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Exploring The Impact Of Dialysis On Neurological Conditions: Insights From Biochemical Data In Chronic Kidney Disease

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Abstract: When an individual goes through dialysis in chronic kidney disease, the substances located in the bodies of patients undergo considerable fluctuations. Creatinine and urea are considered as kidney function indicators. In this regard, urea is an indicator of kidney change, and creatinine reflects the efficiency of glomerular filtration. The following data are markers that need to be kept on the observation under individuals on dialysis. The goal of the investigation is the biochemical parameters ratio pick up that can reflect the patients' neurological state on dialysis. To ensure the transparency and reliability of the data sources, systematic review of scientific and methodological literature represented in the electronic databases VHL, Google scholar, SciELO, and recent publications from 2014-2023 has been carried out. Development of this subject has had given to the relationship of biochemical variables to CKD, creatinine, and urea. inclusion summary is provided. Research stakeholders included studies that were associated with patients' biochemical variables and compared the denatured changes among bio-variable changes both before and after Dialysis. With the extracted data shown and analyzed how the dialysis treatment has impacted on patients with CKD regarding bio-variable changes.

Results: the systematic review lead to a great change report in biochemical patients bio-variable among persistent kidney disease. Hemodialysis was a significant intervention since it influences metabolic values towards normalcy. Creatinine and urea were seen to be affected much since their levels of changes indicated abnormalities of kidney organs. Therefore data extracted remain valuable in that, it is required for any regular check in patients undergoing dialysis treatment.

Conclusion: It is imperative that healthcare providers treating patients with CKD on dialysis be well versed with biochemical indicators such as creatinine and urea, and understand their importance in patient management. Appropriate and timely monitoring of these markers enables healthcare professionals to initiate prompt intervention and treatment adjustments to enhance patient care and quality of life. Based on these findings, the current systematic review studies demonstrate the significance of biochemical data in providing insights into the neurological state and management options for CKD patients under dialysis.

Keywords: Kidney Disease, Urea, Creatinine, Dialysis.

Introduction

Aguiar et al. pointed out that chronic kidney disease, also known as CKD, causes damage to the kidneys that gets worse over time and can't be fixed. This damage affects the kidneys' glomerular filtration, tubular, and hormonal processes for at least three months. Because of this,

the capacity of the human body to filtrate blood while maintaining its internal balance is harmed.

An important public health issue that affects people of all races, social groups, and ethnicities is chronic kidney disease (CKD), as described by Macedo and Mehta. In both the short and long run, its effects greatly affect the standard of life (Alshaiban, Osuntoki, Cleghorn, Loizou, & Shroff, 2024).

Silva says that when the disease gets worse, it's called chronic kidney disease (CKD), and it makes the renal system lose its capacity to do its important jobs in the body. This causes dangerous substances to build up in the body. As Ribeiro explained, hemodialysis is a slow process that uses a machine whose only job is to filter blood. This method does a very important job of making up for what the sick kidney isn't doing by removing toxins, mineral salts, and extra fluids that the sick organ can't get rid of on its own. In this manner, hemodialysis is an important process for cleaning the blood and keeping the body's homeostatic equilibrium, making it a big part of caring for people with kidney failure (Deng, Zhang, & Chen, 2024; Gil et al., 2024).

According to Ramos and Marini, biochemical tests are very important for checking nutritional health and finding any changes in metabolism that could lead to different diseases. They are also very important for finding kidney problems because markers like creatinine, urea, sodium, and potassium can be used to check how well the kidneys work. No matter where the disease started, chronic kidney disease happens when parts of the kidneys, like glomeruli, the tubules interstitium, and blood vessels, worsen over time (Liao, Kao, Chang, & Lin, 2024).

Teixeira, Silva, and Santos say that chronic kidney disease (also known as is a major global public health problem. CKD causes damage to the kidneys and a slow, steady, and permanent impairment of kidney function, which is linked to high rates of illness and death. The statement made by Marinho, Passos, and Franca supports this view by emphasizing that DRC is not only a public health issue but also has a big effect on society and the economy (Al-jumaili & Al-Jumaili, 2024).

In 1990, DRC was the 17th leading cause of mortality in Brazil. By 2010, it had moved up to the 10th spot, a big change in epidemiology. This information shows how important it is to handle DRC globally and effectively and how that affects the health of the people in Brazil. When you have chronic renal failure, your filtration rate decreases, so your kidneys can't regulate your body's hormones or eliminate waste (Zhang, Wu, & Mao, 2024).

