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Research Article

Estimation Renalase Concentration in Iraqi Patients with End Stage Renal Disease in Hilla Province

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Abstract— ESKD is a major contributor to Iraq's high healthcare costs and a prevalent, debilitating condition that shortens and worsens patients' lives. These individuals often suffer from diabetes and cardiovascular disease, and they have a significant risk of dying from cardiovascular causes. Dialysis or kidney transplantation are the mainstays of renal replacement treatment in ESKD management. We collected 100 blood samples from patients with stage renal illness admitted to Merjan Teaching Hospital in Babylon Province, Iraq. Everyone involved, from the patients to the 100-person control group of healthy adults ranging in age from 11 to 80, belonged to the same Arab ethnic group. Results showed that renalase levels varied by an average of pg/ml in both the experimental and control groups. The serum of individuals with end-stage renal disease had significantly higher renalase levels (184.21± 4.97 pg/ml) compared to the healthy group (44.06±7.21 pg/ml) (P <0.05).**conclusion**: In this study, we looked at the renalase levels of end-stage renal disease (ESRD) patients who were on hemolysis. These individuals had elevated serum renalase levels. Research shows that renalase production is higher in people with end-stage renal disease (ESRD) and gets worse as the disease progresses. Patients with end-stage renal disease (ESRD) who are undergoing hemolysis are most likely to have elevated serum renalase concentrations due to compensatory synthesis in extrarenal organs caused by hypertension and alterations in the cardiovascular system. It is possible that serum renalase's enhanced degradation of catecholamines is responsible for the lower plasma concentrations of these substances. This could be proof that renalase is involved in catecholamine metabolism.

Keywords— Renalase , Urea , GFR , ESRD, Kidney

1. Introduction

The kidneys stop filtering the blood of waste products from metabolism and maintaining a healthy balance of electrolytes, fluids, and pH in the extracellular fluids when they reach end stage renal failure [1,3]. Kidney illness, systemic disease, or urologic problems not originating in the kidneys could be the root reason. Acute and chronic forms of renal failure are both possible. The onset of acute renal failure is abrupt, although it is generally treatable with early diagnosis and treatment. Chronic renal failure, on the other hand, develops when the kidneys sustain permanent damage. Typically, it takes a number of years for it to fully manifest [4-5].

The high mortality and morbidity rates among ESRD patients are attributed to urea-raising conditions that develop throughout chronic kidney disease. Environmental and activity agents involved in chronic disease, as well as hypertension, chronic nephropathy tract infection, obstruction of the urinary tract, hereditary lesions (such as polycystic kidney disease disorders), infections, medications, or toxic agents can also cause end-stage renal disease (ESRD). In some cases, chemical analysis or kidney transplantation may be necessary for patient survival [6-8].

The incidence and prevalence of end-stage renal disease continue to rise globally, even while polygenic illness, hypertension, and lipidemia are all being treated more aggressively. There is a complex interplay between heredity and environmental factors that determines an individual's risk of acquiring chronic kidney disease.Thus, for various etiologies of renal problem, the surrounding familial clustering of kidney disease has been frequently established across all demographic teams investigated. Furthermore, large-scale screening investigations aim to identify the prevalence of chronic renal disease sickness more accurately. Along with the patient's medical history, educating the public about kidney disease risk factors [9–12] .

Understanding the pathophysiology of nephropathy is crucial for identifying at-risk patients and treating them at earlier, potentially reversible phases of their illness. This is especially

important given the enormous burden of kidney disease globally. The goal is that earlier therapy will prevent ESRD from developing in susceptible individuals, hence there is a huge interest in identifying risk factors for renal failure [13].

In 2009, Desir et al. [4] made the first characterization of renalase, an enzyme-active protein. According to the description, it is a flavin-adenine-dinucleotide-dependent amino oxidase that the kidneys are expected to produce into the bloodstream. It is meant to regulate critical catecholamine metabolism. There has to be more research into isolating this protein, which has modest expression in cardiomyocytes, muscles, and the liver, but significant expression in the excretory organ's capillaries and proximal tube [14].

The human kidneys play an essential role in maintaining fluid homeostasis and waste elimination, in addition to their endocrine functions and regulatory roles in blood pressure and mineral metabolism. At least forty genes have been linked to kidney development, and many more are expressed in the kidneys and control kidney physiology [15].

Patients with end-stage renal illness have elevated plasma catecholamine levels due to an increase in sympathetic activity and a decrease in catecholamine clearance. The prognosis for this group of patients is worse when sympathetic activity is increased. Rate of cardiovascular events and survival in individuals with end-stage renal disease are correlated with norepinephrine concentration [16]. Age, organ function, the length of time since replacement, and blood pressure were all factors that were considered excretory in relation to renalase level [17].
The aim of this study was estimated renalase concentration in patients with end stage renal disease in hilla province

2. Methods

2.1 Subjects and Sampling

From February 2024 through July 2024, researchers ran a case-control study. patients' blood samples taken from the dialysis unit of the Merjan Teaching Hospital in Babylon Province, Iraq.
The research used one hundred blood samples. Patients with End-Stage Renal Disease (ESRD) and 100 healthy individuals were used as a control group to collect blood samples. Dialysis patients at Merjan Teaching Hospital have been hospitalized from the ages of eleven to eighty. This is in contrast to the ESRD and CKD groups, which were matched differently. A competent physician examined each subject. Individuals diagnosed with hepatitis were not included.

