



THE IMPACT OF ECOLOGICAL REHABILITATION PROGRAMS ON KIDNEY FUNCTION AND OVERALL HEALTH IN PATIENTS WITH CHRONIC GLOMERULONEPHRITIS

Sapayeva Z.A., Jumaniyazov B.K., Zaripov Z.O.
Urgench branch of TMA

Article history:	Abstract:
Received: April 14 th 2025 Accepted: May 10 th 2025	This research aims to evaluate the effectiveness of ecological rehabilitation programs in improving the health of individuals suffering from chronic glomerulonephritis (CGN). The study included 100 participants, with 50 of them undergoing an ecological rehabilitation program. The program provided interventions aimed at enhancing air and water quality, improving living conditions, and reducing stress. Results indicated that the ecological rehabilitation led to noticeable improvements in kidney function and the overall health of the participants.
Keywords: chronic glomerulonephritis, ecological rehabilitation, kidney function, environmental toxins, health enhancement, ecological interventions	

INTRODUCTION: Chronic glomerulonephritis (CGN) is a long-term inflammatory kidney disease characterized by gradual damage to the renal glomeruli through autoimmune processes. The underlying mechanisms of the disease include the accumulation of immune complexes, release of cytokines, oxidative stress, and the activation of fibrosis. Over time, CGN can lead to chronic kidney disease (CKD). The World Health Organization (WHO) has recognized kidney diseases as an increasing global health concern.

Recently, the link between environmental factors and kidney diseases has gained attention. Specifically, air pollutants, such as fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂), have been shown to directly harm kidney glomeruli. Research by Zhang et al. found that elevated PM_{2.5} levels correlate with a decrease in glomerular filtration rate (GFR) [1].

Studies by Liu et al. have revealed that individuals residing near industrial sites are more likely to experience deteriorating kidney function, often leading to CGN-related conditions [2]. Additionally, Rahman et al. found that high levels of nitrates and heavy metals in drinking water contribute to kidney tissue toxicity [3]. Air pollutants, particularly PM_{2.5}, along with heavy metals and inadequate drinking water quality, contribute to kidney tissue damage, intensifying inflammation and fibrotic changes [1,4]. These environmental factors not only trigger kidney disease but also exacerbate its progression and hinder treatment effectiveness.

At the same time, the positive impact of a clean environment on health has been widely documented. Ecological rehabilitation programs—such as improving green spaces, cleaning up waste, and ensuring safe

drinking water—have been found to improve overall health, including kidney function [5,7]. Studies have shown that patients living in ecologically clean environments exhibit better kidney health and improved overall well-being. For example, Xu et al. demonstrated that residents of ecologically healthier areas had higher GFRs [5]. Furthermore, Smith et al. found that ecological rehabilitation had beneficial effects on blood pressure and metabolic health [6]. Research by Chen et al. indicated that people living in environmentally safe areas face a lower risk of chronic diseases, including kidney failure [7].

These findings underscore the importance of environmental factors in the development and progression of CGN, while also highlighting the potential therapeutic role of ecological rehabilitation programs. However, there remains a need for more clinical research specifically focused on CGN to understand the full impact of ecological measures on kidney health

AIM: This study seeks to explore how environmental factors affect patients with chronic glomerulonephritis and assess the effectiveness of ecological rehabilitation programs.

MATERIALS AND METHODS: The study involved 100 patients diagnosed with chronic glomerulonephritis. They were divided into two groups: the experimental group (n=50) received ecological rehabilitation (including cleaner air, better water, exercise, and counseling), while the control group (n=50) received standard medical care.

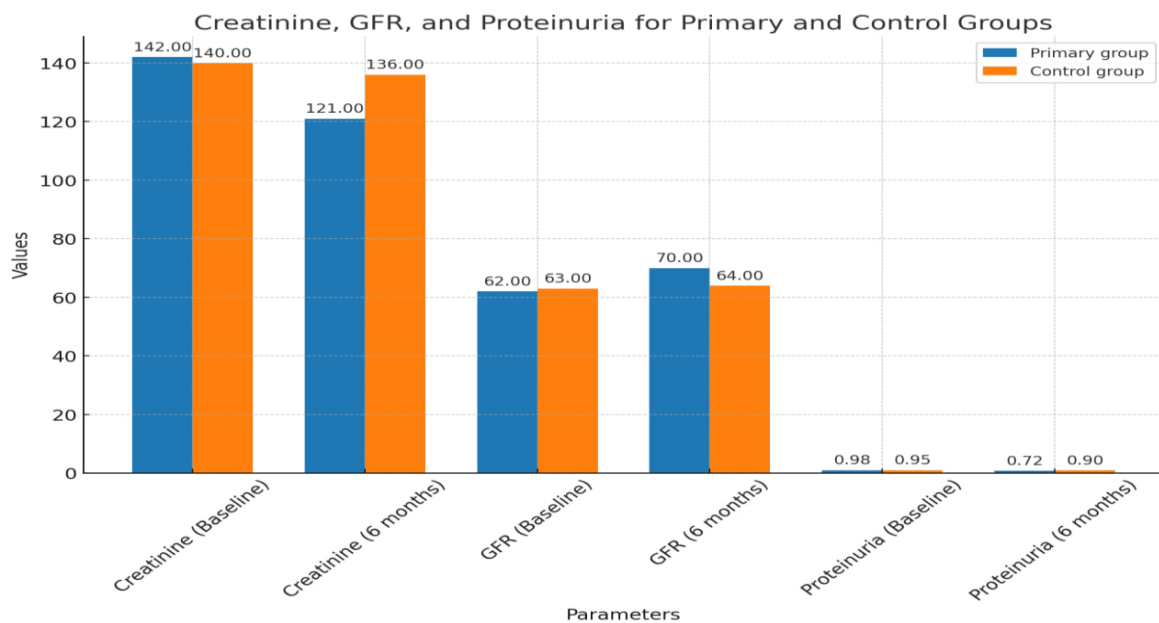
The study measured several factors, including kidney function (creatinine levels, proteinuria, GFR), blood



