. This study aimed to determine the prevalence of kidney dysfunction among pre-elementary pupils at Bauang North Central School, La Union, using urinalysis, body mass index (BMI), and survey data assessing lifestyle, family history, and medical background. An analytical cross-sectional design was employed, including a total of 47 students. Physical, chemical, and microscopic urine examinations revealed a prevalence rate of 34.04% for early kidney dysfunction, with 81.25% of these cases being asymptomatic. Urinalysis findings included proteinuria, elevated albumin-creatinine ratios, and presence of urinary elements such as casts and crystals, suggestive of early renal impairment. Lifestyle factors, particularly excessive gadget use and intake of processed foods and sugary drinks, emerged as notable contributors, while family history had limited influence in this population. Statistical analysis revealed no significant correlation between BMI, lifestyle, or family history and kidney status, although medical history, particularly the use of medications without professional guidance, showed potential impact. The findings emphasize the critical need for early detection, public health education, and preventative efforts in schools to reduce the burden of undetected pediatric kidney dysfunction and its progression to chronic disease.

Keywords: kidney dysfunction; urinalysis; pre-elementary children; public health; Biomarker.

1. Introduction

Kidney health in children is an often overlooked area, yet its early decline can have long term effects. According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the kidneys remove waste and extra fluid and balance water, salts, and minerals, such as sodium, calcium, phosphorus, and potassium, in the bloodstream. In addition, the kidneys maintain strong and healthy bones, filter blood, and regulate blood pressure (National Kidney and Transplant Institute (NKTI), n.d.). The growing consumerism of the past few decades has significantly influenced global dietary patterns and health outcomes. Unhealthy consumption patterns from aggressive marketing and the accessibility of processed foods high in sugar and sodium affect kidney health. A screening test must be done for early detection to prevent severe kidney dysfunction. In this regard, researchers analyzed the urine specimens of children in Bauang North Central School for early detection of kidney dysfunction to help improve the community's public health.

Kidney dysfunction is defined by the NIDDK as the loss of the ability of the kidneys to efficiently filter waste and filter the blood. Kidney dysfunction often results from untreated or undiagnosed conditions like diabetes and cardiovascular disease (NIDDK, 2016). Poor appetite, edema or swelling of the hands or feet, ankles, fatigue, itchy skin, insomnia, dyspnea, headaches, cramping in the muscles, and erectile dysfunction in men are some of the symptoms of kidney failure (Vaidya & Aeddula, 2024). Kidney dysfunction has the potential to kill a human being. The global burden of kidney dysfunction affects over 10% of the global population, approximately 843.6 million people worldwide (Kovesdy, 2022). Children in intensive care are at higher risk for acute kidney injury (AKI), whereas adults with diabetes or hypertension are more prone to develop chronic kidney disease (CKD). Alarming are cases that develop in younger people. The CDC (2023) reports that 35.5 million U.S. adults, or 14% of the population, have CKD, with nine out of ten unaware of their condition, highlighting the prevalence of asymptomatic cases, which includes children. Asymptomatic means that a person who has a disease (or is diagnosed with one) but does not show any visible symptoms of that disease. They are sometimes known as infections or subclinical diseases, while symptomatic exhibits symptoms of that disease (Shabir, 2021).

The screening tests for kidney dysfunction include physical examination, chemical examination (e.g., urine dipstick and Micral test), and microscopic examinations of urine. A patient who has kidney dysfunction exhibits foamy urine which indicates that there is presence of proteins which is often linked to kidney dysfunction. The urine dipstick results of a patient with kidney dysfunction detect abnormalities in pH that may indicate kidney stones or infections, a protein which is a sign of kidney dysfunction due to damaged glomerular membrane which cannot filter properly (Strasinger & Di Lorenzo, 2021); glucose in which it is linked to diabetes, white blood cells that may indicate infection; bilirubin which is a sign of liver disease, and blood which suggests infections or kidney problems. Microscopic examinations of of urine from a patient with kidney dysfunction may show red blood cells, which may indicate kidney dysfunction or stones, white blood cells signaling infection, fatty casts, granular casts, red blood cell casts, renal tubular epithelial cell casts,

waxy casts, and white blood cell casts may signify specific kidney disorders, and crystals that could form into kidney stones (National Kidney Foundation, 2014). Glomerular filtration rate (GFR) is used to screen, diagnose, and monitor kidney disease, assess its severity, evaluate treatment effectiveness in CKD, and check kidney health before starting treatments or medications that may harm the kidneys (Glomerular Filtration Rate Test, 2023). GFR correlates with the stages of kidney disease: Stage 1 (GFR $\geq$ 90, normal), Stage 2 (GFR 60–89, possibly normal for some), Stage 3 (GFR 30–59, moderate CKD), Stage 4 (GFR 15–29, severe CKD), and Stage 5 (GFR < 15, end-stage CKD) (KDIGO 2012).

Several studies have shown a strong correlation between kidney dysfunction and bacterial infections, particularly in diabetic children with asymptomatic bacteriuria (ASB). In one study, 100% of diabetic children with bacteriuria had positive urine cultures, with Eschericia coli being the most common isolate (42.31%), followed by Klebsiella pneumoniae (28.85%), Staphylococcus saprophyticus (15.38%), and Enterobacter (13.46%) (Bebars et al., 2022). Pyuria was present in 48.1% of these cases, predominantly among females (80%). Biomarkers such as NGAL and hsCRP were significantly elevated in children with bacteriuria ($p < 0.001$), with NGAL demonstrating 100% sensitivity and specificity for early kidney injury detection. These markers were positively correlated with serum creatinine and pus cell count, and negatively correlated with GFR, indicating a relationship between bacterial infection and declining kidney function. Also, another indicator is crystalluria, the presence of crystals in urine, is a recognized early marker of kidney dysfunction, particularly in the development of urolithiasis. A study by García-Nieto et al. (2020) found that the incidence of renal colic (RC), a common symptom of kidney stones, was 2.24% in high-risk patients with crystalluria compared to only 0.46% in the general population, indicating nearly a fivefold increased risk. The study also observed that certain types of crystals, such as calcium oxalate dihydrate (COD) and calcium oxalate monohydrate (COM), were significantly more prevalent in those who developed RC. These results confirm that crystalluria is not only associated with stone formation but can also serve as a predictive factor for kidney dysfunction (García-Nieto et al., 2020).

The study of American Academy of Pediatrics which focuses on Acute Kidney Injury (AKI) reveals that significant health risks and high mortality rates, particularly in children, are associated with AKI. In order to better understand how AKI can result in Acute Kidney Disease (AKD) in children, this study looks into the risk factors, survival rates, and possible progression to chronic kidney disease (CKD). Kidney Disease Improving Global Outcomes (KDIGO) criteria explains that prolonged kidney dysfunction that lasts from 7 to 90 days after AKI is a prerequisite for the progression from AKI to AKD. The study indicated that the prevalence of AKD in children varies greatly based on age, pre-existing medical conditions, and region. Critical health status, infection (sepsis), exposure to kidney-damaging (nephrotoxic) drugs, and previous CKD are important risk factors for AKD (Dharnidharka, Ciccia, & Goldstein, 2020).