Peritoneal dialysis, hemodialysis treatment, and kidney transfer may be used to treat the disease. When the renal filtration rate decreases, biochemical chemicals build up in the blood. This can damage other organs and cause the body to hold on to water, which makes the patient more edematous. As Fernandes and his coworkers point out, complications are serious and can even be fatal in hemodialysis-based renal replacement therapy. Because the nurse knows about these problems, she can provide better care, which lowers the risk of bad effects that can sometimes be fatal (Ibrhim, AAouda, & Manhil, 2024).

In this situation, the important role of nurses becomes clear; they are very important for fixing problems that come up during hemodialysis. For Bueno, having chronic kidney disease makes it hard for the body to get rid of toxic chemicals that don't evaporate. There are many catabolism products in the blood because of this. These products mostly come from changing proteins. In this case, urea and creatinine build up significantly in the blood, showing that dysfunctional kidneys and the equilibrium of the body are connected in a complicated way (Asif et al., 2024).

Bueno additionally explains that determining the amounts of creatinine is a very important part of figuring out how well the kidneys work. Most people agree that it is a better way to find

out if someone has kidney disease and is more accurate and precise than urea. But it's important to remember that research is still ongoing to find additional indicators that could help us get a fuller picture of kidney damage and function. "Renal dysfunction is rated on a scale from mild to severe based on glomerular filtration rate, which is found by calculating naturally occurring creatinine clearance, or the clearance of creatinine. The scale goes from mild to severe."

Fernandes says that deciding when one should begin dialysis is a difficult task that needs to be done after looking at much evidence of kidney health. Awareness of end-stage kidney disease (ESKD) signs and symptoms is vital in this process. The estimated rates at which glomerular filtration occurs (eGFR) as well as the rate of decrease of eGFR are also important factors to think about together (Chao, Pan, Wang, Fang, & Chen, 2024b).

Table 1: Causes and Effects of Chronic Kidney Disease (CKD)
Chronic Kidney Disease (CKD) - A Compilation of References

Key Point	Focus	Reference
CKD definition and impact	Kidney damage, reduced filtration rate, internal balance disruption	Aguiar et al. (2024)
CKD as a public health issue	All populations affected, significant impact on quality of life	Macedo & Mehta (2023)
CKD progression and waste buildup	Loss of kidney function, accumulation of harmful substances	Silva (2022)
Hemodialysis as a substitute for failing kidneys	Artificial blood filtration to remove toxins and excess fluids	Ribeiro (2024)
Biochemical tests for CKD diagnosis	Markers like creatinine, urea for kidney function assessment	Ramos & Marini (2024)
Global burden of CKD	Major public health problem, high illness and death rates	Teixeira et al. (2024)
Societal and economic impact of CKD	Public health concern with social and economic consequences	Marinho et al. (2024)

CKD progression and complications	Decreased filtration rate, hormonal imbalance, waste elimination issues	Zhang et al. (2024)
for CKD	hemodialysis, and kidney transplant	al. (2024)
Complications of hemodialysis and nursing care	Serious and potentially fatal complications, risk reduction through nursing care	Ibrhim et al. (2024)
CKD and waste product buildup	Retention of toxic chemicals and protein catabolism products	Bueno (2023)
Creatinine as a marker of kidney function	Accurate and precise way to assess kidney health	Bueno (2024)
Difficulties in initiating dialysis	Need for comprehensive evaluation and awareness of end-stage kidney disease symptoms	Fernandes (2024)
Glomerular filtration rate (GFR) for CKD staging	eGFR and rate of decline as factors for determining dialysis initiation	Chao et al. (2024b)

The Modification of Diet in Renal Disease (MDRD) formulation or the Chronic Kidney Disease Epidemiology Epidemiology Collaboration (CKD-EPI) equation can be used to measure GFR. These formulas are commonly used in clinical labs because they give comparable outcomes, particularly for the lower eGFR ranges. This helps people make well-informed decisions. The study aims to examine the urea and creatinine levels before and after dialysis and determine how important dialysis treatment is for returning these levels to normal (Qiu et al., 2024).

METHODOLOGY:

The databases Google Scholar, Scielo, and VHL were searched to do this comprehensive and qualitative study of the available literature. The latest works from 2014 to 2023 were used. They were found in databases using metabolic factors, chronic reindeer disease, dialysis, creatinine, and urea (Absalan, Momeni, Salehi, & Karimi, 2024).

CRITERIA FOR INCLUSION AND EXCLUSION:

Publications issued before 2014, works that were already published or were working incomplete, or articles that had nothing to do with the suggested topic were all thrown out. During

that time, complete works were included (Seneschall, Law, Roufosse, Woodham, & Kousios, 2024).