pressure, general health, and mental well-being. Methods included biochemical testing, functional assessments, psychological evaluations, and environmental surveys. The study took place over six months, and statistical analysis was conducted using SPSS v.24, applying t-tests and chi-square tests

RESULTS AND DISCUSSION: The impact of ecological rehabilitation on patients with chronic glomerulonephritis was assessed. In the experimental group, creatinine levels decreased by 15%, and GFR improved by 12% ($p < 0.05$), indicating significant enhancement in kidney function. In contrast, no significant changes were observed in the control group (creatinine decreased by 3%, GFR increased by only 2%; $p > 0.05$). (Figure-1)

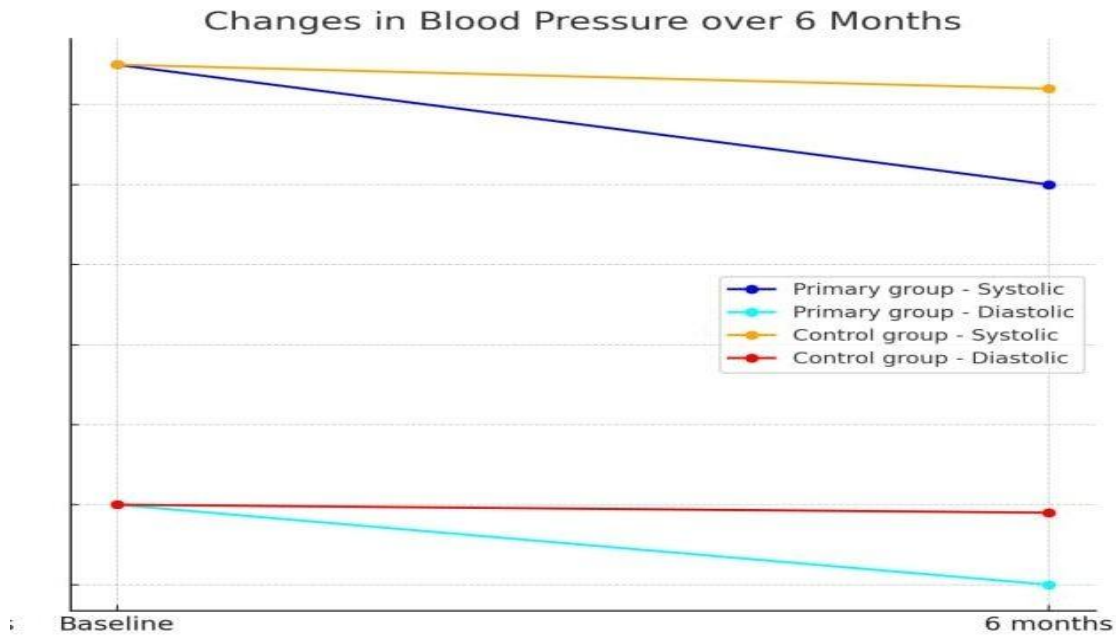
Figure-1
Kidney function indicators



Notably, proteinuria in the experimental group decreased by 20% ($p < 0.01$), suggesting improved kidney filtration. In the control group, proteinuria reduction was only 5%.