Individuals with heart failure or high blood pressure face increased risks of AKD. This confirms previous research showing that serious medical conditions increase the

likelihood of chronic kidney problems. Additionally, there is an independent correlation between AKD and increased mortality rates during hospital stays and following discharge. Given that children with AKD have a significantly increased risk of developing CKD, AKD plays a crucial role in the AKI-AKDCKD progression, which can affect growth, development, and overall quality of life. It emphasizes the need for proactive management to prevent further deterioration of kidney function. The study utilized cohort and retrospective analyses to examine AKD's risk factors and outcomes, reporting a 17% AKD incidence rate in children who previously experienced AKI (Chisavu et al., 2024).

The study by Amanullah et al. (2022) stated that kidney dysfunction in children is a significant public health issue, with a global prevalence ranging from 15 to 74.7 cases per million children. The burden of chronic kidney disease (CKD) is high, especially in low- and middle-income countries (LMICs), where the healthcare system is not sufficient. According to the study, 49% of children with CKD had congenital abnormalities of the kidney and urinary tract (CAKUT), and 72.5% of them appeared at late stages (stages 3–5). Additionally, the study also indicated that compared to children identified at earlier stages, children with advanced CKD stages had a 4.5 times increased risk for worst outcomes, such as dialysis and death. This emphasizes how urgently public health initiatives, early identification, and better access to treatment are needed in environments with limited resources.

A study conducted in Bangladesh (Afroz et al., 2022) focused on Acute Kidney Failure (AKF). This condition can be deadly for children and causes a rapid decline in kidney function. AKF can develop into chronic kidney disease (CKD), particularly in situations where referrals are delayed and diagnostic resources are limited (Afroz et al., 2022). Severe dehydration, frequently brought on by diarrheal illnesses, neonatal asphyxia, and systemic infections, are risk factors for AKF; in Bangladesh, prerenal causes such as hypovolemia are responsible for 68% of cases. According to the study, 76% of the affected children recovered normal renal function, while 20% succumbed to the condition, and 4% developed chronic kidney disease. Afroz et al. (2022) used a prospective observational study design, concentrating on pediatric AKF patients admitted to the Dhaka Medical College Hospital for over 19 months. With different etiologies in different regions, recent studies indicate that the incidence of AKF in children is rising globally. Further highlighting the gaps in current research is the lack of data regarding the long-term impacts of genetic predispositions and prenatal health factors on AKF outcomes.

A recent study stated that kidney dysfunction is an emerging health concern among school children, highlighting the importance of early detection. Shaheen et al. (2020) conducted a study in the Qallin City, Egypt, which included primary school children. The study screened 320 primary school children for asymptomatic urine abnormalities using dipstick tests followed by microscopic analysis. According to the findings, 15% of children had abnormal urine, with hematuria (9.7%) being the most common, followed by proteinuria (0.9%), leukocyturia (7.5%), and nitrituria (2.2%). The most prevalent microscopic finding was crystalluria. Early detection of these abnormalities is critical for preventing chronic kidney disease progression and ensuring prompt intervention.

Numerous studies have highlighted the significant role of family history as a risk factor for kidney dysfunction. According to the American Kidney Fund (2024), individuals with a close relative such as a parent, grandparent, or sibling diagnosed with kidney dysfunction are at an increased risk of developing the condition themselves. This heightened risk is attributed to shared genetic factors and common lifestyle or environmental influences within families. Moreover, the American Kidney Fund emphasizes that conditions like diabetes and high blood pressure, which are leading causes of kidney dysfunction, also tend to run in families, further compounding the risk. These findings underscore the importance of incorporating family medical history into routine health assessments to identify individuals at risk and implement early intervention strategies.

Chronic kidney disease (CKD) is a growing global health concern, influenced by both genetic predisposition and modifiable lifestyle factors. Recent research has expanded to examine how modern habits, particularly technology use and sedentary behavior, may contribute to renal dysfunction, even in populations previously considered healthy. A large-scale cohort study by Xie et al. (2023) explored the relationship between mobile phone usage and new-onset chronic kidney disease. The findings indicated that individuals who used mobile phones for 30 minutes or more per week for calls exhibited a statistically significant increase in CKD risk. Moreover, participants with both prolonged phone use and high genetic risk for kidney dysfunction were shown to have an even higher likelihood of developing CKD. Although biological mechanisms remain under investigation, the study suggests that radiofrequency electromagnetic fields (RF-EMF) and associated behaviors—such as sleep disturbances, stress, and reduced physical activity—could negatively impact kidney function (Xie et al., 2023).

Similarly, a systematic review conducted by González-Ortiz et al. (2022) emphasized the role of sedentary behavior as a modifiable risk factor for CKD in healthy individuals. The review analyzed eight studies, most of which reported an association between prolonged sitting time and decreased kidney function. Although the studies varied in methodology, the overall conclusion pointed to a clear need for lifestyle interventions promoting physical activity to mitigate kidney related health risks. The authors advocate for more longitudinal and standardized research to solidify this connection and inform preventive healthcare strategies.

Altogether, these studies underscore how modern behaviors—including extensive gadget use and sedentary lifestyles, may contribute to the early onset of kidney dysfunction. As such, recognizing these modifiable risk factors is essential in developing public health campaigns and preventive interventions that aim to reduce the burden of CKD across diverse populations.

Body mass index (BMI) is a commonly used metric of body fat and overall health through calculating the weight and height of the individual. Its link to kidney dysfunction is being researched due to its significance in metabolic and cardiovascular health. Obesity

might contribute to the progression of kidney dysfunction, a study conducted by García-Carro et al. (2021) explains the significant role of obesity as a driver of kidney damage through a combination of hemodynamic, inflammatory, and metabolic pathways. Hemodynamic stress caused by increased renal perfusion and glomerular hyperfiltration is highlighted as a primary contributor to nephron injury. This mechanical strain is further compounded by adipose tissue dysfunction, where excessive secretion of pro-inflammatory cytokines such as leptin and TNF-α, alongside decreased levels of the protective adipokine adiponectin, exacerbates oxidative stress and inflammation. These alterations directly impair glomerular filtration barrier integrity and podocyte function, leading to albuminuria and progressive kidney damage. Insulin resistance, a hallmark of obesity, adds to this pathology by intensifying proteinuria and disrupting glucose and lipid metabolism within renal structures. The study underscores the need for effective interventions, such as bariatric surgery and GLP-1 receptor agonists, which have demonstrated efficacy in reducing not only renal injury, but also cardiovascular risk associated with obesity. These findings advocate for integrative treatment approaches targeting both obesity and its renal implications to improve patient outcomes.