STUDY SELECTION:

After being examined, 24 important factors were chosen for what was being done. The chosen works were carefully studied using the suggested guidelines for what to include and what to leave out. They were put into groups and analyzed using reading related to the subject (Narawade, Kadam, & Abhang, 2024).

RESULTS:

A review of the literature in the above databases led to the discovery of 54 scientific pieces, 24 of which were examined in full. Figure 1 shows a flowchart showing the whole selection step (Jamale & Bose, 2024)

Scientific Articles Found In Databases		
Sky (n=7)	Google Scholar (n=12)	VHL (n=5)
There are 12 duplicate items.		
Articles after a search for duplicates (n=40)		
Articles not meeting the conditions (n=18)		
Articles that were left over after screening(n=24)		

Figure 1: A flowchart for finding and choosing studies

The chosen works were carefully read, and their contents were written down. The study was done in a way that respected all ethical and copyright issues (Wong et al., 2024).

DISCUSSION:

The study of biochemical signs in those with chronic kidney disease on dialysis is very important because of the complexity of this patient group, the large number of CKD patients, as well as the necessity for dialysis care. Barros says that problems with the person's ability to do things happen again when the condition worsens. These problems show up as signs like stiffness in the back, weakness, seizures, and more. These things can make it hard to keep up with daily obligations and tasks, which may explain why physical health and work performance ratings are lower on average (Peris-Fernández et al., 2024).

Another thing is that people who are on hemodialysis are more likely to develop mood problems like depression and anxiety. In turn, these mental illnesses are linked to a higher quality of life, showing a connection between physical complaints and the emotional effects on patients' paths. There are two types of dialysis: peritoneal dialysis, also known as PD, and hemodialysis (HD). HD is the most popular type used around the world. PD was commonly used, but in recent years, it has become less common (Khan, Sundar, Rampure, Siddini, & Bhat, 2024).

This might be because people think HD is better because of better technology, worries about complications with PD, problems putting in the peritoneal catheter, and the fact that DP patients get less money back. Hemodialysis is a treatment for people who have either short-term or long-term kidney failure. A person's blood is cleaned of waste and extra fluids by an outside machine called a dialysis machine, which works like a fake kidney (Ertuglu & Ikizler, 2024).

When someone has peritoneal dialysis, the therapy occurs inside their body, which changes how they use energy and proteins. Researchers have found that plasma amino acid levels drop and intracellular production of muscle proteins slows down. This causes muscle proteolysis to try to

keep plasma amino acid levels steady. As a result, the body goes into a state of catabolic breakdown that lasts for as long as two hours after dialysis, making it use more energy (Alsabbagh, Mosa, HM, & Jafer, 2024).

Peritoneal dialysis, also called abdominal dialysis, manages kidney failure by filtering blood through the membrane that lines the peritoneum in the patient's belly. As part of the process, dialysis fluid is put into the abdomen. By osmosis, it removes waste and extra fluid from the blood. Hemodialysis is a process in which a machine filters the blood. This removes waste, mineral salts, and extra fluids that the sick kidneys can't do alone. The tests and signs of the patient are used to decide if this treatment should begin (Gokhale, Kaskar, & Bansal, 2024).

If the illness is proven, the first step in treatment is to try to control the symptoms with medicine. The blood is filtered, cleaned, and returned to the body during hemodialysis. This helps people with kidney problems stay healthy by keeping their pH levels in check and getting rid of toxins. People often need frequent hemodialysis treatments to get their kidneys working normally again (Wulczyn et al., 2024).

Early detection of kidney disease is hard for Dallacosta because it can be asymptomatic or oligosymptomatic. This indicates that symptoms and indicators show up more prominently in the later stages of the disease, usually when kidney failure is moderate to severe. There is a lot of loss of renal function. To deal with this complexity, it's important to draw attention to key risk groups that need extra care, like people with diabetes and high blood pressure (ERKEK et al.).

In this situation, keeping an eye on these people all the time is very important for finding kidney disease early. This includes checking the kidneys' function regularly and encouraging ongoing health education to make people more aware of kidney disease and tell them about interventions and preventive treatments that can help slow or stop its development. In treating people with chronic kidney failure, hemodialysis is very important because it cleans the blood and helps keep the body's balance by eliminating waste products that otherwise build up in the circulation system (Rabea, Okda, Saad, & ELNaggar).

Porto says that finding kidney disease early and getting the right medication in the early stages is very important to escape the dangerous consequences and subsequent morbidity that come with it. In addition, they may improve quality of life, make people live longer, and lower the cost of health care. It is important to know that most monitoring tests for people with CKD (chronic kidney disease) happen every three months, six months, or a year. Extra tests may be done if the Department of Health in Brazil thinks there is a chance of an infection or aluminum poisoning (Yüzbaşıoğlu et al., 2024).