Blood pressure in the experimental group dropped by 10% ($p < 0.05$), pointing to beneficial effects on cardiovascular health. Meanwhile, the control group saw only a minor reduction of 2%, which was not statistically significant. (Figure-2)

Figure-2
Changes in blood pressure over 6 months

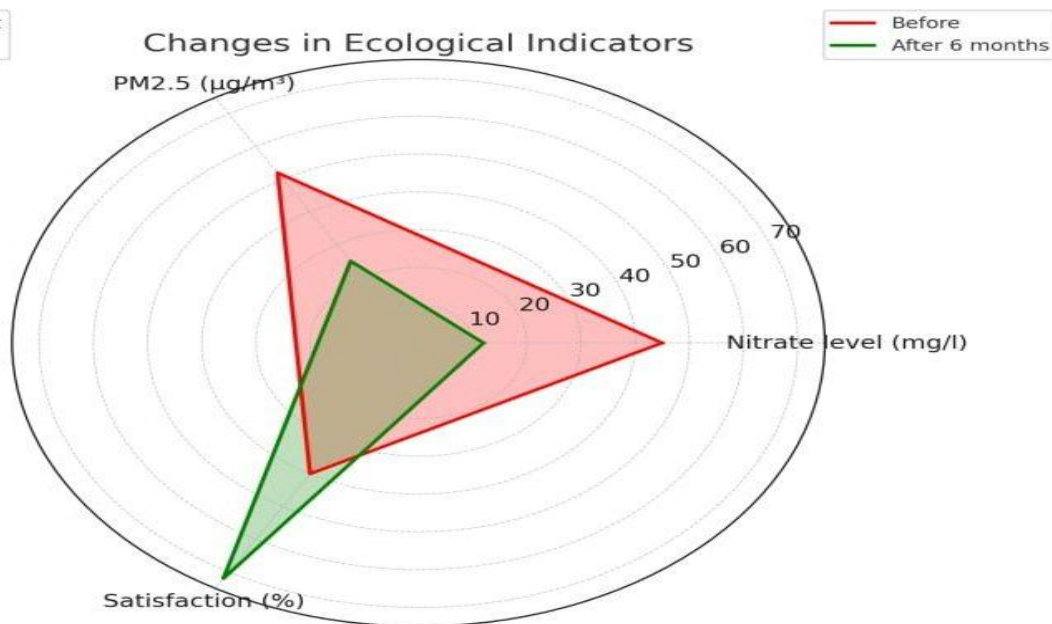


Psychological assessments revealed an 18% decrease in stress levels in the experimental group ($p < 0.05$), signaling better mental health. The control group's stress reduction was limited to just 5%.

The environmental improvements made for the main group of patients were reflected in the following factors:

- Drinking water quality: Nitrate levels decreased from 45 mg/l to 12 mg/l (in accordance with WHO standards).
- Airborne dust (PM2.5): $52 \mu\text{g}/\text{m}^3 \rightarrow 25 \mu\text{g}/\text{m}^3$
- The average living environment temperature and ventilation were improved (based on subjective surveys, 72% of patients were satisfied with the conditions). (Figure-3)

Figure-3
Changes in Ecological indicators



Overall, participants in the ecological rehabilitation group showed significant improvements in

kidney function, cardiovascular health, and mental well-being.



CONCLUSION: The study demonstrated that ecological rehabilitation programs have a positive impact on the clinical condition of patients with chronic glomerulonephritis. By improving access to clean air, water, and reducing environmental toxins, combined with stress management and physical activity, these programs contribute significantly to better patient outcomes.

The findings support the integration of ecological rehabilitation strategies into modern treatment protocols for chronic glomerulonephritis. Further studies on a larger scale, with long-term follow-up, are needed to fully understand the long-term therapeutic benefits of ecological interventions for kidney disease.

REFERENCES

1. Zhang Y., Li H., Wang W., et al. (2020). "Exposure to PM2.5 and Risk of Chronic Kidney Disease: A Population-Based Cohort Study." *Environmental Health Perspectives*, 128(6): 067003. <https://doi.org/10.1289/EHP5840>
2. Liu M., Xu H., Wang Y., et al. (2018). "Industrial Pollution and Glomerular Damage: A Longitudinal Study." *Journal of Nephrology Research*, 10(2): 112–120.
3. Rahman M., Pasha Q., Hossain M.M., et al. (2017). "Nitrate and heavy metal contamination in drinking water and risk of kidney dysfunction." *Environmental Science and Pollution Research*, 24(9): 8491–8501.
4. Feng Y., Zhang X., He M., et al. (2021). "Air Pollution and Chronic Kidney Disease: The Impact of Nitrogen Dioxide and Fine Particles." *BMC Public Health*, 21: 1123.
5. Xu J., Zhao Y., Chen H., et al. (2022). "Environmental Restoration and Kidney Function: A Longitudinal Study of Urban Green Zones." *International Journal of Environmental Research and Public Health*, 19(15): 9450.
6. Smith A., Lee J., Khan F. (2019). "Environmental Rehabilitation Programs Improve Cardiovascular and Renal Biomarkers in At-Risk Populations." *Nephrology Dialysis Transplantation*, 34(3): 478–485.
7. Chen R., Wang J., Huang Y., et al. (2023). "Ecological Interventions and Chronic Disease Outcomes in Industrial Zones." *Environmental Research*, 220: 115010.