Additionally, several factors can contribute to kidney dysfunction, including the use of medications such as painkillers and antibiotics. According to the National Kidney Foundation (2025), many people take NSAIDs (nonsteroidal anti-inflammatory medicines) without a physician's prescription. NSAIDS reduce blood flow to the kidney, resulting in acute renal failure and chronic illness. Pain relievers and other antibiotics are filtered by the kidney. A Stanford University study also suggests that athletes or runners who use ibuprofens are more likely to develop acute renal disease. Runners who took ibuprofen before the race had an 18% greater risk of renal dysfunction than those who took a placebo, such as starch or sugar for energy (White, 2023). However, incorrect use of these medications can build in the kidney and damage it. Self Medication is still significant today; thus, it is necessary to review patients' medical histories, including the medications they use, in order to diagnose, prevent, and treat kidney dysfunction.

A significant cause of illness and mortality in the Philippines is chronic kidney disease (CKD) and other genitourinary disorders (Mangotara et al., 2024). According to an analysis of health data from 1960 to 2019, chronic kidney disease (CKD) is the most common cause of death, with rates increasing from 13.6 per 100,000 in 1960 to 19.28 in 2019 and peaking at 22.68 per 100,000 in 2016. High alcohol consumption, sedentary lifestyles, and poor diets are significant risk factors that contribute to high blood pressure, diabetes, and obesity. Men have a statistically significant higher mortality rate ($p = 0.003$) than women, indicating that they are considerably more affected. Mortality rates vary by geographic area and age, with Region XII having the highest regional mortality rate (17.79 per 100,000) and those 70 and older having the highest rate (205.76 per 100,000). The study used methodological techniques, including data mining to handle missing data and t-tests to evaluate sex-based mortality differences. The study highlights the necessity of focused regional interventions, better access to healthcare, and cost-cutting measures for the treatment of chronic kidney disease (CKD) since dialysis fees may reach up to PHP 40,000

per month, placing a burden on patient finances and medical resources (Mangotara et al., 2024).

The Department of Health (DOH) in the Philippines has released new reports indicating an increase in kidney dysfunction prevalence. In low- and middle-income Asian countries, the prevalence of chronic kidney disease (CKD) is 35.94%, according to the article "Prevalence of chronic kidney disease stages 3–5 in low- and middle-income Asian countries: A systematic review and meta-analysis" (Suriyong et al., 2022). This rate is higher than the estimated global rate (Pajimna et al., 2023). Similarly, according to the National Kidney Transplant Institute, one Filipino becomes chronically renally compromised every hour, or 120 Filipinos per million people annually (PHILIPPINE SOCIETY OF NEPHROLOGY LAUNCHES WORLD KIDNEY DAY 2024, 2024).

Locally, the Ecological Profile Provincial Health Office - La Union, in 2020, there were 115 chronic kidney disease (CKD) cases in the Province of La Union for every 1000 residents. However, only one piece of data was acquired due to the limited number of articles published on this topic.

In addition, therapy is required if the kidneys are no longer functioning for the patient. One treatment option available to patients who have kidney dysfunction is hemodialysis. During this procedure, the blood travels through a tube into an artificial kidney or filter, and waste is removed from the blood by a special fluid in the other portion of the filter (Hemodialysis - NIDDK, 2025). Medical Pinas states that dialysis costs Php 2,000 to Php 7,000 and more per session (Dialysis Price in the Philippines 2024 to Clean Your Blood, n.d.). Additionally, a kidney patient needs two to three weekly sessions at Php 6,000 to Php 21,000. It is difficult for someone in a lowto middle-class community to make this money. It is intolerable how many people are unable to afford dialysis, particularly in situations where resources are limited.

Thus, in order to prevent more complications, early detection and intervention are essential in AKD cases. Findings stated that AKD in children can be due to different reasons, which include the study populations and healthcare settings. Furthermore, there is still a lack of information regarding the impact of genetic variables and prenatal illnesses on the development of AKD, suggesting possible directions for further research (Chisavu et al., 2024).

The study aimed to identify the presence of kidney dysfunction and provide information to support preventive measures. This calls on government agencies to take action in order to engage in awareness campaigns and offer improved health care. Furthermore, even though early detection is a crucial strategy for halting the progression of kidney dysfunction and its related complications, several studies suggest that there is still a need for increased public awareness of kidney dysfunction. Increasing knowledge and putting long-term solutions for early detection into practice should be the primary goals for public health.

Kidney dysfunction is becoming increasingly prevalent globally, ranking seventh in terms of risk factors for death at the moment.

This study aims to promote early intervention and improve kidney health through better screening and education. Targeting younger populations, especially children, for early screening and preventive strategies may help address long-term public health needs and reduce the growing burden of kidney dysfunction in the community. In order to improve quality of life and reduce health disparities, it is essential to comprehend these dynamics as kidney dysfunction increasingly impacts marginalized populations. This study aims to improve children's health at Bauang North Central School while raising awareness of factors affecting kidney health in the community, allowing the way to a healthier future for everybody.

This study is significant in helping students and parents at Bauang North Central School to understand the potential connection between lifestyle choices and kidney dysfunction. By raising awareness through laboratory tests and educational sessions on the health risks associated with unhealthy lifestyle habits, the study aims to encourage healthier decision-making and greater participation in government health programs. These initiatives are designed to help parents and students recognize the long-term impacts of dietary habits, motivating them to embrace healthier lifestyles and reduce excessive consumption of harmful foods.

In addition, the study benefits educators and school administrators by providing them with information to address students' dietary habits. It recommends holding regular health discussions focusing on the risks of unhealthy lifestyles. The study also supports government initiatives to limit access to unhealthy foods and beverages outside the schools and encourages future research on the effects of diet on children's health.

The study focuses on pre-elementary students enrolled from 2024 to 2025. The study aimed to determine the prevalence of students who show signs or symptoms of kidney dysfunction using available clinical methods such as physical, chemical, and microscopic examination of urine, as well as measuring the student's body mass index and completing questionnaires provided by the researchers. The study also aimed to identify asymptomatic cases through clinical and diagnostic methods. In addition, the study will observe possible risk factors for kidney dysfunction in this population, such as family and medical history and dietary habits or lifestyle.

However, this study will only include pre-elementary students from the school, which may not reflect the larger community of children in other municipalities. The study will use noninvasive methods and survey questionnaires for parents, for which invasive methods are beyond the scope of the study.

2. Objectives

This study aimed to determine the prevalence of early kidney dysfunction among pre-elementary students and identify the factors contributing to the prevalence of the disease among the participants of Bauang North Central School. Specifically, this study sought to answer the following questions:

1. What are the most common diagnostic findings in urinalysis that are indicative of kidney dysfunction?

2. What is the prevalence of kidney dysfunction among the students based on their urinalysis results?

3. What is the prevalence of asymptomatic cases of kidney dysfunction among the children?

4. What role do family history, lifestyle choices, and existing medical conditions play in determining the risk level for kidney dysfunction in children?

5. What is the Body Mass Index (BMI) status of school children?

6. What is the significant correlation between body mass index (BMI), risk factors, and kidney status among pre-elementary students?

7. What is the correlation between diagnostic findings and the prevalence of kidney-related conditions among the school children?

