IL-4 VNTR POLYMORPHISM AND ITS ASSOCIATION WITH ARTERIAL HYPERTENSION IN OLDER PATIENTS WITH CHRONIC KIDNEY DISEASE

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Abstract

Background: Interleukin 4 (IL-4) is an anti-inflammatory cytokine associated with the Th2 immune response, playing a crucial role in regulating inflammation in chronic conditions such as systemic arterial hypertension (SAH) and chronic kidney disease (CKD). Polymorphisms in the IL-4 gene, particularly the variable number of tandem repeats (VNTR) located in intron 3, have been linked to gene expression modulation and the balance between pro- and anti-inflammatory cytokines. In hypertensive individuals, immune dysregulation involving low IL-4 expression may contribute to chronic vascular inflammation, vascular remodeling, and endothelial dysfunction—central mechanisms in SAH pathophysiology and its progression to CKD. Genetic variants associated with reduced IL-4 levels may increase susceptibility to sustained inflammation, exacerbating kidney damage and cardiovascular risk. Conversely, adequate IL-4 levels may exert protective effects by modulating inflammatory responses that preserve renal and cardiovascular function. Therefore, IL-4 gene polymorphisms may influence renal decline and clinical outcomes in CKD patients, underscoring the importance of genetic and inflammatory profiling in managing hypertension within this population. Purpose: This study investigated the possible association between the VNTR polymorphism in intron 3 and the presence of arterial hypertension in older patients with CKD. Methods: This descriptive study consisted of 51 older patients (mean age 67 ± 10 years), all diagnosed with CKD and undergoing hemodialysis at a private clinic in the Federal District. Venous blood was collected for DNA extraction using the PureLink® Genomic DNA Mini Kit (Invitrogen). Genotyping was performed via polymerase chain reaction (PCR) using IL-4 intron 3-specific primers, followed by 3% agarose gel electrophoresis. The RP1 (183 bp) and RP2 (253 bp) alleles were visualized under UV light (L-PIX Touch, and genotypic frequencies were determined by direct counting. Associations between the RP2 allele and SAH were analyzed using the chi-square test ($\alpha = 0.05$). Results: Among the 30 participants with hypertension, 22 (73.3%) did not carry the RP2 allele, while 8 (26.7%) did. Among the 21 participants without hypertension, 16 (76.2%) did not have the polymorphism, and 5 (23.8%) did. The genotypic distribution was similar between groups, and no statistically significant association was found between the VNTR polymorphism and hypertension ($p = 0.225$). Conclusion: In this sample, the IL-4 VNTR polymorphism was not significantly associated with the presence of arterial hypertension in elderly individuals with CKD undergoing hemodialysis. Implications: While no direct association was observed, exploring immunogenetic polymorphisms

such as the IL-4 VNTR remains essential for understanding inflammatory pathways in CKD and its comorbidities. Identifying genetic markers that influence inflammation could support future development of personalized, effective strategies for managing hypertension in CKD. Further studies with larger, more genetically diverse samples and combined biomarker analyses are needed to clarify the clinical significance of such variants.

Keywords: Polymorphism; Interleukin-4; Inheritance Patterns; Arterial Hypertension; Chronic Kidney Disease