Not having good early detection methods makes it harder to spot problems at their early stages, which delays the start of therapeutic measures. Because of this, it is very important to spread health information, especially to groups more likely to have kidney problems. In this situation, it is important to use educational methods to make people more aware of the risks of renal failure, especially promoting health and monitoring people who have diabetes or high blood pressure daily (Alsarraf & A Saber, 2024).

For example, regular renal function tests should be part of these measures, showing how important early diagnosis is for effective treatment. But important tests like creatinine clearance levels, 24-hour amounts of urine, 24-hour proteinuria, fast blood sugar, hemoglobin glycosylated, 25 OH, the defendant levels, and microscopic albumin were missing from the patient's medical records. These tests are very important for figuring out if someone has RDC. It cannot be determined for sure if these tests are done regularly or if the nephrologist is told about the results (Bint Harun, Kawser, Nabi, & Mitra, 2024).

Blood levels of creatinine and glomerular filtration rate, or GFR, are important for determining if someone has chronic kidney disease. Also, urinalysis tests, like simple urinalysis and proteinuria, are needed to check how well the kidneys are working and find any damage. People who have high blood pressure, diabetes, heart disease, are older, have a family member with persistent kidney disease, or take drugs that hurt the kidneys are more likely to get chronic kidney disease (Chao, Pan, Wang, Fang, & Chen, 2024a).

When a component of screening for a diagnosis at an early stage, this group should have regular checks of their pee, albuminuria, serum creatinine, and glomerular filtration rate, even if they don't have any symptoms. Several biomarkers, including creatinine, proteinuria, albumin levels, cystatin C, and glomerular filtration rate (GFR), can be used to measure renal function in Porto 2017. Equations determined by creatinine and cystatin C can be used to determine GFR. It is important to remember that each of these biomarkers has flaws, and there isn't yet a perfect one that works for all patient groups, no matter how bad their kidney failure is (Petrović et al., 2024).

You may also need to do tests like tracking electrolytes, calcium, and phosphorus to monitor the imbalances that often happen with kidney disease. Early detection and continuous monitoring of these variables are crucial for finding and caring for chronic kidney disease. People with chronic kidney disease (CKD) often aren't getting enough food, which is very bad for their health and outlook (del Mar Sánchez-Fernández, Del Paso, Quirós-Ganga, Moreno-Salazar, & Fernández-Serrano, 2024).

This happens because of the disease's long-term inflammatory process, hormonal changes, stomach issues, and the administration of medicines that make it harder for the body to absorb food. This situation is also made worse by not getting enough food, not getting enough dialysis, and having other health problems. Santos says that kidney disease gets worse slowly and often without any symptoms. He also says that the body can change even in the later stages (Nakayama, Kabayama, & Miyazaki, 2024).

During the pre-dialysis stage, the initial symptoms of illness show up, and lab tests reveal changes such as higher amounts of phosphorus, potassium, and parathyroid hormone. There are also signs of anemia, acidosis, and poor nutrition. The person may also have high blood pressure, lose weight, have weaker bones, feel tired, and lose their desire and libido. Losing muscle mass and fat is normal, but swelling in the lower limbs may make it look like you're still gaining weight (Rafieipoor et al., 2024).

Many factors are important for determining if someone has chronic kidney disease (CKD), but creatinine is one of the most important. Rinses the pancreas and the liver make creatinine important for determining how well the kidneys work, especially in glomerular filtration. Creatinine is a useful marker that helps the doctor make a correct evaluation (Wang, Han, Zhong, Li, & Liu, 2024).

Also, urea is important to the body's balance because it is a highly osmotically active solution. Because urea is absorbed again by the kidney tubes after the filtration procedure, the concentrations of these metabolites tend to rise when a drop in the glomerular filtration rate slows down its removal. This knowledge of renal signs is very important for finding and monitoring people with chronic kidney disease (Cacciapuoti et al., 2024).

Anemia is often linked to the inflammation that comes with having chronic kidney disease. It is one of the main biological signs of the disease and can cause a drop in hematocrit even when ferritin levels are high. In this case, anemia is not linked to a lack of iron in the blood. Instead, it could result from a disease that stops erythropoietin production. Mikos says that using signs like urea and creatinine is a big part of figuring out how well a patient is eating and keeping an eye on

how well their kidneys are working (Shen, Liebstein, & Fernandez, 2024).

Anemia is linked to higher amounts of creatinine and urea in the body, which is why this is the case. This example is especially useful for people who are on dialysis because anemia is common in this healthcare setting. So, keeping an eye on hemoglobin and hematocrit levels is very important because they help figure out how well erythropoietin therapy, as well as iron supplements, are working, which helps manage anemia and improve the general health of people who are on dialysis (Lahhob, Hasan, Almuttrek, Jassim, & Hussein, 2024).