3. Materials and methods

This chapter presents the research design, population and locale of the study, the tools for data analysis, validation and reliability testing, data gathering procedures, establishing trustworthiness, and ethical considerations.

This research utilized analytical cross-sectional design in evaluating the biomarkers. An analytical cross-sectional design is a type of observational study that analyzes data from a population at a specific point in time. It examines the relationships between different variables to determine associations. This design was useful in assessing the prevalence of an outcome or a particular characteristic in a population and is often used to identify potential risk factors (Setia, 2016). In particular, this research design enabled this research to systematically detect kidney dysfunction using biomarkers before it progresses to advanced stages. The findings are expected to contribute to improved strategies for the early diagnosis and management of pediatric kidney health.

The study involved testing pre-elementary students of Kinder 1 and Kinder 2 ages 4-6 years old at Bauang North Central School in Bauang, La Union. Since the study focused on pre elementary students, only Kinder 1 and Kinder 2, which are the only available classes in the school, are tested following the total enumeration sampling method. This locale of the study was chosen due to its geographic location as it is near to different establishments (e.g., fast food chains, convenience stores, and food stalls) and due to the progressive state in this part of the town. The study selected the school due to the objectives being well aligned with the diverse population of pre-elementary students at the school, allowing for a representative sample for analyzing the prevalence of kidney dysfunction in this age range. The inclusion criteria covered both male and female students within the specified category to represent all the students, while exclusion criteria applied to those students that are not Kinder 1 and Kinder 2 or those unwilling or unable to provide consent.

The study used total enumeration as its sampling method. Total enumeration was a technique in which all members of a defined population who meet the inclusion criteria are selected for the study. This method ensured that every eligible individual is included, providing comprehensive data and reducing sampling bias (Etikan & Bala, 2017). The total sample of 47 pre elementary students from Bauang North Central School was included. This approach was appropriate due to the manageable size of the target group, allowing for a detailed and exhaustive investigation of the prevalence of kidney dysfunction among this population

The findings were shared with the Bauang North Central School Health Committee and the Medical Laboratory Science Department at Lorma Colleges to support further initiatives in healthcare. All efforts focused on protecting participants' rights and welfare while contributing to the broader understanding of early kidney dysfunction among young children.

First, the study utilized a questionnaire to collect demographic, body mass index (BMI) measurement, and other relevant information among pre-elementary students which included an interview on the students whether they are presenting signs or symptoms of kidney dysfunction. Second, the researchers performed urinalysis to examine urinary biomarkers associated with early kidney dysfunction.

The questionnaire, developed by the researchers, consists of Likert-scale questions to evaluate dietary practices, medical history, lifestyle, and health habits. Validated tools on lifestyle and kidney health were modified to suit parents by simplifying the language and providing translations. Key factors assessed included lifestyle such as hydration habits, soda consumption, exercise frequency, and other risk factors specific to the age group.

Body Mass Index (BMI) was a widely used tool for assessing body weight relative to height, serving as an indirect measure of body fat. In children and adolescents, BMI was age- and sexspecific, commonly referred to as BMI-for-age, and was interpreted using percentile

rankings derived from growth charts developed by the Centers for Disease Control and Prevention (CDC) (Kirkilas, 2024). For this study, researchers calculated the children's BMI using the standard formula and compared the results against the CDC's BMI-for-age percentile chart to determine their weight classification.

For urinalysis, dipstick screening was utilized, in addition to microalbumin testing which is a method for detecting trace amounts of albumin in urine, which could serve as an early marker of kidney dysfunction (Microalbumin Creatinine Ratio, 2022). Microscopic analysis was also conducted to detect casts, crystals, cells, bacteria, and yeast, providing additional insights of kidney function. These methods collectively aim to establish a link between urinary biomarkers and the early detection of kidney dysfunction in children. In accordance with ethical guidelines, the sample collection was observed by qualified medical laboratory personnel in collaboration with the adviser and clinical instructors, and both parental and child consent were acquired.

To establish the validity of the questionnaire, the researchers presented their questionnaire to the members of the medical laboratory science department to ensure clarity, applicability, and to be able to acquire valuable comments and suggestions. This was done to gather critiques and opinions to further improve the questionnaire, which served as the foundation of the findings of the study. Their recommendations ensured that the questions were suitable for the age group and related to the cultural setting.

The same group of pilot participants completed the questionnaire over the course of two weeks as part of a test-retest procedure to ensure consistency. Parents from San Gabriel Central School who have kindergarten students served as the pilot participants. A reliability coefficient was calculated to verify the internal consistency, particularly for questions related to lifestyle, beverage and food intake, and diet.

The process of conducting surveys and collecting urine samples for the study was carried out at Bauang North Central School. The researchers initially coordinated with the school's principal and other relevant authorities, including the Research Ethics Committee, to formally request and secure permission to conduct the investigation within the school premises. Upon receiving approval, the researchers collaborated with the school principal and kindergarten adviser to arrange and facilitate the data collection process.

The research was conducted in accordance with established ethical standards and protocols, with priority given to the privacy, safety, and well-being of all participants. Informed consent was obtained prior to sample collection and interviews, ensuring that no physical or emotional harm was inflicted. All data collected were handled with strict confidentiality and integrity to uphold ethical and professional standards. Throughout the research process, the investigators maintained intellectual honesty, diligence, and professionalism.

The parents of the child participants were provided a comprehensive explanation of the study, emphasizing its focus on promoting health and wellness among the students. To ensure that the process was fully authorized and aligned with ethical standards, consent forms were distributed to the parents, allowing them to review the details. Then, signed in agreement with their children's participation. Only the children whose parents provided written consent were included in the study.

Informed consent was obtained prior to sample collection and interviews, ensuring that no physical or emotional harm occurred. Data were handled with strict confidentiality and integrity to maintain ethical and professional standards throughout the study. Intellectual honesty, diligence, and professionalism in every aspect of the research process were upheld by the researchers.

The materials used for urine collection included sterile urine containers, glass slides, coverslips, an ice box, ice, labels and markers, a disinfectant kit and personal protective equipment. For laboratory procedures, the following were utilized, such as a centrifuge (DIGISYSTEM Laboratory Instrument Inc.), micropipettes, and microscope (Olympus CX23). Additionally, reagent kits, including the Insight urine dipstick and the Micral test kit from Roche, were used in the analysis.

During the pre-analytical phase, the parents were requested to complete a detailed questionnaire. This questionnaire gathered essential background information, including the child's weight, height, age, gender, eating habits or dietary patterns, and general awareness about health. After all the questionnaires were thoroughly answered and completed, the participant identification procedures were initiated to confirm and document each child's identity.

Printed instructions outlining clear and proper procedures were provided to the parents prior to the scheduled collection date. Sterile containers were then distributed to the parents for the collection of their child's urine samples. As stated in the instructions, parents were advised to collect their child's first morning urine, approximately 30–50 mL, using the provided container. After collection, the parents were instructed to securely seal the container to prevent contamination or leakage and to hand it over to the researchers immediately to preserve the quality and integrity of the sample.