2.2. Renalase Quantity Assay by ELISA

The specific kit (ELISA) provided by Elascience - China company was used to measure the quantity of human renalase.

3. Results

3.1 Serum renalase concentration in both genders of the study groups

All of the patient groups and the control group had their renalase levels shown in ng/ml in table (1). In comparison to the healthy control group, the males in the ESRD group had significantly higher renalase levels (184.21 ± 4.97 ng/ml) in their sera ($P \leq 0.05$). The healthy group had a serum renalase level of 55.45 ± 7.56 ng/ml, while the ESRD group had 172.29 ± 8.28 ng/ml. In contrast, the males in the healthy management group had a serum renalase level of 44.06 ± 7.21 ng/ml, whereas those in the ESRD group had 165.59 ± 6.64 ng/ml.

Table -1 Serum renalase levels in both genders of the study groups

Groups Mean± SE				
Renalase Level (ng/ml)	ESRD	Control		
Male	**Female**	**Male**	**Female**	**LSD**
184.21 ± 4.97	172.29 ± 8.28	44.06 ± .21	55.45 ± 7.56	**0.001**

***P ≤ 0.05; SE: Standard error; CKD: Chronic kidney disease; ESRD: End- stage renal disease**

4. Discussion

The process of identifying renalase began with a search of public databases using an algorithm that sought for proteins with significant kidney expression and a high probability of secretion. One clone, renalase, stood out among the chosen genes for its strong expression in the kidneys, particularly in the proximal tubule [18]. Chernobyl is home to the enzyme renalase on chromosome 10.The 33 gene has 342 amino acids and is encoded by nine exons that span 310,000 base pairs. The protein it produces has a molecular mass of around 38 kDa. Nevertheless, it is also highly expressed in the liver, muscles, and cardiomyocytes, making it an excretory organ. Renallase 2-4 splice variants were identified [19].

A putative signal organic molecule (amino acids 1–17) and a flavine A dinucleotide (FAD)–binding domain (amino acids 3-42) are its primary structural choices. The protein domain, which is related with amino acids 75–335, is located at the other end of the protein. While hRenalase3 and hRenalase 4 have not been investigated, it is highly improbable that they possess amino acid protein performance due to their structure containing shorter domains. Knowing its structure was a huge step forward since it opens the door to better understanding the molecular mechanisms that control and operate it. But there has been talk of synthetic counterparts with possible medicinal associations [20].

There was a correlation between renalase level and urinary organ function, replacement time, age, and force per unit area. Contrary to what Xu et al. [10] found, these outcomes persist. Western blotting with polyclonal antibodies was one of the methods used to evaluate renalase [20]. The Malyszko firm backed an ELISA test that was sold commercially and used an antibody that was specific for renalase. Patients undergoing peritoneal dialysis also had elevated serum

renalase levels compared to the healthy control group. Although it showed a positive link with dialysis duration, neither blood pressure control nor residual renal function were connected to its levels [21].

The current study's findings were in line with those of Lilia D'Marco et al. [22] Researchers discovered that pre-dialysis patients had significantly greater serum renalase levels compared to healthy individuals. On a more intriguing note, patients whose dialyzed duration was greater than six months had significantly elevated serum renalase. Updated from Gu et al. [7], an animal model of unilateral renal artery stenosis was validated. A decrease in renalase expression compared to non-ischemic kidneys suggested that renal blood flow may affect renalase synthesis, as demonstrated in the study. Renal transplant recipients' serum renalase levels were much greater than those of healthy participants. Furthermore, compared to healthy volunteers, peritoneal dialysis patients had a higher serum renalase level, according to a recent study. Multiple investigations have also shown that renalase is inactive when it circulates in the bloodstream as a proenzyme, but that it is rapidly activated by high quantities of plasma catecholamines [23-25].

The kidneys are involved in the elimination of circulating catecholamines to the tune of about 15–24%. Other tissues and organs actively remove most circulating catecholamines through non-neuronal monoamine transporters. The amines are then processed before being released back into the circulation. Plasma catecholamine concentrations in renal failure patients may be elevated due to an increase in sympathetic nervous system activation and a decrease in circulatory clearance caused by decreased renal function [26].

A greater renalase level was seen in those who had kidney transplants compared to healthy controls, according to other research. Serum renalase levels, systolic blood pressure, proteinuria, and elevated plasma norepinephrine levels are all associated with chronic kidney disease (CKD) patients. Indications suggest this protein (renalase) has a significant role in the metabolism of catecholamines, contributes to the onset of hypertension and cardiovascular diseases, and might potentially lead to kidney damage and higher mortality rates in individuals with chronic kidney disease [27-32].

5. Conclusion and future studying

Current research points to renalase as a potential therapeutic strategy for reducing the advancement of chronic kidney disease (CKD) and associated cardiovascular illness, and it may also play a significant role in the pathophysiology of CKD. Still, twenty years following its finding, renalase is still in the promising phase. Questions remain about the specifics of how it works takes place, how mediators engage with one another, and whether a uniform the primary obstacles to the adoption of renalase as a serum level measurement among the tools used to treat chronic kidney disease. This area requires ongoing investigation to make CKD patients' bad prognoses better [33-36].

Conflict of interest statement
None of the author has declared a conflict of interest with respect to this work.

Data Availability
None.

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None.

Authors' Contributions
Ahmed Abdulhaleem Al Shammari works conceived the idea and wrote the original draft of the manuscript, and the author reviewed and edited the final version.

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