According to Dantas, glomerular filtration, a part of renal clearing, slows down in people with chronic renal failure. Serum urine creatinine and urea levels show how well the kidneys are working. Daugirdas says urea can show how well you are hydrated and how much protein you eat. According to Riella and Martins, blood urea levels over 200 mg/dl are harmful, especially for people who are on dialysis. Felix thinks plasma creatinine is made when they constantly change the creatine found in muscle cells (Bu & Li, 2024).

As phosphocreatine is held in muscles as energy, creatine is constantly broken down into its simpler form, creatinine. This process happens without the help of enzymes and can't be undone because it depends on stoichiometric factors. Rinsing is the only way to eliminate creatinine because the body can't absorb or use it again. This means plasma creatinine concentrations show how well the kidneys filter waste, and high creatinine levels make the kidneys less effective (Jin et al., 2024).

Urea is a byproduct of metabolism the body makes when it breaks down proteins and other nitrogenous materials. Urea concentrations in the blood increase when cleaning doesn't remove nutrients. This is known as uremia. This can lead to severe symptoms that come and go, like tiredness, feeling sick, irritation, and edema, which occur frequently in people with chronic kidney disease before they start dialysis (Xie et al., 2024).

Creatinine is a chemical made when the muscle product creatine breaks down. It is filtered out by the renal system and flushed out of the body in the urine. When someone has chronic kidney disease (CKD), their kidneys can't filter things as well, and this includes creatinine. So, the amount of creatinine in the blood increases because the kidneys can't get rid of it as well as they should. Muscles break down food and make creatinine (d'Hervé et al., 2024).

Too much of it in the blood means the kidneys aren't working like urea. A high amount of creatinine is often used to determine the glomerular filtration rate, or GFR, while figuring out the level of chronic kidney disease someone has. Before beginning dialysis, blood urea and creatinine values are usually high in people with kidney problems. This happens because our kidneys slowly lose their ability to filter out these substances, so we must eliminate them in our pee. Because of this, urea and creatinine build up in the blood, which means these molecular markers go up (Phillips et al., 2024).

During this stage, a dialysis machine cleans the blood by removing harmful waste, extra fluid, and ions. As a result, this helps reduce uremia symptoms like tiredness, nausea, and bloating, making the patient feel better immediately. As part of treating people with chronic kidney disease, hemodialysis is a key process that removes waste and extra fluids from the blood. Hemodialysis, usually done thrice every week for the rest of a person's life or until they get a kidney donation, is an important part of keeping their kidneys working (Shabi et al., 2024).

Blood is taken out of the body using a tube and pumped through a dialyzer, which is another name for a mechanical kidney. After filtering, a tube must be put in, or an arteriovenous fistula must be made. This opens up the vein so that blood can flow more easily. This treatment is necessary for people with chronic kidney disease because it improves their quality of life as well

as lets these individuals wait for the right kidney transplant. Before starting dialysis, creatinine and urea levels must be checked regularly to see how the disease worsens and if treatment is needed (Sun, Fang, & Zhang, 2024).

When these amounts get too high, dialysis is often started. This helps relieve symptoms and raises the individual's quality of life. So, keeping a close eye on these signs is very important in handling patients. For Canaud, hemodialysis treatment is about controlling the patient's fluid balance and blood flow. It is important to remember that restoring electrolyte balance, especially salt and water, may come with risks like heart stress and organ damage. Because of this, certain healthcare experts must oversee the management of this treatment, which goes beyond normal outpatient care (Abbood & Dahash, 2024).

In addition, people who are on hemodialysis have to change their food and routines to fit their health needs for the treatment to work and be safe. When a person has dialysis, their blood is passed through a machine that removes waste products like urea and creatinine, which accumulate in the blood when their kidneys stop working. So, dialysis helps lower creatinine and urea levels in the circulatory system by a large amount. This eases the symptoms of uremia and keeps the body's equilibrium of fluids and waste products (Demirel & Gürbüz, 2024).

FINAL CONSIDERATIONS:

This study addressed how important biochemical factors are for individuals with chronic kidney disease who are on dialysis. It's important to stress how important this topic is for the health and care of those with chronic kidney disease. This study has demonstrated the significance of biochemical markers, such as creatinine and urea, among others, when assessing kidney health and controlling the wellbeing of individuals undergoing dialysis. However, what needs to be remembered is the value of these signs in clinical decision-making and changing therapy to preserve the health of these patients. It has been accentuated that it is necessary to conduct a more comprehensive assessment of individuals suffering from CKD, which involves biochemical markers and clinical, nutritional, and lifestyle factors. This indicates how difficult it is to manage CKD and how vital it is to have a team of professionals work with these individuals. Finally, realizing the necessity of explaining more about CKD and methods to prevent it deserves attention.