Following collection, each sample was carefully labeled with participant details, including a respective code for each student and date and time of collection, to ensure accuracy and prevent any mix-ups during subsequent stages of analysis. The safety and proper transport of all urine samples was ensured to the designated laboratory by maintaining cold conditions throughout the process. Specimens were transported using an ice box with ice packs for preservation and prevent the degradation of critical urinary components such as proteins (e.g., albumin), cells, casts, and other biomarkers like glucose, ketones, and urobilinogen, as well to retard any bacterial growth. To avoid photooxidation, the urine container used is translucent which prevents exposure to light. Immediate analyses of

physical, chemical, and microscopic examinations were conducted at the College of Medical Laboratory Science laboratory.

A physical examination of the urine provided the researchers with preliminary information about potential disorders and supported the confirmation of findings following the chemical examination. The physical examination involved assessing the color, clarity, and the presence of bubbles in the urine, which could indicate the presence of protein. Each sample obtained was clean and properly labeled. The sample was positioned against a white background under sufficient lighting to accurately identify its appearance (e.g., colorless, dark yellow, amber, orange, red, pink, brown, black, green, blue). The sample was held against printed text, allowing to determine whether the urine was clear, hazy, cloudy, or turbid (Strasinger & Di Lorenzo, 2014).

The chemical examination included testing with a urine dipstick to evaluate parameters such as pH, glucose, protein, ketones, blood, leukocytes, nitrites, bilirubin, urobilinogen, and specific gravity. InSight brand was used for this test. Quality control was performed in accordance with the manufacturer's guidelines prior to the chemical examination of the urine. In this case, the quality control protocol was obtained from Acon Laboratories, the manufacturer of the InSight urine reagent strips. Following the quality control procedure, one test strip was removed from the bottle, ensuring that the cap was immediately replaced and tightly secured. The strip was held by the end opposite the color blocks

Before dipping the strip into the urine, the specimen was thoroughly mixed using uncentrifuged urine. The reagent strip was briefly dipped into the sample, ensuring that all reaction pads were fully soaked. Excess urine was removed by blotting the edge of the strip on absorbent paper. At the appropriate time intervals, the results were read of each reaction pad by comparing the strip to the color chart on the container. Glucose and bilirubin were read at 30 seconds, ketones at 40 seconds, specific gravity at 45 seconds, and blood, pH, protein, urobilinogen, and nitrite at 60 seconds, while leukocytes were read at 120 seconds (Brunzel, 2016). The results, including the date, were accurately recorded. Used strips were discarded in designated biohazard waste containers.

Microalbumin and creatinine tests were conducted to detect their presence in the urine samples. These are parameters as early indicators of kidney dysfunction. The Insight brand was used for this test. Quality control procedures were performed according to the manufacturer's guidelines. For this test, a urine sample, preferably the first-morning specimen, was collected. One test strip was taken from the bottle and dipped into the urine up to the marked level, then held for a minute. The test strip was then removed from the urine, and excess urine was drained off by blotting the edge on absorbent paper. After waiting for one minute for the reaction to occur, the result was observed. The color of the reaction pad was compared to the chart provided in the test strip container to determine the concentration of albumin and creatinine. The Albumin:Creatinine ratio (ACR) was computed using the albumin and creatinine concentrations. Results were recorded, including the test

level. For interpretation, the reaction pad indicated the level of albumin and concentration of creatinine present in the urine. The used strip was disposed of in the biohazard waste container.

The microscopic examination focused on identifying elements such as casts, crystals, red blood cells, white blood cells, epithelial cells, bacteria, and yeast. Urine insoluble materials were found, identified, and quantified to separate clinically significant components from normal or insignificant ones (Strasinger & Di Lorenzo, 2021). The procedure began by carefully mixing the urine sample, followed by transferring 5 mL (or the necessary volume) to a test tube using a disposable pipette. The tube was placed into the centrifuge, balanced, and the lid was closed. The sample was then centrifuged for 5 minutes at 450g (approximately 1500–2000 rpm). After centrifugation, the tube was carefully removed, and the supernatant was discarded, leaving approximately 0.5 mL to preserve the sediment pellet. The sediment was re-suspended by gently spinning or flicking the tube, and a drop was transferred to a microscope slide. The sample was then covered with a coverslip and examined under a microscope at low (x10) and high (x40) power. This process revealed cellular elements (e.g., red blood cells, white blood cells, and renal tubular epithelial cells), casts, and crystals. Findings were recorded as none, few, moderate, trace, or images were taken as needed. These analyses aimed to provide a detailed understanding of urinary biomarkers and their relationship to kidney health. After collating and documenting the results for each sample, the researchers worked alongside a licensed physician to interpret the findings. This collaborative effort focused on identifying any potential signs or early indicators of kidney dysfunction among participants.

The validity of the questionnaires was assessed by calculating the average of the responses. A five-point scale was applied to evaluate each item, and the descriptive interpretation of the average scores was determined based on the corresponding range of the weighted mean as shown in Table 3. The Statistical Package for the Social Sciences (SPSS) software was used to organize and analyze the data for reliability.

The data obtained from the answered questionnaires were tallied, classified, and tabulated. Descriptive statistics, such as frequencies, mean, median, and mode, were utilized to present, analyze, interpret, and summarize the data gathered. The profiles of the pre-elementary students were determined through total enumeration. Quantitative research was used to quantify multiple variables and understand their correlations. It also allows data analysis and identification of patterns to create significant conclusions. To identify biomarkers that could serve as reliable indicators of early kidney dysfunction, descriptive analysis and statistical tools were utilized to establish the relationships between specific biomarkers and kidney function.

For research problems 1, 2, 3, 4, and 5, descriptive statistics, specifically frequency counts and percentages, were applied to calculate the prevalence of students with kidney dysfunction relative to the total number of participants. The interpretation of the findings was based on established standards for various biomarkers. The results of the survey were

interpreted using the Likert four-point scale with classifications as presented in Table 4 and 5. Data collected from the physical examination, urine dipstick test, Microalbumin and creatinine test, and microscopic analysis were organized and presented in tables aligned with the specific research questions. Following the identification of students with indicators of kidney dysfunction, the prevalence of kidney dysfunction among the group was computed.

For research problems 6 and 7, regression analysis was employed to determine the significant correlation between body mass index (BMI), risk factors, and kidney status among student participants. The data were examined on how kidney health was influenced by categorizing students based on their BMI, such as underweight, normal weight, and overweight, as well as by associated risk factors like dietary habits, physical activity, and family history of kidney dysfunction. The alpha level utilized was 0.05. A probability value of 0.05 was used to determine whether or not the results were significant, meaning that findings with a p-value of 0.05 or less are considered to be statistically significant. The study aimed to identify patterns and associations to determine which variables were most strongly linked to kidney dysfunction. Once the necessary data were obtained, they were summarized in tabular form. The distribution of symptomatic and asymptomatic cases across BMI categories and other relevant factors was also illustrated through cross-tabulation.

