

VDR GENE POLYMORPHISMS ARE ASSOCIATED WITH VITAMIN D INSUFFICIENCY IN ELITE MALE POWER ATHLETES OF KAZAKHSTAN

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Background: Vitamin D plays a vital role in musculoskeletal health, immune function, and athletic performance. Its deficiency is common among elite athletes due to factors such as training environment, season, diet and high physiological demands. Genetic variation may influence individual susceptibility to vitamin D deficiency by affecting its metabolism, transport, and signaling pathways. This study aimed to investigate the association between VDR gene polymorphisms and vitamin D status in elite Kazakhstani athletes.

Materials and methods: A total of 92 elite male power athletes, involved in several Olympic disciplines, were recruited during the summer training period. Serum 25(OH)D concentrations were measured using a chemiluminescent immunoassay. Four common VDR single-nucleotide polymorphisms - FokI (rs2228570), TaqI (rs731236), BsmI (rs1544410), and ApaI (rs7975232) were genotyped using TaqMan real-time PCR. Associations between genotypes and vitamin D were analyzed with linear regression, adjusted for age, BMI, and sports experience.

Results: Vitamin D insufficiency (<30 ng/mL) was observed in 63% of participants, including 38% with deficiency (<20 ng/mL). Among the four studied polymorphisms, only the FokI A/A genotype showed a strong association with vitamin D insufficiency (OR = 9.25, 95% CI: 2.01– 42.51, p <

0.01), while no significant associations were found for TaqI, BsmI, or ApaI. **Conclusion:** Our findings reveal a high prevalence of vitamin D inadequacy among elite male power athletes in Kazakhstan. The VDR FokI A/A genotype is a potential genetic biomarker for vitamin D insufficiency, highlighting the importance of personalized monitoring and targeted supplementation strategies to optimize athlete health and performance. Future studies should investigate additional genetic factors that influence vitamin D metabolism in athletic populations. **Acknowledgement:** This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19680003)

Keywords: Vitamin D deficiency, genetic polymorphisms, athletic performance

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