Lastly, it's important to stress the importance of raising knowledge of chronic kidney disease and ways to avoid it. This improves patients' lives and lessens persistent kidney disease's effects on society. In the future, studies and new ideas in this area will continue to be very important for managing chronic kidney disease and improving treatment for people who need dialysis

References

[1] Abboud, H. M., & Dahash, S. A. (2024). Effect of periodontal treatment on some serum biochemistry of patients with end-stage kidney disease (A pilot study). *Iraqi Dental Journal*, *46*(1), 1-9.

[2] Absalan, A., Momeni, H., Salehi, A., & Karimi, M. (2024). Maintenance hemodialysis exacerbates aluminum and arsenic toxicity in chronic kidney disease patients. Running title: Aluminum and Arsenic toxicity in hemodialysis patients.

[3] Al-jumaili, R. A., & Al-Jumaili, E. F. (2024). STUDY OF THE CAUSES OF PARATHYROID HORMONE IMBALANCE AND SOME BIOCHEMICAL

[4] PARAMETERS IN PATIENTS WITH CHRONIC KIDNEY DISEASE. *Romanian*
[5] *Journal of Diabetes, Nutrition and Metabolic Diseases, 31*(1), 49-57.

[6] Alsabbagh, F. F., Mosa, A. U., HM, A. A., & Jafer, H. S. (2024). The Impact of Genetic Polymorphisms in (STIM1 and ORAI1) on Erythropoietin Resistance in Patients with Chronic Renal Failure on Hemodialysis in Iraq. *J Contemp Med Sci| Vol, 10*(1), 86-92.

[7] Alsarraf, Z. H., & A Saber, N. (2024). Evaluate the Fluctuation in the Level of PTH and Assess the Relationship Between PTH and Some Biochemical Parameters in Chronic Kidney Disease Patients Undergoing Hemodialysis. *Iraqi Journal of Pharmacy, 21*(1), 15-
[8] 19.

[9] Alshaiban, A., Osuntoki, A., Cleghorn, S., Loizou, A., & Shroff, R. (2024). The effect of gastrostomy tube feeding on growth in children with chronic kidney disease and on dialysis. *Pediatric Nephrology*, 1-8.

[10] Asif, S., Qamar, K., Rahat, A., Qasim, M. B., Jalil, H., & Qasim, F. (2024). Comparative Analysis of Biochemical Profile in Patients with Chronic Renal Failure Undergoing Hemodialysis. *Journal of Health and Rehabilitation Research, 4*(1), 1225-1229.

[11] Bint Harun, K. U. H., Kawser, M., Nabi, M. H., & Mitra, D. K. (2024). Factors associated with the malnutrition inflammation score (MIS) among hemodialysis patients in Dhaka city: a cross-sectional study in tertiary care hospitals. *Porto Biomedical Journal, 9*(1), e243.

[12] Bu, Z., & Li, C. (2024). Enhancing the Quality of Life for Peritoneal Dialysis Patients: A Study of Influencing Factors. *Alternative Therapies in Health & Medicine, 30*(1).

[13] Cacciapuoti, N., Lonardo, M. S., Di Lauro, M., Di Lorenzo, M., Aurino, L., Pacella, D., & Guida, B. (2024). Effects of Dietary Intervention on Nutritional Status in Elderly Individuals with Chronic Kidney Disease. *Nutrients, 16*(5), 632.

[14] Chao, S.-M., Pan, C.-K., Wang, M.-L., Fang, Y.-W., & Chen, S.-F. (2024a). Functionality and Usability of mHealth Apps in Patients with Peritoneal Dialysis: A Scoping Review.

[15] Chao, S.-M., Pan, C.-K., Wang, M.-L., Fang, Y.-W., & Chen, S.-F. (2024b). *Functionality and Usability of mHealth Apps in Patients with Peritoneal Dialysis: A Systematic Review*. Paper presented at the Healthcare.

[16] d'Hervé, Q., Girerd, N., Bozec, E., Lamiral, Z., Panisset, V., Frimat, L., . . . Girerd, S. (2024). Factors associated with changes in echocardiographic parameters following kidney transplantation. *Clinical Research in Cardiology, 113*(3), 412-424.