4. Results

Table 6. Diagnosis result of the participants

Diagnosis	Frequency	Rate
Essentially normal	19	40.43%
Diagnosed Otherwise	28	59.57%
Total	47	100.00%

Table 6 presents the diagnosis outcomes based on urinalysis findings among 47 student participants. The data shows that 28 students (59.57%) were found to have results that require further medical evaluation, while the remaining 19 students (40.43%) were classified as essentially normal. This indicates that a notable proportion of the participants may be at risk of underlying health issues, including possible kidney dysfunction.

The results suggest that more than half of the population tested may have abnormalities in their urinalysis that are not yet associated with obvious symptoms. This reinforces the concern that kidney dysfunction and related conditions can develop silently, especially among children. Therefore, early detection through routine screening becomes essential to prevent the progression of kidney-related disorders. Even though only a small

percentage may show clinical symptoms, the data highlights the importance of identifying those at risk before serious complications arise.

Table 7. Abnormal Diagnosis from the Respondents.

Diagnosis	Frequency
ACR Abnormal	15
Bacteriuria	11
Crystalluria	5
Pyuria	5
Hematuria	2
Ketonuria	1

Table 7 summarizes the frequency of different abnormal urine results. An abnormal albumin-to-creatinine ratio (ACR) was the most prevalent occurring in 15 cases. This finding may indicate early signs of kidney dysfunction, as elevated ACR is recognized marker for renal impairment. Following ACR, 11 cases of bacteriuria were reported, suggesting the potential presence of urinary tract infections (UTIs). Pyuria and bacteriuria are expected to be consistent with each other; however, discrepancies may occur due to contamination during the urine collection process. This can happen, for example, if proper hygiene was not observed, such as not washing the genital area before collecting the sample. Other abnormalities included five cases of crystalluria, five cases of pyuria, two cases of hematuria, and one case of ketonuria. These findings are consistent with the study conducted by Shaheen et al. (2020), which focused on screening for urine abnormalities among elementary school pupils. The study reported that 15% of the students had abnormal urine results. Overall, these findings are valuable in the early detection of kidney problems and in addressing health concerns among students.

Table 8. Prevalence Rate Among Pre-elementary Students Based on their Urinalysis Test Results

Prevalence of Kidney Dysfunction	Frequency	Prevalence Rate
Present	16	34.04%
Not present	31	65.96%
TOTAL	47	100.00%

Table 8 shows that based on 47 sample respondents, the percentage of students with kidney dysfunction is 34.04%. The 95% confidence interval of $0.20864 \leq p \leq 0.49313$ reflects that the true prevalence rate of kidney dysfunction of the population where the sample was derived ranges as low as 20.864% and as high as 49.313%. The 95% confidence level indicates a high degree of certainty in the reliability of the study's findings. This means that if the same research were conducted multiple times under the same conditions, approximately 95% of those studies would yield results within a similar range. Therefore, the observed outcomes are unlikely to be due to random variation alone and are a reasonable estimate of the true values in the population. With this, there is a considerable prevalence of kidney dysfunction among the students in Bauang North Central School (refer to page 87, Appendix H for the urinalysis results).

The urinalysis results of the tested school children revealed that a significant number of cases showed early signs suggestive of potential kidney dysfunction. Proteinuria or presence of protein in urine, was observed in several urine samples, with some showing 1+ levels, which is an early indicator of possible glomerular damage. Additionally, 16 of the tested school children had elevated ACR ratios between 30 to over 300, suggesting signs of albumin in the urine, which can be an early sign of possible kidney damage. Although most urine samples presented with normal physical characteristics such as clear appearance and pale yellow to amber color, some showed abnormalities like turbid appearance, mucus threads, transitional lining epithelial cells, hyaline casts, bacteria, calcium oxalate dihydrate crystals, red blood cells, white blood cells, antibiotic crystals, and cholesterol crystal, which are signs of kidney dysfunction.

The findings suggest a 34.04% prevalence rate of potential kidney dysfunction among pre elementary pupils. This study supports the findings of Amanulla et al. (2022) which highlights kidney dysfunction as a significant public health issue in children, particularly in low- and middle income countries (LMICs) like the Philippines. Moreover, the findings of Shaheen et al. (2020) reported only a 15% prevalence of urine abnormalities among school children. The 34.04% prevalence rate observed in this study is notably higher than those reported by both Amanulla et al. (2022) and Shaheen et al., 2020.

Table 9. Indication of Symptoms among Students

Indication	Frequency	Rate
Symptomatic	3	18.75%
Asymptomatic	13	81.25%
Respondents with Kidney Dysfunction	16	100.00%

Table 9 shows that, among the 16 students identified with kidney dysfunction, only 3 (18.75%) exhibited observable symptoms, while 13 students (81.25%) were asymptomatic. A 95% confidence interval of $0.04047 \leq p \leq 0.45646$ suggests that the presence of symptoms in similar populations may range up to 45.65%. This implies that even if the students have developed kidney dysfunction, it can only be observed 45% of the time (or 4 of every 9 patients) without medical testing, which means that it could be overlooked and may pose risks of developing into more complicated diseases or conditions. Additionally, this suggests that most of the students with kidney dysfunction did not exhibit any visible symptoms at the time of testing. One participant showed symptoms such as frequent tiredness, despite not having kidney dysfunction. It was later revealed that the participant had an underlying condition.

These findings are consistent with the global prevalence of asymptomatic cases of kidney dysfunction. The Centers for Disease Control and Prevention (CDC, 2023) reported that 90% of adults with chronic kidney disease are unaware of their condition due to lack of noticeable symptoms, which supports the findings of this study. Additionally, these findings align with existing literature, which indicates that the early stages of kidney disease are often clinically silent. According to the National Kidney Foundation (2020), chronic kidney disease (CKD) may progress without symptoms until significant kidney damage has occurred. This shows that kidney dysfunction may remain undiagnosed in up to two out of every 5 patients without medical laboratory testing, highlighting the potentially silent nature of the condition. Vaidya and Aedulla (2024) emphasized that signs like tiredness, swelling, loss of appetite, and itchy skin might appear, but are often mild or not noticeable in the early stages.

Table 10. Indication of Family History as a risk factor contributing to the development of kidney dysfunction in children

Family History	Frequency	Rate
YES	1	10.64%
NO	46	89.36%
TOTAL	47	100.00%

Table 10 shows that only 1 out of the 47 respondents have experienced kidney dysfunction. With this, a 95% confidence interval of $0.00054 \leq p \leq 0.11294$ reflects that only less than 11% of the children of those patients who experienced kidney dysfunction will also develop kidney dysfunction, based on family history.

This finding aligns with existing literature on hereditary health risks. According to the American Kidney Fund, individuals with a close relative—such as a parent, grandparent, or sibling—diagnosed with kidney dysfunction increases the risk of an individual developing the condition. The elevated susceptibility is attributed not only to shared genetic traits but also to common lifestyle patterns and environmental exposures prevalent within families. In this context, even a relatively small percentage of affected individuals warrants attention, as it underscores the latent risk carried through familial links.

