Effects of a Home-Based Exercise Program on Inflammatory Cytokines and Functional Capacity in Men with Prostate Cancer Under Active Surveillance

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Category: Doctoral

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ABSTRACT

Regular exercise can improve physical fitness, functional performance, and quality of life in men with prostate cancer (PCa); however, few men with PCa meet national physical activity guidelines. Structured, home-based exercise programs may bridge this gap and increase physical activity in men with PCa. **PURPOSE**: This pilot study aimed to investigate the impact of a home-based exercise program on cytokines associated with tumor progression in men with PCa. **METHODS**: A single group, self-controlled study design was used. Fifteen men with PCa under active surveillance were recruited to complete 24 weeks of a home-based exercise program, combining aerobic and body-weight based exercises. The aerobic portion of the intervention included 5 days of light-to-moderate intensity walking for 30 minutes at 40-60% of the participant's heart rate reserve as calculated using the Karvonen formula. Body-weight based exercises were performed 3 times per week consisting of 3 sets of 15 reps of bodyweight squats, inclined push-ups, and hip thrusts. Serum was collected at baseline and end of study to measure circulating eotaxin, interferon (IFN)γ, interleukin (IL)-12, IL-1a, IL-5, IL-6, tumor necrosis factor (TNF)-α, and vascular endothelial growth factor (VEGF) cytokines using an 8-protein multiplex (Millipore Sigma, Billerica, MA). A 6-minute walk test (MWT)was completed at the beginning and end of study to measure physical function. T-tests were performed with significance set to $p < 0.05$. **RESULTS**: A total of 15 men were consented with 9 men completing the intervention (40% attrition due to COVID). At baseline, participants were 70.11 ± 5.42 years of age, weighted 85.31 ± 6.41 kg with a body mass index of 27.77 ± 2.93 kg/m^2. A non-significant tendency was observed for improved 6MWT distance (meters) (Pre: 382.7 ± 108.1; Post: 466.7 ± 73.78; p=0.08). Analysis of circulating cytokines showed tendencies for reduced circulating concentrations (pg/mL) of IFNγ (Pre: 152.9 ± 312.7; Post: 118.9 ± 258.8; p=0.08), and VEGF (Pre: 125.2 ± 198.7; Post: 80.29 ± 124.3; p=0.06) following the intervention. Several other biomarkers showed relevant, though not significant, decreases as well, including IL-12 (Pre: 28.69 ± 32.06; Post: 23.92 ± 19.38; -16.6%), IL-1a (Pre: 78.76 ± 183.3; Post: 65.55 ± 147.7; -16.8%), IL-6 (Pre: 23.71 ± 45.64; Post: 21.24 ± 45.18; -10.4%), and TNF-α (Pre: 24.58 ± 35.4; Post: 19.71 ± 20.76; -19.8%). **CONCLUSION**: Due to institutional COVID-19 protocols limiting in person research visits, six participants declined to continue the study. The small sample size likely accounts for the lack of statistically significant findings. Although the study did not yield statistically significant outcomes, the results of this study show promising indications that a home-based exercise program could be effective in reducing inflammatory cytokines and increasing functional capacity in men with PCa. Further investigation is needed to confirm these results with a powered sample.