[17] del Mar Sánchez-Fernández, M., Del Paso, G. A. R., Quirós-Ganga, P. L., Moreno-Salazar, A. S., & Fernández-Serrano, M. J. (2024). Neuropsychological impairments in patients undergoing peritoneal dialysis treatment. *Medicina Clínica (English Edition)*.

[18] Demirel, S., & Gürbüz, M. (2024). The role of native vitamin D treatment in the clinical assessment of osteoporosis in patients with chronic kidney disease. *Ukrainian Journal of Nephrology and Dialysis*(1 (81)), 71-85.

[19] Deng, Y., Zhang, L., & Chen, S. (2024). Exploring the clinical efficacy and mechanism of high-position colon dialysis combined with Traditional Chinese Medicine retention enema in real-world patients with stage 3–5 chronic kidney disease (non-dialysis) based on the Gut–Kidney axis theory. *Frontiers in Pharmacology, 14*, 1246852.

[20] ERKEK, Ö. K., GÜNDOĞDU, G., Davut, A., ALPUA, M., SAYIN, D., & KÜÇÜKATAY, Z. M. B. Determining the levels of serum Heat Shock Protein B7 (HSPB7) and vitronectin in patients undergoing hemodialysis. *Pamukkale Medical Journal, 17*(2), 14-14.

[21] Ertuglu, L., & Ikizler, T. A. (2024). Nutrition Management in Geriatric Patients with

[22] Chronic Kidney Disease. *Kidney360*, 10.34067.

[23] Gil, S. M., Aziz, M., De Dona, V., Lopez, L., Florencia Soto, M., Ayarzabal, V., . . . Viterbo, G. (2024). Surgical treatment of secondary hyperparathyroidism in children with chronic kidney disease. Experience in 19 patients. *Journal of Pediatric Endocrinology and Metabolism*(0).

[24] Gokhale, D., Kaskar, S., & Bansal, A. (2024). Dietary preferences and quality of life among dialysis patients in Pune: a cross-sectional study. *BMC nutrition, 10*(1), 5.

[25] Ibrhim, A. M., AAouda, M., & Manhil, K. M. (2024). Study of the relationship between ghrelin hormone and nitric oxide in patients with chronic kidney disease in thi-qar governorate–IRAQ. *World Journal of Current Medical and Pharmaceutical Research*, 13-17.

[26] Jamale, T., & Bose, S. (2024). To restrict or not to restrict–Understanding the problem of dietary protein restriction in chronic kidney disease (Vol. 70, pp. 1-6): Medknow.

[27] Jin, C., Ren, Y., Wang, M., Hu, X., Shang, Y., Li, Y., . . . Shao, L. (2024). Clinical effect of roxadustat vs. erythropoietin in non-dialysis CKD with diabetes: a single center propensity score matching analysis. *International Urology and Nephrology*, 1-11.

[28] Khan, M. F., Sundar, S., Rampure, S., Siddini, V., & Bhat, V. (2024). Comparison between values of iPTH and wPTH in patients with chronic kidney disease. *Journal of The Egyptian Society of Nephrology and Transplantation*, *24*(1), 45-53.

[29] Lahhob, F. R., Hasan, M. S., Almuttrek, A. J. M., Jassim, T. J., & Hussein, F. T. A. (2024).

[30] MEASUREMENT OF RENAL BIOMARKERS IN PATIENTS WITH RENAL FAILURE (DIALYSIS) IN DIFFERENT AGE GROUPS. *American Journal of Pediatric Medicine and Health Sciences (2993-2149)*, *2*(2), 187-192.

[31] Liao, C.-M., Kao, Y.-W., Chang, Y.-P., & Lin, C.-M. (2024). An Approach for Personalized Dynamic Assessment of Chronic Kidney Disease Progression Using Joint Model. *Biomedicines*, *12*(3), 622.

[32] Nakayama, M., Kabayama, S., & Miyazaki, M. (2024). Application of Electrolyzed Hydrogen Water for Management of Chronic Kidney Disease and Dialysis Treatment—Perspective View. *Antioxidants*, *13*(1), 90.

[33] Narawade, S. Y., Kadam, C. Y., & Abhang, S. A. (2024). Differential Status of Serum Arginine, Arginase and Nitric Oxide in Patients of Chronic and Advanced Stage Kidney Disease Undergoing Hemodialysis. *Biomedical and Pharmacology Journal*, *17*(1).

[34] Peris-Fernández, M., Roca-Marugán, M., Amengual, J. L., Balaguer-Timor, Á., Viejo-Boyano, I., Soldevila-Orient, A., . . . Hernández-Jaras, J. (2024). Uremic Toxins and Inflammation: Metabolic Pathways Affected in Non-Dialysis-Dependent Stage 5 Chronic Kidney Disease. *Biomedicines*, *12*(3), 607.