Although the observed proportion is low in this specific sample, the statistical range, supported by the American Kidney Fund's findings, emphasizes the importance of monitoring individuals with a family history of kidney dysfunction. Preventive strategies, early screenings, and health education among at-risk populations could be essential in mitigating the progression or onset of kidney dysfunction in genetically predisposed individual.

Table 11. Participant Lifestyle

Question	Mean	Description	Positive Rank
Eating fruits, vegetables and vegetables with meals or snacks.	2.76	OFTEN	4
Eating salty snacks (e.g., Chips, fast foods).	2.11	SELDOM	7.5
Eating foods that include processed ingredients (e.g., Canned goods, Noodles, etc.).	1.94	OFTEN	9
Implementing dietary restrictions.	2.51	OFTEN	6
Preparing home cooked meals.	2.94	OFTEN	2
Consuming protein-rich meals such as meat, beans, and eggs.	2.89	OFTEN	3
Skipping meals like breakfast or lunch.	2.11	SELDOM	7.5
Drinking sugary or carbonated beverages and energy drinks such as soda and juice.	1.91	OFTEN	10
Drinking water throughout the day.	2.98	OFTEN	1
Engaging in physical activity like playing outdoor activities or	2.70	OFTEN	5

exercise.			
Playing with gadgets and watching videos in a day.	1.59	OFTEN	11
GENERAL AVERAGE	2.40	MODERATELY GOOD LIFESTYLE	

Table 11 shows the frequency of the activities of the students that may be contributory to the development of kidney dysfunction. In this table, the negative statements have been recalculated to their equivalent positive rating to reflect which bad habits have been frequently done. The most prevalent negative habit of children is that they often use gadgets. This finding aligns with Xie et al. (2023), who found that using mobile phones for 30 minutes or more per week was linked to an increased risk of CKD, particularly among individuals with high genetic susceptibility. Prolonged exposure to radiofrequency electromagnetic fields (RF-EMF), poor sleep, and stress were identified as possible contributing factors. Similarly, González-Ortiz et al. (2022) said excessive gadget use leads to sedentary behavior, in which people who are absorbed in playing with gadgets often become physically inactive, neglecting basic needs such as eating, drinking, or even going to the restroom to relieve themselves. It is a likely consequence of extended gadget use—as a modifiable risk factor for CKD. Reduced physical activity and prolonged sitting were associated with lower kidney function, even in healthy individuals. Overall, the literature suggests that gadget use and sedentarism play a growing role in CKD risk, especially when combined with hereditary and environmental factors.

This is followed by children drinking sugary, carbonated, or energy drinks and eating heavily processed meats. According to the National Kidney Foundation, ultra-processed foods, including sugary beverages and processed meats, are linked to a higher risk of chronic kidney disease (CKD). These foods are often high in sodium, phosphorus additives, unhealthy fats, and added sugars, which can increase blood pressure, cause metabolic disturbances, and promote inflammation—factors that contribute to declining kidney function. The excessive consumption of these products, particularly at a young age, may therefore play a significant role in early kidney stress and long-term renal health issues.

Table 12. Medical History as a Potential Risk Factor for Developing Kidney Dysfunction.

Question	Mean	Description	Rank
Ignoring frequent tiredness or weakness	1.38	SELDOM	3.5

without addressing the underlying cause?			
Having back pain or discomfort in the lower abdomen.	1.38	SELDOM	3.5
Experiencing frequent dehydration	1.23	SELDOM	6
Having a history of kidney stones or its complications.	1.15	SELDOM	7
Experiencing frequent urinary tract infections (UTIs) symptoms without seeking medical attention.	1.30	SELDOM	5
Taking Painkillers (e.g., ibuprofen, aspirin, or paracetamol)	1.61	SELDOM	1
Taking medications for other medical conditions without considering the impact on your kidneys.	1.47	SELDOM	2
GENERAL AVERAGE	1.36	SELDOM	

Table 12 shows that the participants generally seldom take actions that increase the risk of developing kidney dysfunction. However, it also shows that respondents mostly take over-the counter pain medicines when experiencing possible symptoms.

For medical history the highest mean score (1.61) was from the response on taking over-the-counter pain medicines (e.g., ibuprofen, aspirin, or paracetamol). Though it was classified as “Seldom”, it still indicates that the respondents used over-the-counter painkillers without seeking medical advice and proper prescriptions which can lead to renal or hepatic toxicity. The results from Table 3c indicate that patients seldom participate in acts that might

cause damage to the kidneys. The findings shown in this table are consistent with existing studies from the National Kidney Foundation (2025) and White (2023), which state that incorrect use of drugs such as painkillers can dramatically affect kidney function. The use of drugs without a valid prescription might be harmful. Although people seldom engage in behaviors that might harm their kidneys, it is critical to consider their medical history when managing kidney dysfunction.

Table 13. Body Mass Index of the Pupils

Classification	Frequency	Percentage
Normal	34	72.34%
Underweight	8	17.02%
Obese	5	10.64%

The table shows that a total of 47 children aged 3 to 6 years were assessed for their Body Mass Index (BMI) using the standard formula (kg/m^2), and their values were classified into three categories: Underweight, Normal, and Obese, based on approximate reference thresholds for this age group. Most of the pupils, (72.34%), have a normal BMI, while eight (17.02%) are underweight and five (10.64%) are considered obese.

The results showed that out of 47 children aged three to six years, 72.34% had a normal Body Mass Index (BMI), while 17.02% were underweight and 10.64% were classified as obese. Although fewer children in the study were classified as obese compared to those with normal weight, the presence of obesity remains a growing concern because of its serious impact on long term health. Research has shown that being obese in early childhood can harm the kidneys, as carrying excess body fat may lead to problems like increased pressure in the kidneys, ongoing inflammation, and the development of insulin resistance, all of which can contribute to kidney damage over time (García-Carro et al., 2021).

Table 14. Logistic Regression Results of Kidney Status

Indicator/Metric	Odds Ratio	95%CI	p-value
BMI	0.97	-0.31,0.25	0.8

Family History	1.13 x 10-7 ayaw ma raise		>0.9
Medical History	0.57	-1.9,0.70	0.4
Lifestyle	1.01	-0.93,0.92	>0.9

Table 14 shows that none of the indicators or metrics significantly contribute to the development of kidney dysfunction, as no indicator reached the threshold value of $p < 0.05$. The odds ratio (OR) is a statistical measure used to determine the strength of association between a particular factor and an outcome, in this case, kidney dysfunction. An odds ratio of 1 indicates no effect, meaning the factor does not influence the likelihood of the condition. An OR greater than 1 suggests an increased likelihood of the outcome, while an OR less than 1 suggests a decreased likelihood. For p-value, it is used to assess the statistical significance of the results. A p-value less than 0.05 is commonly considered statistically significant, meaning that the observed effect is unlikely to have occurred by chance and can be considered meaningful. Conversely, a p-value greater than 0.05 indicates that the result is not statistically significant, and any observed effect may have occurred by chance. In the present study, all the p-values exceeded 0.05, suggesting that none of the examined factors significantly contributed to the development of kidney dysfunction (Gravetter & Wallnau, 2021). Even though none of the factors showed a strong influence, medical history came the closest. This includes behaviors like taking medicine without a doctor's advice, not seeing a doctor when feeling unwell, or ignoring symptoms. These actions might still play a role, even if the data wasn't strong enough to prove it definitively. This is demonstrated through statistical regression analysis; however, urinalysis findings independently provide clear evidence of kidney dysfunction.

The results shown in Table 14 indicate that none of the considered variable BMI and risk factors such as lifestyle habits, medical history, and family history, had a statistically significant correlation with kidney dysfunction, as all indicators failed to meet the significance threshold. These findings align with the insights from García-Carro et al. (2021), which highlight metabolic and inflammatory changes in obese individuals; however, this relationship did not reach statistical significance in the present study. Similarly, Vaidya and Aeddula (2024) described clinical symptoms such as fatigue and swelling, yet the findings support that these are often absent in children, particularly in the early stages. The lack of a strong correlation emphasizes the silent nature of kidney dysfunction in children, where clinical signs may not clearly manifest, an observation also emphasized by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK, 2016). This highlights that the data does not wait for an abnormal BMI for kidney dysfunction to manifest or develop.

Table 15. Initial Model of Regression Analysis Between Diagnostic Findings and the Prevalence of Kidney-Related Condition

Characteristic	beta	95%Cl	p-Value
Normal	-0.06	-0.53,0.40	0.8
ACR abnormal	-0.21	-0.57,0.15	0.3
Crystalluria	0.41	-0.04,0.87	0.082
Pyuria	0.40	-001,0.81	0.0063
Hematuria	0.47	-0.17,1.1	0.2
Ketonuria	-0.43	-1.3,0.47	0.4
Bacteriuria	-0.41	-0.41	0.066

The initial model shows that there are no significant indicators as to the prevalence of Kidney Dysfunction. However, values near 0.05 are present, which prompts further investigation. Using stepwise regression, variables or indicators are removed one by one until maximum accuracy is attained for the model. Thus, producing the model below.

Table 16 Improved Model of Regression Analysis Between Diagnostic Findings and the Prevalence of Kidney-Related Condition.

Characteristic	beta	95%Cl	p-Value
Crystalluria	0.41	0.02,0.79	0.045
Pyuria	0.37	-0.02,0.76	0.070

Hematuria	0.50	-0.11,1.1	O.11
Bacteriuria	-0.35	-0.63, -0.07	0.017

Table 16 shows that Crystalluria and Bacteriuria are significant ($p < 0.05$) indicators or markers for possible kidney dysfunction. While, Pyuria and Hematuria are not significant ($p > 0.05$), however, implies that these may contribute also to the development of kidney dysfunction. In statistical terms, the beta value reflects both the strength and direction of the relationship between each diagnostic characteristic and kidney dysfunction. Positive beta values ($\beta > 0$) indicate a potential increase in risk or likelihood of the condition, while negative beta values ($\beta < 0$) suggest a possible decrease in risk or a protective effect. Hematuria presents a beta coefficient (β) of 0.50, suggesting a positive relationship with the development of kidney dysfunction; however, this finding is not statistically significant, as indicated by its p-value of 0.11, which exceeds the commonly accepted threshold of $p < 0.05$ for statistical significance. Additionally, the 95% confidence interval (-0.11 to 1.1) includes zero, further implying that the observed association may have occurred by chance and lacks sufficient evidence to be considered statistically reliable. Despite this, the relatively high beta value implies a potential trend that may justify further investigation, especially in larger samples or more controlled settings. Therefore, while hematuria is not a confirmed predictor of kidney dysfunction in this study, it may still contribute to the condition and should not be entirely dismissed in clinical or preventive contexts (Gravetter & Wallnau, 2021).

The study by Bebars et al. (2022) found that children with type 1 diabetes and asymptomatic bacteriuria (ASB) exhibited significantly higher levels of urinary NGAL and hsCRP, along with reduced glomerular filtration rates (GFR), indicating early signs of kidney injury even without symptoms. These results support the study where bacteriuria was identified as a significant indicator of kidney dysfunction in school children, suggesting its broader impact beyond diabetic populations. Although Bebars et al. did not explore crystalluria, García-Nieto et al. (2020) emphasized its role as a precursor to kidney stone formation and potential renal impairment. Their study highlighted the need for early intervention through hygienic and dietary measures to prevent crystalluria from progressing into serious kidney conditions. Together, these studies reinforce the importance of monitoring bacteriuria and crystalluria as early markers of kidney dysfunction in children.

5. Discussion

The study aimed to determine the prevalence of Kidney dysfunction among pre elementary students in Bauang North Central School. This study utilized a quantitative approach, and the characteristics of pilot study were used as the research method. A Likert scale questionnaire was utilized, with 4 indicating always, 3 for often, 2 for seldom, and 1 for never. Percentage, General Weighted Mean, and Regression Analysis were employed in treating the data.

The data gathered analyzed in the study yielded the following relevant findings:

1. Abnormal albumin-to-creatinine ratio (ACR) was the most frequently observed urine Abnormality.

2. The urinalysis findings suggest a notable prevalence of potential kidney dysfunction among pre-elementary students at Bauang North Central School.

3. A high prevalence of asymptomatic kidney dysfunction is observed among school Children.

4. Family history shows minimal influence on kidney dysfunction, while lifestyle factors—especially frequent gadget use, and improper medical practices, such as unsupervised intake of pain relievers, significantly contribute to its development in children.

5. The majority of children aged 3 to 6 years old have a normal BMI, with smaller proportions classified as underweight or obese.

6. There is no statistically significant correlation between body mass index (BMI), identified risk factors, and kidney status among pre-elementary students.

7. Crystalluria and Bacteriuria are significant indicators of potential kidney dysfunction.

6. Conclusions

1. An abnormal albumin-to-creatinine ratio (ACR) was the most frequently observed urine abnormality, followed by bacteriuria, with fewer cases of crystalluria, pyuria, hematuria, and Ketonuria.

2. Based on the urinalysis results, the prevalence rate of possible kidney dysfunction among pre-elementary students of Bauang North Central School is 34.04%.

3. There is a high prevalence (81.25%) of asymptomatic cases of kidney dysfunction among the
Children.

4. There is a low level (10.64%) of significant contribution between family history and kidney dysfunction in children, whereas there is a significant contribution of lifestyle factors particularly frequent gadget use, which may be associated with biological stressors and unhealthy habits and there is also a significant contribution of medical history, especially the frequent intake of over-the-counter pain relievers without medical supervision, as improper medication practices can lead to kidney damage over time.

5. The assessment reveals that 72.34% of children aged 3 to 6 years have a normal BMI, while
17.02% are underweight and 10.64% are classified as obese.

6. There is no significant correlation between the body mass index (BMI), risk factors, and kidney status among pre-elementary students.

7. Crystalluria and Bacteriuria are significant indicators of potential kidney dysfunction, Pyuria and Hematuria, though not statistically significant, may still contribute to their development.

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