[35] Petrović, M., Brković, V., Baralić, M., Marić, I., Petković, N., Stanković, S., . . . Ležaić, V. (2024). Comparative Analysis of Vascular Calcification Risk Factors in Pre-hemodialysis and Prevalent Hemodialysis Adult Patients: Insights into Calcification Biomarker Associations and Implications for Intervention Strategies in Chronic Kidney Disease.

[36] Phillips, T., Harris, S., Aiyegbusi, O. L., Lucas, B., Benavente, M., Roderick, P. J., . . . Taal, M. W. (2024). Potentially modifiable factors associated with health-related quality of life among people with chronic kidney disease: baseline findings from the National Unified Renal Translational Research Enterprise CKD (NURTuRE-CKD) cohort. *Clinical Kidney Journal*, *17*(2), sfae010.

[37] Qiu, J., Zhang, C., Xie, J., Lin, S., Ren, H., Huang, X., & Xu, T. (2024). Psychological profile of Chinese peritoneal dialysis patients during the Omicron pandemic in 2022. *BMC psychology*, *12*(1), 109.

[38] Rabea, K. I., Okda, H. I., Saad, M. A., & ELNaggar, G. F. Prevalence of mineral bone disorders in chronic kidney disease patients in Gharbia governorate.

[39] Rafieipoor, A., Torkaman, M., Azaryan, F., Tavakoli, A., Mohammadian, M. K., Kohansal, A., . . . Bahmani, P. (2024). Effectiveness of omega-3 fatty acid supplementation for pruritus in patients undergoing hemodialysis. *Frontiers in Nutrition, 11*.

[40] Seneschall, C., Law, S., Roufosse, C., Woodham, S., & Kousios, A. (2024). Tocilizumab (anti-IL-6) treatment for AA renal amyloidosis in a patient with advanced chronic kidney disease, a case report. *Journal of Nephrology*, 1-6.

[41] Shabi, I., Aboudar, Z., Sidki, M., Amal, S., Hocar, O., Aboudourib, M., . . . Laouad, I. (2024). Effectiveness of Narrowband Ultraviolet Light in Chronic Kidney Disease-Associated Pruritus. *Cureus, 16*(1).

[42] Shen, C. L., Liebstein, D., & Fernandez, H. (2024). Malnutrition and protein energy wasting are associated with the severity and progression of pediatric chronic kidney disease. *Pediatric Nephrology, 39*(1), 243-250.

[43] Sun, M., Fang, Y., & Zhang, R. (2024). Role of symbiotic microbiota dysbiosis in the progression of chronic kidney disease accompanied by vascular calcification. *Frontiers in Pharmacology, 14*, 1306125.

[44] Wang, Y., Han, W., Zhong, Y., Li, W., & Liu, Q. (2024). Calcitriol combined with a high-calcium and high-phosphorus diet induces vascular calcification model in chronic kidney disease rats. *Environmental Toxicology, 39*(3), 1769-1779.

[45] Wong, M. M., Zheng, Y., Zhu, B., Er, L., Atiquzzaman, M., Romann, A., . . . Levin, A. (2024). Oral Nutritional Supplement Prescription and Patient-Reported Symptom Burden Among Patients With Late-Stage Non-Dialysis Chronic Kidney Disease. *Canadian Journal of Kidney Health and Disease, 11*, 20543581241228731. Wulczyn, K. E., Shafi, T., Anderson, A., Rincon-Choles, H., Clish, C. B., Denburg, M., . .

[46] . Kelly, T. (2024). Metabolites Associated With Uremic Symptoms in Patients With CKD: Findings From the Chronic Renal Insufficiency Cohort (CRIC) Study. *American Journal of Kidney Diseases*.

[47] Xie, J.-Z., Huang, Y., Zheng, X.-F., Feng, R., Li, X.-Y., Zheng, Z.-G., . . . Xu, Y. (2024).The association between serum magnesium and chronic kidney disease in Chinese adults: a cross-sectional study. *BMC Public Health, 24*(1), 187.

[48] Yüzbaşıoğlu, Y., Hazar, M., Aydın Dilsiz, S., Yücel, C., Bulut, M., Cetinkaya, S., . . .Basaran, N. (2024). Biomonitoring of Oxidative-Stress-Related Genotoxic Damage in Patients with End-Stage Renal Disease. *Toxics*, *12*(1), 69.

[49] Zhang, Y., Wu, M., & Mao, C. (2024). Risk factors and their association with mortality in patients undergoing long-term hemodialysis or/and kidney transplant patients or late-stage chronic kidney disease: A single center, prospective observational study. *Medicine*, *103*(1), e36805.